RECONSTRUCTION OF THE UNDERWATER PASSAGE

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The modern state of pipeline transport is characterized by a long period of operation, as a result of which ensuring the stable functioning of main pipelines, as well as maintaining their safe and reliable operation, become one of the most important and priority tasks of the operation of the pipeline system.

Ensuring efficient and reliable operation of main pipelines can be achieved by conducting timely repair work, equipment renovation and reconstruction. Carrying out repair and renovation of equipment is aimed at maintaining the design technical condition, while reconstruction allows to achieve improvement of technical and economic indicators, as it is carried out based on modern solutions developed taking into account the latest achievements of science and technology. The reconstruction of individual pipeline sections allows for the renewal of capital assets in a shorter time and with lower costs than with new construction. Also important is the fact that in the process of reconstruction, new technologies and constructive solutions are implemented, as well as the latest technology, and such socially significant problems as improving working conditions and environmental protection are solved [1, 2].

The main part of the requirements for the organization of reconstruction works are set out in regulatory documents. In addition, most operating organizations develop their own technologies, instructions and rules for organizing and conducting work.

Another problem is that many of the technical solutions adopted during the years of design and construction are now morally outdated for certain sections of the linear part of main oil pipelines and do not meet modern requirements for reliability and safety, as they do not correspond to the actual conditions of operation of oil pipelines. The reason for this is anthropogenic human activity and changes in the situation in the area of the pipeline route (change in climatic characteristics, soil erosion, construction of industrial enterprises and settlements, etc.). All this requires solving the tasks of creating highly effective methods and special technical means of performing work on the reconstruction of existing pipelines in a short time, with the lowest costs, ensuring the safety of pipelines and environmental safety.

The reliability and safety of underwater pipelines is determined by the following man-made and natural factors [3, 4]: • Defects of the pipe body and welds: metal loss (delamination, burrs, cracks), pipe geometry defects (dents, ovality, corrugations); • External anthropogenic mechanical actions: pipeline laying depth, degree of protection of ground equipment, control over work in the protected zone; • Corrosion: regulatory provision of EHS means, condition of the insulating coating, corrosive activity of the soil, presence of underground metal structures and energy systems near the pipeline route, stress corrosion (corrosion under tension), biocorrosion; • Quality of pipes: manufacturing technology and grade of steel, supply of pipes, duration of pipeline operation; • Quality of construction and assembly works: site category by complexity of works, quality control of welding and assembly and construction works, technology

of construction works, construction season; • Structural and technological factors: the thickness of the pipeline wall, the state of protection against hydraulic shocks, the reliability of telemechanization systems, the leakage control system, the presence of linear fittings and ground nodes of a branched configuration on the site; • Natural influences: soil bearing capacity, landslides, wind and water erosion, seismicity of the area; • Operational factors: operational documentation; state of the security zone; frequency of patrolling the track; quality and periodicity of repairs and diagnostics; qualification of workers; organization of staff training; quality of communication; notification system; emergency work plan; technical equipment. [5].

According to the rules of operation of main pipelines, the main ways of maintaining their working condition are maintenance and repair.

Repair of main pipelines is a complex of technical measures, the purpose of which is to restore the main assets of pipeline transport facilities. Repair of the linear part of main pipelines is divided into the following main types depending on the scope and nature of the work: emergency (unscheduled), current, medium and capital.

Emergency repairs include work related to the elimination of accidents that occurred due to ruptures of pipelines (along the pipe body or in the area of welded joints); punctures of the oil pipeline as a result of unauthorized cuts; corrosive effect on the pipeline; clogging of the pipeline, leading to its complete or partial stoppage; malfunctions in linear fittings, etc.

Current maintenance is minimal in scope and content planned maintenance, which is carried out during the operation of the pipeline and consists in systematically carrying out work to prevent premature wear and failure of linear structures, as well as in the elimination of minor damages and malfunctions. Current repairs are carried out based on the results of maintenance. Current repairs are divided into preventive (quantitatively and qualitatively determined and planned in advance in scope and execution) and unforeseen (detected during operation and performed urgently) [6, 7].

Medium repair refers to repair performed to restore the serviceability and partial life of products with the replacement or restoration of component parts and control of their technical condition. The average repair includes planned works on the restoration of linear fittings and equipment, communication lines, electrical protection devices, cleaning of the inner surface of pipelines, inspection and repair of water crossings. During medium repairs, small sections of the pipeline are opened. Medium and major repairs are carried out based on the results of technical diagnostics.

The largest planned repair in terms of scope and content is capital repair. Capital repair of the main pipeline is a complex of technical measures aimed at full or partial restoration of the linear part of the oil pipeline in operation to the design characteristics, taking into account the requirements of current regulatory documents, which is carried out when the limit values of wear in linear structures are reached. Capital repair of pipelines, depending on the nature and technology of work, is divided into repair with replacement of pipes, repair with replacement of insulating coating, and selective repair. Repair with the replacement of pipes is carried out in the following ways [8, 9]:

1. Laying in a combined trench the section of the section of the pipeline that is being laid again, next to the replacement one, with the subsequent dismantling of the latter;

2. Laying in a separate trench the section of the section of the pipeline that is being laid again, with subsequent dissection and dismantling of the replacement;

3. Dismantling the replaced pipeline and laying the newly laid pipeline in the former design position.

Priority main pipelines and their individual sections that require planned repair are determined based on the analysis of project solutions, construction methods, actual working conditions and technical condition, as well as modern requirements for the reliability and safety of industrial facilities.

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