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Choosing optimal decisions on laying pipelines in permafrost in terms of the reliability theory.

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The paper is concerned with the solving of the fundamental problem -improving the reliability and reducing the cost of oil pipelines in permafrost area. It consists of 4 stages
Step 1. Development of analytical and numerical methods to assess technological risks in laying pipelines in the permafrost zone in terms of probability-statistical approach and theory of reliability for the three cases: buried, ground and above-ground laying of the pipeline.
Step 2. Analysis of the economic consequences of accidents of pipelines in permafrost and cost of risk.
Step 3. The formulation and solution of optimization problem: the sum of the cost of building an oil pipeline and the price of risk tends to a minimum. Risk management solution is achieved using the design parameters of the pipeline and different way of its laying in specific environmental conditions
Step 4. Developing a methodology for constructing cost engineering and permafrost maps
The paper is concerned with probabilistic – statistical approach for oil pipelines designing. The existing optimization studies of engineering constructions stabilization on frozen ground is based on deterministic model and has some substantial defect-this model can't compute the reliability of system and the variants can be compared just with theirs initial cost. So it is necessary to use probabilistic approach using the analytical method of estimation of pipelines reliability and cost of risk in the context of different types of pipelines.
Proposed methodic of estimation of oil-trunk pipelines in permafrost area let us consider stochastic heterogeneity of the geotechnical system «pipeline-permafrost» and actual loadings, to manage system quality, make emergency situations forecast , and the financial estimation of the consequences (in standard units). After getting the information about material costs it gives us an option to represent the optimization problem- cost rate for system implementation and cost of risk goes to lower limit. We can manage the system reliability and cost of risk by changing the construction solutions, e.g. for above-ground pipeline it's modifying the length of piles, for buried pipelines modifying the thickness of radial heat-insulation. . A Solution of the problem allows to make a choice of optimum design decisions - trace the optimum pipeline route, optimum way of its laying and appropriate design values in different geological environmental conditions in permafrost area.