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New Research Project – Interaction of Mercury with Metal Surfaces

Many in the oil and gas industry have known anecdotally that steel equipment, tanks and pipe that contact mercury-laden process streams retain substantial amounts of mercury. The process is seemingly reversible (what goes in can come out). The mercury species involved is most likely elemental mercury because mercury evolved from contaminated steel is a volatile species. In locations where mercury is known to be present in process streams or produced fluids, rigorous safety precautions are employed to detect mercury vapor in workplace atmospheres encountered when steel vessels are opened for maintenance or inspection purposes. Likewise, the industry is cognizant of mercury vapor liberated when process piping is subjected to welding or other types of hot work.

The suspected mechanisms of uptake of (elemental) mercury by steels are largely uninvestigated but thought to be one or a combination of the following:

- Adsorption to the surface corrosion scale and underlying metal interface
- Chemisorption to the surface corrosion scale and underlying metal interface
- Chemical incorporation into steel corrosion scale or mill scale
- Amalgamation with steel at the steel/corrosion scale interface
- Incorporation by diffusion into the steel lattice
- Incorporation by diffusion into the steel grain boundaries
- Reaction with grain boundary constituents or steel alloying elements

Mercury Technology Services is pleased to offer a proposal for laboratory research services directed to understanding mercury uptake by metals and ways to remove mercury contamination from surfaces.

The anticipated benefits that will derive from successful completion of the research tasks are as follows:

- Development of methods to measure the amount of mercury contamination (per unit surface area) and location (depth of penetration) in steels and stainless steels.
- Ranking of common alloys for ability to adsorb (or absorb) elemental mercury.
- Determination of rates of mercury vapor emission from vessels and pipelines as a function of amount of surface contamination.
- Prediction and remediation of mercury contamination in tankers.
- Estimation of cargo contamination in tankers.
- Prediction of mercury lag times in pipelines.
- Development of methods to measure mercury contamination in steel that can be applied in the field.
- Determination of effectiveness of surface decontamination treatments.
- Prediction of mercury loss in drill stem tests for mercury.

Companies interested to participate should contact Mark Wilhelm (smw@HgTech.com).