

Getting most value from your Petrochemical Catalysts

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Precious Metal (PM) catalysts are an integral part of Downstream Processing and Petrochemical Manufacturing. The Petrochemical Industry uses PM catalysts, mostly Platinum on alumina, to produce high octane components of gasoline from naphtha and to produce many critical organic chemicals such as cyclohexane for polymer fabrics. It is estimated that over 642 refineries worldwide process 87 million bpd of crude oil¹ using 41 Thousand MT of PM catalysts². On an average, these catalysts contain 0.25% Platinum; so a total of 102.5 MT of Platinum is deployed in the industry. At today's prices, it represents an investment of \$3.13 billion! Needless to say, significant value optimization can be achieved by judicious management of these assets.

Over time, all catalysts lose their functional ability due to deposits of carbon, sulfur and metals. Or they may suffer from pore closures and lose effective surface area. Although they can be regenerated a few times, eventually they must be retired as 'spent' catalysts and replaced with fresh catalyst in a catalyst 'change-out' event. In general this replacement period is 5 to 7 years; although for some special catalysts it can be as short as 2 years.

The Petrochemical Industry is really advanced when it comes to efficient use and recycling of metals used in these catalysts, especially the precious metals such as Platinum, Palladium and the special metal Rhenium. The Industry collaborates with companies like Heraeus Metal Management to efficiently recover more than 95% of the precious metals³. Compare that with the automobile catalysts, where only 50 to 60% of the Platinum needed for fresh catalysts comes from recycling⁴! Heraeus offers precious metals recycling service to the Petrochemical Industry from its 9 precious metal refineries located around the globe; especially the refinery in Hanau, Germany.

Platinum from the insoluble residue is separated out as a salt or sponge and Rhenium is recovered as Ammonium Perrhenate (APR). The catalyst support of these 'spent' catalysts is digested in hot caustic in an autoclave to form sodium aluminate. This sodium aluminate is used as flocculants in wastewater plants. Therefore, we are able to not only recover the precious metals contained in the spent catalysts but we are able to produce an environmentally friendly product! That is a truly 'Green' story.

This presentation will outline the various process steps companies like Heraeus go through to return the most value to its customers; including a customer focused 'bridge lease' program for the advance preparation of the replacement catalyst. Each 'change-out' in an oil refinery involves 25 to 50 MT of precious metal catalyst containing \$2 to \$4 million worth of precious metals. Full loop recyclers like Heraeus Metal Management offer metal leases to oil refineries, provide hedging services to manage price risks and supply precursor compounds like Chloro-platanic Acid so that replacement catalyst can be prepared in advance and the change-out time is minimized; saving money, time and energy.

Often the 'spent' catalyst requires pretreatment to remove volatile organics or deleterious chemicals prior to metal reclamation. Specifically for our customers in the Middle East, Heraeus has partnered with Al Bilad Catalyst Company (ABC) located in Jubail Industrial City in the Kingdom of Saudi Arabia. We

provide door-to-door service from your refinery to ABC right here in the Middle East and then manage the export to Heraeus's Hanau, Germany plant.

Because of the enormous value of the precious metals involved, the most important consideration for choosing the refining/recycling service is the trust you can place and the financial stability of the service provider. Heraeus is a 160 year old, financially stable, family owned, globally active precious metals company with 12,600 employees in 35 countries. We have earned our customer's trust over those years and grown the company into a €3.4 billion per annum precious metals powerhouse with €12.2 billion in precious metals trading revenue.

By operating subsidiaries globally we are able to offer focused products and services to different customer groups while enjoying the financial and technological power of the multi-billion dollar global company.



¹ Based on data from *Oil & Gas Journal* / Dec. 5, 2014

² Heraeus calculations

³ Heraeus calculations

⁴ Based on data from Platinum & Palladium Survey 2015, GFMS, Thomson Reuters