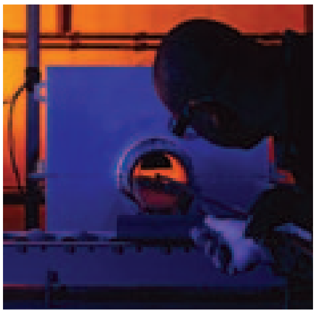
A Belgian smelter operation located in Hoboken provides a flexible and competitive recovery outlet for spent precious metal-bearing catalysts from the oil refining and petrochemical industry.

Processing complex spent catalysts



Refining platinum at Umicore

Umicore Precious Metals in Hoboken, Belgium (near Antwerp) offers refining services for precious metal-bearing material, such as industrial by-products from the Pb, Cu, Zn and Ni industry, as well as a wide variety of recyclables (including electronic scrap, sweeps and bullions, spent automotive and industrial catalysts). As part of the latter, palladium-containing hydrocracking catalysts from the oil-refining industry have long been an important part of the business.

Spent palladium hydrocracking catalyst partially mixed with a base-metal catalyst guard bed

Catalytic hydrocrackers produce motor fuels and high-quality middle distillates. The catalytic function in these reactors is obtained through a precious metal (Pd) or base metal (Ni in combination with W, for example) catalyst. Said catalyst, present in most of the reactor beds, will often be preceded by a base metal hydrodesulphurisation catalyst (HDS, such as Ni-Mo) in order to reduce the sulphur content of the feed, which would contaminate the precious or base metal catalyst. All in all, a hydrocracking catalyst load could consist of about 80 per cent Pd hydrocracking catalyst, 10 per cent HDS catalyst and 10 per cent inert support balls.

Umicore Precious Metals has historically processed the larger part of available spent palladium-bearing hydrocracking catalysts in the world, characterised by an insoluble carrier (most often Al_2O_3-SiO_2) and a relatively high 'loss on ignition' (typically 10–20 per cent, sometimes as high as 35–40 per cent).

In a particular case, the generator of the spent catalyst (i.e. the oil refiner) had not been able to screen out and separate the Pd-hydrocracking catalyst from the base metal HDS catalyst during the catalyst unloading operations. Upon arrival at Umicore, the entire charge was divided into various lots and sampled 'as is'. After extensive blending, a ten per cent bulk sample of each lot was screened in order to confirm the respective quantities of Pd hydrocracking catalyst, inert support material and HDS catalyst plus fines.

The Pd-hydrocracking fractions of these bulk samples were further sampled in the usual way in order to obtain the official samples representative for the spent hydrocracking catalyst material. The HDS catalysts plus fines fractions of all bulk samples were reassembled into one virtual lot in order to also generate a representative sample of this material, allowing for a Pd determination. Finally, the complete shipment, including all fractions, was processed through the smelter to recover the Pd.

Limiting itself to screening the large (ten per cent) bulk samples rather than the whole load (for which the catalyst owner nor Umicore were well equipped) was made possible by the fact that the material was later processed through Umicore's large smelter. Here, it does not make a shred of difference whether the various fractions are loaded separately or commingled.

This sampling and processing method had significant advantages compared with a separate, off-site screening (with or without carbon burn-off) prior to precious metal recovery. Firstly, it minimised dust and screening losses of Pd (during the particular change-out mentioned above, an equivalent of 2.3 per cent of the total Pd content was recovered from the HDS/fines fraction). Secondly, it yielded the fastest out-turn time for the palladium, saving at least an estimated 30 to 45 days. Finally, it represented an environmentally superior processing solution, whereby all fractions were processed through the smelter as part of its normal feed stream; all streams exiting from the smelter, including the granulated slag, represent marketable products.

Conclusion

Spent precious metal-bearing catalysts from the oil refining and petrochemical industry, whether almost as clean as the initial fresh catalyst or contaminated with various impurities (such as fines, carbon chloride, iron or arsenic) as a result of their past use, can find a perfect home at Umicore Precious Metals' smelter.

The flexibility of the operations means the smelter can cope with a high degree of complexity in the raw material, thereby offering a reliable, no-strings-attached and competitive recovery outlet. This should entice the catalyst owner to seriously consider the option of sending the unregenerated catalyst directly for reclaim, rather than going first for an off-site regenerating/trashburn followed by reclaim. ●