PECULIARITIES OF STRESS-STRAIN STATE OF TWO-LAYER PIPES EXPOSED TO NON-STATIONARY THERMAL AND MECHANICAL CONDITIONS

Background
Corrosion and reliability of equipment and pipelines are the highly relevant problems of oil and gas upstream and downstream industries. One of the advanced methods to solve these problems is to use two or more layered pipelines and vessels, so that protection or strength are ensured by different layers. However, the materials differ by their mechanical and thermal properties, which leads to formation of complex stress-strain condition of such equipment. This article investigates some common regularities of stress-strain state in the two-layer pipe under the variable thermal and mechanical loads.

Aims and Objectives
To investigate the common regularities of stress-strain state in two-layer pipeline or vessel taking into account the sizes, variable material characteristics, and operating conditions. To determine the possible mechanisms of loads accumulation under the non-stable pressure and temperature conditions.

Methods
All results were determined by analytical methods using the thermal elasticity and plasticity theories.

Results
There were developed the stress-strain state regularities for the case of two-layer pipeline, taking into account the variable sizes, wall and layers thicknesses, mechanical and thermal conditions of metals, pressure and temperature based loads. The optimum pressure and temperature ranges were developed, limited by pipeline elasticity. The mechanism of cyclic thermal creep was investigated under variable pressure and temperature.

Key words: pipeline, vessel, two-metals, load, elasticity, cyclic creep

References


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