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ANALYSIS OF THE CAUSES OF NON-SEALING AND FAILURES OF PUMP-COMPRESSOR PIPES IN OIL AND GAS WELLS

Pump-Compressor Pipes (PCP) are designed to ensure the operation of the well: transporting oil and gas within the casing column, for repair and hoisting operations. Damage to PCP can lead to the well's failure, so the topic of detection, prevention, and avoidance of accidents remains relevant.

The non-sealing of pump-compressor pipes (PCP) may be associated with violations of manufacturing standards for the pipes themselves or their components.Transducers, fittings for mounting column wraps, connecting devices during the descent of column sections, two-stage cementing sleeve couplings, check valves, and other elements should have strength indicators not less than the strength of the pipes themselves.Their threads and sealing elements of connecting nodes should correspond to the sealing elements of the pipes. In other words, all these elements must be manufactured according to precise technical specifications.[1] Additionally, non-sealing under the influence of external and internal pressures can occur due to violations in the technology of descent and hoisting operations, the use of pipes that do not comply with operational conditions and extraction methods, or improper selection of lubrication forlubricantsforscrewingpipes [2].

The failures of pump-compressor pipes (PCP) typically occur due to improper operational procedures, negligence during major repairs, and the intensification of oil and gas wells.I suggest considering their main types:

1) Pipebodyfracture.

The causes of such damage can be incorrectly selected lift pipes, exceeding operational load limits, or the presence of metal defects during the production of pump-compressor pipes (PCP).

2) Threadbreakage.

The causes include poor thread preparation for screwing, uncontrolled screwing of lift pipes, excessive stress on the pipes, latent defects not detected in time, and electrochemical carbon dioxide corrosion (if the pipes are made of steel grades that are not resistant to corrosion).

3) Pipebodywear.

The causes are the friction of rods during oil or gas extraction by rod pumps against the wall of the lift pipe and the corrosive effects of fluids.

4) Pipe body destruction under the thread occurs due to the influence of electrochemical carbon dioxide corrosion, resulting from the use of non-corrosion-resistant steel grades in the manufacturing of pipes.

5) Electrocorrosion of the coupling occurs under the action of stray currents that corrode the metal. Typically, more intense deterioration is observed on the anodic (+) areas.

6) Internalthroughpittingcorrosionofthepipebody.

Thecauseofsuchdamageiselectrochemicalcarbondioxidecorrosion, whicharisesfromthedissolutionofmetalatspecificpointsonthepipe'ssurfacemadeofnon-corrosion-resistantsteelgrades.

7) Corrosion cracking occurs as a result of changes in the thickness of the pipe wall due to abrasion by the pump rod, followed by further deterioration under the influence of aggressive environments during the operation of pipes made of non-corrosion-resistant steel grades.

8) Threadnipplethreaddeformation.

These thread deformations occur due to improper preparation of the nipple for screwing with the coupling. The nipple and coupling were not pre-screwed manually, and the threads of the pipe did not engage or engaged with the threads of the coupling at the incorrect angle.

9) Delaminationintheinitialturnsofthethreadoccurswhenthepipeisscrewedtogetherincorrectly, atanincorrectangleoras a resultofimpactswheninsertingthepipeintothecoupling.

10) Damage in the form of dents, indentations on the pipe end, western bevel and threads is the result of previous manipulations related to tightening the pipe, impacts when inserting the pipe into the coupling or during transport in general.

11) Wear of the initial turns of the thread on the coupling.

The causes are incorrect screwing, lack of preparation for screwing or excessive screwing with increased torque, as well as lack of prior calculation of the same torque.

12) Wear of the first threads of the nipple's thread is typically the result of a violation of the screwing technology, specifically the absence of lubricant on the coupling thread.

13) Surface thread damage in the form of indentations occurs due to mechanical damage to the nipple thread, for example, impacts from a wrench during the screwing of the tubing.

14) Broken threads are the result of a lack ofpreliminarymanualscrewing, screwingatthewrongangle, the use of unsuitable or contaminated sealing grease, or impacts during insertion of the pipe into the coupling. [1]

Ofthesetypesofdamagetotubing, twomaingroupscanbedistinguished: damage to the pipe body and damagetothethreads.Additionally, it is possible to identify the main causes of damage that should be given priority attention.Namely: the grade of steel used in the manufacture of pipes, couplings, and other components of the tubing; the potential for corrosive influence and the aggressiveness of the well environment; the tubing screwing technology; the presence or absence of prior hand tightening, and the maximum loads on the pipes.

Based on the information provided, we can conclude that accidents related to tubing damage can be avoided through timely prevention. This involves adhering to manufacturing processes for pipes, proper screwing and installation, as well as early detection of pipe damage.

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