Heraeus

W. C. Heraeus GmbH

"Precious Metals refining in the change of times"

New applications and technologies require innovative recycling technologies

Heraeus provides state-of-the-art technologies globally

June 2010 - Thomas Trin, Dr. Steffen Voß, Uli Blankenstein
Dr. David Astles, PhosphonicS

Heraeus Introduction

Profile in brief

- **We are a globally active precious metals and technology Group with firm roots in Germany. The company has been family-owned for more than 155 years**
- **In 2009, we generated more than €2.6 billion in product revenue and €13.6 billion in precious metals trading revenue with more than 12,300 employees in over 110 subsidiaries**

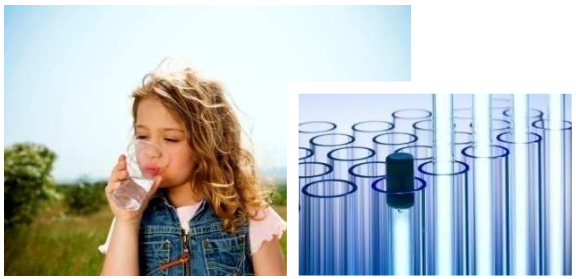
Thanks to Heraeus, the world has changed …

… use and communicate via the internet due to fiber glass cables all over the world.

… more than telephone thanks to modern microchips within our mobile phones.

… support environmentally friendly solar power production to make solar cells more efficient.

… entrust a platinum temperature sensor with our food.



… drink potable water purified by UV-sterilization lamps.

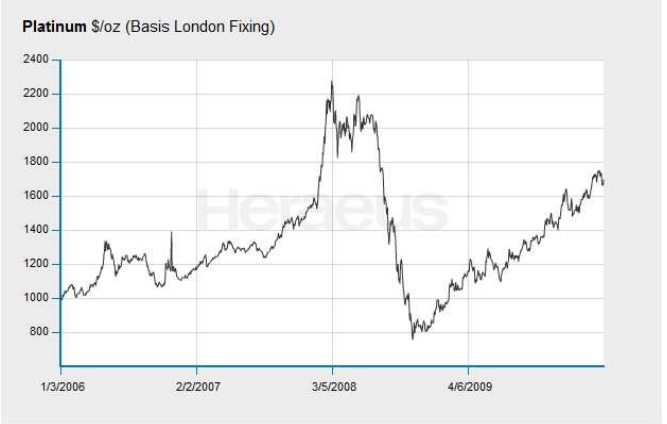
… produce fertilizers with the help of platinum gauzes.

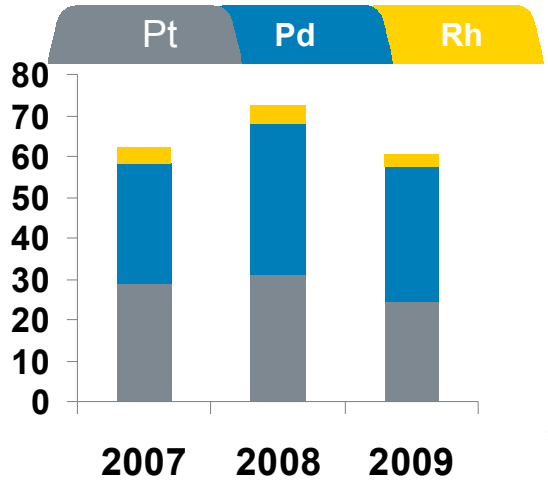
The Challenges of Precious Metal Refining

Challenges for PM refining business:

Metal prices and currencies are fluctuating

- Constant changes of exchange rates are impacting competitive situation
- Low grade streams may become uneconomic and metals might be lost for refining
- Spent car catalyst refining declined considerably in 09*





* Source: JM report

Challenges for PM refining business:

Environmental requirements and laws

- **REACH and GHS regulation have a dramatic impact on chemical producers and distributors in Europe but also globally**
- **Basel Treaty regulates trans frontier shipments of wastes**
- **Local specialties add to the complexity of waste logistics**

Duty and tax legislation

- **Individual VAT and/or duty regulations in certain countries might impact access to precious metal scrap for refiners.**

Challenges for PM refining business:

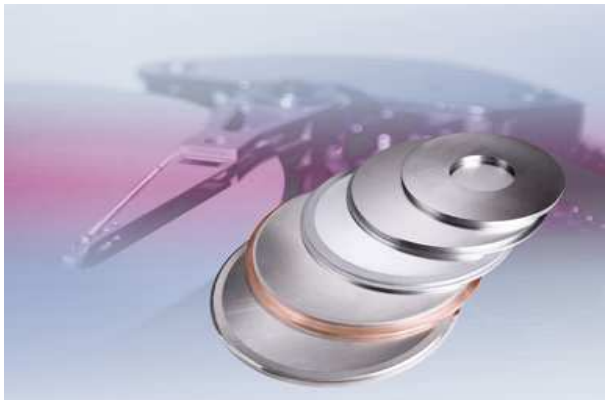
- **Generation of new Trade Zones and the unbroken Trend to move production into low cost countries**

Photo Source: dhl-discoverlogistics.com

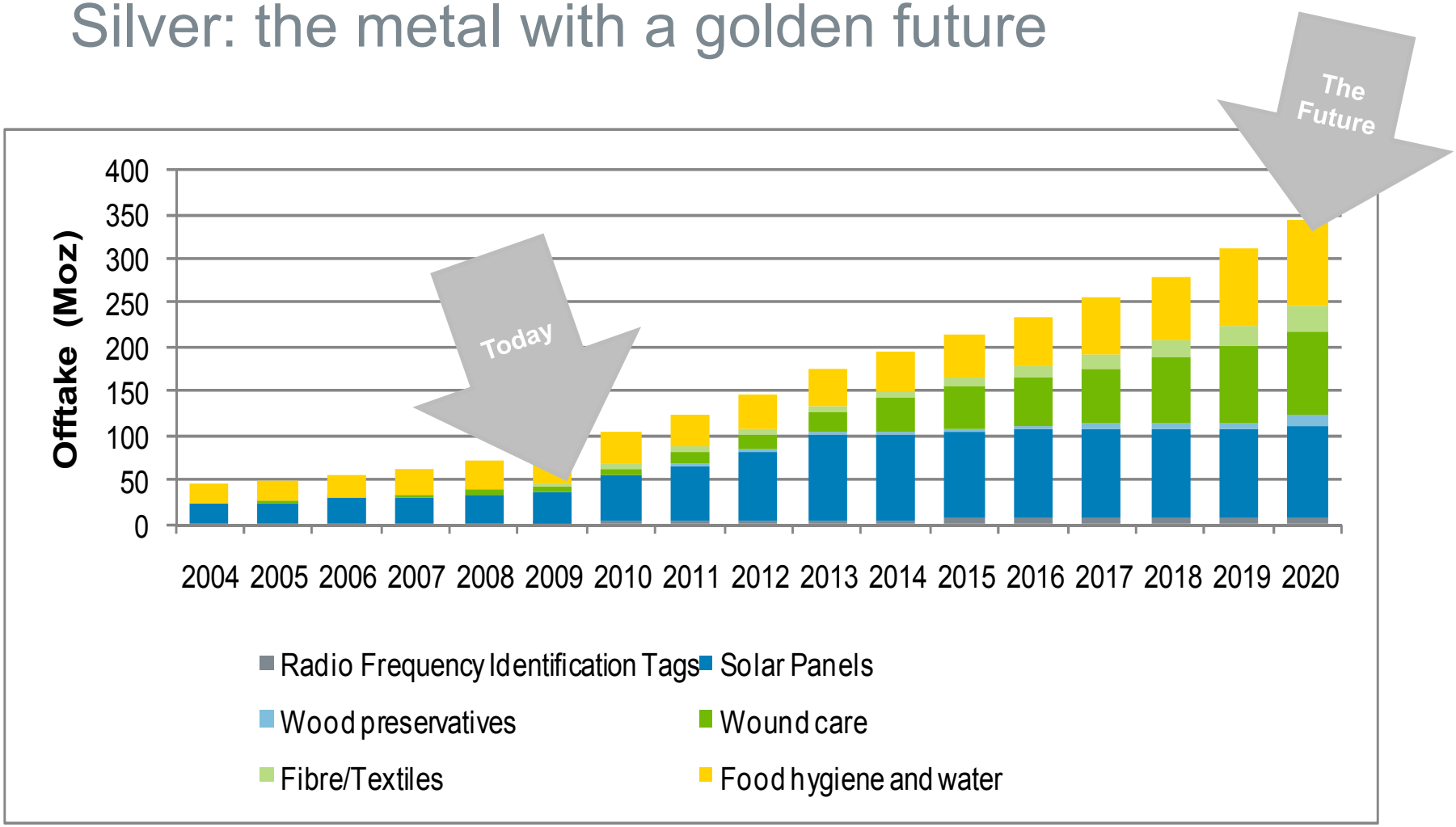
CAFTA
Population: 1,9 billion
GDP: US$ 6.000 trillion
Trade volume: US$ 4.500 trillion

Challenges for refining business:

- **New products and limited product life cycles require permanent development of new refining technologies**
  - **Extremly short life cycles in the Magnetic Data Storage industry require tremendous investments in R&D and equipment**
  - **Upcoming GTL/CTL catalyst systems require new refining processes**
  - **New applications of Ag products will require more efficient Ag refining in the future**

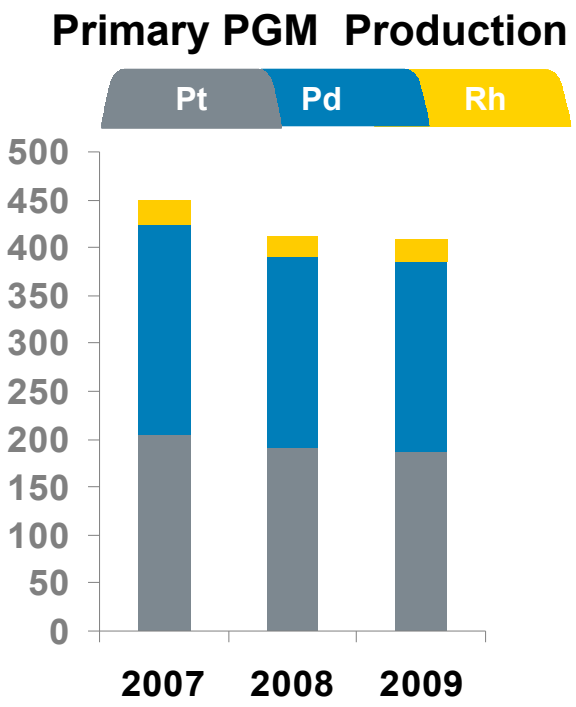


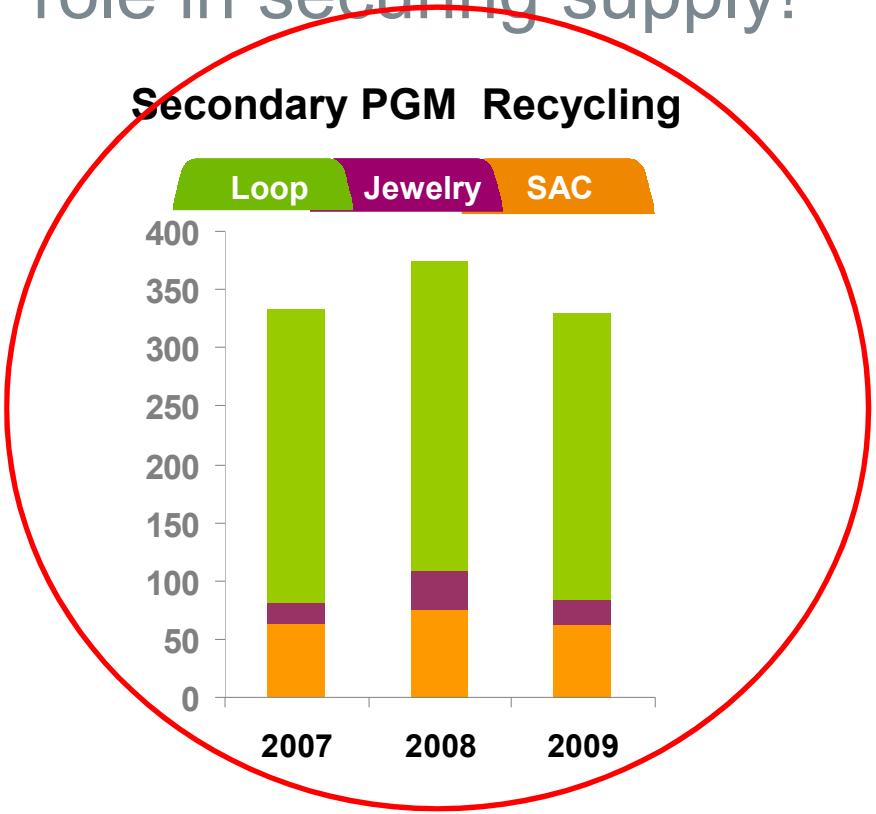
Silver: the metal with a golden future



Source: Virtual Metals, London

PGM supply: secondary recycling volumes (Pt/Pd/Rh) play a major role in securing supply!

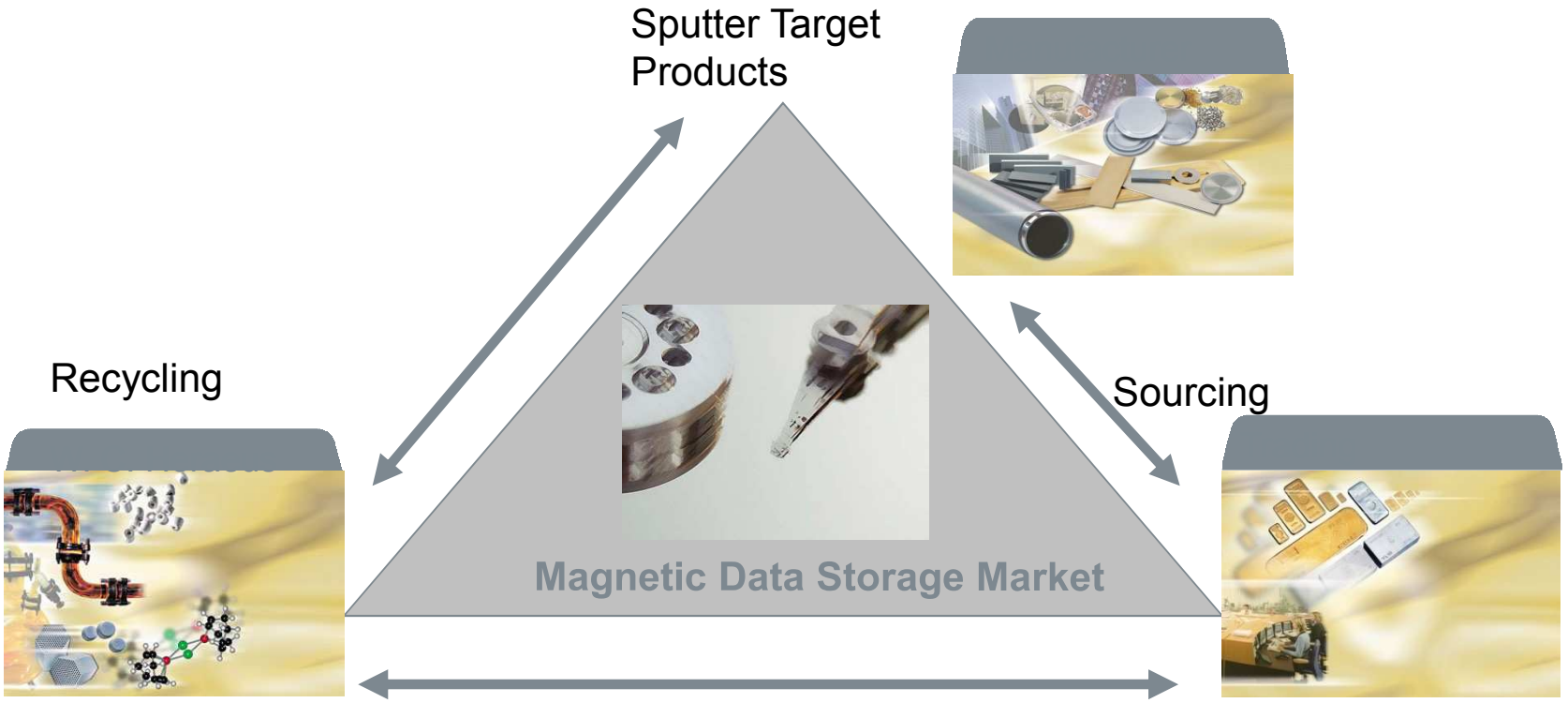




Heraeus refines a significant volume of Pt, Pd and Rh from secondary sources per year and belongs to the top three refiners world wide!

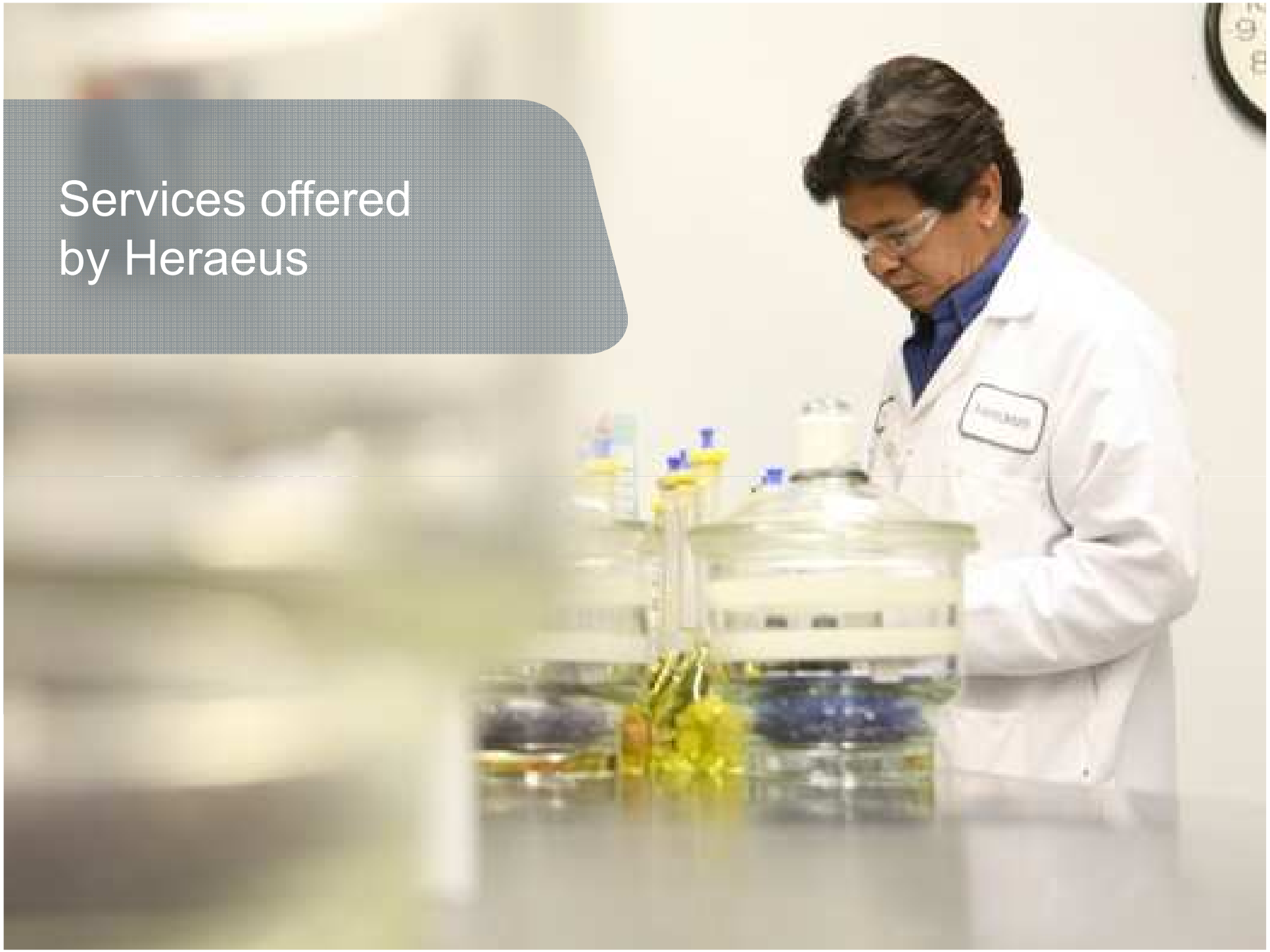
Source: JM Report/GFMS report

Examples for Closed Loop Services: MDS

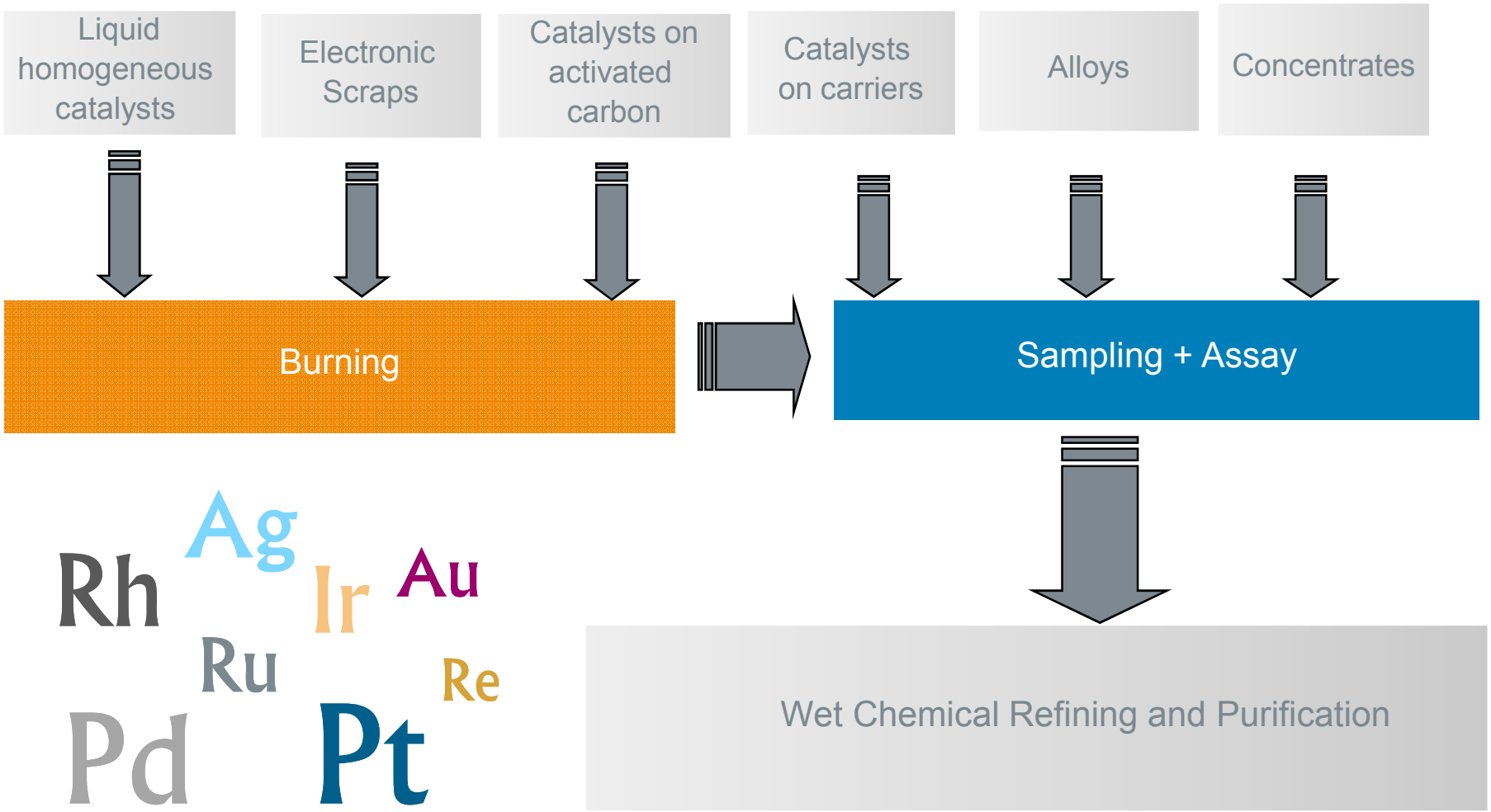


- **The net Pt and Ru demand in 2009 was approx. 7 tons for MDS market**
- **The recycling volumes in the same time period were significantly higher**

Services offered by Heraeus



Key Technologies of CHD-RC



Burning is an integral part of the overall Refining Process:

Heraeus offers State-of-the-Art processes based on customer requirements and material specifications

- **HeraCYCLE®:**

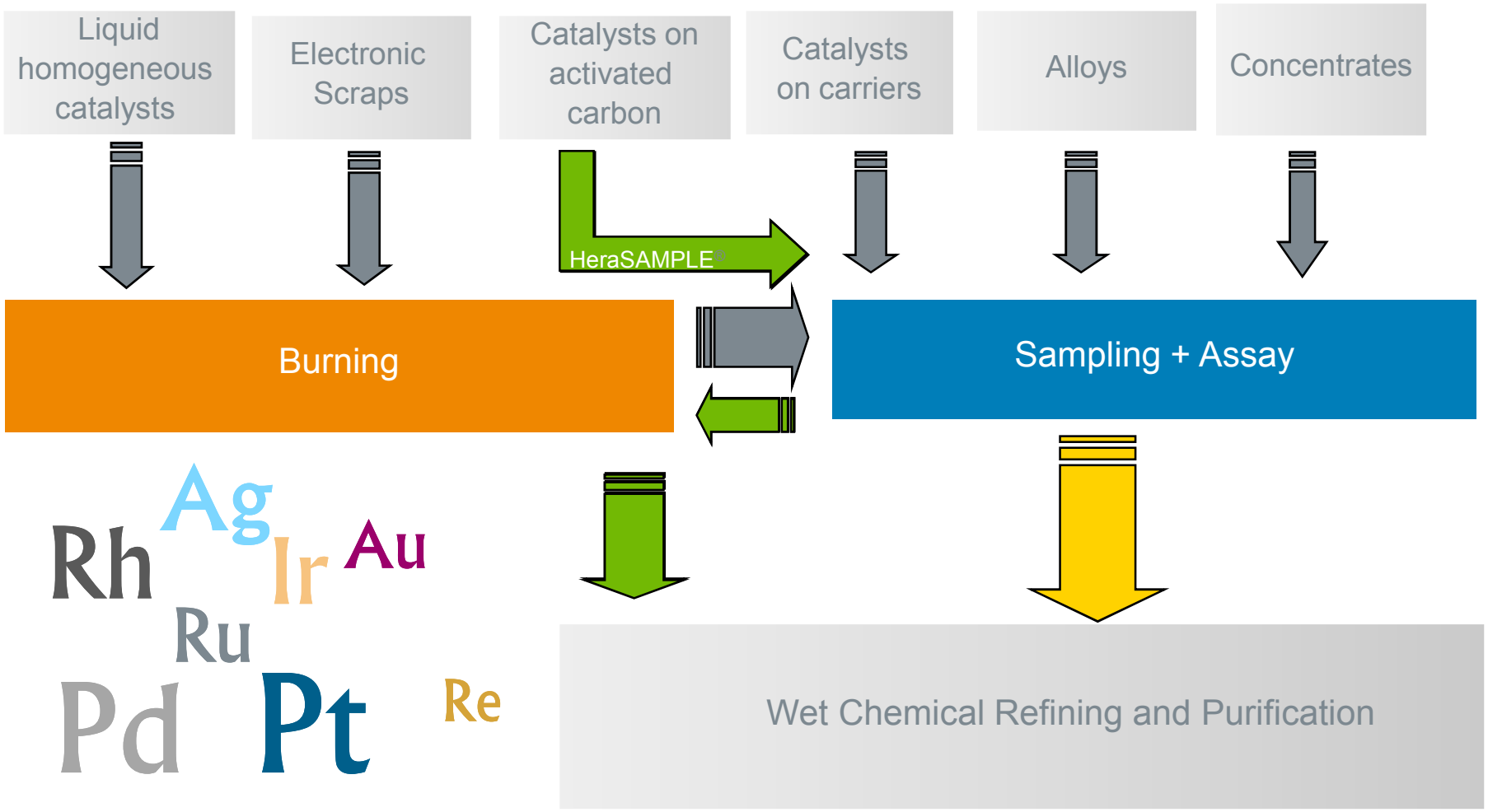
  Proprietary thermal reduction process:
  Proprietary thermal reduction process**:**
  to ensure accurate sampling and PM content determination after milling

  Resulting in a PGM concentrate allowing for cost effective chemical treatment

- **HeraSAMPLE®**

  is capable of providing accurate sampling and PM content determination prior to thermal reduction

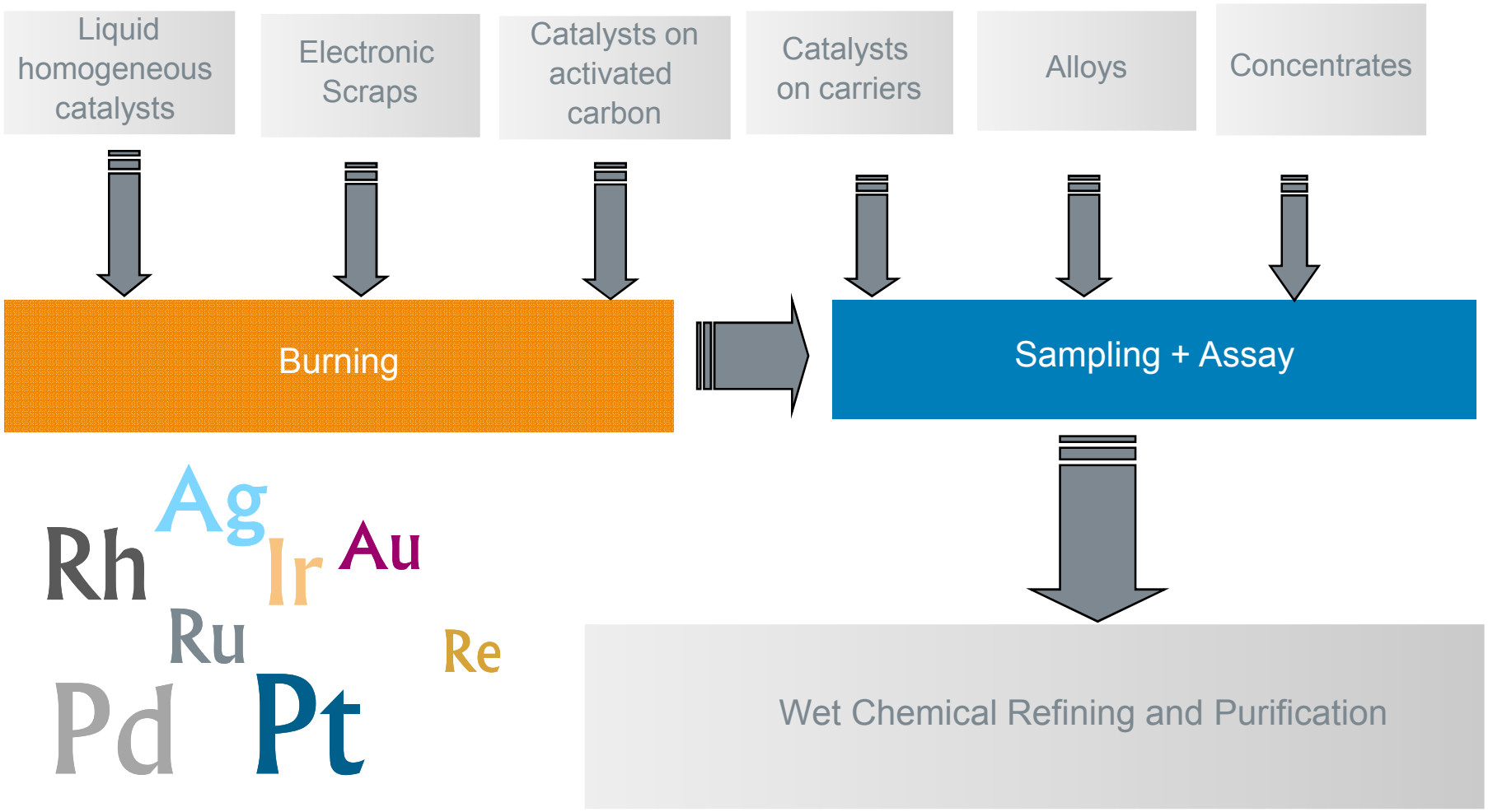
This is how HeraSAMPLE® fits in



This is how HeraSAMPLE® adds value

- **Minimized material modification prior to the sampling process**
- **The resulting homogeneous material provides absolute accurate analytical data on precious metal content**
- **Offers the unique opportunity to the customers to decide between the established system (burning) and advanced technology (HeraSAMPLE®)**

Key Technologies of CHD-RC



PhosphonicS

- Established in 2003
- Commercialising novel technology
- developed at University of London
- 3 sites, with around 30 employees

- **Collaboration agreement designed to expand the application of PhosphonicS™' precious metal scavenging technology in conjunction with Heraeus' precious metals refining expertise**
- **Novel Cleantech solution to improve the economics of precious metals recovery from low grade process and waste streams**

What is a Scavenger?

- **A scavenger is a resin or a silica designed for adsorption of precious metals from liquid residues**
- **The PhosphonicS™ scavenger works in streams from 1 ppm to 500 ppm PM or higher**
- **Can be implemented in a simple process using low Capex equipment**

unloaded

loaded

Benefits of the Heraeus PhosphonicS collaboration to customers

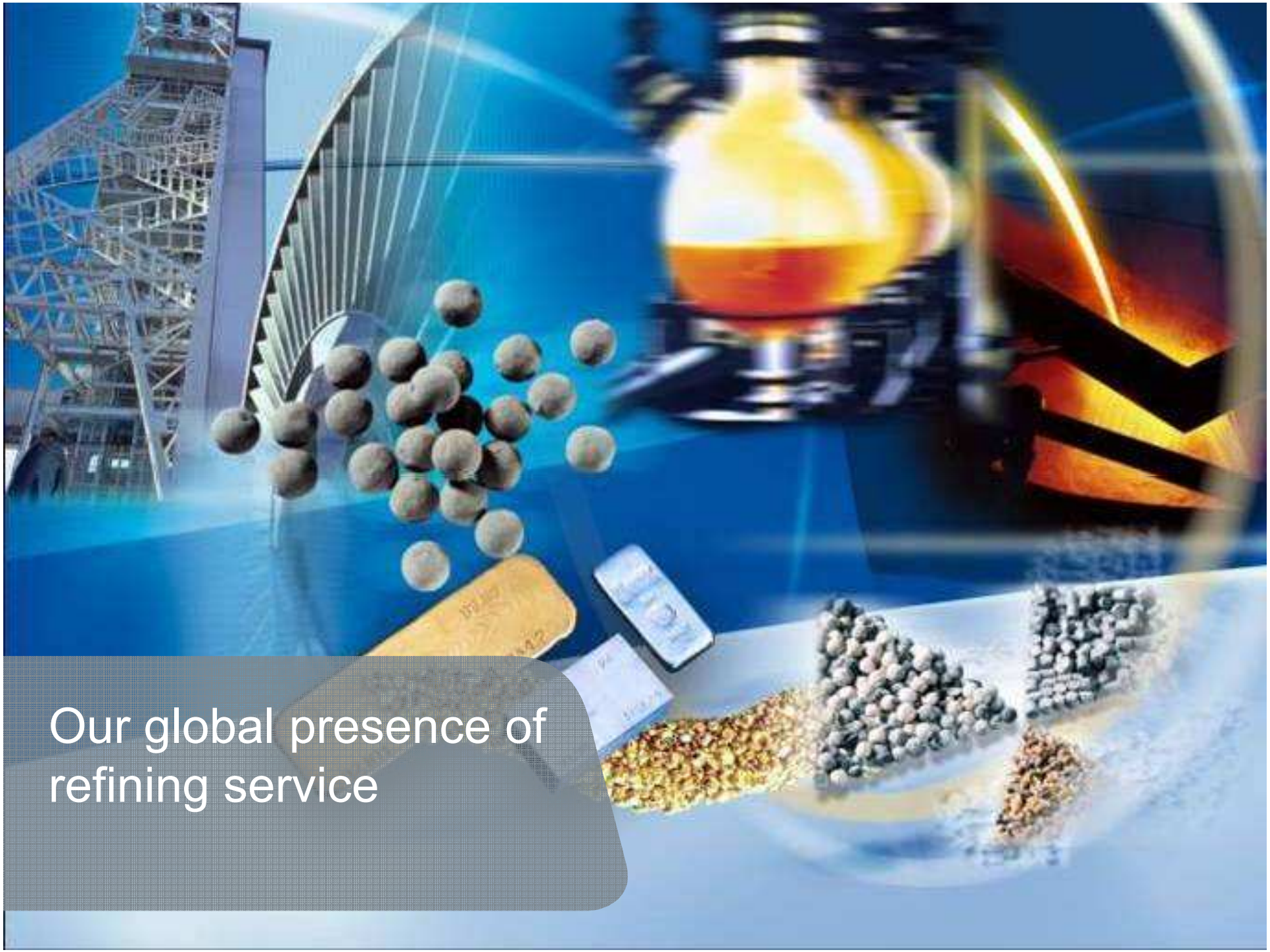
- **Maximise Metal Value Recovery** for **Low Capex**
- **Reduce Metal Investment** – faster recycling, more flexible
- Reduce or eliminate **Waste Disposal Costs**
- Meet **Discharge Targets** for heavy metals
- Enhance **Corporate Social and Environmental Responsibility Profile**

Heraeus

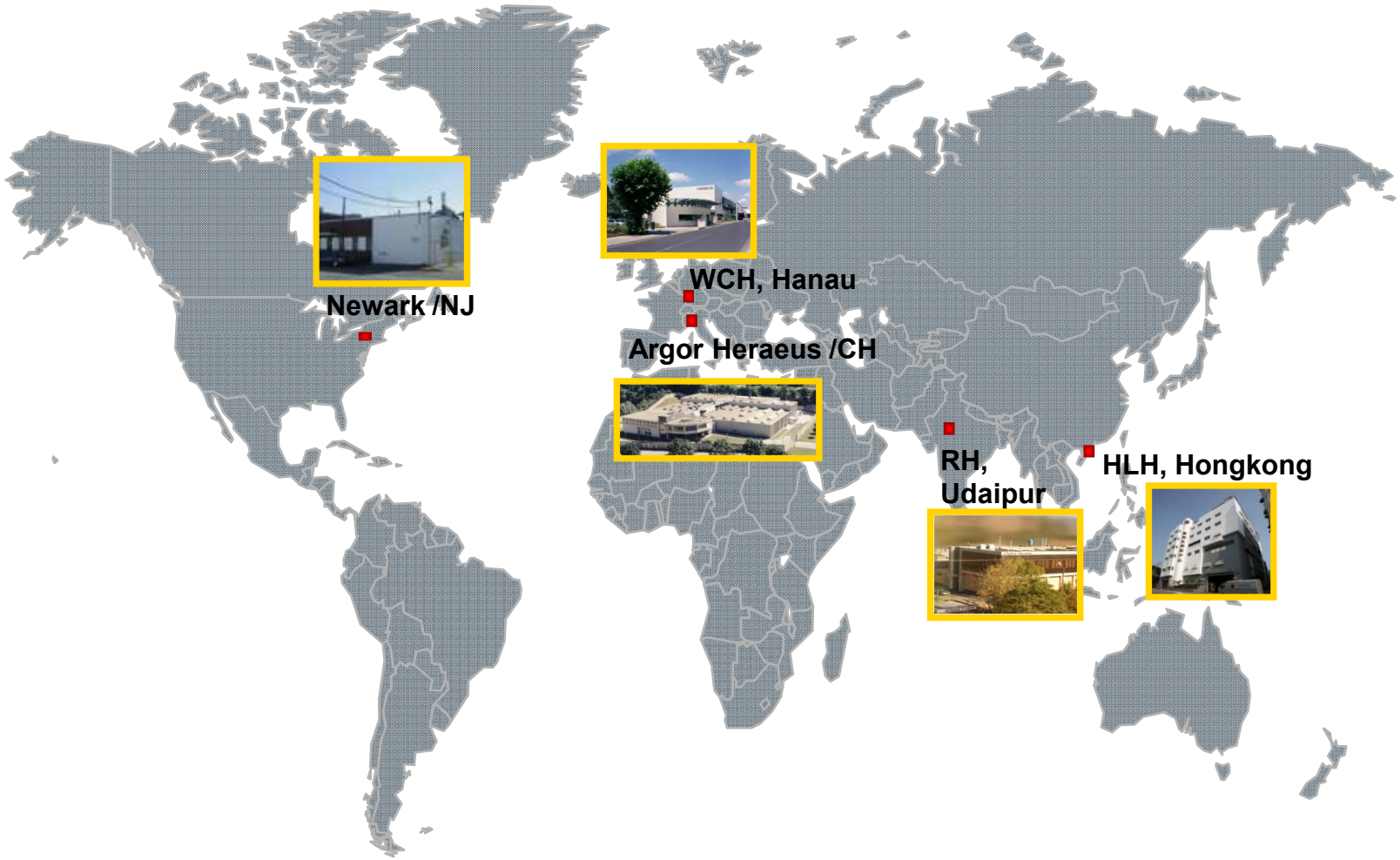
PhosphonicS

Plant/Field Application examples

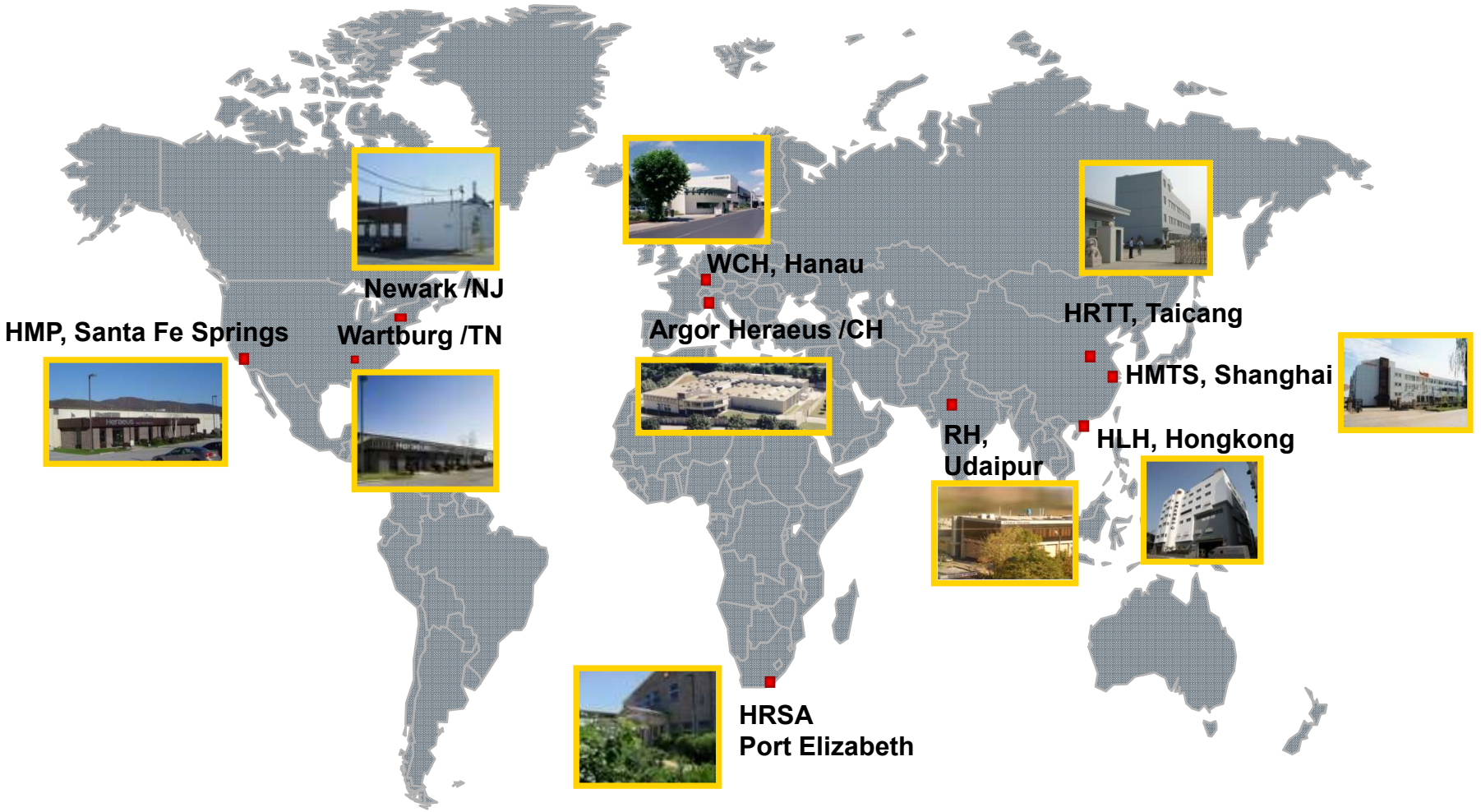
- **Rhodium removal from low concentration catalyst streams**
- **Platinum removal from reactive chemical process & waste streams (e.g. highly acidic streams)**
- **Ruthenium removal from coating and catalyst solutions**
- **Post refinery waste streams**


Our global presence of
refining service

Our global refining facilities: ten years ago…



…and today…


Newark /NJ
HMP, Santa Fe Springs
Wartburg /TN
WCH, Hanau
Argor Heraeus /CH
HRTT, Taicang
HMTS, Shanghai
RH,
Udaipur
HLH, Hongkong
HRSA
Port Elizabeth

Heraeus in China:
Heraeus Recycling Technology (Taicang) Co., Ltd.

- **Establishment: April 2009**
- **Shareholder: Heraeus 100 %**
- **Site area: 7,268 m2**
- **Business scope**
  - **Burning and sampling of catalysts, resins and electronic materials**
  - **Logistic for hazardous materials**
  - **Au/PGM refining**

In summary, Heraeus offers to its customers:

- **A stable, well financed partner over 150 years of precious metals experience**
- **Global refining operations at any major business centre**
- **The ability to react quickly to changing market requirements for refining service**
- **A significant contribution to global Precious Metals supply in order to stabilize the market**


Heraeus
Thank you for your
attention and interest!