Systematic approach to prediction of the stress corrosion condition of trunk gas pipelines in Russia

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Degradation processes have specific impact on the Russia's gas transmission system reliability. These processes include corrosion of general and local nature, erosional wear of gas pipelines and multiple pipe damages with fracture-like defects, most of which were formed due to the stress-corrosion mechanism. Meanwhile, the development of stress-corrosion defects of all others, which recently caused up to 50% of failures of trunk gas pipelines, can be prevented by means of the developed methods of prediction of this process.

Purpose

Improvement of reliability and stability of Gazprom JSC trunk gas pipelines against stress corrosion cracking by means of introduction of a complex of interrelated scientific technical measures.

Goals:

- Collection, analysis and systematization of data on trunk gas pipeline operation parameters and on occurrence of stress corrosion cracking (SCC) in them. Pipeline ranking on the basis of tendency to stress corrosion, selection of pipelines for inclusion into complex diagnostic inspection programs.
- Complex diagnostic inspections of pipelines by means of pig inspection (if possible) or determination of pipeline sections potentially hazardous in relation to SCC, on the basis of assessment of soil properties, pipes' tendency to stress corrosion cracking and the condition of a protective cover. Confirmation of defects in local holes.
- Identification of the mechanism of SCC defects formation, determination of their development stage and calculation of pipeline strength. Resource tests of elements or fragments of pipelines when the terms of safe pipeline operation with SCC defects need to be determined.

- Calculation of the terms of safe pipeline operation with SCC defects, taking into account compensating measures, or selection of an efficient technology for damaged pipes repair.
- Introduction of new technologies, materials and equipment for repair of pipelines with SCC defects. Development of pipe products and protective coating with inhibiting additives, ensuring improved pipeline reliability and resistance to SCC.

Forecast of stress-corrosion condition of trunk gas pipelines in Russia (Fig.1**):**

- Planning - regional defectiveness and accidence, time of operation, type and structure of AZP, pipes' tendency to SCC;
- Inspection - soil parameters, condition of AZP, pipes' tendency to SCC, pig inspections, pipeline surface NDT;
- Assessment of hazard - identification of defect, determination of development stage, strength calculation, pipe and specimen tests;
- Justification - calculation of safe operating terms, selection of pipeline repair technology;
- Repair – technologies, materials, equipment.

Selection of repair technology (Fig. 2)