



Precious Metals Catalyst Recycling

YOUR RECYCLING MANAGEMENT IN THE HANDS OF EXPERTS



PRECIOUS METALS ALL AROUND US



Mankind has always been fascinated by precious metals. They have accompanied us throughout the ages: initially as jewelry, as objects of religious worship or as currency, later as a fundamental constituent of technological evolution. Today, precious metals play an essential role in our everyday lives. Modern cars would not run without them, computers would not work, there would be no flat screen televisions, and major portions of the chemical, glass or oil industry would not exist.

Mines in South Africa and Russia are the primary sources for precious metals, but they cannot supply the entire demand for these raw materials on a sustained basis. For that reason, the use of secondary sources is gaining in importance. The recovery of precious metals from spent material at the end of the product life cycle is an important precondition for an economical and sustainable use of precious metals.

Heraeus is a leading global player in refining precious metals from these sources in an environmentally valuable manner. With the competence acquired over many decades we ensure the efficient supply of these metals.



WE WILL TAKE THIS WORK OFF YOU...

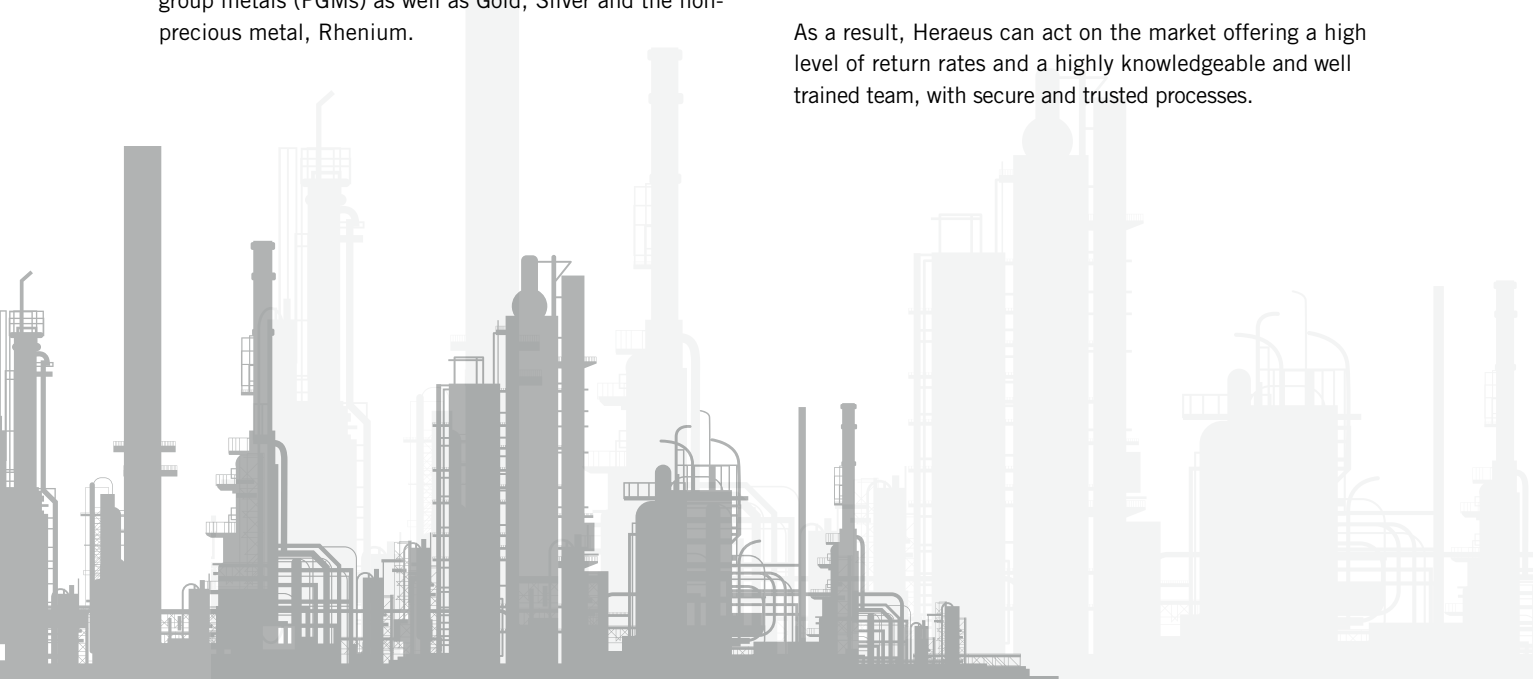


Heraeus – An Expert in Precious Metals Recycling

Ecological and economic interests meet when it is a matter of extracting rare precious metals from production residues and used products. As technological leader in this field Heraeus Precious Metals achieves an excellent rate of recovery of these materials, thus making an enormous contribution to maintaining resources which are globally in short supply. Our portfolio includes recycling services for various heterogeneous catalysts containing all platinum group metals (PGMs) as well as Gold, Silver and the non-precious metal, Rhenium.

Heraeus has developed special recycling processes to optimize the recovery of precious metals and has significant capacity available for the pretreating, sampling and recycling of waste material globally. Through constant transfer of technology and a comprehensive quality management system uniform standards are guaranteed at all locations. In this way the worldwide production processes and the purity levels meet the internationally specified standards.

As a result, Heraeus can act on the market offering a high level of return rates and a highly knowledgeable and well trained team, with secure and trusted processes.





REFINING OF SPENT PRECIOUS METALS CATALYSTS

Specialist Know-how in precious metals catalyst recycling: One of our core competencies is the refining of spent precious metals catalysts occurring as a waste product in oil refining processes such as re-forming, isomerization and hydrogenation. Apart from the Platinum Group Metals these catalysts may also contain Rhenium.

In the petrochemical industry precious metal containing catalysts are also used in various processes. These contain Platinum, Palladium, Rhodium and Ruthenium. Furthermore Silver containing catalysts are widely used in the production of ethylene oxide.

Globally Heraeus has significant capacity available for the pretreating, sampling and recycling of spent catalysts. In addition, the company can process alumina and carbon based catalysts in our facilities in an environmentally friendly fashion.

Heraeus also performs in-house LOI and precious metals analyses in state-of-the-art ISO 17025 certified laboratories, thus ensuring accurate determination of the contained precious metals.

Furthermore Heraeus offers bridge leases to petrochemical refineries so that they can commence manufacturing of the replacement catalyst before the change-out takes place. The metal can be deposited in metal accounts or supplied in a solution form to the catalyst manufacturer.

... Waste Management & Logistics

Waste Management

Shipments of waste materials containing precious metals are subject to specific local, national and international regulations. Heraeus will provide you with the expert advice and assistance you need to navigate these complex and challenging requirements. Most importantly, our major recycling facilities at Heraeus are authorized sites (Treatment and Storage Facility) for hazardous and non-hazardous materials containing precious metals. This enables us to accept customer material without prior consent by officials in most cases.

Logistics

Our extensive experience in international door-to-door logistics, transportation and pick-up services ensures that valuable material will be handled correctly and safely. Our experience in waste declaration, organizing permits and surveying local regulations will reduce logistics costs for our customers and save them time.





SERVICES

...Pretreatment, Sampling and Analytical Service



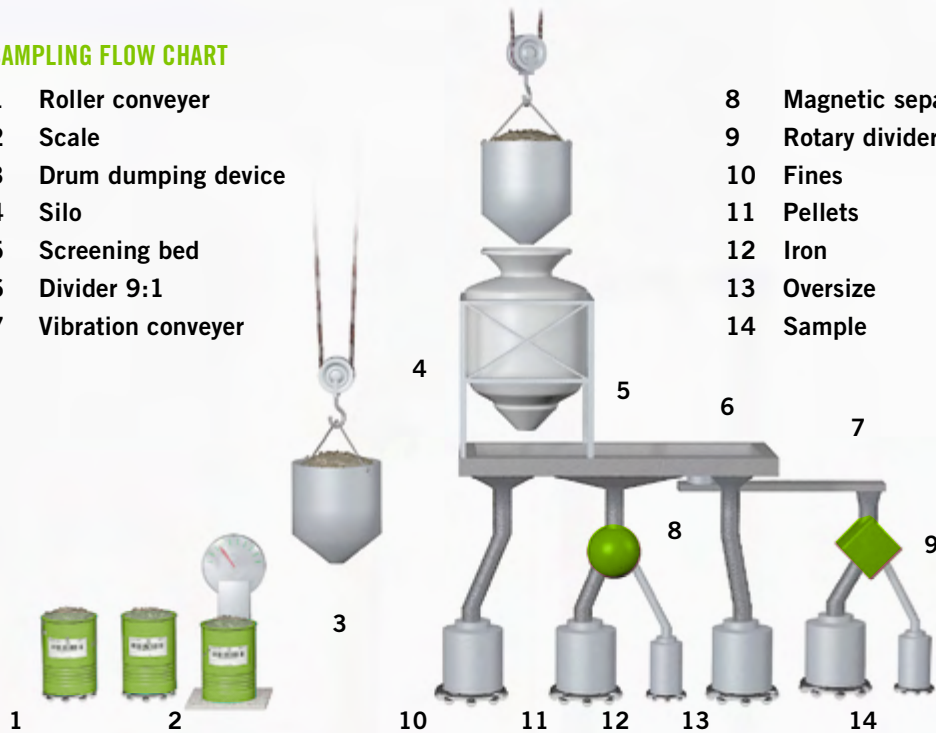
Depending on the type of material, quantity, material matrix and precious metal content involved, the correct sampling process is carefully selected. Heraeus offers the full service in-house, on request witnessed by your independent representative. Transparency is a key factor in this business to select the right refiner.

Pretreatment if necessary sampling, recycling process and analysis are the basic elements of precious metal refining. Dedicated sampling, together with the appropriate analytical equipment, is used to prepare, homogenize and analyze a representative sample of the valuable recycling material. All of these stages are extremely important and critical to both customer and Heraeus alike to determine the precious metal content of the material.

SAMPLING FLOW CHART

- 1 Roller conveyer
- 2 Scale
- 3 Drum dumping device
- 4 Silo
- 5 Screening bed
- 6 Divider 9:1
- 7 Vibration conveyor

- 8 Magnetic separator
- 9 Rotary divider 9.5 : 0.5
- 10 Fines
- 11 Pellets
- 12 Iron
- 13 Oversize
- 14 Sample



RECYCLING LOOP

The highest level of competence at HPM can be seen in our mastery of the complete precious metal cycle.

Only through the control of all steps in the production chain can the highest quality of the products be guaranteed at all times. The extraction of the precious metals marks the beginning of the cycle. Risks regarding price fluctuations are eliminated by long term supply contracts with mining companies which, together with the recycling, ensure access to the necessary raw materials.

The production of innovative and technologically demanding products for the diverse key markets is where the actual core business of Heraeus Precious Metals begins. Whether in the production, R&D or analytical departments of the chemical, pharmaceutical, automotive, plating and electronic industries – Heraeus' precious metal chemicals enjoy a unanimous level of acceptance.

Our **Chemical Products** are used in a multitude of key technologies all over the world. The business segment Chemical Products offers a comprehensive spectrum of chemical compounds and solutions of the Platinum Group Metals (Ruthenium, Rhodium, Palladium, Osmium, Iridium, Platinum) and of Gold, Silver, and Rhenium. Especially Platinum/Rhenium catalysts are making some key steps in modern petrochemistry possible: This is called "Reforming" for the production of highgrade fuel.



Here ammonium tetraoxorhenate (VII) and hydroxo-trioxorhenium (VII) solution ("Perrhenic Acid"), and dihydrogen hexachloroplatinate (IV) hydrate and solution ("Chloroplatinic Acid, CPA") are the most prominent chemicals.

Heraeus' close relationship to its customers and catalyst manufacturers, especially in the fields of petrochemistry, has been growing continuously. With our global R&D services Heraeus, in close cooperation with our customers, can also offer the development of new compounds according to particular specifications (also on an exclusive basis) and professional precious metal management, including precious metal loop and precious metal leasing.



RECYCLING LOOP

Precious Metals
TRADING

Precious Metals
RECYCLING

**Preci
Metal
Cycle**

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Precious Metals
PRODUCTS

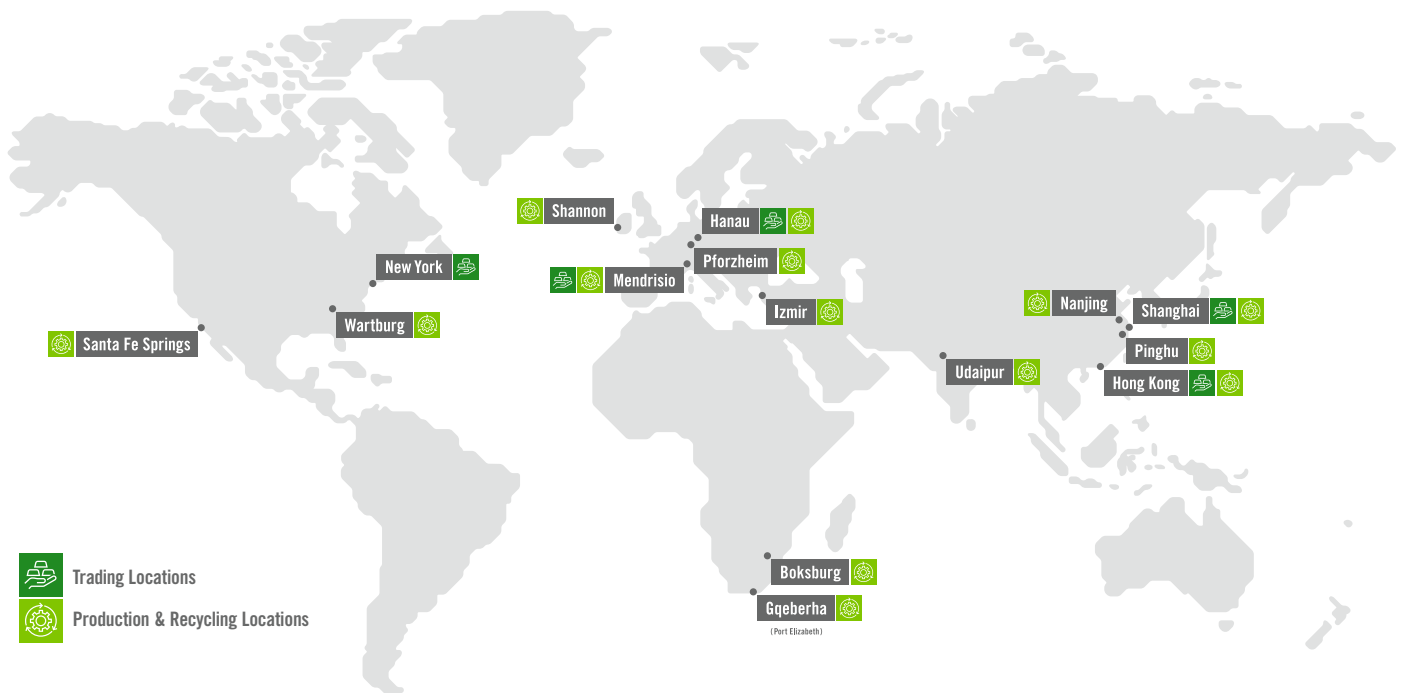
Precious Metals
KEYMARKETS

ENVIRONMENT

Environment protection, regulatory compliance and resource conservation are top priorities. All refineries fully comply with all and any governmental, federal, state and municipal laws and regulations. Regular audits combined with preventive and proactive monitoring and state of the art controls ensure that the highest levels of Quality and Environmental Management Standards including ISO 9001 and 14001 are maintained.



AROUND THE GLOBE... AND AROUND THE CLOCK



Business is a 24/7 enterprise. Companies cannot afford to sleep. That is why Heraeus has established a global network to provide you with continual access and a complete range of services for all your needs. Our global coverage is designed to always be there... whenever you need us.

Our four trading locations in all major timezones allow us to quickly react to price movements 24 hours a day. With our extensive network of eight refining sites, we provide close proximity to our customers.

Through our worldwide refining plants we are able to treat your material locally. Our plants in Europe, India and China are equipped to treat catalysts on mineral carrier such as reforming and isomerization catalysts.

Heraeus is an active member of all important precious metal associations in the market:

- London Platinum and Palladium Market (LPPM)
- London Bullion Market (LBMA)
- Fachvereinigung Edelmetalle (FVEM)
- International Precious Metals Institute (IPMI)
- European Precious Metals Federation (EPMF)
- International Platinum Group Metals Association (IPA)

Find your global support:

**precious.metals@heraeus.com
www.heraeus-recycling.com**