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EFFICIENT CLEANING OF INTERNAL SURFACES OF OIL STORAGE TANKS WITH THE HELP OF CRYOGENIC STREAMING

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Ensuring fire and environmental safety during the pre-repair preparation of tanks for oil products are urgent tasks for oil and gas industry enterprises that require significant financial and labor costs. The greatest man-made danger at the stage of pre-repair preparation is the technological process of cleaning tanks contaminated with oil products.

Contamination of tanks intended for the storage of oil and oil products is characterized by a high content of asphalt-resinous substances, carbenes and carboids, which are solid emulsifiers, which creates significant difficulties in their cleaning.

Deposits in tanks after storage of light petroleum products are characterized by a high content of inorganic compounds, which are mainly corrosion products and sludge deposits.

The mixing of different types of petroleum products, repeated heating and long periods of operation of tanks without periodic cleaning have a great influence on the composition of petroleum products, while a large amount of precipitation accumulates, their compaction and the formation of a solid mass.

Since the surface layer of the structural material of the inner surface of the tank is heterogeneous and has defects, which are schematically considered as cracks, slits of a wedge-shaped section, unevenly distributed over its surface and depth, and not only the outer part, the surface layer, but also the inner part, is subject to contamination.

In the initial period of pouring the petroleum product into the tank with the help of sorption processes caused by the contact of the fuel metal, the outer layer of the metal surface is contaminated with fuel - surface pollution is formed. Further, due to diffusion processes, the oil product penetrates through the mouth of the pore deep into the capillary pores and fills them as a result of adsorption and capillary condensation, forming deep contamination of the structural material. Deep pollution should be taken as pollution at the mouth of the pores, since this is where the main volume of deep pollution is located. Hydrocarbons located in capillary pores do not significantly affect the quality of surface cleaning.

During operation of the tank, mechanical impurities, fuel decomposition products and metal corrosion settle and degas from the volume of oil product stored on the inner

surface of the tank. Thus, after draining the main amount of oil products from the tank, degassed surface and deep pollution remains on its walls in the form of foreign particles and fuel residues in various phase states. The labor-intensiveness of their removal depends on the strength of the connection between the pollution and the construction materials.

Pollution, depending on the connection with a solid body, is unfixed, weakly fixed and strongly fixed. non-fixed pollution corresponds to degassed pollution, and weakly fixed and strongly fixed to surface and deep pollution.

The actual direction of increasing fire and environmental safety incleaninginternal surfacesoil product storage tanks,is the development of a new technological process for their cleaning, based on the application of a cryogenic jet, which combines thermal shock with mechanical impact.

Cryogenic jet cleaning is a pneumoabrasive jet surface treatment method that uses dry ice granules, the temperature of which is much lower than the surface being cleaned. A sharp decrease in the temperature of the surface layer causes the effect of "thermal shock", in which the contaminants cooled to a brittle state are easily peeled off from the surface. The greater the temperature gradient, the less adhesion between the surface material and contaminants due to the difference in their coefficients of linear expansion. At the same time, the main mass of the object does not cool, and the mechanical properties of the structures do not deteriorate, which is experimentally confirmed.

Carbon dioxide expands in volume, and the kinetic energy of the dry ice granules breaks and removes particles of pollution from the surface.

Upon contact with the surface of the object, a huge amount of cold is brought to the granules of dry ice. As a result of heat exchange, solid particles of CO2 instantly heat up and turn into a gaseous state, tending to increase in volume hundreds of times. The gas formed, partially penetrating the space between the contamination and the surface to be cleaned, forms a so-called gas wedge, which under pressure separates the contamination particles from the surface.

For complete removal of dirt, constant mechanical impact on the surface to be cleaned is necessary. This process is ensured due to the kinetic energy of dry ice granules flying out of the atomizer at a significant speed.

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