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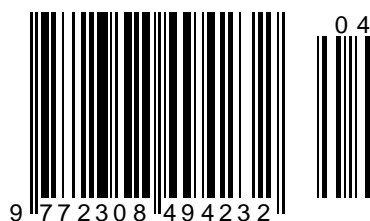
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Article



**Tamar Sekhniashvili**

child and adolescent's rehabilitation center "PUZZLE"  
MA; BCBA, IBA  
Clinical Director

**Tamara Turashvili**

University of Georgia  
Ph.D, Associate Professor  
Lecturer at Georgian institute of Public Affairs (GIPA)  
+996568717272

[Tamara.turashvili@gmail.com](mailto:Tamara.turashvili@gmail.com)

## WELLBEING AT WORK: EXAMINE THE RELATIONSHIP OF WORKPLACE PERMA PROFILER FACTORS WITH BEHAVIORAL THERAPIST

**Abstract:** The key factors to the success of an organization are employee's wellbeing as well as understanding human and intellectual resources. Leaning upon the premises of positivist psychology, the present research aimed at studying workplace wellbeing of behavioral therapists in Georgia and exploring wellbeing as a predictor of happiness. The study was carried out in three stages. Stage 1 included pilot study with translating and administrating instruments, while the actual research was conducted as part of stages 2 and 3 in 2020 and 2022, respectively. The findings supported our assumption: Workplace wellbeing significantly predicted perceived happiness, showing that the higher the perception of workplace wellbeing among behavioral therapists, the higher the rates of subjective happiness. After examining potential changes in the mean scores of The Workplace PERMA Profiler scales in 2022 compared to the 2020 study, we want to say that the only scale that did not undergo any statistically significant changes was the positive emotions scale.

**Key words:** Workplace wellbeing, subjective happiness, behavioral therapist, PERMA profile.

**Language:** English

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### Introduction

#### Literature Review and Hypothesis

The number of children and adults with autism spectrum disorder (ASD) has been increasing each year. Children with ASD require permanent therapeutic support. Behavioral therapists and behavior analysts perform interventions based on applied behavior analysis (ABA). ABA is a learning theory-based scientific discipline, which, by studying and changing social factors, is focused on teaching socially important behaviors and reducing the behaviors that impede individual's integration in a society (Baer, Wolf, & Risley, 1986). Today, ABA is

one of the scientifically proven methods to diminish ASD symptoms (Cooper et al., 2007).

Positive psychological processes and mechanisms lead to healthy outcomes, such as job satisfaction, psychological wellbeing, security, sense of one's competence, self-efficiency or personal growth. Such state of health and wellbeing should be a goal for an ideal organization (Turner, 2002). Wellbeing is defined as a cognitive and affective assessment of one's life, and involves emotional attitudes and cognitive judgments regarding satisfaction and self-fulfillment (Diener et al., 2010).

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Sonja Lyubomirsky argues that happy people enjoy more success than their less happy peers and this success stems from experiencing positive emotions (Lyubomirsky et al., 2011). Given that the majority of people spends most of their time at work, success at workplace is very important with emphasis made on outcomes that are connected to career, teamwork. Happiness is linked to work independence, job satisfaction, work performance, pro-social behavior, social support, popularity, and income. Additionally, happy people get positive appraisal from their colleagues and bosses and the likelihood of burnout and absenteeism is lower.

Sonja Lyubomirsky shares the idea (Walsh et al., 2018) that positive and negative emotions are adaptive in different contexts (Oishi, Diener, & Lucas, 2007) and it is not imperative for a person to feel only happy.

A happy employee makes more effort at work (George, 1995; Langelaan, Bakker, van Doornen, & Schaufeli, 2006) and the quality of their engagement is higher (Bakker & Demerouti, 2008). In 2008, it was hypothesized that happiness fosters success. In line with this, and leaning upon research, we assume that there should be a strong link between workplace wellbeing and subjective happiness. More specifically, we hypothesize that workplace wellbeing will predict subjective happiness among behavioral therapists.

People spend huge part of their lives at work, which, in turn, plays enormous role in development of their identities. Developing positive work-related identity increases the likelihood of thriving at work. Individual's personality is often determined by their role at work. High levels of positive identity lead to individual's perceptions as to how they feel at work, what is their role at the organization, and whether the work performed by them is their calling (Wrzesniewski, 2003). Work-related positive identity – when an employee's strengths are emphasized, when their work is perceived as valuable, when psychosocial functioning is enhanced and positive emotions are experienced during the work process – helps employee thrive (Rothbard & Patil, 2012). The outcomes of this thriving or “flourishing” include increased engagement in work-related activities, vitality, enthusiasm toward work-related tasks, steadiness, cultivating values and unconditional self-commitment (Rothbard & Patil, 2012).

From the positivist psychology perspective, wellbeing is not limited to the absence of negative function, but rather it implies something more. In other words, the absence of negative affect, depression, loneliness or illness does not necessarily entail the presence of positive affect, happiness, trust or social interactions. Different theories propose multidimensional models (e.g., Baltes & Baltes, 1990; Forgeard et al., 2011; Huppert & So, 2013; Friedman & Kern, 2014; Ryff & Keyes, 1995). Julie Butler and Margaret Kern propose that “flourishing” is an

optimal dynamic condition of psychosocial functioning originated from successful functioning in numerous psychosocial domains (Kern & Butler, 2016). They suggest that there is no single best model, although different conceptualizations can prove to be useful to obtain an abstract construct of wellbeing and to measure particular domains. Specifically, they focus on the theory proposed by Seligman: Positive emotions, engagement, relationships, meaning, and accomplishment (Seligman, 2011).

1. *Positive emotions.* People can experience both positive and negative emotions at the same time (Watson & Tellegen, 1985). Martin Seligman argues that happiness and life satisfaction, as subjective indices, should be incorporated into the element of positive emotions (Seligman, 2011). Positive emotions at work enhance cognitive functioning and provide social resources which is a prerequisite for “flourishing” in a team and lead to professional satisfaction and creativity (Roberts & Creary, 2012).

2. *Engagement* is a multidimensional construct (Law et al., 1998; Rich et al., 2010), a psychological condition during which people are focused on the activity that is being performed by them (Forgeard et al., 2011). Similar to positive emotions, engagement is assessed subjectively :”“Did time stop for you?” “Were you completely absorbed by the task?” “Did you lose self-consciousness?””(Seligman, 2011). Engagement in work-related activities at an organization includes intense concentration, the state of being absorbed (Schaufeli, Bakker, & Salanova, 2006; Csikszentmihalyi, 1990).

3. *Relationships.* Social interactions are of fundamental importance to human life (Berscheid & Reis, 1998). Social support is related to reduced depression, improved physical health, reduced risk of death, and other positive outcomes (Tay et al., 2012; Taylor, 2011).

4. *Meaning.* There is no uniform interpretation of meaning. It is defined as life's ontological meaning experienced by individual (Crumbaugh & Maholick, 1964, p. 201), belonging and serving to what one considers bigger than oneself (Seligman, 2011) or simply an answer to the question: “What is the meaning of my life?” (Baumeister, 1992).

5. *Accomplishment.* People often strive to achieve a goal even when this goal cannot bring positive emotions (Seligman, 2011). Accomplishing a goal can be seen as obtaining success and mastery in a specific domain at the highest level (Ericsson, 2022).

The present study deals with the relationship between these important variables. This is the first study carried out in Georgia examining workplace wellbeing and happiness among behavioral therapists with findings having practical implications, both for those working in organizational psychology, in general, and for the organizations that serve children and adults with ASD, in particular, as well as for anyone interested in the field.

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### Method

#### *Participants and Procedure*

The study was carried out in two stages at *Puzzle*, the Center for Rehabilitation of Children and Adolescents.

51 respondents participated in Study 1 (2020) with five males only. The mean age was 27 ( $SD = 6.03$ ) with minimum age of 20 and maximum of 54. 29 of them were single, 22 were married or in a relationship. Out of 17 married respondents, 13 had a child or children (eight were a parent of a single child, four had two children, and one had three children).

By the time of conducting Study 2 (2022), the number of behavioral therapists at *Puzzle* has increased. Therefore, the study participants included 83 therapists with only four male respondents. Their age varied from 21 (minimum) to 56 (maximum). 32 of them were married, 14 were in a relationship and 37 were single. 55 out of 83 participants had a child or children.

During Study 1, part of the behavioral therapists used a pen-and-pencil method to fill out the questionnaire. Participants placed their filled out questionnaires in a box, which was placed in a working space. The questionnaire was filled out independently. The rest of the behavioral therapists filled out the questionnaire online via Google Drive's Google Forms. The time required for filling out the questionnaire was 30-35 minutes on average.

The research started only after obtaining the IRB ethic's approval. Filling out the questionnaire was voluntary. Prior to administering it, all participants read the informed consent. Therapists who participated in a pen-and-pencil method received verbal instructions regarding the goals of the study, rules of filling out the questionnaire and confidentiality of their participation. Those therapists who participated in an online survey received same information through text, in the beginning of the questionnaire. IP addresses have been deleted after completing the questionnaire while no emails or names were recorded. Data safety and privacy protection was ensured.

#### *Instruments*

*The Workplace PERMA Profiler* (Kern, 2014) and *Subjective Happiness Scale* ([HNS], Lyubomirsky & Lepper, 1999) were translated in Georgian and used in the pilot study with 42 participants who filled out the questionnaires online via Google Forms. No language-related or technical inaccuracies were found. Thus, the instruments were used in the next two stages of the research to test out hypothesis.

*The Workplace PERMA Profiler* (Kern, 2014). In his 2011 book, *Flourish*, Martin Seligman proposed his theory on wellbeing, which consists of five elements: Positive emotions (P), engagement (E),

relationships (R), meaning (M), and accomplishment (A). Based on this theory, Margaret Kern (2014) developed research instrument to assess workplace wellbeing profile. After conducting three studies ( $N = 7,188$ ), the questionnaire initially included 15 items. Eight items were added later to assess general state, negative emotions, loneliness, and physical health. Eight studies ( $N = 31,966$ ) were carried out to test the psychometric properties of the measure.

Currently, the questionnaire contains 23 items assessing five domains (positive emotions, engagement, relationships, meaning, and accomplishment). 15 items (P1, P2, P3, E1, E2, E3, R1, R2, R3, M1, M2, M3, A1, A2, A3) measure wellbeing, three items (N1, N2, N3) measure negative emotions, another three items (h1, h2, h3) measure self-reported physical health, and one item measures perceived loneliness. Answers are given on an 11-points Likert-type scale with 0 = *not at all, never or very bad* depending on items, and 10 = *very much, always or completely* depending on items. The items should be presented in original order. Items regarding health and negative emotions are for gathering additional information. For PERMA profile, it is possible to use 16 items, three domains and one general question; however, the author recommends using it in its complete form.

*Subjective Happiness Scale* ([HNS], Lyubomirsky & Lepper, 1999) consists of four items measuring subjective happiness in general, as well as how one views oneself against one's own peers. The questionnaire allows for assessing internal consistency. Answers are given on a Likert scale with 1 = *never happy at all* and 7 = *very happy* for the first item, 1 = *less happy* and 7 = *more happy* for the second item, and 1 = *not at all* and 7 = *great deal* for the third and fourth items.

### Results

#### *Study 1*

According to Study 1 (conducted in 2020), the mean scores for the variables in question were as follows:  $M = 8.36$  ( $SD = .90$ ) for workplace wellbeing (computed with the scores of positive emotions, engagement, relationships, meaning, and accomplishment [PERMA's  $\alpha = .86$ ]; alternatively, the total score can be computed with the scores of negative experiences, perceived loneliness, and self-reported health state, but the score obtained through this method was almost the same [ $M = 7.92$ ,  $SD = .99$ ]; these factors were used for additional statistical analysis which will be reviewed later), and  $M = 20.29$ ,  $SD = 4.62$  ( $\alpha = .74$ , maximum score = 28) for perceived happiness. Respondents' data for both variables were normally distributed with satisfactory internal consistency coefficients for both scales.

In line with the proposed hypothesis, regression analysis showed that workplace wellbeing positively predicted perceived happiness,  $\beta = .42$ ,  $t(49) = 3.28$ ,  $p$



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= .002, although wellbeing was responsible for only 18% of variability in perceived happiness,  $R^2 = .18$ ,  $F(1, 49) = 10.73$ ,  $p = .002$  (see Table 1).

**Table 1. Regression (Outcome variable: Perceived happiness,  $R^2 = .18$ ).**

	<b>b</b>	<b>SE</b>	<b><math>\beta</math></b>	<b>95% CI</b>
<i>Constant</i>	1.82	5.67		[-9.57; 13.22]
<b>Workplace wellbeing</b>	2.21	.68	.42	[.85; 3.57]

Independent samples t-test was performed to test whether there were any significant differences between respondents with different relationship/family status. T-test showed that the participants who said they were married or in a relationship ( $N = 22$ ,  $M = 8.64$ ,  $SD = .82$ ) scored

slightly higher on workplace wellbeing than single respondents ( $N = 29$ ,  $M = 8.15$ ,  $SD = .89$ ),  $t(49) = 2.03$ ,  $p = .048$ ,  $d = .57$ , 95% CI [.004; .982]. No other intergroup differences were revealed, including no significant differences in regard to having children.

**Table 2. Correlations between workplace PERMA profile blocks.**

	<i>P</i>	<i>E</i>	<i>R</i>	<i>M</i>	<i>A</i>	<i>N</i>	<i>H</i>	<i>Lon</i>	<i>Hap</i>
<i>P</i>		.522**	.713**	.523**	.438**	-.378**	.501**	-.498**	.742**
<i>E</i>	.522**		.586**	.662**	.400**	-0.205	0.177	-.466**	.420**
<i>R</i>	.713**	.586**		.603**	.353*	-.299*	.429**	-.610**	.653**
<i>M</i>	.523**	.662**	.603**		.536**	-.426**	0.257	-.486**	.511**
<i>A</i>	.438**	.400**	.353*	.536**		-0.222	0.237	-0.25	.310*
<i>N</i>	-.378**	-0.205	-.299*	-.426**	-0.22		-.284*	.403**	-.285*
<i>H</i>	.501**	0.177	.429**	0.257	0.237	-.284*		-.400**	.342*
<i>Lon</i>	-.498**	-.466**	-.610**	-.486**	-0.25	.403**	-		-
							.400**		.545**

Note.  $N = 51$ , \* $p < .05$ , \*\* $p < .01$  ( $P =$  positive emotions,  $E =$  engagement,  $R =$  relationships,  $M =$  meaning,  $A =$  accomplishment,  $N =$  negative emotions,  $H =$  health,  $Lon =$  loneliness,  $Hap =$  Happiness).

As Table 2 shows, PERMA components were mainly inter-correlated. In most of the cases, there were statistically significant positive correlations, while loneliness and negative emotions correlated negatively with other blocks of the instrument. Correlation of positive emotions with relationships ( $r(49) = .71$ ,  $p < .01$ ) and happiness ( $r(49) = .74$ ,  $p < .01$ ) were among the strongest positive correlations, while the strongest negative correlation, not

surprisingly, included that between loneliness and relationships ( $r(49) = -.61$ ,  $p < .01$ ).

Additionally, a tendency for higher mean scores (out of maximum of 10) was revealed for almost every block, especially for the meaning component ( $M = 9.1$ ). On the other hand, mean scores for negative emotions and loneliness were fairly low (see Table 3), suggesting that therapists were less likely to experience those feelings.

**Table 3. Central tendency measures and standard deviations for workplace PERMA components.**

	<b>P</b>	<b>E</b>	<b>R</b>	<b>M</b>	<b>A</b>	<b>N</b>	<b>H</b>	<b>HAP</b>	<b>LON</b>
<b>MEAN</b>	8.1	8	8.1	9.1	8.5	3.9	7.5	8.3	2.5
<b>MEDIAN</b>	8.3	8.3	8.3	9.3	8.7	3.3	8	8	2
<b>MODE</b>	8.3	9	9	9.7	9	3.3	9	8	0
<b>STANDARD DEVIATION</b>	1.3	1.2	1.2	0.9	1	2.1	2.2	1.4	2.5
<b>MINIMUM SCORE</b>	3.7	4.7	4.7	6.3	6	0	1.7	4	0
<b>MAXIMUM SCORE</b>	10	10	10	10	10	8.3	10	10	8

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**Study 2**

To understand the relationships between different scales of workplace PERMA, Pearson correlation coefficients were computed (See Table 4).

Loneliness significantly (at .01 level) and positively correlated with meaning, general wellbeing (at .05 level) and negative emotions (at .05 level). No

other significant correlations were found for loneliness.

No significant correlations were found for the accomplishment scale with the only exception being its link to general wellbeing ( $r(77) = .518, p < .01$ ).

General wellbeing, in turn, had significant correlations with every scale.

**Table 4. Correlations between Workplace PERMA components.**

	Positive emotions	Engagement	Relationships	Meaning	Accomplishment	General wellbeing	Negative emotions	Health	Loneliness
Positive emotions		.330**	.205	.649**	.146	.757**	.589**	.284**	.078
Engagement	.330**		.423**	.184	.170	.576**	.294**	.257*	.037
Relationships	.205	.423**		.193	.215	.616**	.536**	.359**	.127
Meaning	.649**	.184	.193		.000	.656**	.636**	.277*	.477**
Accomplishment	.146	.170	.215	.000		.518**	.109	.178	.050
General wellbeing	.757**	.576**	.616**	.656**	.518**		.712**	.430**	.269*
Negative emotions	.589**	.294**	.536**	.636**	.109	.712**		.398**	.257*
Health	.284**	.257*	.359**	.277*	.178	.430**	.398**		-.001
Loneliness	.078	.037	.127	.477**	.050	.269*	.257*	-.001	

\*\* Correlation is significant at .01 level.  
\* Correlation is significant at .05 level.

Paired samples t-test was used to examine potential changes in the mean scores of The Workplace PERMA Profiler scales in 2022 as compared to 2020 study (See Table 5).

As shown in Table 5, the only scale that did not undergo any statistically significant changes was the positive emotions scale (Mean difference = .40,  $t = 1.68, p > .05$ ).

At .05 level, statistically significant reduction emerged for the meaning scale (Mean difference = .33,  $t = 2.047, p < .05$ ) with the weak effect size of .03.

As for the rest of the scales, the mean scores obtained in 2020 and 2022 were different from each other at .01 level of significance.

**Table 5. Mean differences between components of The Workplace PERMA Profiler as obtained in Study 1 (2020) and Study 2 (2022).**

	M (2022)	SD (2022)	M (2020)	SD (2020)	Mean Difference	t	sig.
Positive emotions	8.51	1.43	8.11	1.29	.40	1.684	.095
Engagement	6.84	.86	8.03	1.24	-1.19	-6.010	.000
Relationships	7.04	1.11	8.12	1.16	-1.08	-5.314	.000
Meaning	8.75	.94	9.08	0.89	-0.33	-2.047	.043
Accomplishment	6.86	1.44	8.48	1.02	-1.62	-7.553	.000
General wellbeing	7.61	.76	8.36	0.89	-.75	-4.971	.000
Negative emotions	8.14	1.45	3.88	2.13	4.26	12.596	.000
Health	6.26	1.03	7.49	2.16	-1.23	-3.813	.000
Loneliness	8.29	1.70	2.49	2.52	5.80	14.442	.000

**Impact Factor:**

<b>ISRA (India)</b> = 6.317	<b>SIS (USA)</b> = 0.912	<b>ICV (Poland)</b> = 6.630
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Reduction in mean scores occurred for the following scales:

- Engagement (Mean difference = -1.19,  $t = -6.010$ ,  $p < .01$ ), effect size = .21 (strong);
- Relationships (Mean difference = -1.08,  $t = -5.314$ ,  $p < .01$ ), effect size = .18 (strong);
- Accomplishment (Mean difference = -1.62,  $t = -7.553$ ,  $p < .01$ ), effect size = .31 (strong);
- General wellbeing (Mean difference = -.75,  $t = -4.971$ ,  $p < .01$ ), effect size = .16 (strong);
- Health (Mean difference = -1.23,  $t = -3.813$ ,  $p < .01$ ), effect size = .10 (moderate).

Increase in mean scores occurred for the following scales:

- Negative emotions (Mean difference = 4.26,  $t = 12.596$ ,  $p < .01$ ), effect size = .55 (strong);
- Loneliness (Mean difference = 5.80,  $t = 14.442$ ,  $p < .01$ ), effect size = .62 (strong).

Effect size shows what percentage of difference can be accounted for by the difference in years. Specifically, the guideline suggests the following interpretations of the effect sizes:

- .01 = weak effect;
- .06 = moderate effect;
- .14 = strong effect.

Additionally, t-test was used to examine the changes in happiness mean scores in 2020 as compared to 2022 study. No statistically significant changes emerged between 2020 ( $M = 4.82$ ,  $SD = 1.042$ ) and 2022 scores ( $M = 5.07$ ,  $SD = 1.156$ ), with mean difference of  $-0.258$ ,  $t = -1.29$ ,  $p > .05$ .

Prior to performing regression analysis, correlation was computed between workplace PERMA and perceived happiness. Strong positive correlation emerged between the two variables,  $r(77) = .748$ ,  $p = .000$ .

Linear regression was used to test the predictive power of workplace wellbeing on perceived happiness (see Tables 6, 7, & 8). As the tables show, regression model was statistically significant,  $F = 97.549$ ,  $p = .000$ .

**Table 6. ANOVA.**

ANOVA <sup>a</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	141.414	1	141.414	97.549	.000 <sup>b</sup>
	Residual	111.624	77	1.450		
	Total	253.038	78			
a. Outcome Variable: Happiness						
b. Predictors: (Constant), PERMA						

Regression analysis supported the hypothesis, demonstrating that workplace wellbeing (PERMA)

emerged as a significant positive predictor of perceived happiness,  $\beta = .75$ ,  $t = 9.877$ ,  $p < .001$ .

**Table 7. Beta coefficients.**

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-6.007	1.365		-4.402	.000
	PERMA	1.763	.178	.748	9.877	.000
a. Outcome Variable: Happiness						

Given the findings, regression equation can be produced: Happiness =  $-6.007 + \text{PERMA} * 1.763$  (See Table 8). As the Table 8 shows, PERMA was

responsible for explaining 56% of the variability in perceived happiness.

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**Table 8. Model summary**

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.748 <sup>a</sup>	.559	.553	1.204
a. Predictors: (Constant), PERMA				

**Discussion**

In the 21<sup>st</sup> century characterized by constant challenges, the global reassessment of values and needs to ensure improvement of relationships between an employee and an organization never lacks relevance.

The goal of the present research was to study the sense of workplace wellbeing among behavioral therapists employed in Georgia.

Although the research was carried out in a single rehabilitation center and the limited sample size does not allow for generalizations of the findings, it is still possible to make a certain prediction.

The sense of workplace wellbeing of behavioral therapists is an important factor for the development of both, rehabilitation centers and ABA in Georgia as well as for the physical and mental health of an employee in general. Having analyzed the data of 2020 and 2022, it can be argued that the level of workplace wellbeing had been decreased significantly in these two years. In line with our assumption, workplace wellbeing and subjective happiness were positively related; moreover, workplace wellbeing positively predicted subjective happiness. (Lisa C. Walsh<sup>1</sup>, Julia K. Boehm<sup>2</sup>, and Sonja Lyubomirsky<sup>1</sup>, 2018) The results of two studies carried out in 2020 and 2022 clearly suggest that the higher the perception of workplace wellbeing, the higher the level of perceived happiness among behavioral therapists. In turn, as other research shows, perceived happiness at workplace increases the value of the work for an employee, their goals, enhances positive relationships, the sense of belonging to a team, leading, altogether,

to higher level of success. (Lyubomirsky, S., Dickerhoof, R., Boehm, J. K., & Sheldon, K. M., 2011).

It should also be noted that positive significant correlations emerged between the components of workplace wellbeing (The Workplace PERMA Profiler). Particularly striking was the correlation between positive emotions and engagement in 2020 study; interestingly, the mean score of positive emotions was an exception in that, unlike other components, it did not undergo statistically significant changes in 2022.(Boehm & Lyubomirsky, 2008; Connolly & Viswesvarch, 2000)

The present research has several limitations. Firstly, the workplace wellbeing measure was translated in Georgian without being adapted to Georgian context. Secondly, the size of the sample does not allow for generalization of the findings to other organizations or Georgian population in general.

Future research should focus on relatively larger sample of behavioral therapists, assessing workplace wellbeing of other behavioral therapists in other rehabilitation centers in Georgia, which would allow for more accurate and convincing findings and support the growth and development of organizations in the field. As a result of the global pandemic (COVID-19), rehabilitation centers have been facing new challenges. Working styles have been changed with interventions mediated by parents being carried out remotely. Therefore, measuring other factors, not included in the present research, might prove valuable and might even completely change the findings of the correlational analysis performed in our study.

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Otabek Safaralievich Eshonkulov

Samarkand State Institute of Foreign Languages

teacher of German

Uzbekistan

## COMPARATIVE ANALYSIS OF GERMAN LANGUAGE TEACHING METHODS: EFFECTIVENESS AND PRACTICAL APPLICATION

**Abstract:** This article discusses the causes of the main difficulties that arise when learning German as a second foreign language on the basis of English. This study examines the causes of the most typical difficulties in mastering the grammar of a second foreign language (German) under the interfering influence of the first foreign language (English) and native Russian, and ways to overcome these difficulties.

**Key words:** German, English, interference, second foreign language, comparative linguistics, contrastive linguistics.

**Language:** English

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### Introduction

Proficiency in a foreign language is one of the main requirements for employers in the labor market in the modern world, since in all international firms, company documentation and business correspondence are carried out in a foreign language. Knowledge of a foreign language at a high professional level gives great prospects to young professionals where there is a need for knowledge of a foreign language at a high level. And in modern society, the need for specialists who speak several foreign languages is growing, so in many universities students study several foreign languages.

Foreign languages such as English and German are studied intensively in many higher education institutions. But the study of several foreign languages is associated with a number of difficulties in their simultaneous mastery. This article discusses the causes of the main difficulties that arise when learning German as a second foreign language on the basis of English. Teaching experience shows that students who speak their first foreign language (English) have difficulties in mastering a second foreign language (German), especially in free expressions in a foreign language. This is due to the fact that the grammar of the German language seems to be the most difficult to

learn, and it should also be noted that most of the mistakes made by Russian-speaking students when learning German are due to interference, that is, the influence of Russian and the first foreign language (English) being studied on the second foreign language. (German).

Both the difficulties in learning a foreign language, and the analysis of errors, and the correction of errors have long been the subject of scientific research in various aspects. Most of the work in this area is related to language difficulties, their prediction and overcoming.

As for research in the field of teaching foreign languages to Russian-speaking students studying German, in this context, the work of K. Kleppin is interesting, where the author lists some methods for analyzing speech errors, taking into account different degrees of learning, discusses the causes of errors, reflects on the assessment of errors and many options for correcting [Kleppin 1998]. The works of R. Schmitt [2011] are of practical importance in predicting language errors. R. Hessky shows interlingual equivalent relations and differences that can cause difficulties in learning foreign languages [Hessky 1994].



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Thus, the purpose of this article is to identify the causes of the most typical difficulties in mastering the grammar of a second foreign language (German) with the interfering influence of the first foreign language (English) and the native Russian language and to consider ways to overcome these difficulties.

To achieve this goal, it is necessary to consider the main difficulties in studying the grammar of the German language in a comparative aspect. Comparative linguistics is a branch of general linguistics that has been actively developing since the middle of the 20th century. Important Benchmarking Research.

Ignatova M.N., Galchenko S.I., Goncharova N.V. The comparative aspect in teaching the grammar of German as a second foreign language on the basis of English began with the book by Robert Lado "Linguistics over the borders of cultures", published in 1957. The basic principles of this work and other studies in the field of second language learning were developed in the 1960s and 70s. It was based on the ideas presented in linguistic relativity (the Sapir-Whorf hypothesis) that linguistic structures influence cognitive thinking. In the case of learning a foreign language, this is an automatic transfer of the system of rules of one language to another [Lado 1989].

In science, the issue of comparative (contrastive) linguistics and linguistic typology, their demarcation or, conversely, their interconnections, has been actively discussed.

The goal of contrastive linguistics is the study of two or more languages through comparison and the identification of similarities and differences at all levels of the language. The subject of comparative analysis can be a separate linguistic phenomenon, not only in two, but also in several languages. The objects of comparative analysis are phonemes, words, grammatical rules and even texts at all levels of the language. Contrastive studies can be carried out on the basis of several languages [Lutfullina 2017: 16-18; Sternemann 1989: 80-84].

From the experience of observing students learning a second language, it is noted that they basically repeat the same grammatical, lexical, phonetic mistakes as the previous ones. It was then that the assumption arose that mistakes were made due to the fact that the first language studied by the student interfered with the assimilation of the second.

The main goal of contrastive linguistics is to find similarities and differences in compared languages. Particular attention is paid to dissimilar, contrasting features of languages. The theoretical and practical goal of the comparative study of several languages is the development of a partial grammar, the content of which describes the differences between the grammar of the native language and the grammar of the target language [Lutfullina 2017: 16-18; Admoni 1964: 45].

Therefore, the results of a comparison of several languages are needed to overcome and anticipate the

difficulties and avoid mistakes that arise when learning a second foreign language.

In this regard, guided by the general, theoretical and applied tasks of comparative (contrastive) linguistics, students who study German as a second foreign language must, under the guidance of a teacher, master the following skills:

- identify similarities and differences in the use of language means of the first foreign, second foreign and native Russian language;
- to anticipate and overcome unwanted interlingual interference;
- identify similarities and differences in the compared languages [Lutfullina 2017: 6-7].

Thus, the comparative aspect in teaching the grammar of German as a second foreign language helps to solve many practical problems in teaching foreign languages:

- identification of possible problems in the study of a second foreign language, appearing due to interlingual discrepancies;
- selection of grammatical material;
- definition of stages of presentation of new grammatical material;
- use of effective teaching methods and ways of explaining grammatical material;
- development of rational exercises aimed at overcoming interlingual interference and creating an effective set of communicative exercises;
- clarification and analysis of typical mistakes that occur when mastering a second foreign language.

At the same time, it should be emphasized that students studying German, on the one hand, should be able to correctly use the grammatical system of the studied second foreign language when constructing speech statements, as well as see and identify similarities and differences between their native and first foreign languages, and on the other hand, they must be able to predict possible errors and analyze statements that do not correspond to grammatical norms. In addition, they must have a clear understanding of learning a second foreign language and the most common difficulties.

An example is a table that compares and contrasts the grammatical phenomena of several languages (see table).

"Word Order in a Sentence in German, English and Russian"

Subject	Predicate	Minor members	Minor members
---------	-----------	---------------	---------------

Sie geht heute ins Kino.

Heute geht sie ins Kino.

She goes to the cinema today.

She goes today to the cinema.

She is going to the cinema tonight.

She is going to the cinema today.

She is going to the cinema today.

This table, using a comparative analysis, clearly shows the features of word order in a sentence in three

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languages. Therefore, based on this example, one can make clear generalizations and conclusions about this grammatical phenomenon of the German language.

The selected grammatical material and a specially designed set of exercises should allow students to perform communicative exercises and tasks using specially selected authentic material. Authentic communicative exercises help to use various grammatical forms and constructions in the preparation of sentences and dialogues, as well as monologues. It is necessary to evaluate any grammatical phenomenon before its inclusion

Ignatova M. N., Galchenko S. I., Goncharova N. V. Comparative and comparative aspect in teaching the grammar of German as a second foreign language on the basis of English in an educational and

methodological complex of communicative exercises in authentic situations of communication.

Thus, the use of the comparative aspect in teaching the grammar of German as a second foreign language on the basis of English allows students studying German as a second foreign language to master skills that help predict and overcome typical difficulties and mistakes that arise in the process of learning a non-native language, allows to solve a number of practical problems in the field of teaching foreign languages, and also, using a specially designed set of communicative exercises using grammatical structures, to achieve the required level of communicative competence, which is the ultimate goal of learning any foreign language.

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Article



**Nargiza Mardanovna Suleymanova**

Samarkand State Institute of Foreign Languages  
PhD in Philological Sciences, Associate Professor  
Uzbekistan

**Sarvinoz Solekhonovna Alavkhonova**

Samarkand State Institute of Foreign Languages  
teacher of English  
Uzbekistan

## TRANSFERING OF LANGUAGE SIGNS INTO SPEECH

**Abstract:** This article deals with the problem of the transition of linguistic units into speech. As we know, in the twentieth century a significant event took place in linguistic science – the need for separate study of language and speech was realized. More F.de Saussure talked about the need to divide linguistic science into two areas – language and speech.

**Key words:** speech, syntactic structure, nominatives, synergetic, language units.

**Language:** English

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### Introduction

The requirements to distinguish between language and speech were a great positive event in 20th century linguistics. The "language and speech" dichotomy was scientifically substantiated by F. de Saussure. Despite this, it is the real essence of the matter is only now being expressed. The proof of this is that speech linguistics has received a special scientific status today we will see. This, of course, is inextricably linked with the name of Saussure. The scientist gave a lecture on general linguistics to the students of the University of Geneva emphasized the following: "Yes, gentlemen, I ask you to notice the same linguistics, but the field of it is very wide. Linguistics consists of two parts: one is passive close to the language, the other active in speech".

It seems that F. de Saussure predicted in his time that linguistics should be divided into two parts: language and speech linguistics. Obviously, languages until the present period of the development of the science of linguistics problems were thoroughly studied. However, the scientific basis of speech linguistics has just been recognized and it is being given a chance to live.

In our opinion, this is of great importance, since at the same time the problems of external linguistics have also taken place on the agenda of our research, through which the human factor is also the most powerful cognitive-pragmatic tool is being studied. Therefore, he emphasizes that 21st century linguistics has an anthropocentric status.

It should also be said that all issues studied by cognitive linguistics require the substantive aspects of language elements. In addition, such issues are investigated in foreign linguistics includes objects. In other words, the problems of cognitive linguistics are the system, its realization, internal system unit's deals with issues such as their connection, their transfer from language to speech, etc. The main research objects of cognitive linguistics, in our opinion, is integral with the communicative function of language will be connected. Therefore, E.A. According to Popova, cognitive linguistics is not the only field that studies the relationship between language and the human factor we completely agree with his opinion. The following comments he made in this regard are instructive: "... anthropological epithet is the most convenient and correct concept in the study of the

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current paradigm of the language. After all, it is possible to study not only the cognitive nature of the language, but also its functional and communicative aspects" [4, 71].

In today's linguistics, the text is shown as the main unit of the communicative process, in which all the units of the language intersect. However, the text consists of sentences. Of course, we note in the text that the language is used in speech in a broad sense. But it should also be said that the individual use of language occurs through sentences. Therefore, it is appropriate to interpret the sentence as the basic and minimal unit of the communicative process.

In modern linguistics, a unit of communication is called a discourse. And the sentence (высказывание) in most cases requires this very thing.

At this point, although there is a digression, we found it necessary to briefly dwell on the concepts of phrase and sentence. Both concepts of sentence and phrase are actively used in our language. However, phrases and sentences are not mutually exclusive concepts. The concept of a phrase includes all the syntactic structures used in our speech in most cases. In it neither predicative devices nor non-predicative devices are distinguished. The concept of a sentence includes a grammatical event, and therefore it is special requires a category.

However, it should also be said that in many sources, the concept of a phrase is interpreted as a common phenomenon with a sentence. And in some cases the main attention is paid to the concept of a sentence. The concept of speech remains secondary. In this regard, V.B. Kasevich notes the following: "Sometimes we even come across comments that the concept of a sentence was invented by linguists, but in practice there is no such unity" [2, 95].

Emil Benvenist emphasizes that the individual act, which is an important tool when we use language, first of all activates the speaker as a parameter of the speech process. Until a sentence is formed that the language exists in the form of a unique opportunity, and that after the speech process begins, it acts on a person through sounds specifically mentions that it becomes an active tool that creates conditions [1, 313].

In our opinion, it is in this process that the speaker's pragmatist activity begins, and the linguistic units necessary for each sentence are gradually transferred from language to speech. Otherwise in other words, at the same time, the inductive method of using language units in speech is active, and as a result, the text is formed. From a pragmatic point of view, this is the illocutionary plan of the speaker will be done.

Of course, all these events are connected with the communicative process, because in this place the speaker (human factor) plays an important role. W.L. Chafe emphasizes that the psychological state of the

speaker and the listener is also important. In his opinion, thinking the semantic structures associated with the language become phonological structures in the human brain, and thus linguistics has an integral connection with the thinking process (cognitive). It is difficult to study any language phenomenon without taking into account human thinking, in other words, what is happening in his mind [7, 47].

It seems that U.L. in Chafe's linguistic views, the main focus is on learning the language based on inductive that is, private knowledge. However, these views of the scientist, in our opinion, constitute only one side of the general issue. In fact, linguistic research is inextricably linked with the issue of language knowledge. As most of the problems are related to the language, in particular, to the issue of its practical application in this speech, it forms a unity with the cognitive potential of the masses [3, 199].

However, U.L. Chafe's comments that the participants of the communicative process are always related to the non-linguistic environment and that this is important in the use of language in speech is instructive [7, 47]. As a result of the functional activation of language units takes place in the environment of pragmatist factors. The speech environment plays an important role in this. Proof of opinion is the use of a specific language unit it is possible in the speech environment and it can be observed that it is negated in the second environment. In this process, of course, the context has a lot of influence. According to E.V. Paducheva, many words cannot mean an independent meaning by themselves. In most cases, words that come out of context are plural, and when they are used in a sentence, they require a single meaning unit (nominative unit). In addition, despite the fact that word used in the sentence is singular, the sentence is general the content may not come from the meaning of these words [5, 12]. Such a description of the problem means that every word (or to the nominative unit of the language) indicates a specific meaning only in the context, in the chain of syntagmatic lines.

It should also be said that the acquisition of functional value of language units in the process of their use in the syntagmatic line can be more perfectly and clearly observed when the analysis of language material is approached from the system-structural point of view. In other words: "In the study of speech activity and problems related to it, the approach to the description of the problem from the system point of view is considered the most effective tool" [6, 24]. E.V.Panomorenko rightly emphasizes the following: "Language is a system where each of the units functionally related to each other [6, 12].

Language system can be understood in two ways: 1. As a methodological principle. 2. In the form of an immanent (free from external influences) feature of the language. Of course, these concepts are interconnected, and one requires the other to exist.

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However, the second of them is of great importance in studying the functional value of language units is enough. The main reason for this is that the language system (meaning the internal immanent characteristic system) has synergistic power. If synergy itself if we understand it as management, then the fact that the language system has such a quality does not require an explanation.

At the moment, we are emphasizing the concept of the language system. But with this he wants to deny that speech is also a complex system we are not Undoubtedly, speech also operates within this synergetic force. It is inevitable that the human factor will be involved in this process. But at the same time,

the aspects of the speech are only relevant to him there is that their acquisition of functional activity relies on synergetic power.

In fact, during the transfer of language signs into speech, phonological units intersect with morphemes, and morphematic units intersect with words, thereby determining their functional value. Undoubtedly, the position of the speaker (human factor) is also important in this process. Because in his discursive activity, he is constantly engaged in choosing language symbols. In other words, as communication is formed through the human factor, not only the use of language units in speech, but also their acquisition of a certain functional weight is directly related to it.

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Issue

Article



**Barno Usarboyevna Nazarova**  
Andijan machine-building institute  
Researcher

## IMPROVING THE MANAGEMENT SYSTEM OF TOURISM ENTERPRISES THROUGH DOMESTIC TOURISM

**Abstract:** The article examines the importance of tourist enterprises in the development of domestic tourism, theoretical views on improving their management system. Also, the factors affecting the effectiveness of the implementation of the management mechanism of the tourist enterprise have been identified. The theoretical essence of these influencing factors has been studied.

**Key words:** domestic tourism, inbound tourism, services, organizational-economic mechanism of management, horizontal and vertical management structures, local tourists, cultural heritage, competitiveness, risk management.

**Language:** English

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### Introduction

The trends of global change in the world shows that in the period before the pandemic, the rate of growth of the tourism sector in the GDP of the countries of the world has increased significantly. "According to the data of the World Tourism Organization (WTO), in 2019, the amount of income received from tourist activities on a global scale is 1478 billion. US dollars, and the annual tourist turnover is 4700 billion. amounted to US dollars. The share of the tourism sector in the world gross product was 10.4 percent (9.2 trillion US dollars), the number of people employed in the sector was 10.0 percent, and the investments made in the capital for the development of the sector were 4.4 percent [8]". In turn, in countries with high tourism potential, the problems of compensating the losses related to inbound tourism through the development of the domestic tourism sector, developing the domestic tourism sector within the existing potential and improving the management processes to level the level of recession in the economy remain relevant.

In the context of the comprehensive development of tourism services in New Uzbekistan, structural changes are being implemented It shows that it opens wide opportunities for the development of domestic tourism. "The development of the

domestic tourism sector in the development strategy of New Uzbekistan will increase the number of local tourists to 12 million and increase the number of foreign tourists visiting the republic to 9 million to reach and ...to double the number of people employed in the field to 520 thousand people in the period until 2026, to develop the infrastructure of tourism and cultural heritage objects, and to effectively use more than 8 thousand cultural heritage objects [1]" such tasks are defined . The successful implementation of these tasks in the process of managing the activities of the domestic tourism sector in our country, effective use of existing tourist resource components, assessment of the effect of the sector on the development of the regional economy, use of competitive advantages in the activities of enterprises of the sector, management of possible risks, development of strategies for the recovery of the sector in the conditions of socio-economic crises requires improvement of exit processes.

### Analysis of literature on the topic.

The field of tourism includes small socio-economic systems, each of which has its own internal complex structure and goals, which can move from one system to another under the influence of various changes. In the world, the activity that is considered the main subsystem of

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tourism is social because it implements the right to rest, the right to freedom of movement, the right to spa treatment, the right to access cultural values and other basic rights.

According to A. Kosolapov, "domestic tourism is one of the certain segments of tourism that provides economic development of a country or region [2]".

A.Trubin defined that "domestic tourism is one of the types of tourism, which means that citizens of a certain country travel within this country [4]".

I.Tokhliev "distinct from other forms of domestic tourism is the travel of citizens permanently living within the borders of their country to a temporary visitor place (without paid activities) for tourist purposes, the travel of citizens permanently living in the territory of the country to other regions, the crossing of state borders and tourist formalities of domestic tourism signs such as not being related to [4]".

T.Yu.Ivanitskaya's research work, the structural structure of domestic tourism includes activities with the following purposes [5]: recreation in recreation areas and resorts; treatment-rehabilitation recreation; organization of excursions and tours to historical,

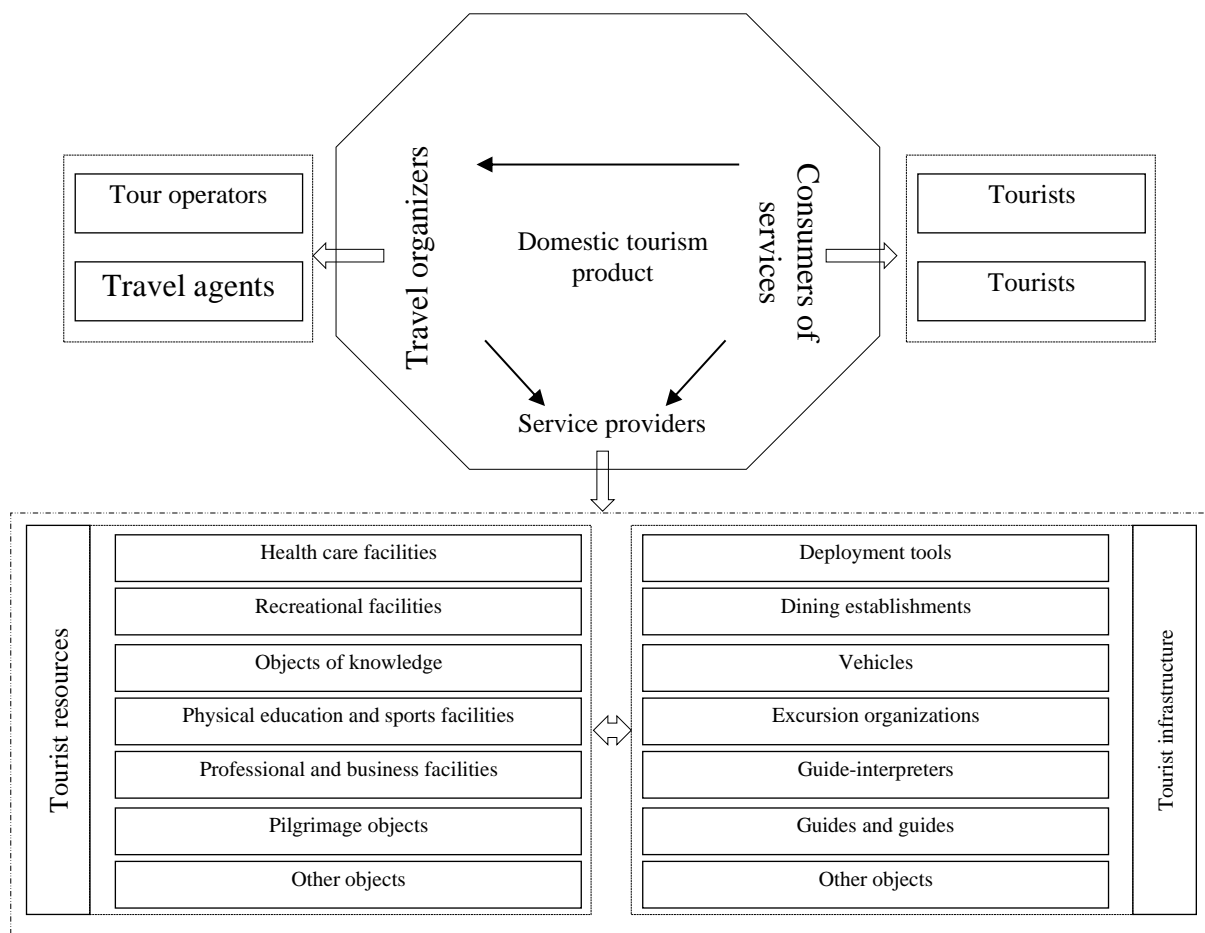
cultural and natural attractions; use of gastronomic tourism services; use of active and extreme tourist services; use of pilgrimage tourism services; use of ecological tourism services; use of sports tourism services; use of agrotourism services; use of business tourism and other types of tourist services.

**Research methodology.**

This article used the methods of systematic and logical analysis, comparative analysis. In particular, the opinion of economists regarding the management system of tourist enterprises was studied and a systematic and logical analysis of their scientific views was carried out. Theoretical information was systematized from general to specific.

**Analysis and results.**

If the above-mentioned tour operators and tourist agencies are included among the organizers of domestic tourism services, the providers of tourist services are structures that offer basic and additional services based on tourist resources (Fig. 1).



**Figure 1. Domestic tourism services created and done increase structures<sup>1</sup>**

<sup>1</sup>Developed based on the author's research.

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In the activities of domestic tourism systems and enterprises, management follows the traditional management laws and principles, and structures engaged in domestic tourism activities also operate within the framework of generally defined management goals, functions and tasks. However, the processes of managing domestic tourism activities also have specific aspects that differ from other systems and enterprises of the economy.

"In the process of managing activities in the field of domestic tourism, together with general functions such as marketing, planning, organization, coordination, promotion, accounting and control functions, specific functions such as management of

main activities, management of additional services, management of service quality, and labor and salary management implementation is ensured [7]".

In 2014-2020, the level of tourism consumption in the country increased steadily due to the increase in the population and the improvement of living standards. If in 2014 the volume of tourism consumption within the country is 13576,2 bln. amounted to 27696,0 billion soums, by 2019 this indicator has increased more than 2 times. However, in 2020, in the context of the pandemic, the demand for tourism services decreased by 2,5 times compared to 2014.

**Table 2. Tourism in Uzbekistan main indicators dynamics [9]**

No	Indicators	Years						
		2014	2015	2016	2017	2018	2019	2020
1	Country domestic tourism consumption, bln. sum m	13576,2	14010,7	13772,5	16568,3	20561,3	27696,0	5271,2
2	The field of tourism by offer done services volume, billion sum m	6651,7	7203,8	7809,0	8261,9	8658,4	9333,8	8540,4
3	He is employed in the field of tourism population, thousand people	185,0	188,4	170,9	187,6	201,0	230,5	189,2
<b>The field of tourism with connected q service show fields activity results</b>								
4	Live and eating services, billion sum m	1118,7	1302,5	1502,5	1693,8	1823,9	1967,1	1690,2
	Culture and art, billion sum m	354,6	373,5	414,7	439,3	547,8	655,8	624,5
	transport and storage, billion sum m	14052,3	14905,7	15725,5	17509,0	18713,4	19950,6	19520,2
	Trade services, billion sum m	12717,6	14095,8	15325,2	15483,6	16275,4	17429,9	17724,1

At the same time, the development of the tourism sector has a multiplying effect on the development of networks and industries that cross the lines of activity. In particular, the development of tourism has an impact on the development of accommodation and food services, culture and art, transportation and storage services, and retail trade, which are the main links of the service sector. The analysis of these indicators also shows parallel trends in the level of development of service industries related to the main tourism industry.

The state of development of domestic tourism services has been analyzed based on domestic tourism resources at the country level and the activities of entities involved in economic processes based on their use.

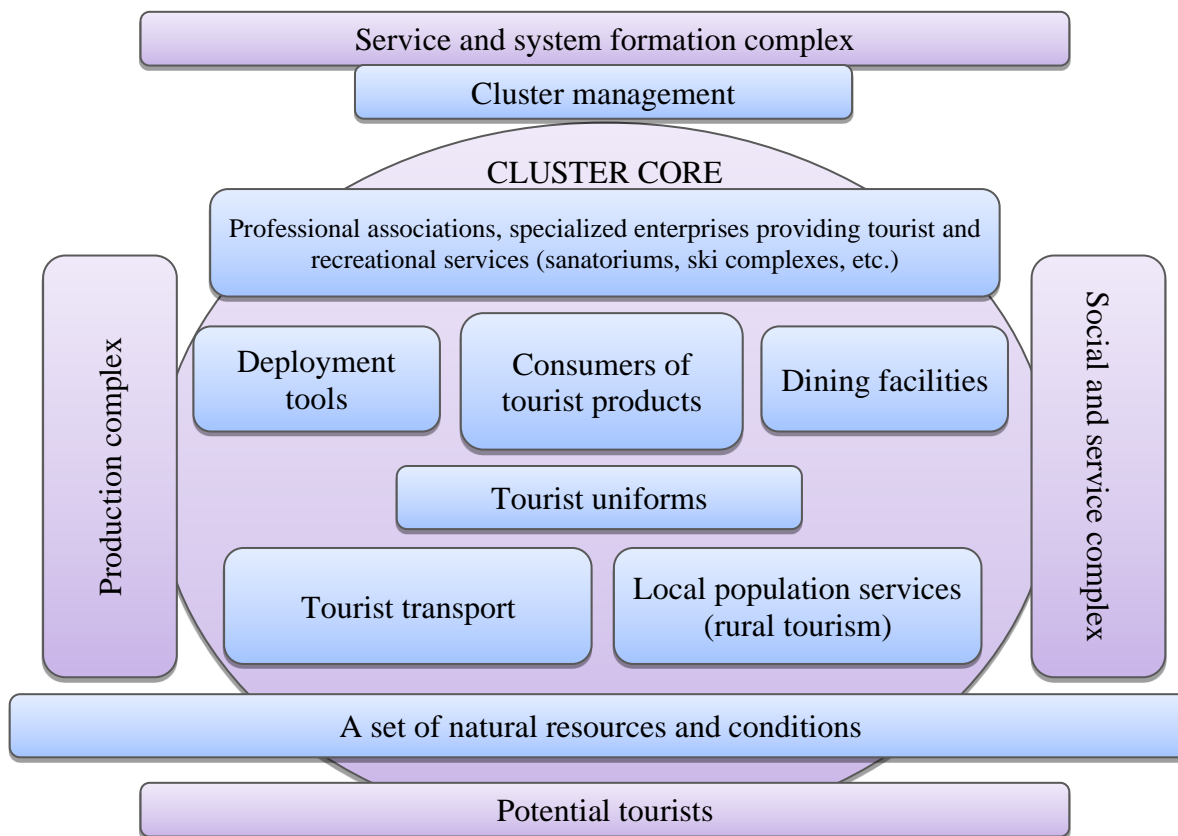
Factors that ensure the development and activation of the field activity in real conditions have been studied through a model that assumes the influence of factors on the effectiveness of domestic tourism activities in the regions.

In the course of the research, the internal tourism cluster was studied as an organizational structure based on innovative activities, but in the study of the structural structure of this structure based on a systematic analysis, an attempt was made to form its optimal structural structure from the point of view of management. In this case, the composition of the domestic tourism cluster was divided into 5 complementary complexes, which include enterprises in different areas of activity (Fig. 4).



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**Picture 4 . \_ Domestic tourism cluster structural structure<sup>2</sup>**

In 2019, before the pandemic, 10,3% of the global GDP was generated in the tourism sector, while the sector generated 330 million. a person is employed. The field of tourism total the world 6,5% of exports and total the world services 27,2% of exports organize did [10]. But today's in the day The whole world touristic organization (BTT) information according to "world tourism industry approximately 450 billion US dollar loss possible [11]".

The purpose of the research conducted in the direction of scenarios for recovery of the industry in crisis conditions is to develop scenarios for getting out of the crisis and bringing the industry to the previous development trend based on a comprehensive analysis of measures to support the tourism industry in the conditions of global and domestic experience in modern conditions. In the process of achieving this goal, it is appropriate to conduct research based on the following directions:

- assessment of the main problem points of the tourism sector in the crisis;
- systematization of the world and domestic experience of supporting the tourism sector in the current conditions;

-assessment of the possible scenarios for the restoration of the tourism sector, taking into account the measures taken and the developing trends.

**Conclusions and suggestions**

Based on the results of the research presented above, we came to the following general conclusion:

Based on the systematic approach, a classification model of the main subsystems and functions of the organization and management of domestic tourism was developed. A study of existing models shows that there are no models based on the separation of subsystems in the classification. The theoretical structure of the classification model of the organization and management of domestic tourism activities is formed on 4 main sub-systems;

- coefficients of difference that allow for a more accurate assessment of the level of disproportion of tourism development by region and the level of regional risks have been determined;
- coefficients of regional disparity reflect the level of differences in the development of the domestic tourism industry in the regions of the country and the general level of inequality compared to the similar index of other regions;

<sup>2</sup>Developed based on the author's research.

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-although the internal tourism cluster was studied as an organizational structure based on innovative activities, based on the study of the structural structure of this structure based on a systematic analysis, its optimal structural structure from the point of view of management was determined in the form of a structure divided into 5 complementary complexes, including enterprises in separate areas of activity formation is recommended;

-in almost all scenarios of the restoration of the tourism industry, the main basis of tactical processes in the direction of supporting the industry in our country is the promotion of domestic, including pilgrimage tourism. In order to ensure the effectiveness of this mechanism within specific limits and scopes, it is necessary to manage possible tourist flows by assessing the level of internal tourism resource potential of the regions of our country.

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Issue

Article



Mansur Kiyomidinovich Muftaydinov  
 Andijan machine-building institute  
 doctorate student  
[mmuftaydinov1980@mail.ru](mailto:mmuftaydinov1980@mail.ru)

## PROSPECTS FOR THE DEVELOPMENT OF THE FOOD INDUSTRY IN THE MEDIUM TERM

**Abstract:** The article examines the prospects for the development of the food industry in the medium term. Also, annual growth rates of growth trends in the price index of food industry enterprises in comparison with the price index of food products in the consumer market and the structural composition of the multifactorial model for its assessment were developed.

**Key words:** mid-term perspective, assessment methodology, change, national methodology, competitiveness criteria, food industry, integrated assessment, global food index, food product, economic mechanism.

**Language:** English

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### Introduction

In recent years, the reforms aimed at the development of the food industry in our country are aimed at improving the economic mechanism of enterprises operating in this field, technically and technologically updated the production processes, turning the food industry into the leading industries of the country, expanding the types of food products, and improving their quality. In particular, given that the population of our country has been increasing in recent years, the demand for food in the consumer market is also increasing, the development of the food industry in the coming years creates the need to

improve the efficiency of the economic mechanism of enterprises operating in this area.

In recent years, due to the fact that priority is being given to reforms aimed at the development of the production of consumer products in the industry of our country, the development of the price index of production by enterprises has been having a downward trend. According to the analysis, in 2016-2021, the producer price index of products produced by food industry enterprises decreased by 7.7 percentage points, from 114.1% to 106.4%, respectively. In particular, the production prices of beverages decreased by 4.4% during the studied period (see Table 1).

**Table 1. Growth trends of producer price index by food industry enterprises in Uzbekistan, in percentage<sup>1</sup>**

Indicators	2016	2017	2018	2019	2020	2021	2016/2021
Manufacturing industry	114,1	135,1	129,0	124,8	108,7	114,9	121,1
including,							
Production of food products	114,1	107,0	127,6	119,6	106,1	106,4	113,5
Production of beverages	126,1	118,4	117,8	118,1	107,9	121,7	118,3

<sup>1</sup> Compiled by the author based on the information of the State Statistics Committee of the Republic of Uzbekistan

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Production of tobacco products	119,8	113,9	123,9	76,9	146,4	116,8	116,3
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At this point, it is appropriate to pay attention to the development trends of the consumer price index of food products. According to the analysis, in 2016-2021, the average annual growth trend of the general consumer price index in our country was 111.8 percent, while the consumer price index of food products has a higher growth than the above average,

the average growth trend was 112.7 percent. (see Table 2). At this point, it should be noted that the growth trends of the product production price index of the food industry enterprises of our country are characterized by low annual growth indicators compared to the price index of food products in the consumer market.

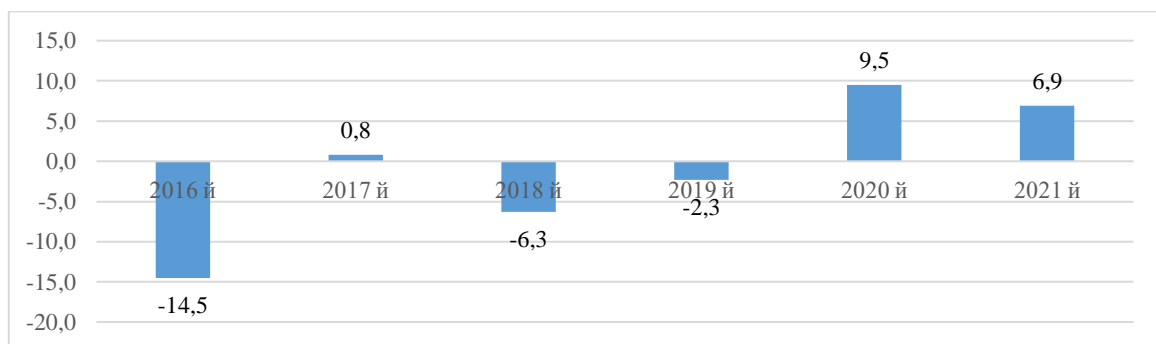
**Table 2. Growth rate of the consumer price index in Uzbekistan, in percentage<sup>2</sup>**

	2016	2017	2018	2019	2020	2021	Average growth in 2016-2021
Consumer price index	105,6	109,5	117,5	114,5	112,9	110,8	111,8
Including							
Goods	104,1	109,6	118,8	114,3	113,6	111,6	112,0
Food products	99,6	107,8	120,1	116,9	117,2	114,3	112,7
Non-food products	110,2	111,7	117,1	111,1	109,1	108,3	111,2
Services	111,6	109,0	112,1	115,5	110,6	108,2	111,2

The difference between the annual growth trends of the index of production prices of food industry enterprises and the index of food prices in the consumer market is characterized by a dynamic trend. According to the analysis, the growth trends of the consumer price index of food products in recent years have shown that the enterprises of the food industry have had higher growth trends compared to the index of production prices (see Figure 1). This situation indicates that reforms aimed at increasing the efficiency of the economic mechanism of food industry enterprises cannot have a sufficiently positive effect on the index of food products in the consumer market. It is also possible to conclude that the consumption price index of food products has grown higher than the production price index due to the

increase in the need for food products in the consumer market due to the increase in the population of our country.

Taking into account the above circumstances, it will be possible to increase the volume of production of food products, improve the quality of products and reduce their consumer prices by developing scientifically based scenarios aimed at increasing the efficiency of the economic mechanism of food industry enterprises in our country. Taking into account this situation, in the context of the implementation of the Development Strategy of New Uzbekistan for 2022-2026, forecast indicators for the development of the economic mechanism of the food industry enterprises of our country were developed.



**Figure 1. The difference between the production prices of food industry enterprises in Uzbekistan and the growth trends of consumer price indices of food products, in percentage<sup>3</sup>**

<sup>2</sup> Compiled by the author based on the information of the State Statistics Committee of the Republic of Uzbekistan

<sup>3</sup> Compiled by the author based on the information of the State Statistics Committee of the Republic of Uzbekistan

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First of all, basic, inertial and mobilization scenarios aimed at increasing the volume of food products produced in the food industry in our country, including Andijan region, were developed. The developed forecast indicators were calculated based on the interpolation method using the MS-Excel program.

In order to evaluate the position of Andijan region in the development of the country's food industry, based on the method of calculating forecast indicators developed above, basic, inertial and mobilization forecast indicators were calculated for

the increase in the production volume of regional food industry products. Table 3 below shows the results of the correlation-regression analysis conducted in 2010-2021 to determine the internal relationship between the indicators of the production volume of food industry products in the Andijan region and the time factor. According to the calculations, the internal correlation between these two factors was significantly strong, and the correlation coefficient representing it was equal to 0.81. This indicator was found to be 0.1 lower than the national average.

**Table 3. The results of the regression analysis conducted in order to assess the relationship between the production of food industry products and the time factor in Andijan region<sup>4</sup>**

Indicators	The value of indicators
Multifactor R	0,899268
R-squared	0,808682
Normalized R-squared	0,787425
Standard error	4474,693
Period of observations	11

Also, the interpolation method used in the calculation of forecasts developed for the republic was used to determine the basic, inertial and mobilization scenario indicators for the development of the volume

of food products in Andijan region. Information about the statistical values necessary for the calculation of prognostic indicators is given in Table 4 below.

**Table 4. Statistical values of forecast indicators of food industry production volume in Andijan region<sup>5</sup>**

Statistical indicators	The value of statistical indicators
Alpha	1,00
Beta	0,00
Gamma	0,00
MASE	3,48
SMAPE	0,23
MAE	5 275,36
RMSE	5 528,83

According to the results of the calculation, the results of forecast indicators for the production of food products in Andijan region are characterized by the fact that they are significantly higher than the indicators of the republic. This situation indicates that the region is a regional "growth point" for the development of the country's food industry. According to the basic scenarios for the development of the production volume of food industry products in Andijan region presented in Figure 2, the volume of

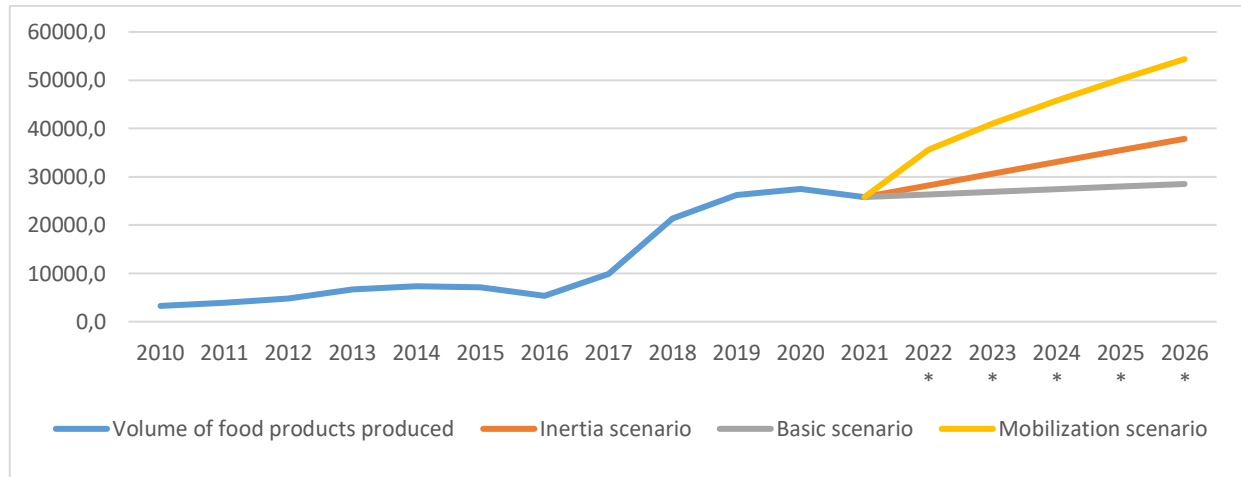
products produced in the food industry of the region may increase by 1.1 times in the medium-term perspective. This indicator was found to be 10% higher than the base indicators for the republic.

According to the inertial scenarios, it was found that in the medium-term perspective, the increase in the production volume of food industry products in Andijan region is 15% higher than the indicator for the republic, and it can increase by 1.5 times in the forecast period (see Figure 2).

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**Figure 2. Forecast indicators on the development of the production volume of food industry products in Andijan region, in billion soums<sup>6</sup>**

According to the mobilization forecast indicators, it was determined that the production volume of food industry products of the region will

increase by 2.1 times in the medium-term perspective. According to calculations, this indicator is 40% higher than the national indicator.

**Table 5. Equations for calculating forecast indicators for the development of the production volume of food industry products in Andijan region<sup>7</sup>**

Scenarios	Calculation formulas
<b>Basic</b>	$y = -35,408x^2 + 2596,3x - 2806$
<b>Inertia</b>	$y = 44,359x^2 + 1620,6x - 742,83$
<b>Mobilization</b>	$y = 190,67x^2 - 47,896x + 2549,8$

In table 5 above, the equations for calculating basic, inertial and mobilization forecasts for the development of the production volume of food industry products in Andijan region were given.

In our opinion, during the development of state programs aimed at the development of the food industry of our country in the following years, based on the calculation of scientifically based forecast indicators for the development of the food industry in

each region, regions with high development potential such as Andijan region, based on the determination of territorial "growth points" - priority should be given to the development of the food industry. Through this, the effectiveness of the use of the development potential of the food industry of our country will increase, and the economic mechanism of enterprises operating in this field will be improved.

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<sup>7</sup> Compiled by the author

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Issue

Article



Gayratbek Maxamadyusupov Mamasoliyev  
Andijan State University  
head teacher of the department «Economics»

## ISSUES OF IMPROVING THE EFFICIENCY OF THE FOOD INDUSTRY

**Abstract:** The article discusses the theoretical and methodological problems of increasing the efficiency of food industry enterprises and analyzes their specific features. In order to increase the efficiency of food industry enterprises and their business activity, scientifically based proposals and recommendations were developed.

**Key words:** experience, strategic management, entrepreneurial strategy, entrepreneurship, competition, competitiveness, modernization.

**Language:** English

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### Introduction

The current experience of many developed and leading countries of the world economy proves that competition and access to world markets, first of all, gradual economic reform, structural changes and deepening diversification, intensification of new high-tech enterprises and industries, can be achieved by accelerating the process of modernization and technical renewal operating capacity.

The market in our Republic is becoming saturated with goods; the stable structure infrastructure are being formed; economic players are getting more independent; good conditions for the development of food industry entrepreneurship is being developed. In recent years, this issue in Uzbekistan has received much attention. As the positive changes taking place in the economy of the country, the growth of food production and the strategy of output of products to international markets are crucial. This, in turn, demonstrates the importance of efforts to study the food market in the country, to establish production and encourage staff. Thus, the study of the consumer market requires meeting the demand and needs of the population for food, as well as the effectiveness of joint ventures.

### 1. Analysis of literature on the topic.

The theoretical and practical aspects of entrepreneurial activity as well as the efficiency of entrepreneurial activity were studied by foreign

scientists G. Viskel, S. Yankov, M. Desai, P. Gompers, J. Lerner, L. Kipper, L. Leyven, R. Rajan, T. Ovaska, R. Sobel, Y. Ukdogruk [2,4,5,10,11] and others. In particular, the scientific-practical and theoretical approach to the consumption of foodstuffs was studied by foreign scientists A. Borkim, J. Connor, R.P. Kohls, Yu. N. Yul [6].

The research of scientists of the Commonwealth of Independent States (CIS) A. Alferev, E. B. Konnov, V. Denisov, G.M.Zinchuk, V. Kamaev, A.A. R. Bekov, V. Vlasov, E. Kiselev, A. Blinov, S. Borisov, N. Burmistrov, Kudryashov, A. Pustuev, OP Presnyakov, I. Stukanov et al. [1, 2, 6, 12, 13].

Scientific studies of local economists Kh.Abulkosimov, I.Iskandarov, M.Ikramov, N.Makhmudov, K.Muftaydinov, N.Murodova, V.Shepelev, A.Kodirov, N.Kosimova, S.Gulyamov, R.Gaybullaev [7, 8] are aimed at creating the scientific and theoretical foundations of the problems of entrepreneurship. In particular, the researches of R.Gaybullaev were aimed at improving the economic mechanism of entrepreneurship development in the Republic of Uzbekistan, N.Muradova paid special attention to improving the theoretical foundations of state support for small business and private entrepreneurship.

Theoretical conceptual aspects of the development of the food industry, increasing its economic efficiency are discussed in the scientific works of L.Abdukhalilova, M. Azlarova, N.



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Ziyavutdinova, O. Ismailov, T. Maksudov, B. Nosirov, B. Mamaev, D. Dzhallolova, G. Madiyarov, N. Saidakhmedova, I. Boboev and A. G. Abdullaev [9]. In particular, in the scientific works of B. Nosirov, the features of the formation and development of the regional food market were studied, the research of I. Boboev examined the formation of a strategy for the production of competitive products based on the localization of the food industry of the Republic of Uzbekistan, and A. Abdullaev's studies studied the economic and geographical characteristics and the territorial composition of the Khorezm region, as well as the creation of regional clusters of the food industry.

## 2. Research Methodology

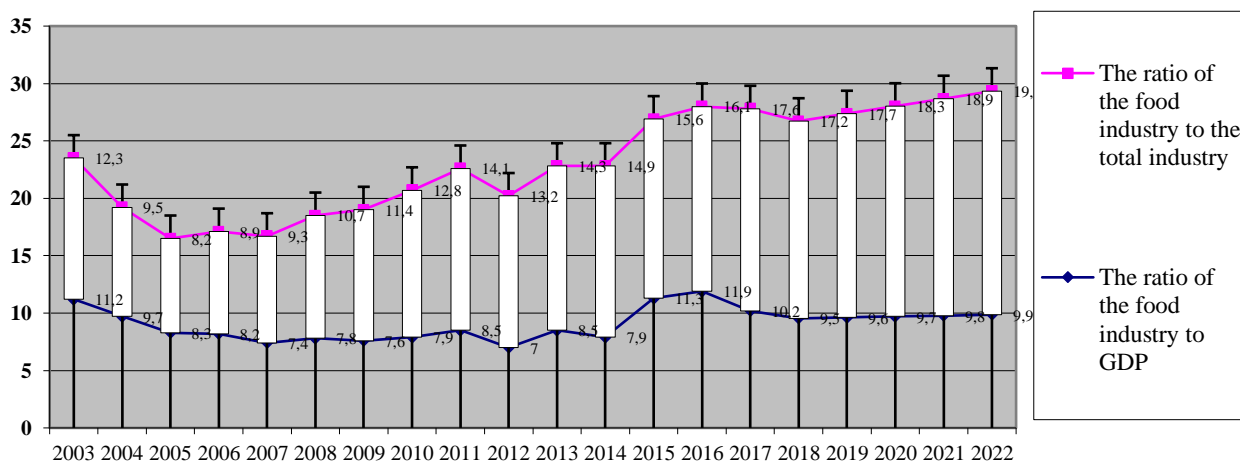
In the course of the study, research methods of induction and deduction, time series, economic statistics, analysis and synthesis, statistical grouping,

monographic research, and other methods were used to increase the competitiveness of food industry enterprises.

## 3. Analyzes and results.

The share of production of food industry enterprises operating in the Republic of Uzbekistan for 2003-2022 in the GDP has changed in the following order. (Picture 1).

The ratio of the food industry to GDP has increased from 11,2% to 10,2% in 2003-2022, and the ratio of total industrial output has increased from 12,3% to 17,6%. This is due to the fact that the volume of gross domestic product production increased by 45,2% in 2008-2022 compared to 2003-2011. Particularly, the increase was mainly due to industrial production, where the volume of production of food products actually did not decrease.



Picture 1. Ratio of Production of Food Industry to General Industry and GDP (in%)[14]

As a result of grouping of the regions of the Republic of Uzbekistan with the share of production of foodstuff industry, the highest growth was observed in Tashkent city (24.3%), Samarkand region (21.3%),

Tashkent region (20.1%) and the lowest in Navoi region (6.6%), the Republic of Karakalpakstan (6.3%).

Table 2. Classification of the Republic's regions by the share of production of food industry

Grouping criteria	Grouping level	Structure of Groups (Region and City) and Its Share (%) in 2022
Share of the region in the food industry	Highest	Tashkent city (24.3%), Samarkand (21.3%), Tashkent region (20.1%),
	High	Andijan (15.8), Fergana (14.0%), Kashkadarya (13.4%),
	Average	Surkhandarya (13.2%), Bukhara (11.8%), Namangan (11.7%),
	Low	Khorezm (10.5%), Jizzakh (10.3%), Syrdarya (9.7%),
	Very Low	Navoi (6.6%), the Republic of Karakalpakstan (6.3%),
The share of the region's population in employment	Highest	Namangan (17.1%), Tashkent city. (16.3%),
	High	Karakalpakstan (15.9%), Karakalpakstan (10.2%), Jizzakh (10.1%), Tashkent region (10.3%), Bukhara (10.3%), Qashqadaray (10.7%)
	Average	Sirdarya (9.7%), Ferghana (9.3%), Surkhandarya (9.1%), Andizhan (8.7%),
	Low	Khorezm (6.9%), Navoi (6.5%),

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JIF = 1.500	SJIF (Morocco) = 7.184	OAJI (USA) = 0.350

Also, average growth rate in 2022 was 9.1%. As can be seen from the study of grouping among the regions and cities, the increase in the number of business entities in the food industry has had a positive effect on the employment of the working population in the country. Therefore, the average share of food business in the economy of the republic in 2012 is 14.3%. The highest indicator was achieved in Namangan region (17.1%), Tashkent city (16.3%) and Khorezm region (6.9%) and Navoi (6.5%).

#### 4. Conclusion

Combining the production process in order to maintain economic stability in the industry will lead

to the expansion of these enterprises. For example, a food company can now produce raw materials that it bought from other companies by creating its own preparatory workshop. In this case, the company:

-first, to improve financial results by maintaining the value added in the process of milk production;

-secondly, the sustainability of production and economic results in exchange for timely and satisfying demand for milk;

-thirdly, to achieve increased competitiveness by improving the quality of cream, sour cream and other products by ensuring the quality of milk.

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Article



Sirdaryoxon O'tanova

institute of Uzbek Language, literature and folklor  
Uzbekistan Academy of Sciences PhD,  
Senior researcher  
[sirdaryoxon@yandex.ru](mailto:sirdaryoxon@yandex.ru)

## THE SPIRIT A SYMBOL OF FLOWER AND A LYRICAL HERO

**Abstract:** In this article, special attention was paid to one of the most used images in Alisher Navoi's ghazals - flower and cypress. In it, it is thought that the flower is not only a means of artistic representation, but also has a knowledge and mystical meaning and is widely used in symbolic meanings.

**Key words:** Navoi, flower, cypress, thorn, nightingale, ghazal, devan, mysticism, symbol.

**Language:** English

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### Introduction

It is known, that the great figures of Eastern poetry used the image of flowers in poetry in order to increase the effectiveness of their works. The flower played an extremely important role in giving the work, especially elegance and delicacy. By using flowers in different ways, the image of beauty and sophistication in the human spirit and situations has gained brightness.

Alisher Navoi's work can be viewed as a complex, perfect lesson, which is adapted to the truths of Islam with attention to content, and many concepts of the theory of Sufism's unity of existence are transferred to the artistic text. They are embodied in the essence of the poet's mystical works, books on religious topics, a series of epics, and many individual poems that entered his lyrical collection.

### Materials and Methods

Mental state of Honest, his inner experiences, the stages of exhaustion, the heartaches [12: 3-4; 12-20.] of the soul who lived in Khokdon Gharibistan [4: 112.] since time immemorial, the heartaches were written in the following ghazal, which was included in the "Gharayib us-sigar" collection, with the help of traditional images, concepts, symbols and reforms. In the poem, we are listening to the moans of the heart, striving for its ideal, striving for its Creator, endlessly confused by beauty. The hero of the poem, which is

written in the size of traditional 7 byte, has priority to reach the vase of cypress and flower.

*Butmadi gulshan tavofi birla bag'rim yorasi,  
Bermadi o'tumg'a taskin sarvu gul nazzorasi.*

*Bir zamone sarvu bir dam gulga ko'p qildim  
nazar,*

*Bo'lmadi ul sarvi gulrux furqatining chorasi.*

*Gul bila sarv istabon gulshan sari mayl aylamas,  
Dashtdin ul sarvi gulruxsoraning ovarasi.*

*Qaddi hajrida har ohim dudi sarvedur baland,  
Yuzidin ayru guledur ko'kragim har porasi.*

*Sarvu gul maftuni bo'lmakim nigoru zeb uchun,  
Sindurub har dam uzar oni falak makkorasi.*

*Sarv o'qdur, gul tikan, bog' ichra to ko'z ollidin  
Borg'ali ul sarvi gulruxning qadu ruxsorasi.*

*Ey Navoiy, sarvu guldin kechki, qaddu yuzidin  
Bor emish yuz yilchilig' yo'l sarv ila gul orasi.*  
[5:628.]

Flower is one of the bright and widely used images of Eastern literature, which is formed from the root "gulzor, gulshan, gulistan", "gulroy, gulzor, gulyuz", "gulgun, gulrang, gulnor, gulira'no", "gulgasht, gulbong, gulfishon, many words such as

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rose, flower leaf, flower season, flower spring" lead the artistic image. Similarly, a number of compound nouns such as "sarvkomat", "sarvi suman", "sarvi sanobar", "sarviboy" created from the word "sarv" created complete landscapes side by side with flowers.

According to Sufiy literature, both images embody symbolic content and are often seen as complementary entities [9:513.] In fact, just as the flower represents divine beauty in the mystical language, it also carries the symbol of Muhammad (s.a.v.). For this reason, the expressions "vardi Muhammadi" or "flower of Muhammad" are often found in classical literature. On the other hand, since the cypress symbolizes unity (unity), and the flower represents kasrat (plurality), it is necessary to understand the unity hidden behind kasrat in the words "cypress flower"[10:62.]

So, let's look directly at the first byte of ghazal. It uses relative nouns that combine similar concepts: gulshan, bagir, yara, ot, sarv, gul. In this case, the word "gulshan" is a garden with flowers, a garden, a flower garden, and it naturally symbolizes the absolute conquest and opening of the soul, the turning of the soul's heart to enlightenment and gnosis.

*Butmadi gulshan tavof<sup>1</sup>i birla bag'rim yorasi,  
Bermadi o'tumg'a taskin sarvu gul nazzorasi.*

*Comment:*

*The wound of my heart did not end with gulshan worship,*

*The sight of the cypress flower did not comfort me.*

In the education and training of the Murshid, the soul of the honest who has achieved the status of Enlightenment by fulfilling certain requirements of the Sharia and Tariqat is wounded. Although he circumambulates the gulshan seven times in order to cure him, the mud of the lake cannot heal his wounded heart. When Jilla built, her heart burning in the flame of love could not be comforted. Even by looking at cypresses and flowers. After all, the cypress tree, which reminds of the fair, flawless height of the man, and the flower, which reminds of the rosy face of the beloved, should comfort the lover. But it didn't happen, the reason for this becomes clear in the next verse.

*Bir zamone sarvu bir dam gulga ko'p qildim nazar,*

*Bo'lmadi ul sarvi gulrux furqatining chorasi.*

Although I looked at a cypress and a flower again and again, that cypress could not be a remedy for the hardships of my separation from the cypress. Here, "one time", "one breath" is a merciful breath consisting of the favor of the Most High.

*Gul bila sarv istabon gulshan sari mayl aylamas,  
Dashtdin ul sarvi gulruxsoraning ovorasi.*

The True Lover, who has taken up the trouble in his desire to get hold of his rich, flower-faced lover, does not enter the gulshan in the sarvigul pilgrimage, because the fire of love burning in his heart has already turned the gulshan into a desert.

*Sarvu gul maftuni bo'lmokim, nigoru zeb uchun,  
Sindurub har dam uzar oni falak makkorasi.*

Those who seek the status of real love, who are sincere in their intentions, who seek the pleasure of God, who hope for the intercession of Muhammad, peace and blessings of God be upon him. , that is, it breaks the heart and breaks the leaf-shaped heart like the leaves of a cypress flower. In the verse, it is warned that any hard-hearted person on the path of fraud will be thrown into the absence and abstraction by the sharp wind and storm of time. Symbols of flowers and cypresses found in each byte connect the ghazal verses as a composite chain, both in form and content, and the poet's use of them in each byte hides a certain aesthetic intention. Forever lover - yearning for the beauty of God, his feelings of longing for his beloved friend and prophet of the end of time Muhammad, may God bless him and grant him peace, are reflected.

*Sarv o'qdur, gul tikan, bog' ichra to ko'z ollidin  
Borg'ali ul sarvi gulruxning qadu ruxsorasi.*

*Ey Navoiy, sarvu guldin kechki, qaddu yuzidin  
Bor emish yuz yilchilig' yo'l sarv ila gul orasi.*

In the last bytes, the poet begins to speak about the artistic interpretation of eternal truths. Above, we talked about the fact that the cypress refers to the oneness of God in the educational sense or to the honest of unity with the original source of wealth, and the flower is the appearance of grace and pleasure.

The poet urges him to abandon the flower, which is likened to the face of the cypress, which symbolizes the incomparable happiness of the cypress, which looks at the tall, straight stature of the river. In other words, the possessor of infinite beauty - with Allah Almighty, his beloved prophet, gul, who embodies purity in all aspects, warns that it is not easy to meet Muhammad, peace be upon him, and to enjoy his conversation. The reason is clear: it is a honest that accumulates in fierce struggles to overcome the lust after consuming a lot of riyazat-u in statuses and stages such as demand, love, forgiveness, and enlightenment - The flower lover must endure even more trials until he reaches his final destination. To find God's approval, to achieve the will is to achieve the love of his beloved friend and messenger,

<sup>1</sup> Tavof – haj yoki umra amallaridan biri bo'lib, Ka'bani yetti karra aylanishdir.

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Muhammad s.a.w., and this is a process that is equal to more than a hundred years of self-struggle, purification of the soul, and the rise of the state of knowledge.

### Conclusion

Such mental scenes described in one ghazal are reflected in many more poems of Navoi in different forms, images and symbols. Studying them brings the reader to a spiritual closeness and consensus with the author, along with a better understanding of the content of the poet's poems. The beautiful allusions in the text, the beauty combined in the flower and the cypress make the reader from indifference to alertness, it leads from an ordinary student to a master, from a seeker of knowledge to an observer, to a servant who prepares his mind and soul for the eternal journey.

So, in Uzbek classical poetry, the image of a flower and its symbolic meanings played an extremely important role in giving the work a lyrical tone and delicate content. Especially in the poetry of Alisher Navoi, the characteristics of artistic symbols are more clearly manifested. The image of a lover, his inner world, and the passions in his heart are impressively and attractively expressed with the help of artistic methods.

It is known that the image of a flower is used both in folklore and in written literature (poetry). It is interesting that in folklore, the lover is compared to flowers in beauty and grace, while in classical poetry, it is said that flowers get their beauty and freshness, color from the lover's pale face, cheeks, white lips, black eyes, musky hair and letter.

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Ra`no Dalabaevna Muminova  
Tashkent State Agrarian University  
Republic of Uzbekistan, Tashkent  
[rano.muminova@tdau.uz](mailto:rano.muminova@tdau.uz)

## APPLE PESTS AND DISEASES

**Abstract:** The apple tree is a deciduous tree of the Rosaceae family that is planted for its apples. It can take 6 to 10 years to develop and start bearing fruit, and small to medium-sized trees can grow to a height of 5 to 10 meters. To maintain healthy, productive trees and fruit, producers should recognize what pests to look for, understand pest biology, use appropriate preventive measures, and apply timely controls when needed. Weed control is essential to keep newly planted trees from competing with weeds, and mowing is sufficient for controlling ground cover plants. The percentage of flawless fruit you want will determine whether and how to spray apple trees for disease and insect pests. The most common apple disease is apple scab, which can be prevented by starting protection when buds open and green tissue emerges, renewing protection every seven days or every two inches of rain until about two weeks after the flower petals fall. Multifunctional home fruit tree spray products are a great option for backyard apple trees, as they make it easier to combine spray solutions. However, it is not recommended to use the spray during the tree's bloom, when honeybees and other pollinators are present. Apple maggot, codling moth, and plum curculio are the principal fruit-damaging insects, and multipurpose spray up until bloom, with a spray just before blossoms open, and then returning with a spray soon after the blossoms fall, will give sufficient control for a backyard apple tree.

**Key words:** codling moth, spider mites, woolly apple aphid, egg, plants, cultivar.

**Language:** English

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### Introduction

Control of the major insect pests of apples for commercial production sometimes involves timely insecticide applications. Unlike some crop pests, pests of apples can be very elusive and damage can often occur without individual pests being seen. To maintain healthy, productive trees and fruit, producers should recognize what pests to look for, understand pest biology, use appropriate preventive measures, and apply timely controls when needed. The apple tree is a deciduous tree of the Rosaceae family that is planted for its apples. One of the most popularly grown fruits worldwide is the apple. It can take an apple tree 6 to 10 years to develop and start bearing fruit once it is planted from a seed. Small to medium-sized trees, apple trees can grow to a height of 5 to 10 meters. They have a central trunk that splits into multiple branches. Oval in shape, apple tree leaves can grow up to 13 cm (5.1 in) long and 7 cm wide. Apples are a delightful fruit that, regrettably, do not only draw

people. To lay their eggs and feed, aphids, maggots, beetles, leafhoppers, mites, and thrips attack the apple tree. These pests all have the trait of laying their eggs in various locations on the tree or the fruit, which results in spots or holes on the fruit, fruit drop, and leaf damage. They are capable of skeletonization, defoliation, and plant leaf bending and yellowing. Let's now discuss the specific illnesses, pests, and remedies for controlling them that affect apple trees.

To keep newly planted trees from competing with weeds, weed control is essential. After the trees are established, mowing is sufficient for controlling ground cover plants in a home orchard. It is not advisable to keep the soil surrounding an apple tree's base bare since ground cover insulates the area from cold winter soil temperatures.

What percentage of flawless fruit you want will determine whether and how to spray apple trees for disease and insect pests. More than ten feet tall trees

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make spraying physically demanding and time-consuming.

The most typical apple disease is apple scab. It's extremely possible that an apple tree will be susceptible to scab unless you are certain that it is a scab-resistant variety.

The cultivar is either scab-resistant or fortunate to have an extraordinarily low inoculum of scab in the area if the tree was left unprotected the previous year and did not develop brown patches, dead leaves, or rough corky marks on the apples.

Starting protection when buds open and green tissue emerges (late April to early May in the majority of Maine) and renewing protection every seven days or every two inches of rain until about two weeks after the flower petals fall are necessary for susceptible varieties to achieve high levels of scab control. Mid-June arrives two weeks after petal fall in central Maine.

For backyard apple trees, multifunctional home fruit tree spray products are a fantastic option because they make it easier to combine spray solutions rather than having to deal with various fungicides and insecticides that must be bought separately and in concentrate form. The packing size is also suitable. It is advisable to only purchase what will be utilized this growing season and start new each year, even though the majority of goods may be stored over the winter if kept unfrozen, cool, and dry (for powder formulations).

Due to the fact that the multifunctional treatments contain both an insecticide and a fungicide, it is not recommended to use the spray during the tree's bloom, when honeybees and other pollinators are present. While applications performed after dusk, when bee activity slows for the day, are less harmful, it is preferable to completely avoid applying the product while the tree's open blossoms are present. If perfection is not the goal, using multipurpose spray up until bloom, with a spray just before blossoms open, and then returning with a spray soon after the blossoms fall, will give sufficient control for a backyard apple tree.

Apple maggot, codling moth, and plum curculio are the principal fruit-damaging insects. Reduce damage from codling moth and plum curculio by using a home fruit spray product that contains an insecticide when 95+% of the apple blossoms fall off the tree and again around ten days later. These two sprays also lessen damage from leafrollers,

roundheaded apple tree borer, and European apple sawfly. Spraying the trunk should be done in addition to treating the foliage for the management of borer.

For protection against apple maggot, a second treatment of a multipurpose spray product is typically not necessary until mid-July. The second generation codling moth and apple maggot are often controlled with one of two further applications at two-week intervals beginning (i.e. repeat sprays on July 30 and August 15). Early harvested cultivars may not require a final spray in mid-late August, but cultivars harvested later may need one (i.e. those that ripen in late September and October). The sooty blotch and flyspeck fungus, which stain fruit, are less likely to develop on late cultivars as a result of the late spray.

Surround can also keep apple maggot flies away from apples, but if you use it that late in the summer, the fruit will still have clay power residue on it when it comes time to harvest. Bt does not function against apple maggots, and Pyganic, an insecticide containing pyrethrin, degrades too quickly to provide sustained control. Entrust is a powerful organic insecticide for apple maggot, but a one-pound box of it costs hundreds of dollars and is more than most home orchards will ever require. Several home spray products contain spinosad, the active ingredient in Entrust, however those products can also contain other substances that prevent them from being certified organic.

When people spray their trees with the proper product at the appropriate times, the biggest issue that results in pest control failures is not applying enough water to deliver the proper amount of insecticide. For multipurpose fruit tree pesticide treatments, the mixing directions are based on spraying the tree to run-off, that is, until the leaves are saturated with water and adding more water would only cause a run-off. This type of spray is known as "dilute." The goal is to spray just enough water to reach the "run-off" point when any additional water would just run off the tree. There won't be enough fungicide and insecticide in the spray if it is only misted on, which won't provide the appropriate level of protection.

Codling Moth. The adults of the typical "worms" that infest apples are called codling moths. These moths lay their eggs on or close to maturing fruits as they emerge from their wintering locations in the spring. From early spring through late summer, there are up to three generations per season.

**Impact Factor:**

ISRA (India)	= 6.317	SIS (USA)	= 0.912	ICV (Poland)	= 6.630
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GIF (Australia)	= 0.564	ESJI (KZ)	= 8.771	IBI (India)	= 4.260
JIF	= 1.500	SJIF (Morocco)	= 7.184	OAJI (USA)	= 0.350



**Pic.1 (Codling Moth and Spider Mites)**

Spider Mites. These tiny arthropods known as mites are more closely related to ticks than to other insects. Spider mites are adults that overwinter at the foot of trees or in ground cover. In the middle and late summer, when the weather is hot and dry, they can become a nuisance because they reproduce quickly.

They strip leaves of their sap and chlorophyll, giving them a stippling appearance.

Woolly Apple Aphid. The woolly apple aphid spends the winter on roots and in the canopy's protected regions.



**Pic.2 (Woolly Apple Aphid and Flatheaded Borers)**

They emerge from the roots as the temperature warms, and colonies in the canopy begin to expand. Late in June, sticky, cottony colonies at the base of leaves, on old pruning cuts, or in cracks and crevices are the first signs of them. Galls are produced by their nibbling on twigs and roots (shown lower right). Most aphids that overwinter in the tree canopy will die during really cold winters.

Flatheaded Borers. Beetles with flat heads, like the one on the right, are typically only an issue on apples that are under stress from drought or when pest populations are high. The larvae of the beetle can damage limbs and trees and girdle trunks. Throughout June and July, mature beetles are active.



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Article



**Shakhnoza Makhmudova**

Tashkent State Agrarian University

Associate Professor of Plant Quarantine and Protection

[shmahmudova73@mail.ru](mailto:shmahmudova73@mail.ru)

## CONTROL OF INSECTS IN AGRICULTURE

**Abstract:** The legume family is the third-largest family of flowering terrestrial plants on the planet, with 20000 distinct species. They can be found all over the world, with the exception of Antarctica, in a variety of environments. Green peas are a delicious legume that provide 118 calories, 8 g of protein, 1 g of fat, and 8 g of dietary fiber. Pest control for grain legumes is important, as early planting of chickpea in the winter has less damage from the leaf miner, *L. cicerina*. Climate change could make planting periods more unpredictable, and short-duration cultivars are often employed to prevent pest damage. Early pea picking minimizes *B. pisorum* losses in Australia. Deep plowing, field irrigation, and flooding are all management strategies for *H. armigera*. Birds like drongos, egrets, and common Mynas can feast on insects exposed to the soil surface. Early blooming and fruiting termination minimize *Helicoverpa armigera* population carryover. Intercropping and trap crops are also used to lessen *Helicoverpa armigera* harm.

**Key words:** pest management, insecticide, resistance, agriculture, control, insect.

**Language:** English

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### Introduction

With about 20000 distinct species, legumes are the third-largest family of flowering terrestrial plants on the planet. They can be found all over the world, with the exception of Antarctica, in a wide variety of environments, from the desert to the plain to the high mountains. Their form varies widely. Others are trees. The tualang tree, also known as *Koompassia excelsa*, is one of the world's tallest tree species and can reach heights of more than 280 feet in Southeast Asian rainforests. A legume it is. And Brazilian rosewood, a luxurious hardwood frequently utilized in the construction of musical instruments. It is also a legume. With a few exceptions, legumes can also grow as shrubs, vines, and small annual herbs, but they all share one trait: their fruit. Green peas are a delicious legume that are simple to eat either raw or cooked. With 1 cup providing about 118 calories, 8 g of protein, 1 g of fat, and 8 g of dietary fiber. They have a lot of vitamins A, K, and C and are a great

source of folic acid. Phytonutrients, minerals, and antioxidants are all abundant in peas. It is clear why peas are regarded as one of the most nutrient-dense legumes.

### Pest control for grain legumes.

Cultural customs to prevent significant pest damage to grain legumes, it is helpful to plant early and on schedule. Compared to crops grown in the spring, early planting of chickpea in the winter has less damage from the leaf miner, *L. cicerina*. In contrast to the winter-sown crop, the second generation of the leaf miner attacks young, spring-planted chickpea plants, which accounts for the higher amount of infestation in these plants. The huge populations of *Helicoverpa armigera* in southern India, however, do more harm to early chickpea plantings. Climate change could make planting periods more unpredictable.

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**Pic. 1. *Helicoverpa armigera*, larva shown here (Legume plants)**

For example, in the 2009 rainy season, a 30-day delay in the arrival of the monsoons caused pigeonpea plantings to be put off, which caused *Helicoverpa armigera* damage. Meanwhile, strong rains in August caused additional bug damage to soybeans. Short-duration cultivars are frequently employed to prevent pest damage, although in southern India, *M. vitrata* causes more harm to short-duration pigeonpea. In Syria, late-sown lentils have shown an increase in *Sitona crinitus* infestations (280 Integrated Pest Management in the Tropics). Early pea picking minimizes *B. pisorum* losses in Australia. Before and after crop harvest, deep plowing fields eliminates the overwintering population of *Helicoverpa armigera* and pests that live in the soil. Field irrigation or flooding

during pupation decreases *Helicoverpa armigera* survival and lowers population densities the following generation or season. Birds like drongos (*Dicurus adsimilis* L.), egrets (*Egretta* spp.), and common Mynas (*Acridotheres tristis* L.) accompany the ploughshare during agricultural activities to feast on insects that are exposed to the soil surface. A heavy fertilizer application causes lush plant growth, which increases insect pest damage. Early blooming and fruiting termination minimize *Helicoverpa armigera* population carryover from one season to the next as well as the number of generations, and has been utilized as one of the management strategies for this pest on cotton.



**Pic. 2. *Helicoverpa armigera*, larva (Legume plants)**

*Helicoverpa armigera* damage is lessened when chickpea, pigeonpea, and cowpea are interplanted with mustard, linseed, or safflower. Moreover, intercropping can be employed to promote the activity of natural enemies. Widespread use of trap crops and distracting hosts has also been made to lessen the harm caused by *H. armigera*. Carrots, marigolds, sesame, sunflowers, and sesame can all be utilized as

*Helicoverpa armigera* trap crops. In Australia, trap crops like chickpea and pigeonpea are grown alongside cotton to lessen *Helicoverpa armigera* harm. It has also been proposed to use plant kairomones to entice *B. pisorum* and *Helicoverpa armigera* into traps or poison baits.

Although sources of insect pest resistance have been found, breeding programs have not frequently

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utilised these sources. It has been challenging to create pest resistant cultivars quickly due to irregular insect infestations between seasons and the difficulties of growing particular insect species. There are cultivars of pigeonpea, chickpea, cowpea, black gram, green gram, and field pea that are resistant to insect infestations. The levels of resistance to some pests, such as *H. armigera*, are, however, low to moderate. Yet, when used in conjunction with synthetic pesticides, even low levels of resistance could be extremely successful.

The creation of cultivars with dependable insect pest resistance would represent a successful pest management strategy. However, because the levels of resistance in the cultivated germplasm are low to moderate, it is not viable to generate cultivars with high levels of resistance to numerous important grain legume pests, particularly the pod borers. In order to make host plant resistance a workable part of integrated pest control, efforts must be undertaken to introduce resistance genes, either through extensive hybridization from the wild relatives of these crops or by inserting foreign genes through genetic engineering.

### Biological control.

There is a wealth of knowledge available on parasitism and, to a lesser extent, on insect pest predation on various edible legumes. Large numbers of *Helicoverpa armigera* and *H. punctigera* eggs are destroyed by the egg parasitoids *Trichogramma* spp. and *Telenomus* spp., but in chickpea and pigeonpea, their activity levels are too low due to trichome exudates. In India, the most significant larval parasitoid of *Helicoverpa armigera* on chickpea is the ichneumonid *Campoletis chlorideae* Uchida. Tachinids parasitize late-instar *Helicoverpa armigera* larvae, however the number of the larvae is not much decreased. *Palexorista laxa* (Curran), *Goniophthalmus halli* Mesnil, and *Carcelia illota* (Curran), all to a lesser extent, parasitize up to 22% of *Helicoverpa armigera* larvae in pigeonpea and up to 54% of larvae in chickpea.

### Biopesticides.

There is a lot of knowledge on entomophagous pathogens that can kill *Helicoverpa armigera* and *H. punctigera*, the pod borers, but these strategies have not proven to be a viable alternative to synthetic insecticides. Better control is achieved by applying *Bacillus thuringiensis* (Bt) (Berliner) spray in the evenings as opposed to other times of the day. Whereas *Beauveria bassiana* (2.68 x 10<sup>7</sup> spores per ml) caused 6% damage by *Helicoverpa armigera* on chickpea compared to 16.3% damage in untreated control plots, *Nomuraea rileyi* (106 spores per ml) caused 90 to 100% larval mortality.

### Chemical control.

Insecticides are frequently used exclusively in the management of insect pests in grain legumes. The most efficient control techniques for reducing *Helicoverpa armigera* are those targeted at adults, eggs, and neonatal larvae. Invading adults as well as eggs might be destroyed by spraying decisions based on egg counts, and the residue could kill subsequent eggs and newborn larvae. Juvenile larvae are hard to discover because they burrow inside the blossoms, making it harder for them to come into contact with insecticides. Economic thresholds have therefore been unable to be used for pest management. To stop the emergence of resistance or to contain it, some nations have devised insecticide resistance management measures. To reduce selection for resistance, all approaches rely on a rigorous time restriction in the use of pyrethroids and their modification with other insecticide groups. Also, a significant amount of knowledge has been produced regarding the chemical control of *B. pisorum* in pea *S. lineatus*, *A. fabae* in faba bean, and aphid vectors in lupins. One of the most powerful tools for pest management is chemical control. Yet, repeated and extensive use of highly toxic insecticides results in resistance building, pesticide residues in food, and negative impacts on natural enemies. They are the only option for providing immediate respite from pests' ravages in cases of severe pest infestations.

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V.S. Minasyants  
 unemployed  
 researcher

T.Kh. Norkobilov  
 unemployed  
 researcher

## BRONZE CAULDRONS FROM TASHKENT AND OTHER REGIONS OF CENTRAL ASIA, STORED IN THE COLLECTION OF THE STATE MUSEUM OF HISTORY OF UZBEKISTAN

**Abstract:** This article is devoted to the study of Saka bronze cauldrons stored in the collection of the State Museum of the History of Uzbekistan of the Academy of Sciences of the Republic of Uzbekistan. The purpose of this work is to publish and introduce into scientific circulation new samples of artifacts of nomadic peoples who lived on the vast territory of steppe regions not only in Uzbekistan, but also in Kazakhstan and Kyrgyzstan. Of the eleven boilers considered in the article, three of them were published earlier. The author also considered it necessary to include them in his work and consider them in conjunction with other first-published boilers stored in the museum. Unfortunately, some of the boilers originate from random collections of old years of receipts and have not preserved information about the time and circumstances of the finds, but most likely they were found on the territory of Central Asia. The analysis of the study showed the use of boilers for ritual purposes for the preparation of sacrificial food, as well as the developed foundry production of the peoples who inhabited the territory of Central Asia in ancient times.

**Key words:** Uzbekistan, Tashkent region, nomadic Saka tribes, bronze cauldrons, ritual sacrificial food.

**Language:** Russian

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### БРОНЗОВЫЕ КОТЛЫ ИЗ ТАШКЕНТА И ДРУГИХ РЕГИОНОВ ЦЕНТРАЛЬНОЙ АЗИИ, ХРАНЯЩИЕСЯ В СОБРАНИИ ГОСУДАРСТВЕННОГО МУЗЕЯ ИСТОРИИ УЗБЕКИСТАНА

**Аннотация:** Настоящая статья посвящена изучению сакских бронзовых котлов, хранящихся в собрании Государственного музея истории Узбекистана АН РУз. Целью данной работы является публикация и введение в научный оборот новых образцов артефактов кочевых народов, обитавших на обширной территории степных районов не только в Узбекистане, но и в Казахстане и Кыргызстане. Из одиннадцати рассматриваемых в статье котлов, три из них публиковались ранее. Автор посчитал нужным также включить их в свою работу и рассматривать в комплексе с другими впервые публикуемыми котлами, хранящимся в музее. К сожалению, часть котлов происходят из случайных сборов старых лет поступлений и не сохранили сведений о времени и обстоятельствах находок, но скорее всего они были найдены на территории Центральной Азии. Анализ изучения показал использование котлов в ритуальных целях для приготовления жертвенной пищи, а также развитое литейное производство народов, населявших территорию Центральной Азии в древности.

## Impact Factor:

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**Ключевые слова:** Узбекистан, Ташкентский регион, кочевые сакские племена, бронзовые котлы, ритуальная жертвенная пища.

### Введение

В археологическом фонде Государственного музея истории Узбекистана Академии наук РУз хранятся одиннадцать бронзовых котлов, которые являются памятниками материальной культуры кочевых сакских племен, обитавших на обширной территории Центральной Азии в I тысячелетии до нашей эры.

Кто же они такие, эти таинственные легендарные саки, оставившие после себя на обширных просторах Центральной Азии многочисленные памятники культуры, к числу которых относятся и ритуальные бронзовые котлы.

Рядом с земледельческими областями Центральной Азии в I тыс. до н.э. жили племена скотоводов и кочевников, которые в Авесте упомянуты как «туры с быстрыми конями».

Вот, что можно узнать о саках из сочинений древних авторов: «По ту сторону Яксарта (Сырдарьи) живут скифские племена. Персы их называют саками. Знаменитейшие из них саки, массагеты, даи, исседоны, аримаспы. Они передвигаются на повозках и питаются молоком. Кочевники – саки великолепные наездники и стрелки из лука. [6, с. 13-15; 13, с. 77-78].

Саки верили в древнейших индоиранских богов-дэвов и поклонялись явлениям природы. Верховным богом массагетов было солнце, которому приносили в жертву лошадей. [13, с. 84].

Особой любовью у них пользовался праздник весеннего равноденствия, который знаменовал собой победу Солнца в начале весны. В эти дни они возжигали огонь, совершали возлияния, устраивали скачки и стрелковые соревнования.

Во время праздников большие группы сакских племен съезжались в определенные традиционные священные для них места. На специальных жертвенниках или алтарях в виде столов из бронзы, приносили в жертву коней или других животных, затем варили мясо в котлах и поедали его сообща. Это должно было гарантировать всеобщее благополучие. [13, с. 109-110].

По окончании праздника люди расходились, предварительно укрыв котлы и жертвенники в специально устроенных тайниках. Постоянно возить эти предметы с собой, ввиду их крупных размеров и тяжеловесности было нелегко, поэтому их прятали. Это подтверждают находки, так называемых «кладов саков», в состав которых входят целые наборы, связанные с ритуалом жертвоприношений и трапез: котлы, жертвенники, курильницы, которые обнаруживают в одном месте. Находки подобных «кладов» в северной Киргизии (Семиречье), на

юге Казахстана, и в Узбекистане уже никого не удивляют, равно как и находки отдельных предметов, из которых эти клады обычно состоят. [25, с. 112-118].

Большие котлы, служившие для приготовления горячей пищи, могли, конечно, применяться и не только в дни празднеств. Но обойтись без них в праздники было невозможно.

Сами котлы также наделялись магическими свойствами. Часто они встречаются среди погребального инвентаря в сакских курганных могильниках.

Свидетелями былых пиров являются и котлы, хранящиеся в Государственном музее истории Узбекистана. Из одиннадцати котлов у пяти известны места находок. Два из них были обнаружены в окрестностях Ташкента, один в районе озера Иссык-Куль в Кыргызстане, один в Ферганской долине и один в Самаркандской области. К сожалению, неизвестны места находок семи котлов и нет никакой информации о том, откуда и когда они поступили в музей. Скорее всего, эти котлы из старых поступлений.

Приведем описания котлов.

1. Котел бронзовый, литой, (рис.1) полусферической формы, на полой конусовидно-раструбной ножке. Найдено близ Ташкента, время и обстоятельства находки неизвестны.

В месте скрепления ножки с корпусом котла имеется разрыв шва. Край слегка загнут внутрь, подтреугольно расширен и с плоским верхом. В верхней половине тулова, ниже края котла на 3,5 см крепились две горизонтальные, диаметрально противоположные дугообразные ручки. Одна ручка с частью стенки отломана. На ручке в средней части имеется округлый маленький выступ. На корпусе ниже края на расстоянии 24-25 см по кругу неровно идет выступающий стыковочный шов от формы. Края котла в двух местах обломаны, имеются трещины, в корпусе пролом. Котел помят. Высота котла - 45,5 - 46 см, высота ножки - 15,5 см., диаметр ножки - 10-17,5 см. Диаметр венчика - 43-48,5 см; ширина ручки - 10 см. Инв.№ 66/3.

2. Котел бронзовый, (рис.2) литой. В инвентарной книге Туркестанского народного музея за 1918 год, записано, что «котел был найден в селении Богородицком в 40 верстах от Ташкента по Чиназской дороге».

Котел имел, вероятно, конический поддон-ножку, которая не сохранилась, но сохранился круглый по форме (диаметр 13 см) след шва соединения поддона и тулова. Тулово слегка вытянутой полусферической формы с грубо отогнутым, неровным бортиком, шириной 5 см, который завершается заостренным краем. Бортик

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помят, деформирован и имеет следы ремонта. С внутренней стороны у котла в месте изгиба бортика имеется концентрический заостренный выступ, сделанный, по-видимому, для упора крышки. Снаружи на корпусе от линии загиба бортика в шести местах ниспадают рельефные дугообразные жгуты, которые концами соединены между собой. В верхней части чаши котла, ниже линии изгиба на 5,5 см, крепились две горизонтальные диаметрально противоположные приподнятые дугообразные ручки (одна ручка отломана). Сечение ручек округлое. Внутри на дне котла в центре имеется раскованная округлая «закленка». Котел поврежден: часть венчика утрачена, по краю трещины; в верхней части сохранившейся ручки ремонтная заплатка. Снаружи и изнутри; на корпусе вмятины. Высота котла 30 см; Диаметр венчика 46-48 см.; ширина ручки 9,5 см, выступает на расстояние 4,5 см; толщина стенок 0,5-0,7 см. Инв. № 66/5

3. Котел, из красноватой бронзы, литой (рис.3). В инвентаре за 1918 г. указано, что котел «был извлечен из озера Иссык-Куль». Округло вытянутое бокалообразное тулово котла имеет широкое устье, относительно низкий, рюмкообразный полый поддон, отлитый отдельно, прикреплен с внешней стороны дна котла. Край котла прямой, неровный, с маленьким выступом внутри, слегка утолщен наружу. В верхней половине тулова, ниже края котла на 9,5 см., закреплены две горизонтальные, диаметрально противоположные дугообразные, загнутые вверх ручки. В месте соединения поддона с туловом котла образовался выступающий шов. Высота котла 61-62 см, высота ножки – поддона – 16 см. Диаметр ножки в основании – 27 см. Диаметр венчика – 63,5 см. Ширина ручек-18 см., выступают на расстояние 6 см от корпуса. Инв. № 66/1.

4. Котел бронзовый, цельнолитой (рис.4), обнаружен во время работ при строительстве Большого Ферганского канала в 1939 году, к северо-западу от селения Тюячи. (18, с.23, таб VIII; с.41). Корпус котла цилиндрический, с горизонтальным ребром в верхней трети, край отогнут наружу (шир.-2 см). Дно уплощено – коническое с большой ремонтной вставкой в центре, размером 37х40 см. Котел имел три ножки, из которых полностью сохранилась только одна, причем, она имитирует человеческую ногу (выс. ножки - 26,5 см); вторая уцелела наполовину (сохранившаяся дл.19,5 см); третья – отломана, а на месте крепления рваное сквозное отверстие в днище, диаметром 7 см. Ножки котла отлиты отдельно и затем, закреплены к корпусу, путем вставок в днище и заливки изнутри, о чем свидетельствуют округлые наплывы металла в местах крепления ножек внутренней. На диаметрально противоположных сторонах котла

прикреплены 4 ручки – кольца, таким образом, что верхняя половина каждой выступает над стенкой. На наружной поверхности ручек по два глубоких желобка, так что ручки имеют вид трех вписанных друг в друга концентрических колец. По краю котла в каждом из четырех промежутков между кругами – по одному скульптурному изображению горного козла, идущего по направлению часовой стрелки. В передней части туловища козлов имеются по рельефной овальной пластинке – крылу (?) Ручки – кольца и фигурки козлов отлиты вместе с котлом.

Котел имеет следы длительной эксплуатации и ремонта: прогоревшая середина дна вставлена вторично, на боках имеются заплатки.

Высота котла (с ножкой) – 55,5 см., высота корпуса – 30 см., диаметр венчика – 64,5 см., диаметр округлой ножки в верхней части – 3,5 см., снизу – 2,5 см., диаметр ручек – колец – 16 см., ширина – 3 см., толщина 1,5 см. Размер фигурок козлов: высота 7,7 см. длина- 8 см. Инв. № 29/520.

5. Котел бронзовый, литой, (рис.5) на конической полый ножке-поддоне, которая деформирована, треснула и имеет утраты по краям. В месте соединения поддона с корпусом имеется шов. Котел был обнаружен во время раскопок погребения II-I вв. до н.э. участниками совместной узбекско-французской археологической экспедиции в 2000 году на городище Коктепа, расположенном в 30 км севернее Самарканда. Погребение располагалось в трапецевидной катакомбе, с южной стороны которой имелись еще две камеры округлой формы. В восточной камере обнаружено четыре сосуда – два кувшина, фляга и тагора. В западной камере был найден бронзовый котел. [12, с. 79-85].

Корпус котла полушаровидный с несколько раздутыми боками. Стенки в верхней части несколько сужаются внутрь и затем образуют вертикальный, слегка отогнутый наружу бортик, высотой 3 см., который завершается прямой закраиной. С внутренней стороны котла в месте изгиба бортика имеется концентрический кольцевой выступ, служивший, по-видимому, для упора крышки. Чуть ниже изгиба бортика расположены выступающие, почти эллипсовидной формы, «нашлепки», к которым прилиты две диаметрально расположенные горизонтальные, приподнятые вверх, петлевидные, округлые в сечении, ручки. В средней части тулова котла, прослеживаются следы рельефного литейного шва. Котел снаружи закопчен, покрыт окисью, на бортике трещина. Высота котла – 32 см. высота корпуса -21 см. высота ножки поддона – 11 см. Диаметр венчика – 24,5 см. диаметр корпуса в широкой части – 26 см, диаметр ножки поддона в основании – 13,5 см; диаметр в месте скрепления с котлом – 7 см. Толщина стенок котла -0,3 см. Ширина ручек – 7



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см. выступают на расстояние – 4 см. от корпуса. Инв. № 328/5.

6. Котел, литой из красноватой бронзы, (рис.6) на полый конической, слегка раструбной, ножке-поддоне, края которой местами утрачены. Место и время находки котла неизвестны. Корпус полусферический, слегка сужается в верхней части. Закраина скошена внутрь и образует горизонтальный заостренный выступ изнутри. В верхней части тулова на расстоянии 5,5 см. ниже края закреплены две горизонтальные, диаметрально расположенные ручки с двумя продольными глубокими желобками снаружи (поперечное сечение ручек подпрямоугольное). Между ручками на том же уровне были закреплены две вертикально расположенные петли из согнутого круглого в сечении прута (сохранилась одна петля). На противоположной стороне, на месте, где крепилась вторая петля, по-видимому, часть стенки была вместе с петлей отломана и на это место грубо наложена бесформенная ремонтная заплатка.

По максимальному диаметру тулова котла ниже венчика на 11 см. проходят в три ряда жгуты в виде имитаций перевитых шнуров. В придонной части котла следы ремонта в виде округлой расклепки в центре и овальной заплатки сбоку. Котел в верхней части погнут. Ручки котла отлиты вместе с туловом. Высота котла -55 см., диаметр по венчику 46-52,5 см. Высота ручек – 5,5 см., расстояние между концами оснований ручек – 11 см, выступают от стенки на 5,5 см. Ширина вертикальных петель - 6,5см., выступают от стенки на 4 см. Инв. № 66/2.

7. Котел бронзовый литой (рис.7), на полом, по-видимому, коническом поддоне, который сохранился частично. Место и время находки котла неизвестны. Тулово котла уплощенно-полусферической формы. Стенки котла в верхней части сужаются внутрь, затем, делая двойной излом, образуют отогнутый наружу, горизонтальный нависающий бортик (шир. -3см.) со скошенной закраиной. С внутренней стороны на уровне бортика резкий излом стенок образует скос с узким концентрическим выступом, который, по-видимому, служил местом для упора крышки. В верхней части котла (ниже бортика на 2,5см.) с четырех сторон прилиты диаметрально расположенные вертикальные дугообразные ручки с шестью поперечными сегментовидными выступами-ребрами. По максимальному диаметру тулово котла, ниже бортика на 12 см, под ручками украшено тонким (шир. 0,5 см.) жгутом в виде имитации перевитого шнура.

Сохранившаяся высота котла 36 см, диаметр ножки – 13см. сохранившаяся высота ножки -4 см., диаметр венчика – 58 см, ширина ручек -3 см, расстояние между концами оснований ручки - 10см. Инв. № 66/4.

8. Котел бронзовый, литой (рис.8) с полусферическим, слегка вытянутым туловом, на невысокой полый, слегка раструбной ножке-поддоне. Место и время находки котла неизвестны. В месте скрепления ножки с корпусом образовался шов в виде наплывов металла. Край котла резко отогнут наружу и заострен. В верхней части корпуса на расстоянии 5,5 см. от края расположены две горизонтальные округло-дугообразные, приподнятые вверх ручки. Снаружи ниже края на корпусе котла неровно проходит широкий опоясывающий желобок. Под закраиной в трех местах вертикально расположены короткие узкие ребровидные напайки (длина -3см.), почти доходящие до желобка. Котел поврежден, деформирован, в нескольких местах проломы стенок. На корпусе следы ремонта в виде заплат. Высота котла – 35-36 см., диаметр венчика 34,5-35,5 см. Высота ножки - поддона – 7 см., диаметр основания – 12см. Ширина ручек – 8-8,5см., выступают на расстоянии 6,5 см. от корпуса. Инв. № 66/6

9. Котелок бронзовый, литой, (рис.9) полусферической формы, без поддона. Корпус котла завершается слегка вогнутой, утолщенной подтреугольно и скошенной внутрь закраиной. В верхней части тулова на 4 см. ниже закраины были закреплены две диаметрально расположенные дугообразные округлые в сечении ручки. Венчик котла смят, что придает ему форму овала. Снаружи на половине высоты котелка (на расстоянии 12 см от края) хорошо заметен горизонтальный рельефно выступающий шов. На выпуклом днище следы ремонта в виде поперечного шва и округлой заплатки. В корпусе со стороны обломанного края, где находилась ручка, вдоль котелка почти до середины корпуса идет трещина, которая раздваивается в стороны. На венчике также имеются трещины. Диаметр по венчику – 23-29см. Высота -17,5см. Высота ручки – 4 см., расстояние между концами основания ручек – 7,5 см. Инв. № 66/7.

10. Котелок бронзовый литой, (рис.10) полусферической формы на высокой полый конической книзу ножке-поддоне, которая частично обломана. Место и время находки котелка неизвестны. Корпус в верхней части слегка заужен внутрь и завершен отогнутой наружу чуть заостренной закраиной. В верхней части корпуса закреплены две горизонтальные, диаметрально расположенные, приподнятые вверх дугообразные ручки. В месте соединения корпуса котелка с ножкой-поддоном имеется шов. На поверхности следы коррозии, расслоение металла на венчике. Высота котелка – 20см, высота поддона – 7 см. диаметр корпуса – 17см, диаметр венчика – 16,5см. диаметр ножки - поддона в основании – 9,5см. Ширина ручек – 4,5см. выступают на расстояние – 3 см. от

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корпуса. Инв. № 188/124

11. Котелок бронзовый литой, (рис.11) с шаровидным корпусом. Котелок имел, по-видимому, ножку-поддон, которая не сохранилась. Место и время находки котла неизвестны. В средней части тулова закреплены две горизонтальные диаметрально расположенные широкие ручки в виде полуовальных дуг. Одна ручка отломана. Край котла подтреугольно утолщен, чуть вогнут и скошен внутрь. Свободные от ручек поверхности корпуса украшают диаметрально ниспадающие от края две рельефные узкие дуги. Венчик помят, на нем имеются трещины. В нижней части корпуса следы ремонта в виде грубо наложенной заплатки диаметром 5,5 см. Высота котелка – 13,5см, диаметр венчика – 11-12,5см, диаметр корпуса – 16см. Высота ручек – 5,5см, расстояние между концами-оснований – 11 см. Ширина рельефных «дуг» – 6 см, они ниспадают на расстояние – 4,5см от края. Инв. № 188/123

Как видно из вышеизложенного большинство среди котлов из собрания Государственного музея истории Узбекистана составляют сосуды на конических ножках – поддонах. Бронзовые котлы на конических поддонах известны почти во всех ареалах скифо-сарматского и сакского мира и бытуют более чем тысячелетие.

Длительный период бытования их и распространенность на огромных пространствах великого степного пояса – от Северного Китая до Дунайской равнины – объясняется, прежде всего, чрезвычайно продуманной, удобной в быту кочевников – скотоводов формой, приспособленной к небогатому степному топливу, а также долговечностью и портативностью их. Такой котел на полной подставке, обложенный кизяком или поставленный в середину костра, быстро нагревался, так как жар охватывал сразу его стенки. [23, с. 157].

В царских могилах скифов в Причерноморье, в Крыму было найдено немало котлов на полых ножках с ручками на венчиках. Это и дало повод называть все котлы на полых конусовидных ножках «скифскими». В настоящее время установлено, что не только скифы, но и сарматы, а также и более поздние кочевники пользовались котлами такого же типа. Задолго до V в до н.э. - в VIII-VI вв. до н.э. – такие котлы уже бытовали на Кавказе, Кубани и Китае. [21, с. 127-138; 10, с. 112-131, рис. 13,14; 23, с. 156-157].

К рассматриваемой группе котлов музейного собрания можно отнести котлы: № 1 (66/3), найденный близ Ташкента, № 2 (66/5), № 3 (66/1), найденный в озере Иссык-Куль, № 5 (328/5) найденный в погребении на городище Коктепа, № 6 (66/2), № 8 (66/6) и № 10 (188/124). Котлы этой группы различаются размерами, некоторыми

особенностями формы корпуса, элементами орнаментации и профилировкой венчика, но все они на полых усеченно конических ножках-подставках. Практически всем котлам этой группы мы находим аналогии среди котлов V-IV вв до н.э. обнаруженных в разные годы в Киргизстане, а также в Казахстане (г. Алматы и его окрестностях, Павлодарской области и др.). [20, с. 1-5,10,11, таб. П].

Котлы этой группы можно подразделить на четыре типа:

I тип. К этому типу можно отнести три котла под № 1 (66/3), 6 (66/2), 8 (66/6). Все они имеют похожую форму тулова в виде полусферы, более или менее округлый низ и слегка зауженный верх, который завершается подтреугольно утолщенной или слегка отогнутой закраиной. У всех у них в верхней половине корпуса ниже края котла крепились две горизонтальные диаметрально противоположные дугообразные ручки. У котла под № 6 кроме ручек, имеются небольшие вертикальные петли, расположенные в верхней части корпуса на уровне ручек. Эти петли являются характерной особенностью семиреченских котлов и служили для закрепления веревкой при навьючивании на лошадей или верблюдов. (23, с. 158). У этого же котла по максимальному диаметру тулова проходит тремя параллельными рядами шнуровой орнамент в виде рельефных веревочек. Датировать этот тип котлов можно V-IV вв. до н.э.

II тип. К V в до н.э., по-видимому, можно отнести большой котел нашего собрания, найденный в озере Иссык-Куль в Киргизстане. Его бокалообразное тулово имеет широкое устье с утолщенной прямой закраиной. В верхней половине тулова закреплены две дугообразные ручки. У котла рюмкообразный полый поддон.

Похожие по форме котлы мы находим в Киргизстане [23, таб. I, № 4,10], Казахстане, в Восточно-Казахстанской области (Чардояк и Усть-Каменогорск) [23, таб. I, № 24,25], в Поволжье (котел из Куйбышевского музея, найденный в савроматском кургане у с. Овсянка) [21, с. 128-129, рис. 70А, № 6]. На левобережье нижнего Дона и в Приазовье были также найдены похожие котлы V-IV вв. до н.э. [22, с. 23-24, рис. 3 (1,3,4)]. У котлов из Киргизстана ручки также, как и у нашего горизонтальные, а у котлов из Казахстана, Поволжья и Приазовья ручки вертикальные с одним или тремя отростками на вершине. Подобные котлы К. Ф. Смирнов датирует V в до н.э., а Н. А. Боковенко считает, что датировка этих котлов не выходит за рамки III-II вв. до н.э. или даже они датируются II-III вв. н.э. Нам кажется, что датировка К. Ф. Смирнова более правильная.

III тип. Этот тип представлен котлом, найденным «в селении Богородицком в 40 верстах

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от Ташкента». Тулово котла слегка вытянутой полусферической формы с грубо отогнутым бортиком. Снаружи на корпусе по линии загиба бортика в шести местах ниспадают рельефные дугообразные полуовальные жгуты. Котел имел конический поддон, который не сохранился. (№ 2, 66/5). Некоторые аналогии орнаментации этому котлу мы находим у котла V-IV вв. до н.э., обнаруженного в районе г. Алматы, у которого в отличие от нашего вместо шести, четыре рельефных полуовала. У него более округлое основание сферического корпуса и округло уплощенная закраина. [20, с. 70]. По-видимому, этот тип котлов можно датировать V-IV вв. до н.э.

IV тип представлен двумя небольшими котлами № 5 (328/5) и № 10 (188/124). Первый котел был обнаружен во время раскопок женского погребения II-I вв. до н.э. на городище Коктепа, а второй котел неизвестного происхождения. Эти небольшие котлы с корпусом полушаровидной формы с раздутыми боками и на полый конической слегка раструбной ножке. Корпус в верхней части слегка заужен и завершен отогнутой наружу закраиной. У котлов в верхней половине корпуса крепились две горизонтальные слегка приподнятые ручки. Кроме датированного котла из Коктепа, подобный котелок был обнаружен в погребении № 2 кургана Сирлибайтепе в Кошрабадском районе Самаркандской области в 1983-84 гг. Погребение тоже было датировано II-I вв. до н.э. (10, с. 48-51, 56-57, рис. III). Похожий котел находится в собрании котлов Государственного Эрмитажа, найденный в районе Нижнего Абакана (инв. № ГЭ 1123/36) в Сибири [17, с. 74, рис. 5]. Подобный по форме котел известен в Семиречье. А. Н. Бернштам датировал его V-III вв. до н.э. [2, с. 350, рис. 8-9].

По классификации котлов Восточной Европы сарматского времени Н. А. Боковенко, подобные котлы отнесены им ко второму типу и датируются I в. до н.э. – I в. н.э. Такие котлы были найдены в степях Прикубанья, Нижнего Дона и Поволжья. (4, с. 232-234). На основании вышеизложенного датировка второго котелка нашего музея, не имеющего места находки, может быть определена также II-I вв. до н.э.

Среди металлических котлов, хранящихся в музее, выделяются миниатюрные сосуды-котелки. Это котелки под № 9 (66/7), 11 (188/123). Полную аналогию котелку под № 11 (188/123) дают два бронзовых сосуда обнаруженные в 2004 г. в ауле Узынбулак, Кегенского района Алмаатинской области в Казахстане и которые датируются III-II вв. до н.э. [20, с. 42, 43, 46]. Похожие котлы были найдены также в Казахстане в составе Бесагашского клада (район г. Талгара) и в долине р. Когалы. [20, с. 42, 43, 64]. Кроме того подобные котелки с аналогичными ручками

зарегистрированы Б. А. Литвинским при раскопках сакских могильников Аличур и Харгуш на Памире в Таджикистане [15, с. 44-49], датированные им IV-III вв. до н.э. У памирских котелков более округлые кольца-ручки, а между ними выступ-ложный носик в виде изогнутой лошадиной шеи, кончающейся головой хищной птицы (Аличур II), или же между горизонтальными ручками – две вертикальные ручки в виде фигурок горных баранов-архаров (Харгуш II).

К.Ф. Смирнов также отмечает находки подобных котелков у савроматов в степном Заволжье. Один из них найден во время пахоты в поле близ с. Рахинка в 1911 г., а другой котелок был найден местными жителями в 1886 г. в кургане у с. Салтово Новоузенского уезда. На боку одного из котелков, найденных там, между ручками – рельефное изображение лежащего кулана или лосихи. По поводу этих котелков К. Ф. Смирнов пишет: «Не известно, изготовляли ли эти котелки савроматы Поволжья..., но родину самой формы подобных сосудов надо определенно искать на Востоке у саков Семиречья и Памира...». К. Ф. Смирнов датировал их V в. до н.э. (21, с. 134-135).

Котел из Тюячи, найденный при строительстве Большого Ферганского канала (№ 4, инв. 29/520) стоит особняком среди других среднеазиатско - казахстанских котлов. Именно поэтому он уже неоднократно привлекал внимание исследователей. Л. М. Рутковская в специальной работе посвященной этому котлу считает цилиндрическую форму котла китайской, а изображения козлов, по ее мнению, примыкают к памятникам скифского искусства. Она считала, что котел изготовлен не в Центральной Азии, а привезен сюда хуннами и датируется III в. до н.э. (19, с. 45; 15, с. 49-50). М. Е. Массон датировал этот котел рубежом нашей эры. [19, с. 41].

Ю. А. Заднепровский в своей книге «Древнеземледельческая культура Ферганы» признает, что тюячинский котел имеет некоторое сходство с китайскими котлами, но считает это сходство относительным, ибо «для китайских котлов характерно более округлое тулово, своеобразная форма ручек и ножек, а также обязательное наличие крышки». Потом рассматривается форма котла, его украшения и делается заключение о местном происхождении этого котла. По мнению Ю. А. Заднепровского, котел относится к «сакскому периоду». [8 с. 162-164].

Б. А. Литвинский считал, что основным элементом для датировки этого котла являются его ручки и, что котлы Северного Кавказа с аналогичными ручками датируются VIII – началом VII в. до н.э. Б. А. Литвинский пишет, что «котел с БФК сближает с северокавказскими

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также наличие горизонтального рельефного валика на корпусе. Все это позволяет предполагать очень раннюю дату и для котла с БФК VIII или скорее VII в. до н.э.». (15, с. 50).

По-видимому, VI веком нашей эры можно датировать наш котел под № 7 (Инв. № 66/4). Тулово котла уплощено полусферической формы на полом, по-видимому, коническом поддоне, который сохранился частично. Стенки котла в верхней части делают излом и образуют отогнутый нависающий бортик. В верхней части котла с четырех сторон прилиты диаметрально расположенные вертикальные дугообразные ручки с шестью поперечными сегментовидными выступами-ребрами, имитирующие фактуру рогов архара.

В настоящее время котлы, подобные нашему в Центральной Азии известны относительно неплохо. Все они были найдены случайно, и соответственно датировка их не является точной.

Почти полную аналогию мы находим в Казахстане у котла, обнаруженного в 1928 г. в районе озера Борового, в урочище Бармашино у сел. Щучье, Петропавловского округа, Казахской ССР, (ныне – Кокчетавская обл., Казахстан). [3, с. 216-229; 23, с.32, табл. I; 1958. с.184; 1, с.75, 201; 28, с.441-445]. У этого котла также широкий, отлогий венчик, четыре вертикальные ручки-петли на корпусе, имитирующие фактуру рогов архара, такой же обведенный вокруг корпуса жгут в виде перевитого шнура, но в отличие от нашего котла у него более глубокий сферический корпус.

Сразу же после случайной находки котла сотрудниками Петропавловского музея были проведены раскопки каменной могилы, где под огромной плитой был обнаружен вышеупомянутый котел. Ниже котла было найдено погребение с черепом человека и погребальным инвентарем, среди которого было много золотых изделий. Впервые эта находка была опубликована А.Н. Бернштамом, который датировал предметы из погребения IV-V вв. н.э. и определил его, как гуннское [3, с.216-229]. Е.Ю.Спасская датировала котел из Бармашино тоже IV-V вв. н.э. [23, с.164].

Материалы этого погребения также публиковала И.П.Засецкая, которая весь комплекс, на основании совокупности дат всех предметов, датировала в пределах V – первой половины VI в., но время захоронения - началом VI в. [9, с.95-110].

Подобные котлы были обнаружены и в Таджикистане. Так в Фахрабаде, Курган-Тюбинской области был найден случайно при рытье канала аналогичный котел. В настоящее время он хранится в Национальном музее Таджикистана (г. Душанбе). По своей форме он более близок котлу из Бармашино. Диаметр его венчика 48 см., высота сосуда – 42 см. Венчик

значительно толще стенок, резко отогнут наружу относительно низкой горловины котла. Внутренняя закраина венчика поднята вверх и, таким образом, расположена на одной линии с площадкой венчика. Сохранилась приземистая ножка почти цилиндрической формы. В верхней части сосуда крепились четыре ручки, украшенные снаружи насечками. Котел изготавливался в литейной форме, состоявшей из нескольких секций, что заметно по стыковочным швам. [27, с. 293, рис. 1; 5, с.61-62, рис. 14]. Аналогичен нашему и котел из Руфигара (район г. Душанбе) обнаруженный геологами в 1972 году и передавшими его фрагменты в Национальный музей Таджикистана. Диаметр его венчика 55 см. и сохранился он на высоту 41,5 см. Тулово сосуда округлое, неширокий венчик плавно отогнут наружу. Частично сохранилась низкая ножка выпукло-конической формы. На плечиках сосуда, на стыке тулова и венчика расположены четыре вертикально поставленные ручки с насечками, снабженные выступами-кнопками [5, с.62, рис. 15, 2; 26, с.140-141, рис. 3, 5].

Почти полностью схож с нашим котлом котел из Зидды (район г. Душанбе). В 1969 году котел поступил в Институт истории им. А. Дониша АН Таджикской ССР. Диаметр венчика его 48 см. и сохранился на высоту 31,5 см. Тулово сосуда округлое, венчик плавно отогнут наружу, на поддоне сохранилось основание ножки. Между венчиком и плечиками сосуда расположены четыре вертикальные ручки с горизонтальными насечками и выступами-кнопками. На высоте ручек тулово котла, как и нашего, опоясывает горизонтальный валик, имитирующий скрученный шнур. [26, с. 140-141; 5. с. 62-63, рис. 15, 1].

Ю.Я.Якубов, впервые опубликовавший данные сосуды из Руфигара и Зидды, датировал их VII– началом VIII в., на основании находки обломка бронзового котла на поселении Гардани Хисор в помещении, которое по керамическому и монетному материалу датировалось VII – началом VIII вв. [26, с.135].

На городище Тахти-Сангин при раскопках цитадели в 2004 г. была обнаружена мастерская по производству крупных бронзовых изделий, где в верхних слоях греко-бактрийского времени второй половины II в. до н.э. были найдены фрагменты литейной формы для отливки крупного котла с греческой надписью. Литейная форма была изготовлена из глины с добавкой органического материала. Снаружи литейная форма была покрыта слоем необожженной глины. Диаметр котла реконструирован в пределах 75-80 см.

Десять фрагментов формы являлись частями внешней закраины венчика. Были найдены и те части литейной формы, которые предназначались

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для отливки 4 ручек, располагавшихся симметрично по четырем сторонам котла. На литейной форме ручки начинались непосредственно на стыке венчика с горловиной и направлены вниз к тулову. Снаружи они украшены сплетенным наподобие косы орнаментом.

Было найдено и несколько фрагментов внутренних частей литейной формы, состыковав которые авторы воссоздали форму котла. По реконструкции археологов Н. Бороффки и Цзян Цзун Мэя литейная форма служила для отливки большого котла с четырьмя вертикальными ручками с декоративным плетением. Форма отливаемого котла округлая, венчик резко отогнут наружу относительно низкой горловины. Помимо упомянутого выше декоративного плетения на ручках, на котел было нанесено не менее двух горизонтальных рельефных валиков в виде скрученного шнура, опоясывающих сосуд на уровне ручек. Как видно из вышеизложенного котел, который бы мог быть отлит в этой литейной форме очень напоминает наш музейный котел с четырьмя ручками.

Авторы датируют литейную форму из Тахти-Сангина второй половиной II века до н.э. и приводят в качестве аналогии котлы, найденные в Бармашино, Фахрабаде, Руфигаре и Зидде [5, с.54, 60-63].

По поводу котла из Бармашино нам хотелось бы уточнить один важный вопрос.

Авторы Н. Бороффка и Цзян Цзун Мэй публикуя вышеописанную литейную форму для отливки котла с греческой надписью в статье «Распространение технологий в Центральной Азии: взаимопроникновение китайской, греческой и скифо-сарматской традиций металлообработки» и приводя в качестве аналога наш музейный котел с четырьмя ручками, ошибочно считают его котлом, найденным в Бармашино. [5, с.61, рис.13]. Котел из Бармашино, судя по рисунку, в таблице у Е. Ю. Спасской несколько отличается от нашего котла глубоким с округлым основанием корпусом. В своей статье Е. Ю. Спасская ясно пишет, что «котел ..., найденный в Бармашино имеющий четыре оригинальные ручки на корпусе, имитирующие фактуру рогов архара, обведенный одной линией веревочки, убранством своим, аналогичен котлу, хранящемуся в Ташкентском музее, найденном под Ташкентом» [23, с.164]. Информация о местонахождении нашего котла под Ташкентом также является неправильной. Е. Ю. Спасская ссылается на письмо директора Музея истории Узбекистана АН Уз ССР от 27 февраля 1947 года, где он ошибочно дал ей неверную информацию, что музейный котел найден под Ташкентом. К сожалению данный котел не имеет точного места находки, а котел из Бармашино хранится в музее в

Петропавловске [24, с.184; Демиденко, 2014, с. 79].

С.В. Демиденко в дискуссионной статье «Котлы типа Тахти-Сангин-Бармашино: к проблеме взаимопроникновения традиций металлообработки в Центральной Азии» не согласен с датировками Н.Бороффки и Цзян Цзун Мэя. Фрагменты литейной формы из Тахти-Сангина датирует второй половиной I – началом II в. н.э. Приведенные в качестве аналогий котлы из Зидды и Руфигара - VII -началом VIII вв., а котел из Фахрабада относит к гуннскому времени или эпохе раннего средневековья. (7, с.87). С.В.Демиденко также отмечает неправильное понимание авторами Н.Бороффкой и Цзян Цзун Мэем информации, почерпнутой из работ Е.Ю. Спасской о котлах из Бармашино и нашей коллекции. На основе сходства техники литья с котлом, найденным в Бармашино, котел из нашего музея он датирует началом VI в., и эта датировка нам кажется наиболее правильной [7, с.79, 87].

Скульптурки горных козлов на котле из Тюячи, а также ручки с поперечными сегментовидными выступами-ребрами, имитирующие фактуру рогов архара на котле № 7 имели не только декоративное значение, но носили, по-видимому, ритуальный характер и подчеркивали ритуальный характер этих сосудов. Известно, что горный козел воспринимался как «чистое жертвенное животное, животное мира богов». Поэтому эти изображения, возможно, определяли связь котлов с жертвенным животным и жертвой; а содержимое зооморфного котла отождествлялось с самим животным [20, с. 42].

О характере использования и функциональном назначении котлов у исследователей до сих пор нет единого мнения. У причерноморских скифов письменными источниками зафиксировано использование металлических котлов в ритуальных целях для приготовления жертвенной пищи. (6, IV, 61). О том, что котлы могли использоваться для приготовления пищи, в том числе ритуальной, свидетельствуют наскальные изображения. В частности, в святилище Тамгалы (Алмаатинская область) выявлены петроглифы с изображением котлов и животных, помещенных непосредственно над котлом. Подобные наскальные изображения известны и в других районах Евразийского пояса степей. На наскальных изображениях в Кызылкае и Сулеке (Хакасия) изображены большие котлы, около которых люди, мешающие, что-то в котлах, подкладывающие под них топливо или поправляющие угли. Очевидно, это изображения сцен какого-то ритуала, возможно связанного именно с варкого мяса жертвенных животных [14, 1952, с.136, рис. 46]. Учитывая, что скопления петроглифов обычно воспринимаются как

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древние святилища, можно предположить, что на них изображены жертвенные животные при совершении культовых церемоний. [20, с.41-42].





Миниатюрные сосуды-котелки могли использоваться в качестве курильниц. Подобные котелки, найденные в склепах с коллективными захоронениями в Минусинской котловине, с остатками сгоревшего и сплавившегося вещества на дне, возможно, предназначались для возжигания наркотических веществ. Например, котелок и квадратная курильница с семенами и камнями внутри были обнаружены в кургане 2 могильника Пазарык на Алтае. Ряд исследователей сходятся во мнении, что от дыма семян галлюциногенов, используемых в погребальном обряде, саки приходили в экстаз, во время которого подразумевалось сопровождение ими с обрядовыми песнопениями души умершего в загробный мир [20, с.42-43].

Котел и очаг занимали особое место у сакских племен, к ним всегда сохранялось особое

положение. У многих народов существовали предостережения с целью предотвратить осквернение очага. Так, например, погашенный очаг, перевернутый котел означали, что жизнь ушла и в этой семье, селении нет больше жизни. Огонь у древних являлся олицетворением стихии жизни и символом единства коллектива. Котел же, как элемент культа очага и на него также переносились все воззрения, связанные с культом огня. Котел символизировал единство, был мерилем богатства, силы, мощи коллектива. Котел и очаг служили сакральными центрами жилища для всей территории обитания сакских племен [20, с.41].

Таким образом, коллекция бронзовых котлов из собрания Государственного музея истории Узбекистана, несмотря на свою малочисленность, разнообразна по составу и дает дополнительные сведения об этой категории памятников материальной культуры.

### Список иллюстраций

Рис. 1. Котел, V-IV вв. до н.э. найденный близ Ташкента. Время и обстоятельства находки неизвестны, по-видимому, из поступлений до 1917 года.	
Рис. 2. Котел, V-IV вв. до н.э. найденный «в селении Богородицком в 40 верстах от Ташкента по Чиназской дороге». Время и обстоятельства находки неизвестны, по-видимому, из поступлений до 1917 года.	
Рис. 3. Котел, V в. до н. э. найденный в озере Иссык-Куль (Кыргызстан). Время и обстоятельства находки неизвестны, по-видимому, из поступлений до 1917 года.	
Рис. 4. Котел, VII в. до н.э. найденный на строительстве Большого Ферганского канала в 1939 году.	

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<p>Рис. 5.          Котел, II-I вв. до н.э. найденный во время раскопок погребения знатной женщины II-I вв. до н.э. участниками узбекско-французской экспедиции в 2000 году на городище Коктепа.</p>	
<p>Рис. 6.          Котел, V-IV вв. до н.э. Место, время и обстоятельства находки неизвестны, по-видимому, из поступлений до 1917 года.</p>	
<p>Рис. 7.          Котел, второй половины II в. до н.э. Место, время и обстоятельства находки неизвестны, по-видимому, из поступлений до 1917 года.</p>	
<p>Рис. 8.          Котел, V-IV вв. до н.э. Место, время и обстоятельства находки неизвестны, по-видимому, из поступлений до 1917 года.</p>	
<p>Рис. 9.          Котелок, IV-II вв. до н.э. Место, время и обстоятельства находки неизвестны, по-видимому, из поступлений до 1917 года.</p>	
<p>Рис. 10.          Котелок, II-I вв. до н.э. Место, время и обстоятельства находки неизвестны, по-видимому, из поступлений до 1917 года.</p>	
<p>Рис. 11.          Котелок, IV-II вв. до н.э. Место, время и обстоятельства находки неизвестны, по-видимому, из поступлений до 1917 года.</p>	

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Таблица 1



Таблица 2

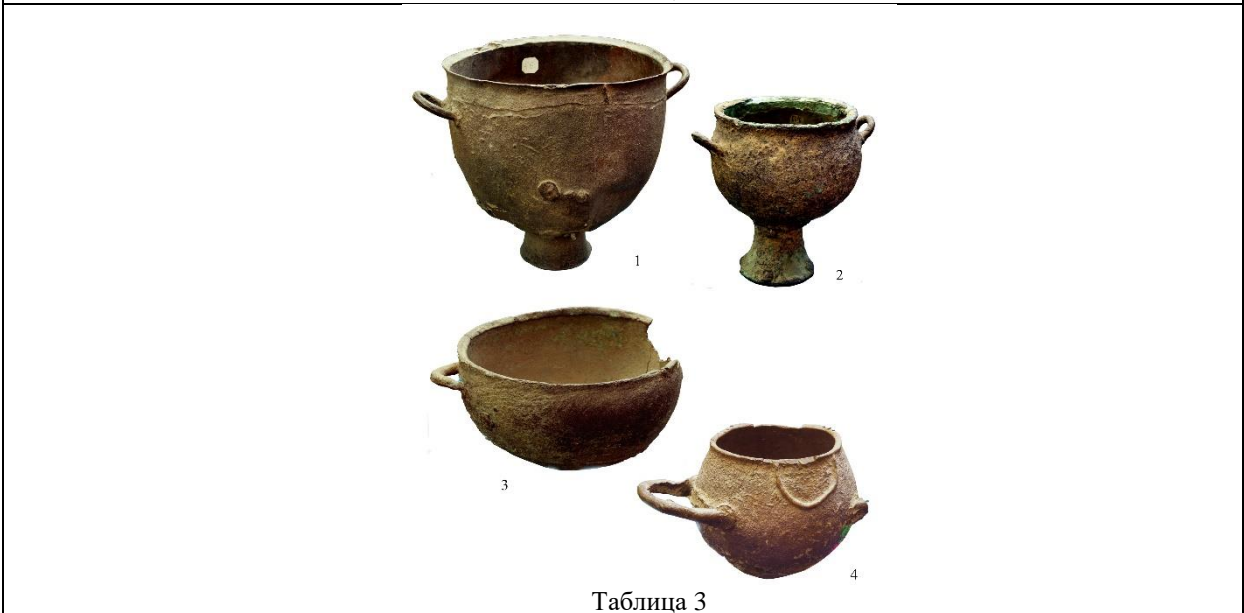


Таблица 3



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IBI (India) = 4.260  
OAJI (USA) = 0.350

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Article



Alibek Gapparov

Uzbekistan world languages university  
Independent researcher

## SOCIO-POLITICAL LEXICON AS A PRODUCT OF COMPLEX DEVELOPMENT

**Abstract:** It is known that the participation of language units is important in every state policy and community life. It is the language that illuminates and controls the process taking place in the lexicon of this field. The socio-political lexicon, in turn, is an open microsystem of the national language, which is created, developed, and works in the political system and the socio-political sphere. This lexicon changes in this process and ceases to function if there is no need for communication. The socio-political lexicon creates a terminological system that is not strictly closed.

**Key words:** lexicon, political, social, term, terminology, activity, culture, consciousness.

**Language:** English

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### Introduction

Politics is an activity and tool aimed at solving simple and complex tasks that occur in various spheres of society, achieving specific goals, understanding the conflicting collective interests of social groups and people, developing decisions that are binding for the entire society, and implementing them with the help of state power. as an activity.

It is known that social sciences, in particular, philosophy, law, history, economics, political science, which are distinguished by ideologies, perform the function of part of the terminology. In addition, the socio-political lexicon is formed by ideological and specialized lexical, semantic and phraseological units of different origins to express concepts in the field of social, political, economic, moral life of the society [1, 108].

Politics is an activity aimed at achieving specific goals in public administration by solving tasks aimed at specific goals in the life of society. In other words, it relies on the conclusions of other socio-political sciences in studying the course of political processes and relations, it is a phenomenon aimed at understanding the conflicting collective interests of social groups and people while summarizing the

essence of the theoretical rules and conclusions developed in them.

The study of the socio-political lexicon in linguistics is directly related to the level of political culture and political consciousness of citizens, such as the understanding of the socio-political reality taking place in the life of society today, deepening the content and essence of the socio-political lexical reforms taking place in the society. After all, the role and function of language in solving such an important issue is incomparable.

It should be noted that the political-social lexicon occupies a special place in the language layer [2, 10]. Linguists use the concepts of “social-political lexicon”, “social-political terminology”, “social-political term” in their research. It should be noted that “... these concepts related to socio-political discourse are present in the lexicon of modern mass media”[3, 11].

The ratio between socio-political lexicon and socio-political terminology can be used as one of the criteria for further classification of the components of socio-political lexicon [4, 35]. Socio-political lexicon and terminology are two systems of one system [5, 15]. For example: agitation, dictatorship, oppression; aristocracy, assembly, senate, legislature and head.

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Social-political terms are the core of the social-political lexicon [5, 16].

Modern studies in the field of socio-political lexicon repeatedly emphasize the relevance of studying this layer of this lexicon.

“Socio-political terminology is a separate layer of the terminological lexicon, which occupies an intermediate position between the functionally limited term systems and the lexicon of general use” [6, 21].

Socio-political terminology is created as an open system of nominative units differing in lexical, semantic and phraseologically specialized origin to express concepts reflecting the sphere of social-production and political life of the nation.

A.L. Golovonevsky shows the following features of socio-political lexicon:

a) social-political lexicon is a multi-faceted, evaluative, critical, controversial, and finally known, which differs from each other in conceptual and functional areas, but reflects the development of the state of society and phenomena of social life in the dynamic processes of language from a sociolinguistic point of view. is a set of words that reflect the real rules typical of a certain society in a historical period;

b) socio-political lexicon is a set of words that differ from each other in conceptual and functional areas, but are verbalized into one flow from a sociolinguistic point of view, that reflect the phenomena and events of the state and social life of society, belong to a specific society in a certain historical period, from words is a shell (corpus) [7, 27].

A. Orozboev emphasizes that the socio-political lexicon is the product of a very long and complex development, and believes that “it is impossible not to preserve substratum elements”. The scientist considers their important aspect to be “... that a certain word acquires its own meaning according to different social formations, state institutions, as well as the individual style of historians and writers, and at different historical stages of the language [8, 39]”.

A socio-political term is characterized by its belonging to one or more terminological systems, but it can also function outside of them. In this case, it acquires new properties, in particular, it becomes an ideological sign, includes axiological designation (marking), emotional-expressive color, loses or adds semantic components, has a flexible connotation. Socio-political terminology has a number of features that are implemented outside the scientific method [9, 134].

According to L.A. Murodova, social-political lexicon is not terminological. In addition, in the field of socio-political lexicon, not the terms of social sciences, but “two-dimensional” lexical units, which interact with the meaning-giving word both in the function of a term and in the function of a non-term word, operate [10, 8]. However, these units define the signifier in different ways, such as “nearest” and

“next”. It is the distinction between these terms as “special concept - non-specific concept” that causes a discussion about their ambiguity. S.D. According to Shelov, the words belonging to the general literary language can have several meanings and correspond to the corresponding term in terms of form and grammatical description. Here, some of the meanings are non-specific - non-terminological, and another part is special – terminological [11, 264].

Terminologists distinguish between socio-political terminology and socio-political lexicon:

A.Sh. Najimov makes the following points in this regard:

1) socio-political terminology - a section of the terminology of socio-political sciences - philosophy, law, history, economics, political sciences;

2) socio-political lexicon is a sub-system of a separate language, which expresses concepts related to the social, political, social, economic, moral spheres of society (society), has an ideological meaning, and is composed of different units according to its origin [15, 11].

The scientist does not recommend including the socio-political lexicon in the terminology system, and the reason for this is that when terms are used in the socio-political lexicon, the meaning of the word means only its characteristic signs, and when it is used as a term, it expresses a specific scientific concept and indicates belonging to the system of terms [15, 14].

M. A. Kazyulina believes that most of the social-political lexicon consists of constitutive terms, which, on the one hand, makes articles on political topics interesting to non-experts by their simplicity and comprehensibility, and on the other hand, leads to ambiguity of some meanings [12, 43].

It should be noted that socio-political terminology is an open system of nominative units of different origins, lexically, semantically and phraseologically specialized to express concepts reflecting the sphere of social production and political life of the nation (L. L. Bantshева) [13, 75].

Ali Khadi "accepts the opinion of linguists who included social-political terminology in the social-political lexicon, social-political terms not only have term symbols outside the terminology system of social sciences, but also their general use in social-political terminology, that is, in the social-political lexicon believes that we can assume that the features that arise as a result of its introduction will be used in practice [14, 67].

Supporters of this concept A.L. Golovonevsky, L.A. Zhdanova [16, 11], according to them, the socio-political dictionary is not a strictly closed terminological system, but creates a system of "free" lexical units, the core of which is formed by terms.

Socio-political lexicon serves as part of the terminology of social sciences, in particular, philosophy, law, history, economics, political science, which is characterized by ideologies. In addition, the

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socio-political lexicon is formed by ideological and specialized lexical, semantic and phraseological units of different origins to express concepts in the field of social, political, economic, moral life of the society [1, 109].

Socio-political terminology works as a dynamic and open set of terms of structurally simple complex units from various terminological systems of social sciences, and it acquires new characteristics and becomes an ideological symbol, includes an axiological brand, an emotional-expressive color, in addition to its scientific method. has the loss of realizable semantic components and the filling of semantics, flexible meaning and string characters. - socio-political terminology - it is considered a separate layer of the terminological lexicon and occupies a place between the system of functionally limited terms and the lexicon in general use;

- the boundary between socio-political terminology and common lexicon is variable and always in motion, and the socio-political term is outside the doctrine of traditional terminology;

- socio-political terms do not belong to the terminological lexicon, because the terms are functionally limited, they are used only in the field of certain science and technology, there is no emotional-expressive color in the terms;

- socio-political terminology includes commonly used words with terminological meaning reflecting

concepts related to socio-political and economic spheres;

- socio-political terminology is included in the socio-political lexicon.

In conclusion, the following can be noted:

1. In order to describe and explain the interaction of socio-political lexicon and lexical subsystems in socio-political terms, it is necessary to take into account many differences. The first difference is a constant level of development or a dynamic state, and the socio-political lexicon has a certain dynamic, and this development is related to the amount of information in the mass media and the political process being transmitted.

2. The semantics of socio-political terms is directly related to broad concepts reflecting socio-political knowledge and includes an important layer of words that are thematically related to specific areas of the ideological, political, socio-economic life of society.

3. Socio-political lexicon changes related to the social life of the society, as a rule, are manifested as social and political vocabulary.

Thus, the selection of the socio-political lexicon as a research object linguistically in the journalistic style and the above-mentioned complex scientific issues can determine the relevance of the topic. After all, socio-political lexicon in journalistic works was not a special research object in Uzbek linguistics.

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**Annaguly Rejepovich Deryaev**

Scientific Research Institute of Natural Gas of the State Concern „Turkmengas”  
Doctor of Technical Sciences, Senior Researcher,  
Corresponding Member of International Academy of Theoretical and Applied Sciences,  
Ashgabat, Turkmenistan  
[annagulyderyayew@gmail.com](mailto:annagulyderyayew@gmail.com)

## CHOOSING THE PROFILE OF AN INCLINED-DIRECTIONAL WELL

**Abstract:** *the article considers the design of the profile of an obliquely directed operational evaluation well for the purpose of successful drilling of well No. 707 at the Western Cheleken field in the coastal zones of the coastal waters of the Caspian Sea. To design the profile in order to avoid accidents and complications, materials of geophysical studies of previously drilled wells were used. And to prevent the collision of boreholes, the Close Approach program was used, as well as safety rules in the oil and gas industry.*

*This work can be used to perform the tasks set when drilling directional wells, to combat possible complications in the open hole, as well as to prevent the risk of collision of boreholes.*

**Key words:** *risk, hole collision, program, complication, accident, absheron, akchagil, red-colored thickness, curvature, displacement, cost, stabilization.*

**Language:** English

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### Introduction

Currently, the oil industry of Turkmenistan is facing the issue of involvement in the active development of hard-to-recover oil reserves, the bulk of which is located in low-permeable reservoirs. The importance of solving this problem is determined by the depletion of reserves in long-exploited areas with a sharp decrease in well productivity.

In foreign practice, drilling of inclined and horizontal wells is widely used, where a reduction in the cost of oil production and an increase in the coefficient of hydrocarbon extraction have been achieved.

The experience of drilling such wells for a number of years in various countries has shown that for successful and economically justified drilling, the following is necessary:

- high engineering qualification of the staff;
- availability of reliable geological data that are necessary for the design and wiring of a particular well;
- creation, development, production and application of special devices and equipment;

- latest software;
- the use of special drilling fluids in some cases;
- new technologies and devices for well completion.

The wiring of wells with various hole deviations in new and old fields is carried out using devices for hole deflection and downhole telemetry systems for controlling the hole trajectory with appropriate software.

In the presence of data on productive formations, it is necessary to choose the most economical technology, which is determined by the target task that the mining company sets before drilling, the properties of the formation and drilling conditions during the work. The most important factor of any project is engineering planning of processes using advanced technologies. In order to avoid undesirable consequences due to poor planning of work, it is necessary to use engineering knowledge of processes from specialists.

Of great importance in directional drilling is the correct choice of the well profile. The profile should be chosen in such a way that, with minimal time and

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money, the well should be brought to the design depth without complications, ensuring proper quality for long-term operation. The rational profile makes it possible to minimize the work with the diverter, to ensure the necessary displacement of the face and the permissible intensity of curvature, as well as free passage along the hole of the bottom of the drill string layout. The profile should allow the well to be operated with deep pumps, including rod pumps, and the wiping of the casing pipes with rods and their breakage should be excluded.

The choice of the profile type is carried out taking into account: the requirements of drilling wells; the strength characteristics of the rocks composing the geological section of the deposits; the patterns of curvature characteristic of the used bottom-hole assembly (BHA); methods and technical means used in the operation of wells. The profile of the well should provide a minimum value of the load on the hook when lifting the drill string (downhole equipment).

Directional wells should be drilled with minimal time and money. The project for the construction of a directional well should include: justification of the choice of profile configuration, calculation and construction of the profile, determination of permissible deviations of the hole from the project. The profile of the directional well must satisfy high-speed and high-quality drilling, have a minimum number of bends, be technically feasible and economically feasible.

There are two types of profiles: conventional and spatial. Profiles of the usual type are a curved line located in one vertical plane; profiles of the spatial type are a spatial curved line.

Directional production and evaluation well № 707 on the West Cheleken area was laid with a design vertical depth of 2620 meters (along the hole of 2764.37 meters) in order to assess the reserve of hydrocarbon raw materials and increase oil production using advanced technologies of foreign companies, as well as the resumption of oil and gas production from the mothballed field.

The project for the construction of an operational evaluation well № 707 with a depth of 2620 m (vertical) 2764 m (along the hole) at the field in question was developed on the basis of a combined pressure graph in drilled wells and calculations of the hole trajectory. That is, the guide shaft with a diameter of Ø708 mm was lowered to a depth of 7 m (vertically) and secured with rubble concrete. An elongated direction with a diameter of 508 mm was lowered to a depth of 50 m, to overlap weakly cemented sandstones. The conductor Ø=339.7 mm was lowered to a depth of 800, to overlap unstable layers of the horizons of Absheron, akchagil and unstable water layers, as well as possible gas layers of the upper part of the horizon of the red-colored thickness. The technical column Ø= 244.5 mm was lowered to a

depth of 2100 m vertically and along the hole of 2119 m, to overlap water and possibly gas layers of the middle, lower horizons of the red-colored thickness, as well as to control the anti-discharge equipment in case of possible gas and oil occurrences. The operational column Ø = 139.7 mm, descended to a depth of 2620 m vertically and along the hole 2764 m.

Profile design procedure:

1) we study in detail the data on previously drilled wells, establish patterns of hole curvature, azimuth change, the influence of various factors on the change in the angle and azimuth of curvature.

2) using a structural map, which shows the position of the mouth and bottom of the projected well, we determine the initial data for calculating the profile: vertical and horizontal projections of the hole and the azimuth of curvature;

3) in accordance with the conditions of penetration, select the profile type;

4) set the length of the vertical sections;

5) select the layout of the bottom of the drill string and determine the intensity of the change in the angle of curvature (or vice versa);

6) by the magnitude of the intensity of the change in the angle of curvature, we determine the radii and compare them with the minimum permissible ones; we take the rate of decrease in the angle of curvature according to practice data;

7) we determine the maximum angle of inclination of the borehole and the projection of all sections of the borehole on the horizontal and vertical planes. If the angle of curvature of the hole is set, then we determine the value of the radius of curvature and the intensity of the angle of curvature;

8) based on the calculated data, we build the design profile of the borehole.

At the end of the profile calculation on millimeter paper, we build horizontal and vertical projections on the scales: horizontal projection - 1:200, 1:400 or 1:500; vertical projection - 1:1000 or 1:2000.

For the projected directional operational evaluation well № 707 on the Western Cheleken field a five-interval profile was selected (vertical section, section of the curvature parameter set, stabilization section, curvature set section, stabilization section).

The design data of the profile of the operational evaluation well №. 707 West Cheleken field shown in Table 1.

In the process of designing the well profile, the risk of collision of the hole of a new directional well with previously drilled wells was analyzed. To prevent the collision of boreholes, the Close Approach program of Schlumberger companies is used. For a more accurate assessment and prevention of the risk of crossing boreholes, the program module requires the following data from previously drilled wells:

- field diagrams of the bush;

**Impact Factor:**

<b>ISRA (India) = 6.317</b>	<b>SIS (USA) = 0.912</b>	<b>ICV (Poland) = 6.630</b>
<b>ISI (Dubai, UAE) = 1.582</b>	<b>ПИИИ (Russia) = 3.939</b>	<b>PIF (India) = 1.940</b>
<b>GIF (Australia) = 0.564</b>	<b>ESJI (KZ) = 8.771</b>	<b>IBI (India) = 4.260</b>
<b>JIF = 1.500</b>	<b>SJIF (Morocco) = 7.184</b>	<b>OAJI (USA) = 0.350</b>

- accurate data on the coordinates of neighboring wells and altitudes;
- the coordinate system used;
- complete information on inclinometry for all neighboring wells, in order to obtain a qualitative analysis of the risk of crossing the holes;
- if there is a choice, it is necessary to use Gyroscope measurements
- precise reference to the north;
- it is necessary to clarify by what type of azimuth the measurement was carried out (magnetic, geographical, cartographic);

- location of all adjacent wells.
- In geometric analysis, the key parameter of convergence is the distance from the center to the center and is defined as the distance between the planned well and the neighboring well. Statistical analysis is the ratio of the distance from the center to the center between the wells and the sum of the radii (main semi-axes) of the ellipsoids of uncertainty around the analyzed well and neighboring wells, which are scanned at any given point.

**Table 1.**

Note	Hole depth (m)	Zenith angle, (°)	Azimuth grad, (°)	Vertical depth, (m)	Displacement (m)	North South (m)	East West (m)	Intensity (deg/30m)	Azimuth of the angle set (°)
<i>Wellhead - SHL</i>	<i>0,00</i>	<i>0,00</i>	<i>0,00</i>	<i>0,00</i>	<i>0,00</i>	<i>0,00</i>	<i>0,00</i>	<i>N/A</i>	<i>250M</i>
<i>Marker MudLine</i>	<i>9,00</i>	<i>0,00</i>	<i>250,00</i>	<i>9,00</i>	<i>0,00</i>	<i>0,00</i>	<i>0,00</i>	<i>0,00</i>	<i>250M</i>
<i>Intermediate column №1 - 13 3,8" Casing Shoe</i>	<i>800,00</i>	<i>0,00</i>	<i>250,00</i>	<i>800,00</i>	<i>0,00</i>	<i>0,00</i>	<i>0,00</i>	<i>0,00</i>	<i>250M</i>
<i>The starting point of the angle set - KOR</i>	<i>1650,00</i>	<i>0,00</i>	<i>250,00</i>	<i>1650,00</i>	<i>0,00</i>	<i>0,00</i>	<i>0,00</i>	<i>0</i>	<i>250M</i>
	1680,00	1,80	250,00	1680,00	0,47	-0,16	-0,44	1,80	250M
	1710,00	3,60	250,00	1709,96	1,88	-0,64	-1,77	1,80	250M
	1740,00	5,40	250,00	1739,87	4,22	-1,45	-3,98	1,80	HS
	1770,00	7,20	250,00	1769,68	7,50	-2,58	-7,08	1,80	HS
	1800,00	9,00	250,00	1799,38	11,71	-4,02	-11,05	1,80	HS
	1830,00	10,80	250,00	1828,94	16,85	-5,79	-15,89	1,80	HS
	1860,00	12,60	250,00	1858,31	22,91	-7,87	-21,61	1,80	HS
	1890,00	14,40	250,00	1887,48	29,89	-10,26	-28,19	1,80	HS
	1920,00	16,20	250,00	1916,42	37,77	-12,97	-35,63	1,80	HS
	19500,0	18,00	250,00	1945,09	46,56	-15,99	-43,92	1,80	HS
	1980,00	19,80	250,00	1973,47	56,24	-19,31	-53,05	1,80	HS
2010,00	21,80	250,00	2001,53	66,80	-22,94	-63,01	1,80	HS	
2040,00	23,40	250,00	2029,25	78,24	-26,86	-73,80	1,80	HS	
2070,00	25,20	250,00	2056,59	90,54	-31,08	-85,40	1,80	HS	
<i>Angle Stabilization - EOC</i>	<i>2100,00</i>	<i>27,00</i>	<i>250,00</i>	<i>2083,53</i>	<i>103,69</i>	<i>-35,60</i>	<i>-97,80</i>	<i>1,80</i>	<i>HS</i>
<i>Intermediate column №2 - 9 5,8" Casing Shoe</i>	<i>2118,49</i>	<i>27,00</i>	<i>250,00</i>	<i>2100,00</i>	<i>112,05</i>	<i>-38,47</i>	<i>-105,69</i>	<i>0,00</i>	<i>HS</i>
<i>The starting point of the angle set - KOR</i>	<i>2150,00</i>	<i>27,00</i>	<i>250,00</i>	<i>2128,08</i>	<i>126,30</i>	<i>-43,36</i>	<i>-119,13</i>	<i>0,00</i>	<i>28,73R</i>
	2160,00	27,48	250,57	2136,97	130,86	-44,91	-123,44	1,65	28,22R
	2190,00	28,95	252,19	2163,40	145,01	-49,43	-136,89	1,65	26,79R
	2220,00	30,43	253,66	2189,47	159,86	-53,79	-151,09	1,65	25,52R
	2250,00	31,93	255,00	2215,13	175,39	-57,98	-166,05	1,65	24,36 R
	2280,00	33,44	256,24	2240,38	191,59	-62,00	-181,74	1,65	23,32R



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	<b>JIF = 1.500</b>	<b>SJIF (Morocco) = 7.184</b>	<b>OAJI (USA) = 0.350</b>

	2310,00	34,96	257,38	2265,19	208,45	-65,84	-198,16	1,65	22,38R
	2340,00	36,50	258,44	2289,54	225,94	-69,51	-215,29	1,65	21,52R
	2370,00	38,04	259,42	2313,42	244,07	-72,99	-233,12	1,65	20,74R
<b>Angle Stabilization - EOC</b>	<b>2388,64</b>	<b>39,00</b>	<b>260,00</b>	<b>2328,00</b>	<b>255,63</b>	<b>-75,07</b>	<b>-244,54</b>	<b>1,65</b>	<b>HS</b>
<b>The roof of the formation</b>	<b>2700,04</b>	<b>39,00</b>	<b>260,00</b>	<b>2570,00</b>	<b>450,86</b>	<b>-109,10</b>	<b>-437,53</b>	<b>0,00</b>	<b>HS</b>
<b>Final depth - TD</b>	<b>2764,37</b>	<b>39,00</b>	<b>260,00</b>	<b>2620,00</b>	<b>491,19</b>	<b>-116,13</b>	<b>-477,40</b>	<b>0,00</b>	

Schlumberger's indicators for the Close Approach program to determine the collision prevention of the borehole are as follows:

- if OSF > 5 in addition to the minimum separation (MAS) > 80% of the allowable deviation from the ADP plan – Drilling is allowed;
- if 5 > OSF > 1.5 in addition to the minimum separation (MAS) > 80% of the allowable deviation from the ADP plan – Drilling is allowed;
- if 1.5 > OSF > 1.0 in addition to the minimum separation (MAS) > 80% of the allowable deviation from the ADP plan is a Risk zone (Minor risk zone). It is necessary to plug the neighboring well. Bring the measurement into the drilling well with a more

accurate instrument or drill with a special resolution (exemption);

- if OSF < 1.0 or minimum separation (MAS) < 80% of the permissible deviation from the plan ADP – intersection (Major risk zone) stop drilling or drill with special permission (exemption).

According to the conclusion of the Schlumberger Close Approach program, the collision of the hole of the projected directional well №707 with the holes of previously drilled wells is low.

Schlumberger's conclusion on the Close Approach program to prevent the collision of the borehole №707 on the Western Cheleken field with the holes of previously drilled wells is shown in Table 2.

Table 2.

Adjacent wells	Separation		Permissible deviation (m)	Separation coefficient (Sep. Fac.)	Depth (m)		Risk level			Status
	Distance (m)	Uncertainty			by the hole	vertically	Warning	Low	High	
<b>Cheleken-217 Surveys(DefSurvey)</b>										<b>Fail Minor</b>
	187,26	186,67	177,26	N/A	0,00	0,00				
	185,64	148,08	129,54	4,99	1983,00	1976,00	OSF < 5.0			
	59,88	19,48	-0.48	1,49	2454,00	2378,79		OSF < 1.50		
	50,92	7,26	-14,33	1,17	2505,00	2418,00				
	51,13	6,89	-14,99	1,16	2514,00	2425,42				
	51,32	6,92	-15,03	1,16	2517,00	2427,76				
	66,77	21,60	-0,75	1,48	2580,00	2476,72		OSF > 1.50		
<b>Cheleken-524 Surveys(DefSurvey)</b>										<b>Fail Minor</b>
	89,77	89,17	79,77	N/A	0,00	0,00				
	247,38	197,32	172,53	4,98	2310,00	2265,19	OSF < 5.0			
	94,41	30,90	-0,57	1,49	2640,00	2523,34		OSF < 1.50		
	86,19	17,12	-17,17	1,25	2703,00	2572,30				

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	86,49	16,74	-17,90	1,24	2715,00	2581,63				
	86,67	16,77	-17,94	1,24	2718,00	2583,96				
	94,88	25,22	-9,36	1,36	2764,37	2620,00				
<b>Cheleken-429 Surveys(DefSurvey)</b>										<b>Warning Alert</b>
	108,27	107,67	98,27	N/A	0,00	0,00				
	264,58	211,23	184,79	5,00	2475,00	2395,11	OSF< 5.0			
	223,36	153,25	118,44	3,20	2764,37	2620,00				

For all calculations of the risk of intersection (collision) of holes, the northern landmark is always used to measure the azimuth angle.

From a depth of 800 m, a hydrocarbon-based drilling mud of the Versadril system was used. The Versadril system is one of the best systems for drilling clays, where the stability of the hole is the main criterion. In addition, this system operates at high temperatures up to 180-190 °C and has more improved rheological properties. The “Versadril” system has a very low water output.

The purpose of directional drilling is to hit the final bottom of the well at a predetermined point in the productive formation. As a rule, it is set along the roof of the productive reservoir and is the center of the tolerance circle. If you get into this circle, the project task is considered completed. For various mining and geological conditions, the purpose of the well, its

depth (vertically), the radius of the tolerance circle ranges from 15 - 60 m.

The project provides for the following purpose and task of the well;

The azimuth angle is  $260^\circ \pm 10^\circ$ , the zenith angle is  $39^\circ$ , the maximum change in the zenith angle degree / 10 m is  $0.6^\circ$ , the vertical depth of the roof of the productive layer is 2570 m. The offset from the vertical at the entrance of the roof of the productive reservoir is  $450,86 \pm 25$  m .

When drilling a well, the maximum displacement of the bottom was 491.19 m with a magnetic azimuth of  $260^\circ$ , the maximum zenith angle at a depth of 2764 m was equal to  $39.0^\circ$ . As a result of the development of the productive facility, an inflow was received with a maximum total flow rate of 30 tons /day.

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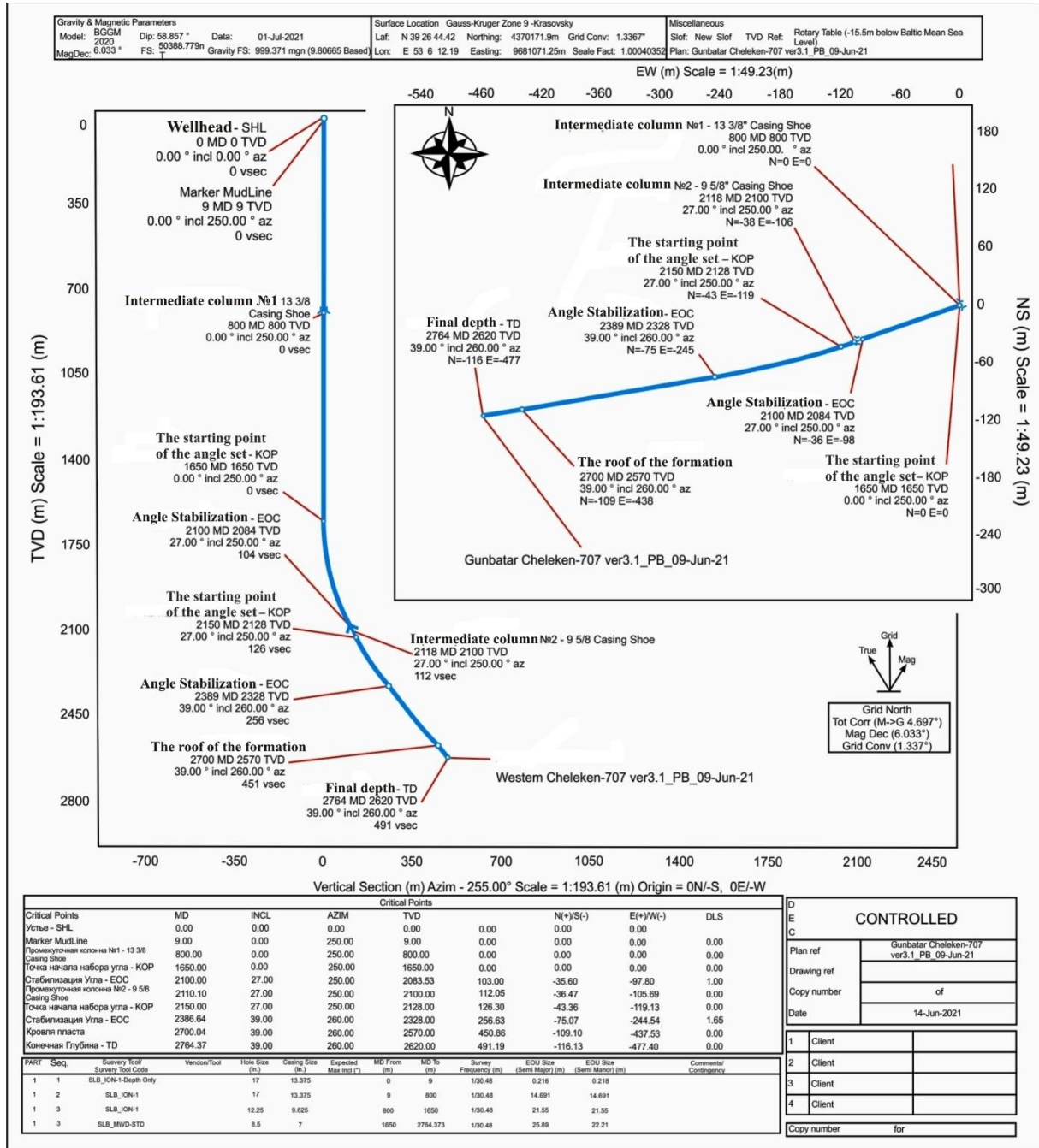


Figure 1. The profile of the hole of the directional operational evaluation well № 707 West Cheleken.

Directional production and evaluation well № 707 on the West Cheleken area has successfully fulfilled its goal, confirming the oil and gas potential of this section of the field without additional costs.

The profile of the hole of the directional operational evaluation well № 707 Western Cheleken is shown in figure.

### Conclusions

1. The directional production and evaluation well has fully fulfilled its purpose and objective.

2. The use of methods and means to control the geometric parameters of the wellbore and the position of the deflecting device, as well as telemetry systems conducted the successful completion of the well.

3. Correct analysis of the trajectory of the holes of previously drilled wells prevented the risk of collision of the holes of wells.

4. The resulting inflow of the well proves the correct selection of the profile.

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Article



**Annaguly Rejepovich Deryaev**

Scientific Research Institute of Natural Gas of the State Concern „Turkmengas”  
Doctor of Technical Sciences, Senior Researcher,

Corresponding Member of International Academy of Theoretical and Applied Sciences,  
Ashgabat, Turkmenistan

[annagulyderyayew@gmail.com](mailto:annagulyderyayew@gmail.com)

## SELECTION OF DRILLING MUD FOR DIRECTIONAL DEVELOPMENT WELL

**Abstract:** The article discusses the design for the selection of drilling mud for the directional development well No. 707 of the Western Cheleken field in the coastal zones of the coastal waters of the Caspian Sea, with the aim of successful drilling.

Materials of previously drilled wells and safety rules in the oil and gas industry were used for the design and development of drilling fluids regulations, as well as the experience of foreign companies in the preparation of a hydrocarbon-based solution was applied.

This work can be used to perform the tasks set when drilling directional wells and to draw up regulations for drilling fluids in extremely difficult mining and geological conditions at abnormally high reservoir pressures.

**Key words:** viscosity, statistical shear stress, clay crust, hydraulic fracturing, absorption, tack, pore pressure, rock pressure skeletal stress, hydrogen sulfide, fluid.

**Language:** English

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### Introduction

The type and properties of drilling mud in combination with technological measures and technical means should ensure trouble-free drilling conditions with high technical and economic indicators, as well as high-quality opening of productive horizons.

When drilling wells that are supposed to open zones with possible gas and oil occurrences or productive horizons in newly drilled areas, as well as when drilling in gas, gas condensate fields with abnormally high reservoir pressures (AHRP) or with hydrogen sulfide and other aggressive and toxic components in the fluid, it is necessary to have a constant supply of drilling mud in the amount of, equal to the volume of the well [1].

For all other wells, the volume of the reserve solution during drilling under normal conditions is carried out as follows: density and viscosity are checked every hour; twice a shift – statistical shear

stress, water output, temperature, pH, solid phase and sand content, filtration crust thickness; twice a week – salt content in the filtrate. When drilling gas horizons and drilling in complicated conditions, control is carried out: every 10-15 minutes – density and viscosity; every hour – statistical shear stress, water output, temperature; once every 10 days – oil content in solution. After the opening of the gas reservoir, in the absence of a gas drilling station, the drilling fluid should be monitored for gas saturation twice a shift [2, 3, 4]. The density of drilling mud during the opening of gas-oil-water-saturated formations should be determined for the horizon with the maximum gradient of reservoir pressure in the range of compatible conditions. Normal reservoir pressure in any geological conditions is equal to the hydrostatic pressure of a column of water with a density of 1 g / cm<sup>3</sup> from the roof of the formation to the surface. Abnormal reservoir pressures are characterized by any deviation from normal.

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The maximum permissible repression (taking into account hydrodynamic losses) should exclude the possibility of hydraulic fracturing or intensive absorption of drilling fluid at any depth of the interval of joint drilling conditions. In intervals composed of clays, mudstones, clay shales and layers prone to loss of stability and fluidity during drilling, the density, filtration and chemical composition of the drilling fluid are established based on the need to ensure the stability of the walls of the well.

Depression on the walls of the well is allowed within 1 – 15% of the effective skeletal stresses (the difference between the rock and pore pressure of these rocks), if this does not cause a threat of flow, scree, landslides and does not lead to gas and oil occurrences.

Let's consider an example of calculating the density of drilling mud. In the range of 3500 – 4000 m there are clays with the coefficient of anomaly of pore pressure  $K_{an} = 1.6$ . The opening of the clay is planned with depression on the walls of the well, which is 12% of skeletal stresses.

Pore pressure at a depth of 4000 m;

$$P_{por} = 1.6 \times 0.1 \times 4000 = 640 \text{ kgf/cm}^2.$$

Rock pressure at a depth of 4000 m;

$$P_{rock} = 0.1 \times 2.3 \times 4000 = 920 \text{ kgf/cm}^2.$$

Skeletal tension:

$$P = P_{moun} - P_{por} = 920 - 640 = 280 \text{ kgf/cm}^2.$$

Hence, 12% of P is 34 kgf / cm<sup>2</sup> and then the design density of the drilling mud will be:

$$\rho = (640 - 34) \times 10 / 4000 = 1.51 \text{ g/cm}^3.$$

If, at the selected values of the drilling mud density, there is a landing or tightening of the drilling tool, the optimal value of the drilling mud density should be selected by stepwise increasing it [5].

It is allowed in case of absorption of drilling fluid during drilling (with or without circulation outlet), opening of collectors at bottom-hole pressure approaching reservoir pressure. The deepening of the well in such conditions should be carried out according to a special plan with a set of measures to prevent gas occurrences, agreed with the anti-spontaneous service. It is not allowed to change the density of the drilling fluid (released from gas) in circulation by more than 0.02 g/cm<sup>3</sup> from the one set by the project. The formulation and methods of preparation, processing, weighting and cleaning of drilling mud are developed by research organizations, and controlled on the basis of regulations. The treatment of drilling mud with chemical reagents and a weighting agent is carried out in accordance with the developed formulation. Before adding oil, lubricating additives and surfactants to the weighted drilling mud, a laboratory assessment of the oil wettability and flocculation of the applied barite should be carried out. When flocculating barite, it is necessary to pretreat the solution with hydrophilizing reagents [6].

During the drilling and flushing of the well, the properties of the drilling fluid should be monitored at

intervals established for a given area (field). Indicators of the properties of the drilling mud at least once a week should be monitored by the central laboratory with the issuance of drilling results and recommendations for bringing the parameters of the solution to the indication in the project. Before and after the opening of formations with abnormally high pressure, when resuming well flushing after descent and lifting operations, geophysical surveys, repair work and downtime, it is necessary to start monitoring the density, viscosity and gas content in the drilling fluid immediately after the restoration of circulation.

During the opening of gas-bearing horizons and further deepening of the well (before the descent of the next casing), the drilling fluid should be monitored for gas saturation [7].

If the volume content of gas in the drilling fluid exceeds 5%, then measures should be taken to degass it, identify the causes of saturation of the solution with gas (reservoir operation, gas intake with drilled rock, foaming, etc.) and eliminate them. Increasing the density of the drilling fluid located in the well by pumping individual portions of the weighted solution is prohibited. When using emulsion, inhibited and non-dispersing polymer drilling fluids, oil-based solutions and others, the control of the properties characteristic of each special solution and their regulation are carried out according to the relevant instructions.

Cleaning of drilling mud from drilled rock and gas should be carried out by a set of means provided for by the well construction project in the sequence: well – coarse cleaning unit (vibrating screen) – degasser – fine cleaning unit (sand and silt separator) – solid phase control unit (hydrocyclone clay separators, centrifuge).

When using hydrocarbon-based drilling fluids (lime – bitumen, inert – emulsion, etc.), measures should be taken to prevent workplace pollution and gas contamination - measures should be taken to eliminate it [8].

For drilling directional production and evaluation well No. 707 at the Western Cheleken field, a special drilling mud formulation was developed, which shows the type, parameters, components and composition of drilling fluids at intervals.

When drilling a well from zero to a depth of 800 m, an oil-emulsion humate-lignosulfonate solution was used to drill unstable sand-clay rocks of the quaternary deposit and stabilize the wellbore.

Stabilizers reagents are used as regulators of the properties of the drilling mud: a carbon-alkaline reagent (CAR) and ligno-sulfonates - condensate of sulfate-alcohol bard (KSSB-2). Caustic soda (NaOH) is used to regulate the alkalinity of the calcium solubility solution in seawater. Oil and graphite are used from specialized reagents functionally designed to hydrophobize the solid phase of drilling mud and

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improve lubricating properties. To prevent foaming of the solution, a surfactant HT-48 is used. The hydrogen pH of the solution is 8.5-9.0.

Preparation of an oil-emulsion humate-lignosulfonate solution [9].

In a clay mixer with a volume of 4 m<sup>3</sup>, water is poured to half the volume and 60 kg of caustic soda (NaOH) is added - mixing is carried out for 15-20 minutes, after that 600 kg of water is poured with periodic scrolling of the blades of the clay mixer and water is added to the upper level. The mixture is mixed for 1-130 hours, after which the reagent is added to the drilling mud during one circulation cycle. During the first treatment, it is necessary to add the 2nd clay mixer (8m<sup>3</sup>) of the carbon-alkaline reagent to 100m<sup>3</sup> of the drilling solution.

In a clay mixer with a volume of 4 m<sup>3</sup>, water is poured to half the volume and 70-80 kg of caustic soda (NaOH) is filled in - mixing is carried out for 15-20 minutes, after that 700-800 kg of KSSB-2 is filled in with periodic scrolling of the blades of the clay mixer and topping up the water to the upper level. The mixture is mixed for 1-1<sup>30</sup> hours, after which the

reagent is released into the drilling mud during one circulation cycle. During the first treatment, the 2nd clay mixer (8m<sup>3</sup>) of the KSSB-2 reagent must be added to 100 m<sup>3</sup> of drilling mud.

For 100 m<sup>3</sup> of drilling mud, it is necessary to add 10tn oil and 500 - 700kg graphite. Surfactant HT- 48 is used in drilling mud as a defoamer. Surfactant HT must be added to 100 m<sup>3</sup> of drilling mud- 48 - 200 - 400kg. All these reagents are alternately added to the drilling mud during one circulation cycle, depending on the volume of the drilling mud being processed [10].

In the future, the processing of an oil-emulsion humate-lignosulfonate solution is carried out in order to reduce the viscosity of the solution and water loss to the set values of the parameters. If the pH of the solution falls below the value, the required amount of NaOH should be injected into the solution. Preparation and addition of reagents in the future is carried out as needed.

The parameters of the oil-emulsion humate-lignosulfonate solution used at well 707 on the Western Cheleken area are shown in Table 1.

Table 1.

Name (type) of the solution	Interval, m		Drilling mud parameters					
	From (top)	To (bottom)	Density g/cm <sup>3</sup>	Condi-tional visco-sity, sec.	Water output, cm <sup>3</sup> / 30 min	Crust, mm	Statistical shear stress, kgf/cm <sup>2</sup> In , min	
							1	10
n/a humate-lignosulfonate	0	200	1,40	40-60	10-12	2-3	20-40	50-70
	200	800	1,47	40-60	10-12	2-3	20-40	50-70

Continuation of table 1.

Interval m		Drilling mud parameters					
		Composition of the solid phase, % vol.			pH	Mineralization, mg/l	Density up to weighting g/cm <sup>3</sup>
From (top)	To (bottom)	V <sub>Colloid.act.subs.</sub>	V <sub>Sand</sub>	V <sub>amount</sub>			
0	200	14,03	5	19,03	9 – 9,5	13 - 15	1,2
200	800	16,69	5	21,69	9 – 9,5	13 - 15	1,2

In order to completely clean the drilled rock from the barrel of directional wells, it is necessary to select the appropriate ratio of the drilling pump parameters, density and rheological parameters of the drilling fluid. The successful flushing of the well from the rheological properties of the drilling fluid primarily depends on the static shear stress and viscosity.

When drilling a well from a depth of 800 m to a depth of 2764 m in an obliquely directional interval, a hydrocarbon-based solution was used in the zone of elevated temperatures +104 °C, in order to suppress the clays of the lower red-colored thickness and open

the productive layers of the well, stabilize the wellbore and excessive saturation of the drilled rock. Provides stability of the solution parameters in the zone of elevated temperatures.

Hydrocarbon-based solutions provide the possibility of drilling unstable, swelling or expanding rocks in the aquatic environment, prevent oil seal formation and tool grabs due to the pressure drop between the well and the formation. They have the best lubricating properties, protect the tool from corrosion [11].

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This system is a solution based on diesel fuel with a highly emulsified system that withstands high temperatures and at the same time does not lose the stabilizing properties of the solution. This system is successfully used for drilling deep wells.

The substitution of an oil-emulsion humate-lignosulfonate solution for a solution with a

hydrocarbon base was performed without opening the cement cup of the 339.7 mm conductor.

Table 2 shows the required amount of materials and chemical reagents for the interval preparation of a hydrocarbon-based solution in a diesel/water ratio of 80/20.

**Table 2.**

№/	Name of materials and chemicals	Required quantity		
		800 m (339.7mm) Conductor (162 m <sup>3</sup> ) $\rho = 1.47\text{g/cm}^3$	800 m-2119m (311.15 mm) technical column (348 m <sup>3</sup> ) $\rho = 1.68\text{g/cm}^3$	2119m-2764m (215.9 mm) production column (246 m <sup>3</sup> ) $\rho = 1.81\text{g/cm}^3$
1.	Diesel	102	214	151
2.	Poliogel (organophilic bentonite)	4	7	6
3.	Lime CaO	7	14	10
4.	STAB – DT (emulsifier)	4	8	6
5.	NeoInvert GF brand 1 (hydrophobizer)	3	5	4
6.	Poli STJ (Calcium Chlorine CaCl <sub>2</sub> )	9	18	13
7.	Polioilchek Filtr-GS (filter step-down)	4	7	6
8.	Polioilchek Wis (viscosity reducing agent)	2	3	2
9.	Poliantifrik (additive against the seizure of drilling tools)	3	5	4
10.	Sawdust	0,162	0,348	0,246
11.	Calcium Carbonate CaCO <sub>3</sub> (large grains)	0,162	0,348	0,246
12.	Calcium Carbonate CaCO <sub>3</sub> (medium grains)	0,162	0,348	0,246
13.	Calcium Carbonate CaCO <sub>3</sub> (small grains)	0,162	0,348	0,246
14.	Barite (weighting agent)	146	122	56

*Preparation of a hydrocarbon-based solution formulation in field conditions for 1 m<sup>3</sup> of solution:*  
 The required amount of diesel fuel (0.5 m) is poured into one of the tanks, then, with intensive stirring, surfactant emulsifiers-Versamul and Versacodt are introduced through the funnel using a jet of centrifugal pumps and agitators, achieving their complete dissolution. In another container, mineralized water (containing CaC<sub>12</sub>) of the required activity is prepared. Mineralized water is slowly added to the container with the treated reagent with diesel fuel through the mixer funnel, mixing thoroughly (in addition, you can add dry powder CaC<sub>12</sub>). Then quicklime (CaO) is introduced, thoroughly mixed for 30-60 minutes and a

filtration reducing reagent, Versatrol, is introduced, mixed for 30-60 minutes. Barite is added to the resulting initial solution to the required density and mixed for an hour. Technological parameters of the finished solution are determined [12].

The necessity is the sequence of reagent input and mechanical mixing of the system. In this regard, constant speed mixers (n = 2000 rpm and more), and hydraulic and mechanical agitators should be used on the drilling rig.

The parameters of a hydrocarbon-based solution for drilling for a technical column and for an operational column are given in Table 3.

**Table 3.**

Name (type) of the solution	Interval, m		Drilling mud parameters					
	From (top)	To (bottom)	Density g/cm <sup>3</sup>	Condi-tional viscosity, sec.	Water output, cm <sup>3</sup> / 30 min	Crust, mm	shear stress, kgf/cm <sup>2</sup>	
							In , min	
n/a humate-lignosulfonate	800	2119	1,68	50-70	3-4	0,5-1	5-15	5-20
	2119	2764	1,81	50-70	2-3	0,5	5-15	5-20



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Continuation of table 3.

Interval, m		Drilling mud parameters					
		Composition of the solid phase, % vol.			pH	Mineralization, mg/l	Density up to weighting g/cm <sup>3</sup>
From (top)	To (bottom)	V <sub>oil</sub>	V <sub>s.f</sub>	V <sub>liq.</sub>			
800	2119	65,09	18,64	16,27	9 – 9,5	15-17	1,47
2119	2764	66,01	17,2	16,79	9 – 9,5	15-17	1,68

Due to the lack of new hydrodynamic research data, when designing the drilling mud formulation, all the data for drawing up the regulations were taken from previously drilled wells. When drilling the inclined part of the well with a drilling mud density of 1.74g / cm<sup>3</sup>, at a depth of 2120 m, due to the pressure drop, the drilling tool was seized. After the release of the drilling tool, drilling continued by reducing the specific gravity of the drilling mud to 1.62 g/cm<sup>3</sup>, which was successfully brought by drilling to the design depth.

There are also some disadvantages in the hydrocarbon-based solution when drilling wells, which requires compliance with the rules of technical and fire safety [13].

Hydrocarbon-based solution has an increased fire hazard, and requires additional environmental protection measures (disposal, closed circulation cycle, storage of materials and substituted solution, etc.).

If the concentration of hydrocarbon vapors exceeds 300 mg/cm<sup>3</sup>, work should be suspended and people removed from the danger zone. The self-ignition temperature of the hydrocarbon-based solution should be 50 °C higher than the maximum expected temperature of the solution at the wellhead.

**Conclusions**

1. The developed drilling mud formulation has successfully fulfilled its purpose and objective.

2. The lack of fresh (updated) data from hydrodynamic studies of previously drilled wells can lead to complications and further emergency situations.

3. When cleaning the bottom of an inclined-directional well, it is necessary to observe the parameters of the solution according to the project

4. When drilling on a hydrocarbon-based solution, it is necessary to observe the rules of technical and fire safety.

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**Annaguly Rejepovich Deryaev**

Scientific Research Institute of Natural Gas of the State Concern „Turkmengas”

Doctor of Technical Sciences, Senior Researcher,

Corresponding Member of International Academy of Theoretical and Applied Sciences,

Ashgabat, Turkmenistan

[annagulyderyayew@gmail.com](mailto:annagulyderyayew@gmail.com)

## SELECTION AND CALCULATION OF CASING PIPES FOR PRESSURE AND DIRECTIONAL WELL CONDUCTOR

**Abstract:** The article presents the design calculation and selection of casing strings for the mine, elongated direction, as well as the conductor of the directional development well for the purpose of successful drilling of well No. 707 at the Western Cheleken field in the coastal zones of the coastal waters of the Caspian Sea.

The materials of previously drilled wells and the guidance document instructions for the calculation of casing strings for oil and gas wells, as well as safety rules in the oil and gas industry were used for the design, calculation and selection.

This work can be useful and used to perform the tasks set when drilling directional wells, when designing the calculation and selection of casing pipes of mine, elongated directions, as well as the conductor in extremely difficult mining and geological conditions at abnormally high reservoir pressures.

**Key words:** strength, pressure, external, shaft, butobeton, preventer, wellhead, shoe, pipe, elasticity, cross-section, coefficient, fluid, extraction, liquid.

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### Introduction

The design of wells is distinguished by the following casing columns, direction, conductor, intermediate and operational.

The direction is an element that secures the wellhead zone and prevents drilling mud and drilled rocks from eroding the wellhead. Most often, one such direction is installed in the hole, but two columns can be used for loose soils. This casing is cemented with butobeton to the wellhead. These pipes can be shaft and elongated. Shaft and elongated directions will not lie down for pressure testing.

The conductor is a column of pipes necessary for the isolation of unstable formations containing fresh and salt water, as well as for the installation of special anti-blowout equipment and other equipment for further safe drilling of the well. The depth of the conductor's descent when drilling ultra-deep wells in difficult mining and geological conditions of

Turkmenistan reaches within 1000 - 1200 meters, and the diameter is 426 – 508 mm. The pipe is pressed [1, 2].

The selection of casing pipes and the calculation of casing columns for strength are carried out taking into account the maximum expected excess external and internal pressures when the solution is completely replaced by reservoir fluid, as well as axial loads on the pipes and the aggressiveness of the fluid at the stages of construction and operation of the well on the basis of existing structures.

The strength of the descending columns and the installed blowout equipment should ensure:

- sealing of the wellhead in cases of gas and oil occurrences, emissions and open gushing, taking into account the additional pressure necessary for their elimination;

- resisting the effects of maximum crushing loads in cases of open gushing or absorption with a

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drop in the level of drilling fluids, as well as in the range of rocks prone to fluidity.

- standards and specifications for casing pipes, as well as safety margin coefficients for the calculation of casing columns must be agreed with the bodies of the Main Standardization Service.

When calculating the conductor, it is necessary to take into account, first of all, those forces that can act on them not only during descent and cementing, but also during further deepening of the well below the shoe of the casing in question.

So, when calculating the resistance to crumpling, the smallest pressure is taken as internal, which may occur in the event of a decrease in the liquid level during absorption, or when replacing the high-density flushing liquid with which the column is filled at the end of cementing with a low-density liquid that will be used for further deepening of the well. The pressure of the crimping and, consequently, the greatest excess internal pressure is determined depending on the pressure that may occur in the column after the closure of the preventer installed on it in the event of an outburst during the deepening of the well, or on the pressure at the end of cementing of this column. When calculating the tension force of the string for strapping, possible changes in temperature and pressure during the period of further deepening of the well are taken into account. If the well is designed to inject a high-temperature liquid into the reservoir (or to extract such a liquid), it is also advisable to take into account the conditions and forces that may arise during the operation of the well [4, 5].

Stability of the conductor. Intermediate and operational columns are tied with a conductor so that the upper sections of these columns are stretched at any time after strapping. But the axial forces that stretch the inner columns act on the conductor as compressive. If at least a small upper section of the conductor is not cemented securely in the borehole, under the influence of axial compressive forces, it may lose stability and bend longitudinally.

The minimum depth of the conductor's descent for the above conditions is determined by the formula:

$$L = V_1/V + 10m \quad (1)$$

where  $V_1$  is the maximum volume of drill pipes lowered to the shoe of the next column,  $m^3$ ;

$V$  - volume of 1 m of conductor length,  $m^3$ ;

10 m is the value below which the fluid in the conductor should not fall.

$V_1$  - the maximum volume of drill pipes lowered to the shoe of the next column is determined by the formula (2) [3].

The bottom of the casing is equipped with a shoe pipe, with holes, the number of these holes is determined by the formula (2).

$$n = Q/\omega F \quad (2)$$

where  $Q$  is the total flow of cementing units,  $m^3/\text{min}$ ;

- The velocity of the cement mortar jet at the outlet of the shoe pipe,  $m/s$  ( $v = 20 - 25 m/s$ );

$F$  is the cross-sectional area of one hole on the shoe pipe,  $m^2$

The length of the pipe is determined by the formula (3).

$$h = (n-1) \times 60 \quad (3)$$

where 60 is the distance between the centers of these holes vertically, mm.

We calculate the distance between the centers of the holes horizontally, determining by the formula (4).

$$L = \pi D/n \quad (4)$$

where  $D$  is the diameter of the shoe pipe, mm

The elongation of the casing string as a result of stretching under its own weight is determined by formulas (5) and (6).

$$F = 0,785(D_{out}^2 - d_{int}^2) \quad (5)$$

where  $D_{out}$  - outer diameter of casing pipes, cm;

$d_{int}$  - inner diameter of casing pipes, cm.

The lengthening of the casing string is calculated according to the following formula.

$$\lambda = QL/EF \quad (6)$$

where  $Q$  is the weight of the casing string, MN,

$L$  - column length, m;

$E$  - modulus of elasticity, Mpa;

$F$  is the cross-sectional area of the pipe,  $m^2$ ;

Unloading during the descent of the casing with a check valve without refilling is determined by the following formulas [6, 8].

$$V_1 = \pi D_{out}^2 / 4 \times L \quad (7)$$

where  $D_{out}$  - outer diameter of casing pipes, m;

$L$  - length of the column, m;

We find the mass of the displaced volume of drilling mud according to the formula (8) in tons.

$$m_{dr.m.} = V_1 \rho_{dr.m.} \quad (8)$$

The weight of the drilling mud is determined by the formula (9) in MN.

$$Q_2 = m_{dr.m.}/100 \quad (9)$$

The discharge of the casing string is determined by the formula (10) in MN.

$$Q_d = Q_1 - Q_2 \quad (10)$$

where  $Q_1$  is the weight of the casing string in MN.

Unloading during the descent of the casing without a check valve is determined by the following formulas.

We determine the weight of the casing string  $Q_1$  in MN.

We calculate the weight of the casing string in the drilling fluid according to the formula (11).

$$Q_2 = Q_1(1 - \rho_{dr.m.}/\rho_m) \quad (11)$$

where  $\rho_m$  is the density of the pipe material,  $t/m^3$ .

The discharge of the casing string is determined by the formula (12) in MN.

$$Q_d = Q_1 - Q_2 \quad (12)$$

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The calculation of the shaft direction and the elongated direction due to the low depth of descent for strength is not performed. Only the weight of the column is determined.

If, due to the absence of zones of gas and oil occurrences and an insignificant depth of descent, the conductor is not calculated for strength [7].

**Table 1. Well design: Based on the combined pressure graph, the following columns are selected:**

№/	Name of the hole	Diameter of casing columns, mm	Depth of descent of casing columns, m	Height of lifting of cement mortar, m
1	Shaft direction	720	10	butabeton
2	Elongated direction	508	50	50
3	Conductor	339.7	800	800

Let's consider the calculation of the casing string 339.7 mm (conductor) in the directional operational evaluation well No. 707 on the Western Cheleken field.

For the elongated direction, a casing turbine is designed according to the API standard Ø508 x 11.13 J-55 Batress.

Weight of the elongated direction:

$$Q_c = g \cdot L_c = 138,8 \cdot 50 = 6,94 \text{ tn.}$$

Casing pipes are calculated according to the maximum values of excess external and internal pressures in accordance with the "Instructions for calculating casing strings for oil and gas wells" - RD 39-7/1 - 0001-89 [11].

**Table 2. Data for the calculation of Ø 339.7mm Conductor**

Conductor descent depth	$L_I = 800\text{m}$
Drilling depth of the intermediate technical column	$L_{II} = 2100\text{m}$
Reservoir pressure at a depth of 800 m	$P_{res.I} = 106 \text{ kg/cm}^2$
Reservoir pressure at a depth	$P_{res.II} = 334 \text{ kg/cm}^2$
The density of drilling mud at a depth of 2100 m	$\rho_{dr.m} = 1,68 \text{ kg/cm}^3$
The safety factor of casing pipes	$n_1 = 1,125; n_2 = 1,1; n_3 = 1,75$

The greatest internal pressure in the casing occurs expectedly at a depth of 2100 m, when the well is working with reservoir fluid, which is determined by the following formula:

$$P_{int.} = P_{wellh.} = P_{res.II} - 0,1 \cdot \gamma_o \cdot L_{II} = 334 - 0,1 \cdot 1,0 \cdot 2100 = 124 \text{ kgf/cm}^2$$

The maximum pressure in the well is expected when the column is pressed on:

$$\text{We accept } P_{pres.test} = 140 \text{ kgf/cm}^2$$

The internal overpressure in the well when the column is pressed on water is determined by the formula:

$$P_{int.ov.} = P_{pres.test} + 0,1 \cdot \gamma_o \cdot Z - P_{res.};$$

$$\text{At } Z = 0; P_{res} = 0; P_{int} = P_{pres.test} = 140 \text{ kgf/cm}^2.$$

$$\text{At } Z = 800 \text{ m}; P_{res} = 106 \text{ kgf/cm}^2; P_{int} = 140 + 0,1 \cdot 1,02 \cdot 800 - 106 = 116 \text{ kgf/cm}^2.$$

The calculated internal overpressure when testing the column for tightness.

The external overpressure is determined by the formula:

$$P_{ex.ov.} = P_{res.} - 0,1 \cdot \gamma_o \cdot Z;$$

$$\text{At } Z = 800 \text{ m}, P_{ex.ov.} = 106 - 0,1 \cdot 1,02 \cdot 800 = 25 \text{ kgf/cm}^2$$

Casing pipes Ø339.7 mm with a wall thickness of 9.65 mm, with a strength group of J55 steel with a Batress thread according to API are planned for descent into the well.

We determine the value of the safety factor when calculating the external overpressure for casing pipes designed for descent [10, 12]:

$$n_1 = P_{cr.} : P_{ex.ov.} = 79 : 25 = 3,1 > 1,125;$$

We determine the value of the safety factor when calculating the internal overpressure for casing pipes designed for descent:

$$n_2 = P_T : P_{pres.test.} = 192 : 140 = 1,3 > 1,1;$$

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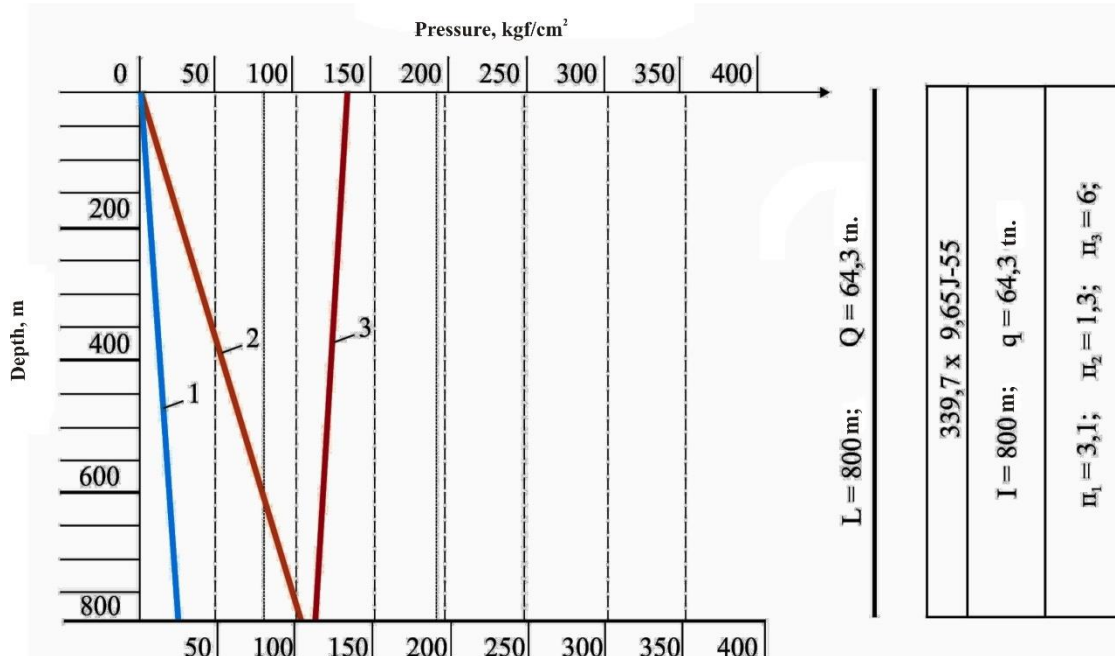


Figure 1. Calculation of excess external and internal pressure in the conductor 339.7 mm

1. Reservoir pressure
2. Internal overpressure when testing the column for tightness
3. External overpressure

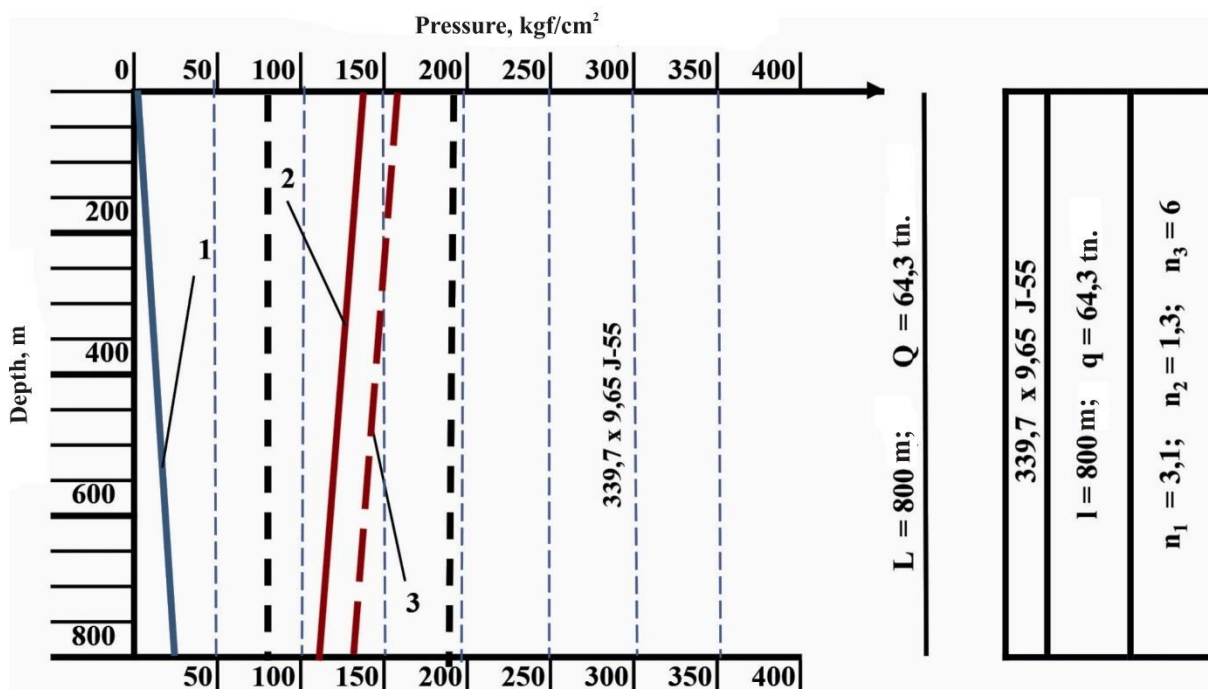


Figure 2. Calculation of 339.7 mm conductor for excessive external and internal pressure

We determine the value of the safety factor in the calculation of tensile strength for casing pipes designed for descent:

$$n_3 = P_{st} : Q_c = 387 : 64,3 = 6,0 > 1,75;$$

Where the weight of the casing pipes in the air to be lowered to the well is:

$$Q_c = q_c \cdot L = 80,4 \cdot 800 = 64,3t$$

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The graphical calculation of the conductor for excessive external and internal pressure is shown in Figures 1 and 2.

The selected casing pipe with a diameter of 339.7 mm with a wall thickness of 9.65 mm, the strength group of steel J55 with Battress thread meets

the strength characteristics for all conditions for the descent of 800m [9].

The selected casing pipe gives the necessary clearance for drilling with a drill bit of 311.15 mm for an intermediate column with a diameter of 244.5 mm.

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**Annaguly Rejepovich Deryaev**

Scientific Research Institute of Natural Gas of the State Concern „Turkmengas”  
Doctor of Technical Sciences, Senior Researcher,  
Corresponding Member of International Academy of Theoretical and Applied Sciences,  
Ashgabat, Turkmenistan  
[annagulyderyayew@gmail.com](mailto:annagulyderyayew@gmail.com)

## SELECTION AND CALCULATION OF THE CASING INTERMEDIATE TECHNICAL COLUMN OF THE DIRECTIONAL WELL

**Abstract:** *the article considers the design calculation and selection of casing strings for the intermediate technical column of the directional production and evaluation well for the purpose of successful drilling of well 707 at the Western Cheleken field in the coastal zones of the coastal waters of the Caspian Sea. The materials of previously drilled wells and the guidance document instructions for the calculation of casing strings for oil and gas wells, as well as safety rules in the oil and gas industry were used for the design, calculation and selection.*

*This work can be used to perform the tasks set when drilling directional wells and for designing the calculation and selection of casing pipes of an intermediate technical column in extremely difficult mining and geological conditions at abnormally high reservoir pressures.*

**Key words:** *deepening, trajectory, perforation, strength, tensile strength, shank, liner, cavernometry, roof, sole, wear, section, tightness, curvature, reservoir pressure.*

**Language:** *English*

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### Introduction

Casing string calculation is a set of procedures aimed at determining the dimensions, design features and other factors that may affect the quality of the well, productivity and operational efficiency. Each selected design must fully comply with the standards and safety regulations.

The casing string is calculated at the well design stage in order to immediately select the wall thickness of the pipes, the type of material, the overall diameter and take into account other characteristics. The process may vary depending on the type of column. So, for inclined gas or oil wells with corresponding casing strings, the tensile strength parameter should be taken into account (the margin is taken into account depending on what trajectory the hole has and at what angle it deepens). It is also important to take into account the pressure inside the pipe and outside, axial loads.

Calculations are made taking into account the profile at the planning stage, they should also take into account the strength characteristics of specific materials, specific tests are determined before the pipe is lowered into the well. The main calculation methods consist of taking into account the pressure difference, additional loads and properties of the cementing compound.

Basic data for the calculation of casing pipes:

- depth of descent;
- the interval of perforation;
- the degree of emptying of the column;
- reservoir pressure;
- reservoir temperature;
- indicators of cavernometry;
- drilling mud indicators.

When calculating the casing string, it is necessary to take into account the tensile forces, crushing pressure, as well as the overall compression load.

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Intermediate technical columns are necessary to separate layers that are incompatible with each other during the development of the well and its deepening. Intermediate pipes include solid columns, shanks (fix only the unsettled section of the well, overlapping the previous pipe) and flyers, or liners that overlap the obstructed area and are not connected in any way with other elements. The descent of individual sections of the column and the use of shanks allows you to solve the problem of creating high-gravity columns, simplify the overall design, reduce the inner diameter of the casing and the use of shanks allows you to solve the problem of creating high-gravity columns, simplify the overall design, reduce the inner diameter of the casing, as well as get rid of cracks and reduce the consumption of materials for padding. As a result, the total cost of drilling is reduced, and the extraction of hydrocarbon resources will be more economically profitable.

A significant factor for intermediate columns is the wear of the inner surface of the pipes during the deepening of the well. As a result of wear, the strength of pipes and their connections decreases. Of course, first of all it is necessary to take measures to prevent the wear of the columns. But since it is impossible to completely eliminate wear, it has to be taken into account when calculating.

The main difficulty here arises in predicting the likely amount of wear of the column in dangerous sections. Statistical material of field observations and measurements should be used to predict wear.

The amount of pipe wear strongly depends on the intensity of the curvature of the column. In order for the predicted wear values to be sufficiently reliable, it is important to know the intensity of spatial curvature as accurately as possible. Therefore, it is desirable that the distances between adjacent measurement points with an inclinometer be no more than 5 m. This technique does not allow predicting the wear of the end sections of the intermediate columns, primarily the wellhead. Since they are subject to very severe wear, the upper section with a length of up to 50-100 m and the lower section with a length of 30 m are completed from thicker-walled pipes than it should be calculated without taking into account wear.

The intermediate casing string serves to separate zones incompatible with drilling conditions when the well is deepened to the intended depths.

Intermediate casing strings are of the following types:

solid – covering the entire wellbore from the bottom to its wellhead, regardless of the attachment of the previous interval;

shanks – for fixing only the unsettled interval of the well with the overlap of the previous casing by a certain amount;

flyers are special intermediate casing strings that serve only to overlap the complication interval and

have no connection with previous or subsequent casing strings.

Sectional descent of intermediate casing strings and fastening of wells with shanks are, firstly, a practical solution to the problem of lowering heavy casing strings and, secondly, solving problems of simplifying the design of wells, reducing the diameter of casing pipes, as well as gaps between columns and walls of the well, reducing the consumption of metal and plugging materials, increasing drilling speed and reducing the cost of drilling operations.

A solid column can be replaced with a shank if, during the drilling period for the subsequent column, the previous one does not wear out to an emergency state and does not allow sealing of the wellhead in the event of a gas-oil manifestation or release. It is not recommended to make two adjacent casing strings in the form of shanks. The upper end of the shank is hermetically suspended in the previous column above its shoe at a distance of at least 100 m. If the previous column overlaps the thickness of rocks prone to plastic flow, then the upper end of the column shank should be placed above the roof of such thickness by at least 25-50 m.

In extremely rare cases, an intermediate column can be lowered into the well in the form of a "fly" (secret column) to overlap a locally complicated interval of the hole (unstable rocks, absorbing layers, etc.). Such a column has no connection with the previous casing.

In severe drilling conditions (hole curvature, a large number of hollows) and well design, special types of intermediate casing strings are provided – repeated and replaceable.

The intermediate column is calculated for excessive external pressure (crumpling) for the moment of the end of cementing and lowering the liquid level when the drilling fluid is absorbed during drilling for the next casing.

For the first 2 – 3 exploration wells in the area (in the absence of reliable initial data), it is possible to take the emptying of the column with the absorption of drilling mud up to 30 – 40%, i.e. take  $H_1 = 0.3 \dots 0.4 L$ .

Where  $H_1$  is the depth of the liquid level in the casing, m;

When calculating pressures in directional wells, all depths are taken vertically. With the total lengthening of the column (the difference in the length of the hole and the depth of the well) by no more than 50 m, it is allowed to calculate the pressures in the same way as for vertical wells.

In deep wells, stepped (two-dimensional) columns are sometimes used (both intermediate and operational), when the upper part is completed from pipes of a larger diameter than the lower one. This makes it possible to significantly reduce hydraulic resistances when drilling for a subsequent column, use less expensive casing pipes with a lower yield strength

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in the column bottom-hole assembly, and place more high-performance oilfield equipment in the upper part of the production column.

Let's consider the calculation of an intermediate (technical) casing string of 244.5 mm in an obliquely directed operational evaluation well No. 707 on the Western Cheleken field.

**Table 1. Data for the calculation of Ø 244.5mm technical column**

Depth of descent of the intermediate technical column	$L = 2100 \text{ m (2119m)}$
Drilling depth of the production column	$L_p = 2620 \text{ m (2764m)}$
Reservoir pressure at a depth of 2100m	$P_{res.} = 334 \text{ kg/cm}^2$
Reservoir pressure at depth	$P_{res.} = 445 \text{ kg/cm}^2$
Drilling mud density at a depth of 2100 m	$P_{dr.m} = \text{kg/cm}^2$
The coefficient of safety margin of casing pipes	$n_1 = 1,125; n_2 = 1,1; n_3 = 1,75$

According to the "Approved regulations for the calculation of intermediate columns, it is possible to replace the solution with an oil and gas mixture, with the wellhead closed to a depth of  $H = 0.70 \times 2620 = 1834 \text{ m}$ . The height of the gas column during the liquidation of the oil and gas occurrence  $h = 2620 - 1834 = 786 \text{ m}$ .

The greatest internal pressure in the casing string will occur when a well is developed from a depth of 2620 m and a sealed wellhead, which is determined by the formulas:

$$P_{int.} = P_{wellh.} = [P_{res.} - 0,1 \cdot \gamma_o(L-h)]e^s,$$

where,  $e^s = (2+S):(2-S); 10^{-4} \cdot \gamma(L-Z);$

so,  $S = 10^{-4} \cdot 0,60 \cdot 786 = 0,047.$

Then,  $e^s = (2+0,047):(2-0,047) = 2,047:1,953 = 1,05;$

$$P_{int.} = P_{wellh.} = [445 - 0,1 \cdot 1,0(2620 - 786)]/1,05 = 249 \text{ kgf/cm}^2;$$

The maximum internal pressure is expected when the column is pressure testing:

$$P_{pres.test.} = 1,1 \cdot P_{wellh.} = 1,1 \cdot 249 = 274 \text{ kgf/cm}^2;$$

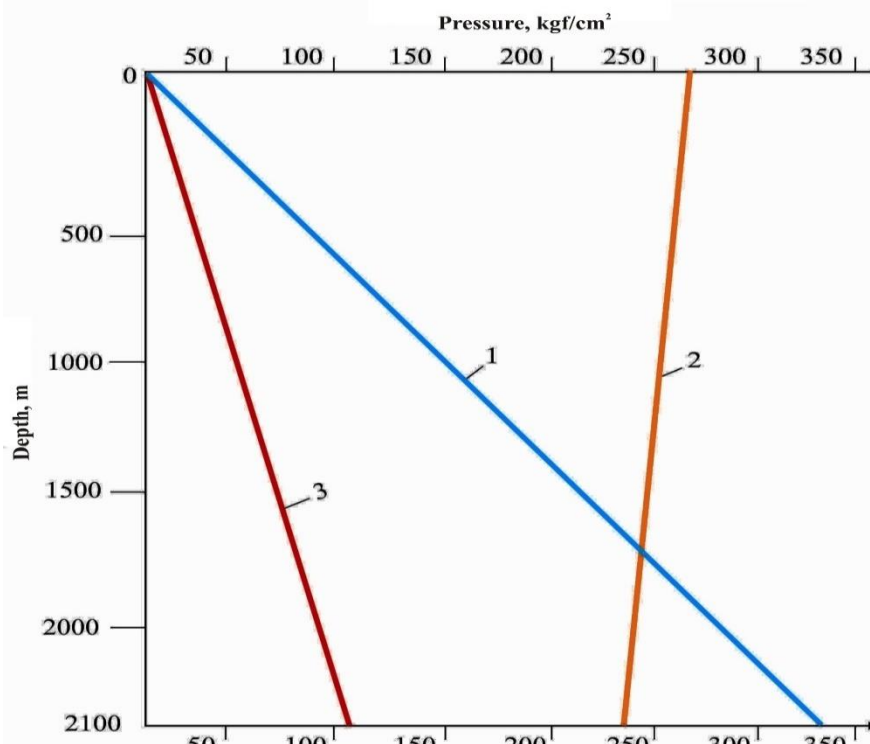
We accept  $P_{pres.test.} = 280 \text{ kgf/cm}^2$

The internal overpressure when the column is pressure testing on water is determined by the formula:

$$P_{int.ov.} = P_{pres.test.} + 0,1 \cdot \gamma_o \cdot Z - P_{res.};$$

At  $Z = 0; P_{res.} = 0; P_{int.} = 280 \text{ kgf/cm}^2.$

At  $Z = 2100 \text{ m}; P_{res.} = 334 \text{ kgf/cm}^2; P_{int.} = 280 + 0,1 \cdot 1,0 \cdot 2100 - 334 = 156 \text{ kgf/cm}^2.$



**Figure 1. Calculation of excess external and internal pressures in a 244.5 mm technical column**

1. Reservoir pressure
2. Internal overpressure when testing the column for tightness
3. External overpressure

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The external overpressure is determined by the formula:

$$P_{\text{ex.ov.}} = P_{\text{res.}} - 0,1 \cdot \gamma_o \cdot Z;$$

At  $Z = 2100\text{m}$ ,  $P_{\text{ex.ov.}} = 334 - 0,1 \cdot 1,0 \cdot 2100 = 124 \text{ kgf / cm}^2$ .

Calculated internal overpressure when testing the column for tightness

In accordance with the above calculations and graphical constructions, casing pipes  $\varnothing 244.5 \text{ mm}$  are planned for the descent into the well with a wall thickness of  $10.03 \text{ mm}$ , steel strength group N-80, Batress thread, with a normal coupling, according to the API standard.

We determine the value of the safety factor when calculating the external overpressure for casing pipes designed for descent:

$$n_1 = P_{\text{cr.}} : P_{\text{ex.ov.}} = 217 : 124 = 1,75 > 1,125;$$

We determine the value of the safety factor when calculating the internal overpressure for casing pipes designed for descent:

$$n_2 = P_T : P_{\text{pres.test.}} = 404 : 280 = 1,44 > 1,10;$$

We determine the value of the safety factor in the calculation of tensile strength for casing pipes designed for descent:

$$n_3 = P_{\text{st.}} : Q_c = 416 : 125,7 = 3,31 > 1,75$$

Where the weight of the casing pipes in the air to be lowered to the well is:

$$Q_c = q_c \cdot L = 59,36 \cdot 2119 = 125,7 \text{ t.}$$

The graphical calculation of the  $\varnothing 324\text{mm}$  intermediate column for excessive external and internal pressures is shown in Fig.1,2.

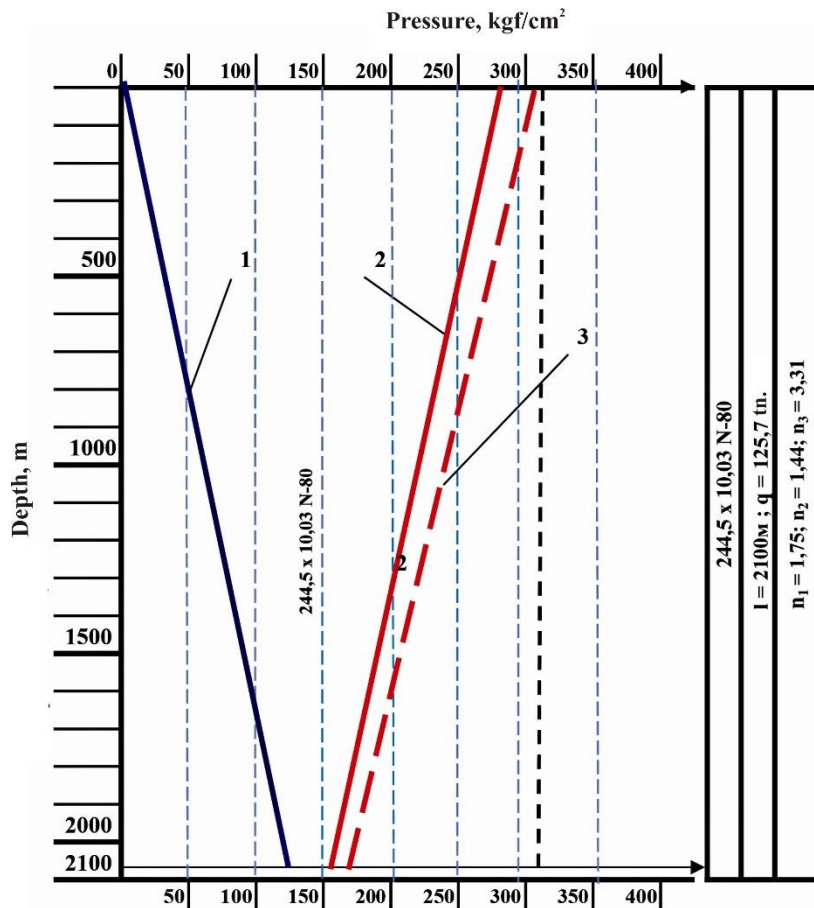


Figure 2. Calculation of 244.5 mm technical column for excessive external and internal pressure

### Conclusion

The casing string is a necessary important element of a well for mining. Correctly performed calculations allow you to build an optimal design in

terms of functionality and cost, which will require minimal maintenance.

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**Annaguly Rejepovich Deryaev**

Scientific Research Institute of Natural Gas of the State Concern „Turkmengas”

Doctor of Technical Sciences, Senior Researcher,

Corresponding Member of International Academy of Theoretical and Applied Sciences,

Ashgabat, Turkmenistan

[annagulyderyayew@gmail.com](mailto:annagulyderyayew@gmail.com)

## SELECTION AND CALCULATION OF CASING PIPES OF THE PRODUCTION COLUMN OF THE DIRECTIONAL WELL

**Abstract:** *the article considers the design calculation and selection of casing strings for the production column of the directional production and evaluation well for the purpose of successful drilling of well 707 at the Western Cheleken field in the coastal zones of the coastal waters of the Caspian Sea. Materials from previously drilled wells and a guidance document, instructions for calculating casing strings for oil and gas wells, as well as safety rules in the oil and gas industry were used for the design, calculation and selection.*

*This work can be used to perform the tasks set when drilling directional wells and for the design of calculation and selection of casing pipes of the production column in extremely difficult mining and geological conditions at abnormally high reservoir pressures.*

**Key words:** *gas compressibility, nipple, packer, filter, fluidity, hydraulic fracturing, curvature, profile, straining, wellhead, stretching, margin of safety, tightness.*

**Language:** English

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### Introduction

An important role in drilling wells for oil and gas production is played by the creation of a casing string – an element necessary for fixing the horizons for development and keeping the entire well in the correct position. When creating this element, all parameters are extremely important to establish the correct length, diameter, wall thickness, therefore, the casing string is calculated beforehand, which includes calculating pressure, checking strength and tightness, as well as a number of other actions. Properly performed work will allow you to create a column that is maximally protected from external influences and capable of ensuring safe extraction of oil and gas.

The main task of casing strings is to reliably fix wells during drilling and seal productive formations from the ingress of sludge and external elements at the time of development. The casing has a composite structure: it is made of pipes, connecting to each other in series. Pipe threads for casing columns can have the

shape of a cone, triangle or trapezoid, if necessary, sealing elements are used to create the most hermetic connection. The wall thickness of the casing pipe varies from 5 to 16 mm, the pipes themselves are classified depending on the strength and yield strength [1, 4].

The casing is made of steel nipple or non-nipple pipes. They differ in wall thickness and inner diameter. The threaded connection is protected from mechanical damage, so the finished structure is characterized by a high degree of strength. Non-nipple pipes have a diameter from 3.3 to 8.9 cm, and nipple pipes from 2.5 to 14.5 cm. The type of casing pipes are selected based on the depth of the productive layers, on the type of product and purpose.

The production column is the last column of casing pipes, which is attached to the well to separate the productive horizons from the rest of the rocks and extract oil or gas from the well, or, conversely, to inject liquid and gas into the layers. Sometimes the

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last intermediate column can be used (partially or completely) as an operational column.

The use of the last intermediate column in the place of the production column in the practice of Turkmenistan was applied at the directional well 147 on the Northern Goturdepe square with simultaneous separate operation of several horizons. A special distinguishing feature of this design from previously used structures is that in order to secure several productive layers, an increase in the depth of descent of a technical column with a diameter of Ø244.5 mm was achieved and this technical column was used as an operational column [2, 4].

The fastening of the lower productive layers in the two tested wells in the form of an operational shank without cementing is achieved with packers equipped externally on special filters, inflating under the influence of the solution used.

The development of the well design is based on the following main geological and technical and economic factors:

a) geological features of the occurrence of rocks, their physical and mechanical characteristics, the presence of fluid-containing horizons, reservoir temperatures and pressures, as well as hydraulic fracturing pressure of passable rocks;

b) the purpose and purpose of drilling the well;

c) the intended method of completion;

d) the method of drilling the well;

e) the level of organization of equipment, drilling technology and geological knowledge of the drilling area;

f) the skill level of the drilling crew and the organization of logistics;

g) methods and techniques of well development, operation and repair.

The diameter of the casing string is calculated starting from the production string, which, in turn, are calculated based on the expected productivity of the

well. The increase in the internal diameter makes it possible to work with more powerful equipment, including developing several horizons and repairing the hole. Nevertheless, a large diameter of the column is not always preferable, since with a large volume, the costs of drilling mud, cementing and other works and materials also increase [5].

The coefficient of safety margin for excessive external pressure (crumpling) for curved and horizontal sections is assumed to be equal to:

- for sections located in vertical and curved sections with a curvature intensity of up to 3.0 degrees / 10 m - 1.0;

- for sections located in vertical and curved sections with a curvature intensity from 3.0 to 5.0 degrees / 10 m - 1.05;

- for sections located in vertical and curved sections with a curvature intensity from 5.0 to 10.0 degrees / 10 m - 1.10.

- for sections located within the horizontal section - 1,3 - 1,5 (depending on the stability of the collector);

When calculating the column for stretching (straining) on curved sections, increased safety factors are used –  $[n'_{str}]$ .

For pipe connections with triangular thread:

$$[n'_{str.}] = n_{str.} / 1 - [n_{str.}] \lambda_1 (\alpha_{10} - 0,5)$$

where  $[n_{str}]$  is the coefficient of safety margin for straining for a vertical borehole (Table. 1);

$\lambda_1$  is a coefficient that takes into account the influence of the size of the joint and its strength characteristics;

$\alpha_{10}$  is the intensity of the borehole curvature, °/10 m.

The minimum values of the coefficients of the safety margin for straining  $[n'_{str}]$  for pipes with triangular threads according to GOST 632 – 80 are given in Table 1.

**Table 1. Minimum values of coefficients safety margin for straining for directional wells**

Casing pipe diameter, mm	Minimum value $[n'_{str}]$
114 - 168	1,30
178 - 245	1,45
273 - 324	1,60
More than 324	1,75

When calculating casing columns made up of pipes with a trapezoidal profile thread and normal coupling diameters (OTM, OTG, MSW, etc.) and imported pipes with similar connections, the following provisions are followed [5]:

- when the intensity of the curvature of wells is up to 5°/100 m for pipes with a diameter of up to 168 mm and up to 3°/100 m for pipes with a diameter above 168 mm, the tensile strength of joints is

calculated in the same way as for vertical wells without taking into account bending;

- when the curvature intensity is from 3 to 5°/100 m for pipes with a diameter above 168 mm, the permissible tensile load on the joint is reduced by 10%.

The coefficient of tensile strength for a smooth pipe body on a curved section of the hole is determined by the formula:

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$$[n'_{s.}] = n_s / 1 - [n_s] \lambda_1 (\alpha_{10} - 0,5)$$

where:  $[n_s]$  is the coefficient of tensile strength for a vertical well (table 1);

Calculation of the casing string for excessive internal pressure is carried out, as a rule, for the moment of its testing by hydraulic crimping in one step without a packer [6].

The excess internal pressure is generally defined as the difference between the internal and external pressure for the same point in time:

$$P_{int.exc.z} = P_{int.z} - P_{ext.z},$$

where:  $P_{int.z}$  and  $P_{ext.z}$  are the internal and external pressures when testing the column for tightness at the appropriate depth (Z).

The pressure at the wellhead when crimping the column must be at least 10% higher than the expected operating pressure ( $P_{wellh.}$ ), and must not be lower than the set minimum pressure testing for a given diameter of the casing string ( $P_{pr.test.min}$ ):

$$P_{pr.test.} \geq 1,1 P_{wellh.}$$

$$P_{pr.test.} \geq P_{pr.test.min}$$

The values of the  $P_{pr.test.min}$  are given in Table 2.

**Table 2. Values of minimum pressure testing pressures ( $P_{pr.test.min}$ ) for casing strings when checking their tightness**

The outer diameter of the column, mm	The value of the minimum pressure testing pressure at the wellhead, MPa
114 - 127	15,0
140 - 146	12,5
168	11,5
178 - 194	9,5
219 - 245	9,0
273 - 351	7,5
377 - 508	6,5

Pressure at the wellhead during the operation of an oil well:

$$P_{wellh.} = P_{res.} - 10^{-6} g \rho_{oil} H_{res}$$

Pressure at the wellhead during operation of a gas well:

$$P_{wellh.} = P_{res.} / e^s,$$

where:

$$e^s = (2 + S) : (2 - S),$$

$$S = 0,034 p_g H_{res} / \beta_{comp} T_{cr},$$

The relative density of gas in the air ( $p_g$ ) for the first 2-3 exploration wells is assumed to be equal to 0.6.

The gas compressibility coefficient ( $\beta_{comp}$ ) depends on its composition and can be in the range of 0.80 – 1.40.

At the depth of the gas reservoir up to 1000 m and  $P_{res} < 10$  MPa, as well as at  $P_{res} < 4$  MPa and any depth of the formation, it is assumed that the internal pressure throughout the depth of the well is equal to the reservoir [7, 8].

The safety margin coefficients when calculating casing strings for internal pressure for vertical and directional wells are assumed to be the same and depend on the diameter and type of casing design (Table 3).

**Table 3. Values of safety margin coefficients for casing strings when calculating for excessive internal pressures**

Pipe diameter, mm	Coefficient of safety margin for internal pressure $[n'_{int}]$	
	Casing pipes according to execution B	Casing pipes according to execution A
114 - 219	1,15	1,15
More than 219	1,45	1,15

According to the obtained values of excessive internal pressures, a plot is constructed on the accepted scale.

The casing arrangement selected based on crumpling and stretching (straining) is checked for internal overpressure. For the top of each section, the

actual value of the safety margin coefficient ( $n_{int}$ ) is determined and compared with the normative one [9, 11].

$$n_{int.z} = P_{crit.z} / P_{int.ext.z} > [n_{int.}]$$

The values of critical internal pressures for casing pipes are calculated using the Barlow formula.



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If the strength condition of the column for excessive internal pressure is met, then the selected pipes are left for the layout of the corresponding section. Otherwise, weak sections are strengthened by increasing the wall thickness or the strength group of the pipe material [10, 12].

Let's consider the calculation of an operational casing string of 244.5 mm in an obliquely directed operational evaluation well No. 707 on the Western Cheleken field (Table 4).

**Table 4. Data for the calculation of Ø 139.7mm of the production column**

Depth of descent of the production column	$L_{pr.} = 2620 \text{ m (2764 m along the hole)}$
Reservoir pressure at a depth of 2620m	$P_{res} = 445 \text{ kg/cm}^2$
Drilling mud density at a depth of 2620 m	$\rho_{dr.m.} = 1,81 \text{ g/cm}^3$
Relative density of reservoir fluid (gas) at the occurrence of gas-oil-water manifestation	$\gamma = 0,60 \text{ g/cm}^3$
The coefficient of safety margin of casing pipes	$n_1 = 1,125; n_2 = 1,1; n_3 = 1,75$

The calculation of the production column for excessive external pressure is carried out at a late stage of well operation. The calculation for excessive internal pressure is made according to the tests of the column for tightness.

**We determine the internal pressure:**

Calculation the highest internal pressure in the casing strings is determined at the late stage of well operation with the closed position according to the formula.

When  $0 < Z < H$

$$P_{int.z} = P_{res.} - 0,1 \cdot \gamma_{int} (L - H) / e^S;$$

$$P_{int.z} = 445 - 0,1 \cdot 0,75 \cdot (2620 - 474) / 1,03 = 276 \text{ kgf/cm}^2$$

$$S = 0,1 \cdot 10^{-3} \cdot 0,601 \cdot 474 = 0,028$$

$$e^S = 2 + 0,028 / 2 - 0,028 = 1,03$$

The height of the possible dissolved gas H saturated in the composition of reservoir oil  $P_{sat} < P_{res.}$ :

$$H = L - (P_{res.} - P_{sat.}) / 0,1 \cdot \gamma_{sp.}$$

$$H = 2620 - ((445 - 284) / 0,1 \cdot 0,75) = 474 \text{ m}$$

where:  $\gamma_{sp.}$  is the specific gravity of reservoir oil.  
The maximum internal pressure is expected when the column is compressed on an air cushion:

$$P_{pres.test} = 1,1 \cdot P_S = 1,1 \cdot 276 = 304 \text{ kgf/cm}^2.$$

**We accept  $P_{pres.test} = 305 \text{ kgf/cm}^2$ .**

**Internal overpressure**

The internal overpressure when the column is pressed on water is determined by the formula:

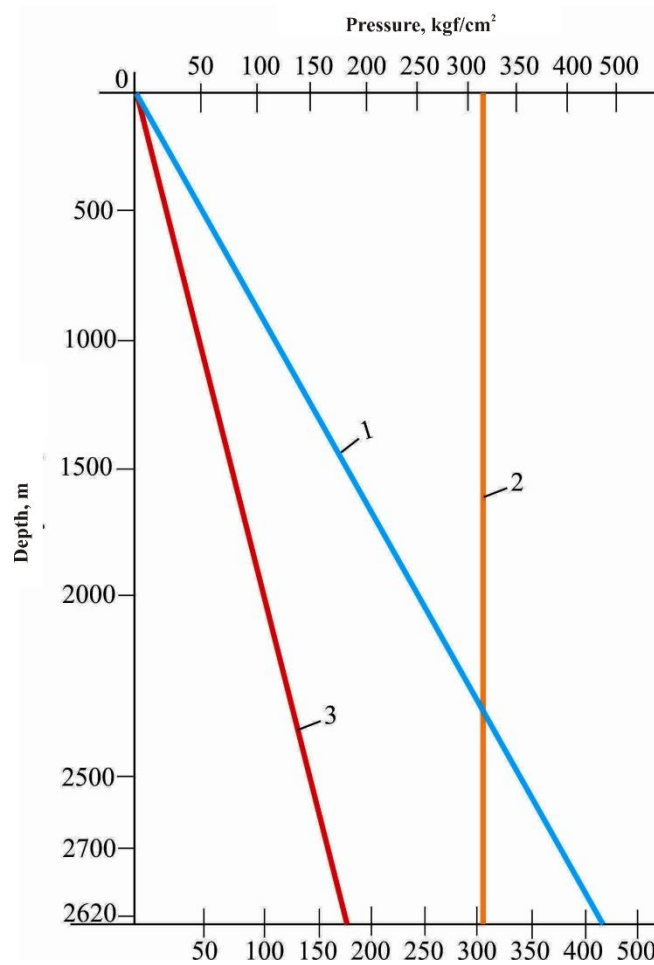
$$P_{int.ov.} = P_{pres.test} + 0,1 \cdot \gamma_o \cdot Z - P_{res.};$$

At  $Z = 0$ ,  $P_{res} = 0$ ;  $P_{int.ov} = P_{pres.test} = 305 \text{ kgf/cm}^2$ .

At  $Z = 2620 \text{ m}$ ,  $P_{res} = 445 \text{ kgf/cm}^2$ ;  
 $P_{int.ov} = 305 + 0,1 \cdot 1,02 \cdot 2620 - 445 = 127 \text{ kgf/cm}^2$ .

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**Figure 1. Calculation of excess external and internal pressures in the production column 139.7 mm**

1. Reservoir pressure
2. Internal overpressure when testing the column for tightness
3. External overpressure

### External overpressure

The external overpressure is determined by the formula:

$$P_{\text{ex.ov.}} = P_{\text{res.}} - 0,1 \cdot \gamma_o \cdot Z;$$

at  $Z = 2620 \text{ m}$

$$P_{\text{ex.ov.}} = 445 - 0,1 \cdot 1,02 \cdot 2620 = 178 \text{ kgf / cm}^2$$

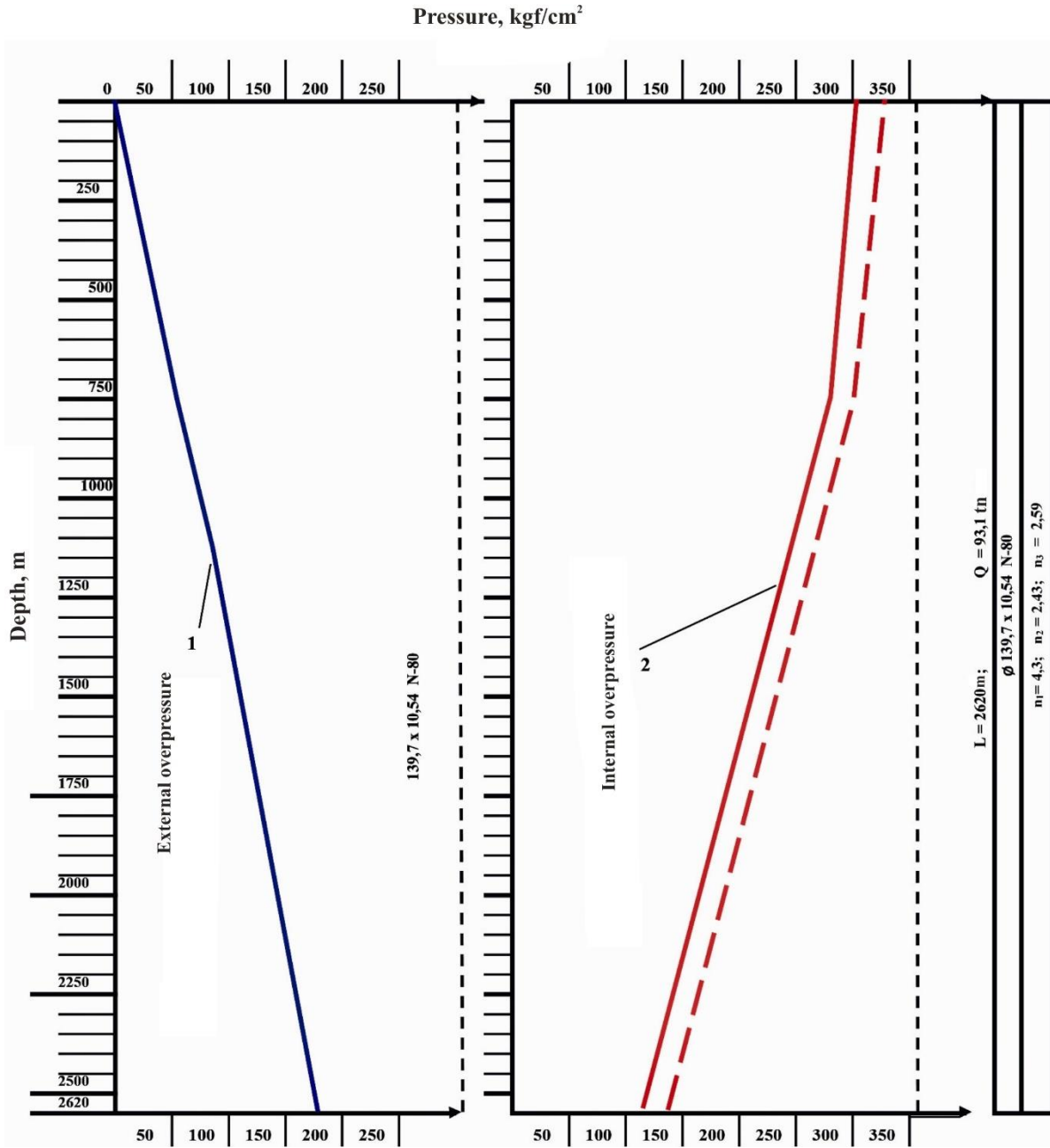
In accordance with the above calculations and graphical constructions, casing pipes  $\varnothing 139.7 \text{ mm}$  are designed for descent into the well. with a wall thickness of 10.54 mm, N-80 steel strength group, Batress thread, with a normal coupling, according to the API standard.

The weight of the casing pipes in the air to be lowered to the well is:

$$Q_c = 33.7 \cdot 2764 \text{ (along the hole)} = 93.1 \text{ tons.}$$

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**Figure 2. Calculation of excess external and internal pressures in the production column 139.7 mm**

We determine the value of the safety factor when calculating the external overpressure for casing pipes designed for descent:

$$n_1 = P_{cr.} : P_{ex.ov.} = 785 : 183 = 4,3 > 1,125;$$

We determine the value of the safety factor when calculating the internal overpressure for casing pipes designed for descent:

$$n_2 = P_T : P_{pres.test.} = 742 : 305 = 2,43 > 1,1;$$

We determine the value of the safety factor when calculating the tensile strength for casing pipes designed for descent:

$$n_3 = P_{st} : Q_c = 241 : 93,1 = 2,59 > 1,75$$

Graphic calculation of the Ø 324mm intermediate column for excessive external and internal pressures is shown in Fig.1, 2.

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Article



Sarbinaz Satbay qizi Kaypbergenova

Nukus branch of Uzbekistan state institute of arts and culture  
English teacher

## THE STRUCTURES ON VARIOUS TECHNIQUES OF TEACHING TERMS

**Abstract:** In the present article some methods of teaching English technical terms to the higher school students and some techniques of translation of technical terms are viewed.

**Key words:** Approach, technical term, reliability, frequency, process, typology.

**Language:** English

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### Introduction

Lexis is one of the most important elements to be considered when discussing English language teaching as the many intricacies and subtleties forming up vocabulary can constitute an important barrier in front of effective and correct acquisition. It has often been pointed out that a major obstacle to comprehending texts in their disciplines for technical students of English is technical vocabulary as it would be expected (highly specialized words usually used only by specialists and which are as a rule taken care of by the subject teachers), or general vocabulary which is usually acquired by the time students reach college, but a third intermediate lexical proportion of scientific and technological texts and known as *sub-technical*, *semi-technical* or *nontechnical vocabulary*. This consists of items of vocabulary from normal English operating within a science context. The aim of this dissertation is to investigate teaching technical words in English the extent to which this vocabulary is semantically and stylistical distinct from the same vocabulary but in a general English context, and then to outline the translation difficulties that Romanian business students technicians and engineers and also computer programmers with these the terms; in other words we shall try to establish the degree of semantic overlap that exists between English and Uzbek as regards this vocabulary.[1.183]

A very detailed theoretical presentation of what sub-technical vocabulary is, as seen through the

various conclusions of those that have studied it along time is given by scientists. Besides the differences existing in the labeling of this special range of words existing between the fully technical and the general English, some researchers preferring the term *sub technical* others using *nontechnical* and still others using *semi-technical*, the problem is further complicated by the existence of different definitions.

We investigate the degree of lexical and conceptual overlap between the sub-technical vocabulary of technology in English, the focus of our research being the creation of reading and lexical materials as follows:

- mainly of Latinate words that form part of the vocabulary of general educated usage;
- referring to linguists whom we acknowledge as the first to use the term sub-technical;
- Sub-technical vocabulary as “context-independent words which occur with high frequency across disciplines”. This definition applies to those words that have the same meaning in several scientific or technical disciplines. Then they go on to say: “To these words we have added those “common” words that occur with special meanings in specific scientific and technical fields. Together, the two sets of words make up the English sub-technical vocabulary.”

The extent to which this overlap or rather the lack of it can facilitate or, on the contrary, adversely affect comprehension and act as a barrier to acquisition of knowledge. The study comprises an

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empirical investigation of the problems which students of technology are likely to encounter in reading technological texts and it should be conducted using a de-contextualised word-level exercise, students should be asked to translate a set of words from English into Uzbek or Russian and then to make up sentences using these words. The list of sub – technical lexical items used for the test was partly drawn from frequency list of positive key words and partly made up based on our own intuition and teaching experience; this latter part includes words such as motor vehicle, accreditation, automatic section, abrasive, damage repairs, range, alund, base ,barrel, combat, condemn, that are felt to have a high frequency of occurrence in the published technical English materials students will encounter in their English classes. However, both the lexical items of key words and those added by us from various teaching materials have been distinguished from technical lexis based on an essentially intuitive method rather than on any empirical data, this approach being motivated on the one hand by the absence of any available large corpus from which statistical conclusions could be drawn, and, on the other, by the fact that, as it has been pointed out before in this study, when speaking about technical/sub-technical vocabulary we seem to be dealing with rather fluid tendencies rather than hard-and-fast categories. Thus, although a number of additional words were at first included in the list (equity, return ,hending, margin, draft, spread, turnover) they were later excluded as it was felt that they required a precise technical explanation by the subject teacher, so they belonged more properly under the heading of “technical vocabulary”.[2.116].

Articles on science and technology published in English books, magazines and newspapers can be used as teaching materials, for these un-simplified (authentic) articles are different from those of the test-oriented textbooks. Technical articles have no plots, which would bore the students. Besides, this is a selective course ,and the students are from different majors, such as Automotive Engineering, Electrical Engineering, Mechanical Engineering and Material Engineering. When selecting the materials, try to choose the subject-related, practical ones which would arouse the interest of the students and meet their needs, and avoid using long, dull and highly specialized texts. It may be more appropriate to look for text that are more interesting in order to generate the motivation needed to learn English. Therefore, some articles on *automobile development, electric vehicle, engine construction, robot, numerical control system, transistor circult* and radio communication are selected respectively from Financial Times. International Business, Motor Vehicle Technology, ARRL Amateur a washer, dital AV amplifler and projector were also selected. With the factors considered, these selected materials could attract the

students attention. Some of the materials are too long and would make teaching dull. Therefore, they were cut into proper length to meet the needs. Translation exercises should be arranged in the end of each text

In fast, all the majors are interwoven or overlapped in some fields and there are twilight zones. With the factors considered, these selected materials could attract the students attention.

Student – centered discussions can be held once in a while in class- the students are divided into groups of 4-5 people and assigned appropriate passages to translate, so that they have opportunities to practice using dictionaries and deciding word meanings. After the discussions, one student from each group read the translation in class, and in the end the teacher would comment on the translation and correct the errors. Discussions make every student use his brain, and the problems that the students have can be quickly diagnosed, the class going on in a relaxing atmosphere. The students might be good at their subject, but not that good at English. Grammar-Translation Method can be party used. Grammar is used as an aid to study. The structure of difficult sentences is explained, and long, difficult sentences are translated into the target language, especially long sentences and sentences with attributive clauses. With the teaching going on, some basic translation techniques, such as amplification, repetition, conversion and division are integrated into the text translation gradually.

At the teaching process the existing pictures are made use of fully. For example, in the teaching of the text about the engine, the illustrations of the engine and components can be used; in the teaching of the text about transistor circuit, some of the mentioned electronic components are shown to the students, making the teaching easier.

At the end of the per term students are tested. The open-book test can be used, i.e. they should be allowed to use dictionaries in the test. The test is an achievement one, consisting of two parts:

1. Explain the terms (or words) in English:
2. Translate passages into Uzbek.

Thus we can check the students’ ability to use simple English words or sentences to explain technical terms or words they have learnt. For example: microphone- a device for transforming sound waves into an electric current.

Some scientists point out that even the differences in vocabulary are far less significant than might be expected.

There are 4 types of vocabulary:

- a) structural: e.g. are, this, however
- b) general: e.g. table, run, dog, road, cause;
- c) sub-technical: engine, spring, valve, aced;
- d) technical: auricle, schist some, fissure;

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Another check student’s knowledge is of two short passages, one taken from the materials the students have learnt and the other from the materials they have not read before, so that both ability and achievement are tested. The students write answers by themselves, no four possible answers as in the case of “ multiple choice”. The results of the tests show that the students can pick much knowledge through learning the materials and do the translation.[4.304]

From this study we can see that students can learn both English and knowledge from English for specific purpose course. English for technical purpose is not a matter of teaching “specialized varieties” of English. The fact that language is used for a specific purpose does not imply that it is a special form of language, different in kind from other forms. General English is the basis of Technical English.

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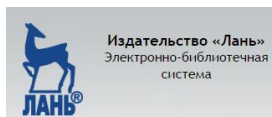
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