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ABOUT THE POSSIBILITY OF EQUIPMENT OF ARCTIC MILITARY SERVICES WITH THE USE OF NANO MATERIALS

Abstract: *The results of previous studies on the choice of a package of materials for gloves and mitts for servicemen in the Arctic did not allow them to reasonably choose such a package that would provide them with a comfortable state for a given time in climatic zones with low temperatures. New research, carried out on the basis of the software developed by the author, made it possible to offer packages of materials that guarantee a comfortable state of service for the military.*

Key words: *nanomaterials and - technologies, material packages, software, gloves, mitts, innovations, time of exposure to a soldier, low temperatures, comfort, safety.*

Language: *English*

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Introduction

UDC 685.44: 337.32

The development of the Arctic and the creation of comfortable conditions for the participants in this process requires the development of a set of suits that would form these most comfortable conditions for them.

The presence of servicemen in climatic zones with low temperatures in order to fulfill their statutory duties presupposes a set of suits that would guarantee the soldier's fulfillment of statutory duties in full during the entire time of his stay in these zones. To create such conditions, it is necessary to have software that would guarantee servicemen the implementation of these very statutory duties without harm to health, providing them with a comfortable state without reducing their combat readiness.

Main part

The peculiarities of the choice of materials for gloves for servicemen in the Arctic are provoked by the climatic conditions of this zone in order to guarantee him comfortable conditions during the entire period of their use of their statutory duties. At the same time, special attention was paid to ensuring

the comfort of not only the soldier's hand, but especially the index finger of the right, if he is right-handed, and the left hand, of course, if he is left-handed. This need is dictated by the specifics of the performance by the military personnel of their duties, namely, to carry out shooting, in which a more intensive cooling of the index finger is provoked. Regrettably, all the variants of materials for gloves considered in previous studies did not provide a comfortable condition of the skin of the hand and index finger for servicemen in the considered range of low temperatures, namely, - 10 ° C; - 20 ° C; - 30 ° C; - 40 ° C.

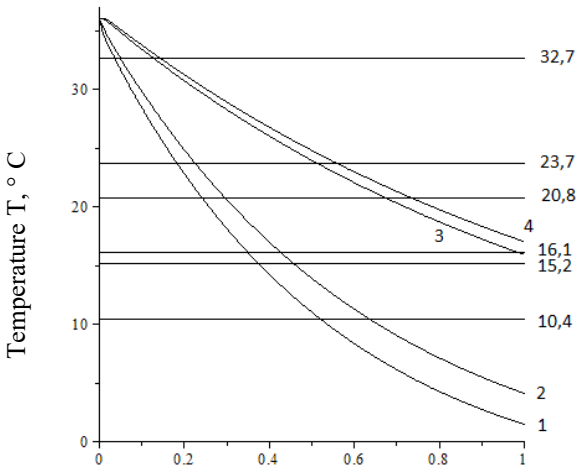
The use of mitts provides the serviceman with additional protection for both the hand and, most importantly, the index finger, while the main protection is provided by the glove, and here the authors test not only yarn from various types of wool, forming one or two threads from it, but also the possibility of using nanomaterials capable of thermoregulation and providing the skin of the hand with a comfortable temperature, namely, not lower than 32 ° C. Such studies are possible using the same software that the authors developed and used to substantiate the packages of materials in the manufacture of a set of a suit for military personnel. The characteristics of these materials are shown in Table 1.

Table 1 - Characteristics of materials in the manufacture of gloves for servicemen of the Arctic using cushioning material TPKM AKR - 622 / AKR – 218

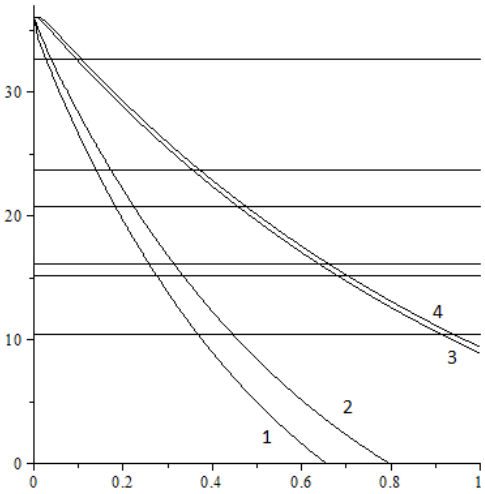
Materials used to make gloves	Thickness mm	Coefficient of thermal conductivity, λ, W / m ° C
1 Single strand yarn:		
1.1 From goat hair	0.7	0.015
1.2 Sheep wool	0.8	0.020
1.3 Camel	0.9	0.005
1.4 From dog hair	0.8	0.010
2. Two-strand yarn:		
2.1 From goat hair	1.4	0.015
2.2 From sheep wool	1.6	0.020
2.3 From camel	1.8	0.005
2.4 From dog hair	1.6	0.010
3. A package of materials for the index finger of the hand, suede + yarn from one thread + TKPM AKR-622 / AKR218		
3.1 when using goat hair	1.7	0.02 / 0.015 / 0.009
3.2 when using sheep's wool	1.8	0.02 / 0.020 / 0.009
3.3 when using willow wool	1.9	0.02 / 0.005 / 0.009
3.4 when using dog hair	1.8	0.02 / 0.010 / 0.009
4. Package of materials for the index finger of the hand, suede + yarn of two threads + TKPM AKR-622 / AKR218		
4.1 when using goat hair	2.4	0.02 / 0.015 / 0.009
4.2 when using sheep's wool	2.6	0.02 / 0.020 / 0.009
4.3 when using willow wool	2.8	0.02 / 0.005 / 0.009
4.4 when using dog hair	2.6	0.02 / 0.010 / 0.009
5 Material for the fingertip of the index finger of the soldier's hand and for mitts - "natural suede leather"	0.8	0.020

With the help of the software developed by the authors, graphs were built characterizing the condition of the skin of a soldier's hand for four ambient temperatures, namely: - 10 ° C, -20 ° C, -30 ° C, -40 ° C from the time it was at post, but not less than 1 hour. The figures show the temperature values of the skin of the hand, characterizing the various heat sensations of a serviceman, namely, comfort (32.7 ° C), slightly cool (23.7 ° C), cool (20.8 ° C), cold (16.1 ° C), very cold (15.2 ° C), pain (10.4 ° C) (frostbite). At -10 ° C, a comfortable state is provided only by a package of suede dog hair (double thread), and for -20 ° C, -30 ° C, - 40 ° C, none of the materials under study and their packages together with natural fur “winter »Do not guarantee comfortable conditions for servicemen.

Goat hair, - 10 ° C

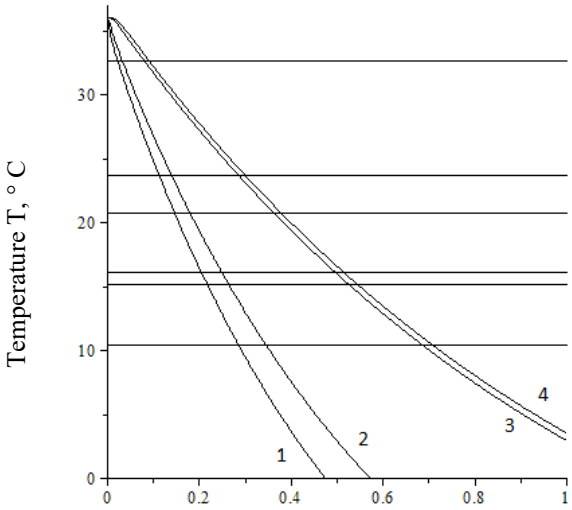


Goat hair, - 30 ° C

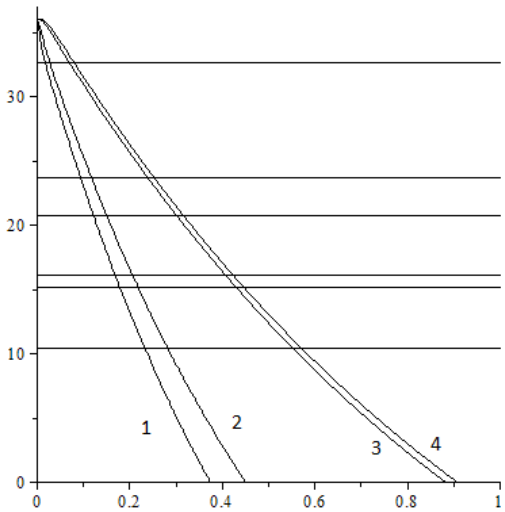


Time, h

Goat hair, - 30 ° C

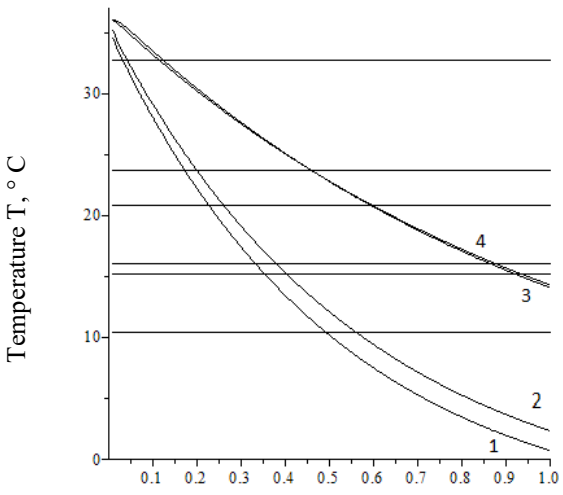


Goat hair, - 40 ° C

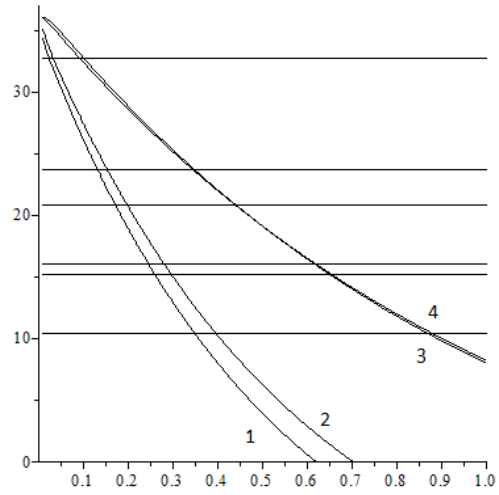


Time, h

Sheep wool, - 10 ° C

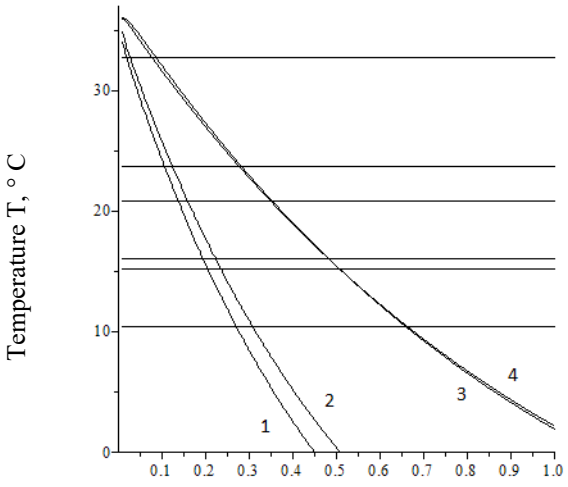


Sheep wool, - 20 ° C

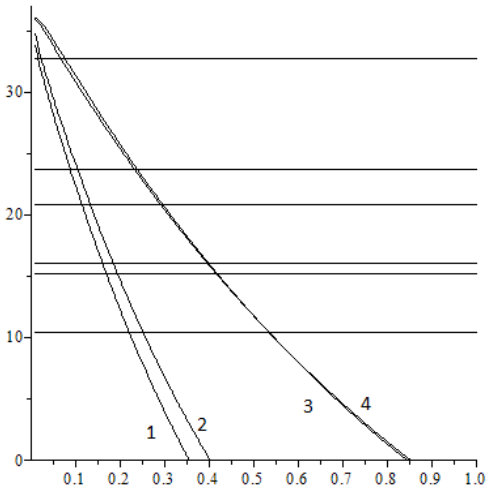


Time, h

Sheep wool, - 30 ° C

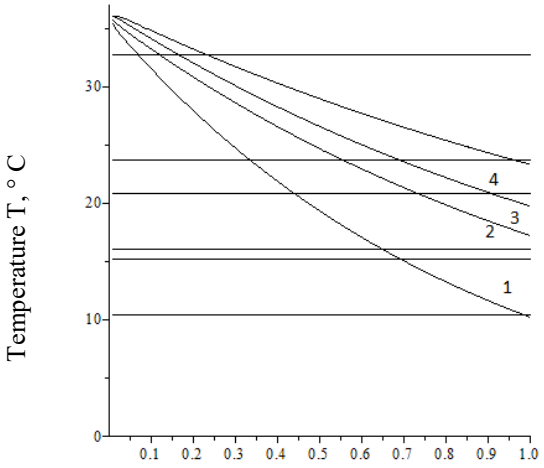


Sheep wool, - 40 ° C

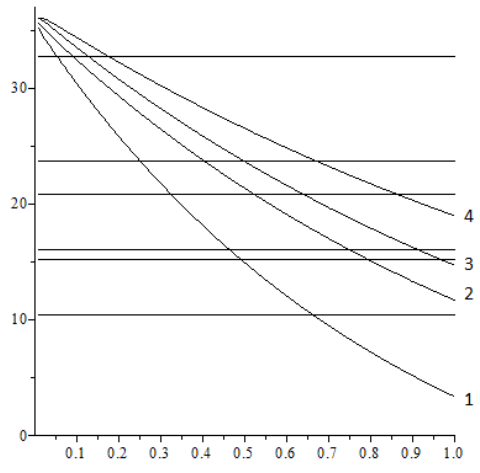


Time, h

Camel wool, - 10 ° C

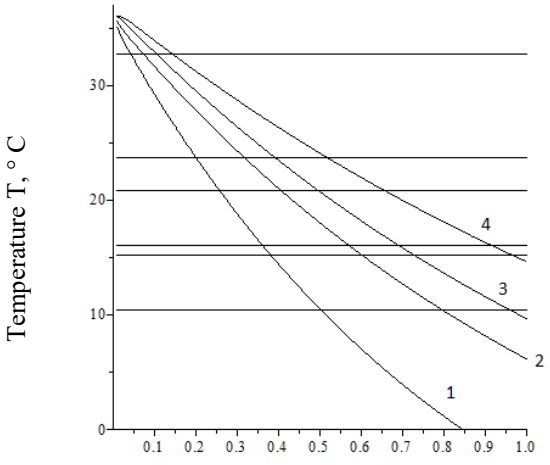


Camel wool, -20 ° C

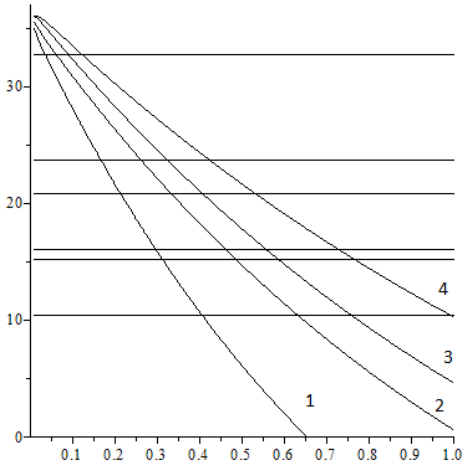


Time, h

Camel wool, - 30 ° C



Camel wool, -40 ° C



Time, h

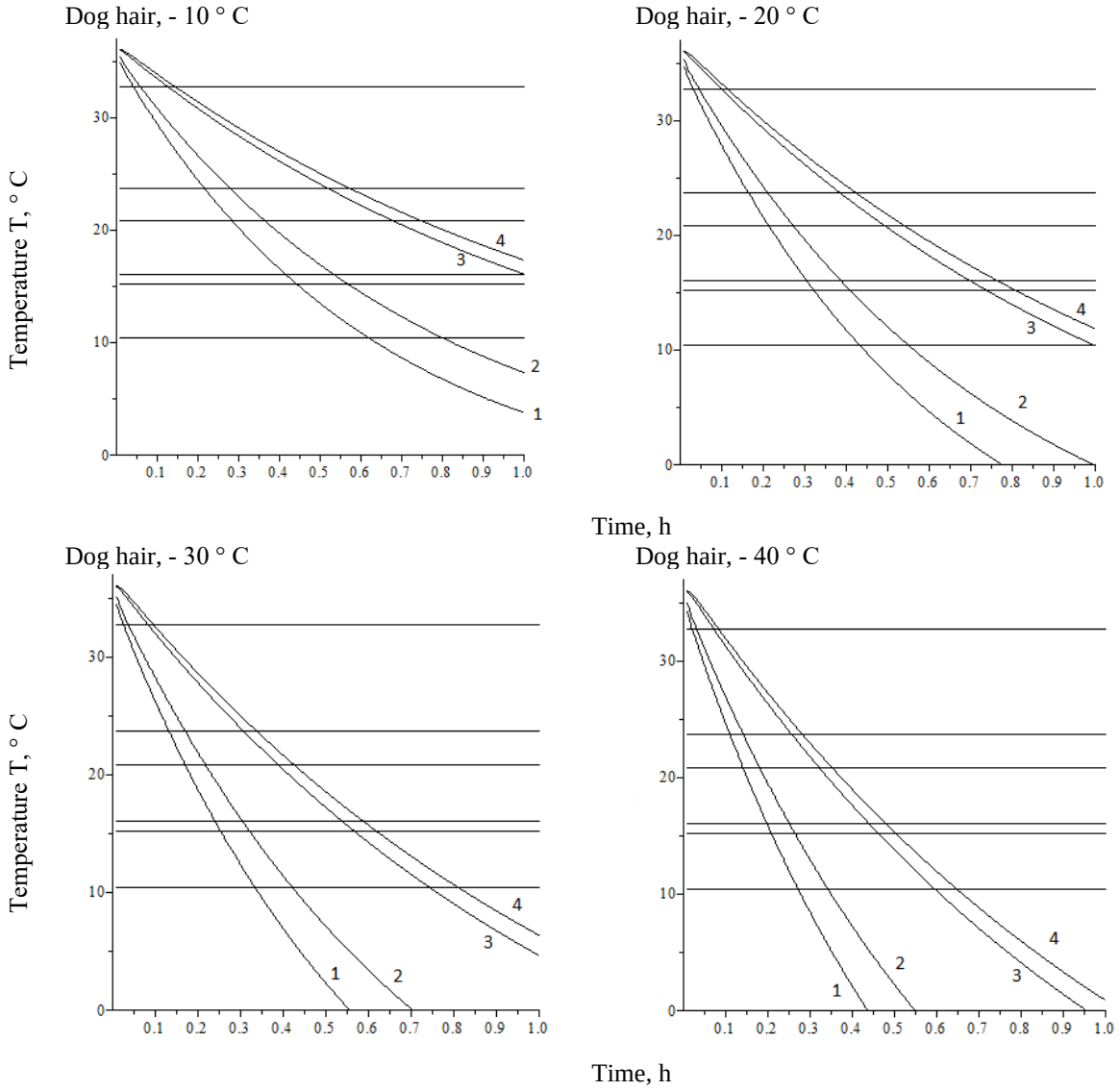


Figure 1 - Characteristics of the state of comfort of the skin of the hand of a serviceman when it is in different climatic conditions when using gloves from various types of yarn, namely: curve 1 - one thread, curve 2 - two threads, curve 3 - one thread + suede + TKPM AKR 622 / AKR 218, curve 4 - two threads + suede + TKPM AKR 622 / AKR 218

Conclusion

For the packages from the materials under study, shown in Table 1, curves were plotted characterizing the state of comfort of the soldier's hand for the following ambient temperatures, namely, curve 1 - at -10 ° C, curve 2 - at -20 ° C, curve 3 - at -30 ° C, curve 4 - at -40 ° C (Figure 1).

Consequently, the results obtained substantiated the high efficiency of using the software for a reasonable choice of packages of materials for gloves and other sets of suits for Arctic servicemen and confirmed the need to continue research on the choice of materials that would provide them with a comfortable state in a given temperature regime for at least two hours [7 - ten].

The software developed by the authors allows the manufacturer to have a tool for making an informed decision on the choice of material packages for the suit of the Arctic military personnel, including in the production of gloves to protect the hand from the effects of low temperatures while performing their statutory duties.

Confirmation of such conclusions is the analysis of the most effective temperatures carried out by the authors in terms of comfortable conditions of the skin of the hand, providing a constant temperature within 32.5 ° C.

Unfortunately, gloves made from wool yarns of various animals, made from either one or two threads, do not guarantee servicemen such a comfortable state

even at a temperature of -10 ° C, not to mention that the air temperature may be lower. In this case, the skin surface of the hand is cooled below the critical value, i.e. below 10.4 ° C, and can lead to frostbite and irreversible processes.

The use of mitts to protect the hand also does not guarantee servicemen protection from the effects of low temperatures and implies the search for such materials and the formation of such bags for the manufacture of gloves that would provide them with a comfortable environment, which is possible when using nanomaterials capable of providing balance for 2 hours, allowing servicemen to fulfill their statutory duties, that is, developers must use the main criterion in the production of new materials. - the value of their thermal conductivity coefficient is not higher than 0.005.

References:

1. Afanasyeva, R.F., Burmistrova, O.V., & Prokopenko, L.V. (2012). *Cold stress: medico-biological aspects of prevention*: Monograph. (p.214). Moscow: LLC firm "Reifor".
2. Dell, R.A., Afanasyeva, R.F., & Chubarova, Z.S. *Hygiene of clothes: Textbook. manual for universities*. (p.160). Moscow: Legprombytizdat.
3. (2013). Hot-melt interlining materials for frontal duplication in the production of a man's suit. Mukhametgalieva N.M., Azanova A.A. *Bulletin of Kazan Technological University*, T. 16, No. 4, pp.168-169.
4. (2009). Features of mathematical modeling of the non-stationary heat transfer process in the “foot-shoes-environment” system, Mikhailova [et al.]. *“Design and Technologies”*, No. 11 (53), pp. 91–98.
5. Noble, A.A. (2019). Evaluation of the effectiveness of creating comfortable conditions for a person in climatic zones with low temperatures. *Izvestiya vuzov. North Caucasian region. Technical science*, No. 2.
6. Ricardo, D. (1955). *The beginning of political economy and taxation*. Coll. Op. in 3 t, gt 1, (p.360). Moscow: Gospolitizdat.
7. Galbait, J. (1969). *New industrial society*. (p.480). Moscow: Progress.
8. Hanika, F. de P. (1969). *New ideas in the field of management*. (p.124). Moscow: Progress.
9. Beer, S. (1965). *Cybernetics and Production Management*. (p.287). Moscow: Nauka.
10. Aleshin, B.S., et al. (2004). *Philosophical and social aspects of quality*. (p.438). Moscow: Logos.
11. Adler, Yu.P., et al. (1999). What is the coming century for us? (Management of the 21st century - a brief overview of the main trends). *Reliability and quality control*, No. 1.
12. Boytsov, B.V., et al. (2007). *Concept of quality of life*. (p.240). Moscow: Academy of quality problems.