



JGC UOP CRP

Aromatics

Application

The JGC/UOP Contaminant Removal (CR) process removes mercury and arsenic from a variety of petroleum-based feedstocks. Mercury is a catalyst and adsorbent poison and is known to corrosively attack equipment made with aluminum, such as heat exchangers in gas processing plants or olefin complexes. Arsenic compounds are also catalyst poisons in many petrochemical processes.

Natural gas liquid condensates from certain parts of the world may contain mercury at various concentrations. Some mercury-containing streams may also contain arsenic compounds. The CR process is designed to reduce the mercury content of certain feeds to 5 ppb or less, and to remove the arsenic compounds typically present in light and heavy naphtha streams to less than 5 ppb. In addition to protecting equipment, catalyst and adsorbents, the CR process provides a means to control emissions of mercury and arsenic.

Process chemistry

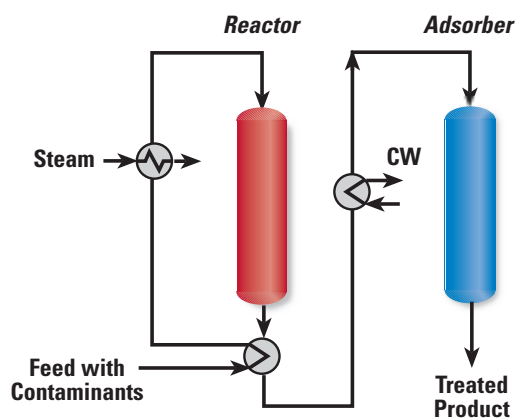
Mercury can generally be present in three forms in hydrocarbon feedstocks:

- Elemental
- Inorganic or ionic compounds
- Organometallic bound compounds

Elemental mercury reacts readily with various reagents, such as metallic sulfides, but the combined forms of mercury do not react with these reagents as readily. For this reason, a catalyst is needed to decompose ionic and organometallic mercury species to elemental mercury. Once elemental mercury is formed it can be removed from the oil by adsorption. With certain materials, this adsorption is irreversible – the mercury cannot be removed without destruction of the adsorbent – so the process is called non-regenerable.

Other materials form a weaker bond with the mercury, and these can be regenerated by temperature swing with the mercury recovered as a pure product. The CR process offers either regenerable or non-regenerable adsorbents to optimize the system for specific local requirements.

JGC/UOP Contaminant Removal Process (Non-Regenerable)



Options exist for the disposal of the non-regenerable spent adsorbent. The material can be burned in a furnace with the liberated mercury condensed and recovered or it can be encapsulated in an inert media, then landfilled. The regenerable adsorbent has a long useful life and when ultimately spent, has no detectable mercury level.

Arsenic generally occurs only in combined forms. The various species of arsenic will be adsorbed by the non-regenerable material depending on the boiling points of the arsenic compounds present. Compounds with boiling points in the 20°C to 200°C range can be removed.

Process description

A schematic process flow diagram of the process in a non-regenerable configuration is shown (above). The feed is pumped to a pressure sufficient to maintain liquid phase and heated by exchange and steam to reaction temperature. In the reactor, a proprietary catalyst causes the conversion of combined mercury species to elemental mercury. After heat exchange, the stream is sent to an adsorber, which removes the elemental mercury and arsenic compounds.

Features and benefits

Feed flexibility - The process is capable of operating on a wide range of feeds. Typical performance for a feed meeting the following requirements is a product mercury level of less than 5 ppb and an arsenic level of less than 5 ppb.

Simple flowscheme - The downflow reactor and absorber are arranged in a guard bed flowscheme. The mild operating conditions make it easy to operate.

Minimal feedstock requirements - The process operates with the following feedstock limits:

Hg & As concentrations	No limit
Basic nitrogen	Max 1 wt ppm
Sludge	Max 3 wt ppm
Dissolved O ₂	Max 5 wt ppm
Saybolt color	Min +10

Economics

The table below contains the economics for treating a heavy naphtha feed at the rate of 38,000 bpd, containing 100 ppb Hg and 30 ppb As to produce a clean product of less than 5 ppb Hg and less than 5 ppb As

Estimated ISBL Cost, US\$ MM **3.6**

Utilities

Electric power, kW	282
Steam, MT/hr	7.4
Cooling water, m ³ /h	64

Commercial experience

The regenerable adsorbent has 15 applications on a gaseous feed and seven applications on a liquid feed. The non-regenerative adsorbent has 18 commercial applications. There are presently 12 units in operation on condensate or naphtha with six more scheduled to start up in 2006-2008.

For more information

JGC/UOP Containment Removal technology services are available upon request. For more information, contact your local UOP representative or our Des Plaines sales office:

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