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Mercury production facility dismantling

Mercury (Hg) is one of the seven elements known to man for a long time. The unique properties of mercury are that this metal is liquid at room temperature and becomes solid only in severe frost.

Mercury has become widely used in various industrial sectors: metallurgical and machine-building, chemical and pharmaceutical, nuclear, electrotechnical, oil and mining, shipbuilding, and military-industrial complex. Therefore, it is not surprising that dismantling companies frequently face the necessity to work with mercury-contaminated sites.

The dangers of mercury to both humans and the environment cannot be underestimated. The main danger is mercury vapor, whose emission from open surfaces increases with rising air temperature. When inhaled, mercury enters the blood. In the body, mercury circulates in the blood, combining with proteins; it is partially deposited in the liver, kidneys, spleen, brain tissue, etc.

For instance, during the dismantling of the fluorescent lamp plant in Korea in 2015, eighteen of twenty-one workers on the project were exposed to mercury vapor. 10 persons among them had persistent symptoms even one and a half years after the initial exposure.

In case of improper dismantling of mercury production facilities, the same adverse impact can be made on nature. The ecological implications of mercury vapor contamination are manifested primarily in the aqueous media - the



vital activity of unicellular algae and fish is suppressed, photosynthesis is disturbed, nitrates, phosphates, ammonium compounds, etc. are assimilated. Mercury vapor is phytotoxic and accelerates plant aging. In Russia, mercury pollution from several plants built in the Soviet times is a significant problem that is considered at the federal level and is under control of top public officials. We will consider the technique of work with mercury waste by the example of the territory of the Usolyekhimprom plant in Usolye-Sibirskoye in Irkutsk Oblast, where the Federal Environmental Operator (part of Rosatom), with the assis-

tance of KrashMash Group of Companies, has been working since 2019. The main hazardous facility on the territory of Usolyekhimprom was an abandoned mercury electrolysis workshop, where 600 tons of mercury were concentrated, as well as tanks with chemical waste and underground wells where waste was pumped. Soil, ground and underground waters are saturated with toxic substances and heavy metals.

The following flow sheet is used for mercury facility dismantling. The demercuration of the contaminated structures is carried out before the start of dismantling works. Today, there are many methods for this: physical, chemical, mechanical, vapor-vacuum, electrokinetic and thermal. At Usolyekhimprom, chemical methods of demercuration were applied.

Specialists start dismantling works only after the air temperature drops to 10 degrees, which allows avoiding the mercury evaporation.

When dismantling structures contaminated with mercury, it is the most important not to create a dust cloud containing poisonous vapors, because it will be consistent with a radioactive cloud. Therefore, the dismantling works are accompanied by creation of water curtains so that dust, which can be raised by the wind, does not accumulate. So, more than 900 tons of water were used during creation of



water curtains on the territory of Usolyekhimprom. At the site, the air chemical analysis was constantly carried out and the strictest safety measures were observed.

After dismantling of all structures on the territory, reclamation is carried out with processing or removal to a specialized site.

