

PGM Catalysts Recycling for the Fine Chemical, Pharmaceuticals and AgroChemical Industries

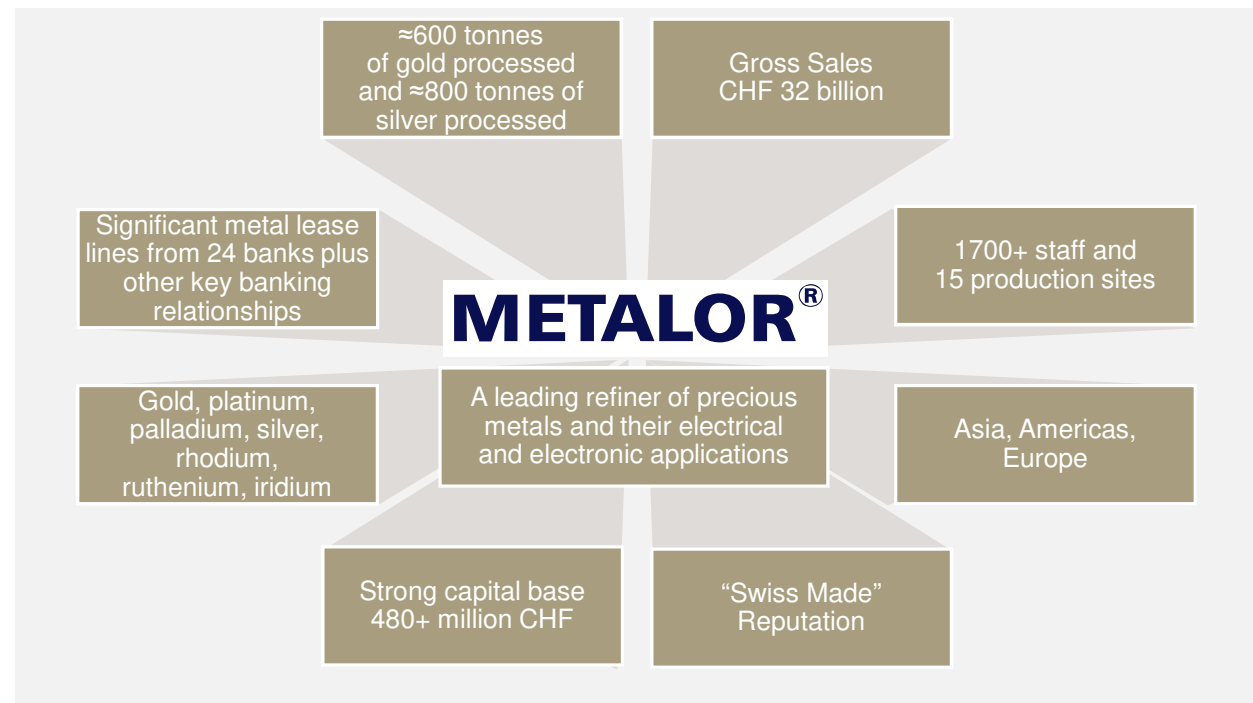
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METALOR[®]

Leading Position in Precious Metals

Metalor is a leading global precious metal refiner. Its core business is refining of precious metals from high grade materials. It also has global trading platform as well as metal distribution network



METALOR®

Three Main Business Groups plus Treasury

Metalor Refining

- Refining of high grade and complex precious metal doré and scraps
- Gold, platinum, palladium, silver, rhodium
- Good delivery status on all key exchanges
- Added value powders and grains and other semi-finished products

Metalor Treasury and PM Management

- Important lease lines from more than 24 banks plus other key banking relationships
- Full hedging of all metal flows for 7 precious metals
- Rapid and precise settlement of purchases key to refining competitiveness
- Buy/sell and interest rate margin income
- Inventory control and management

at-arms-length

Metalor Advanced Coatings

- Electrolytic processes and chemicals for decorative and electronic industries
- Chemical and electrolytic silver powders for use in electronics and solar industries
- Commodity and proprietary product portfolio
- Strong customer service component, diverse and large customer base

Metalor Electrotechnics

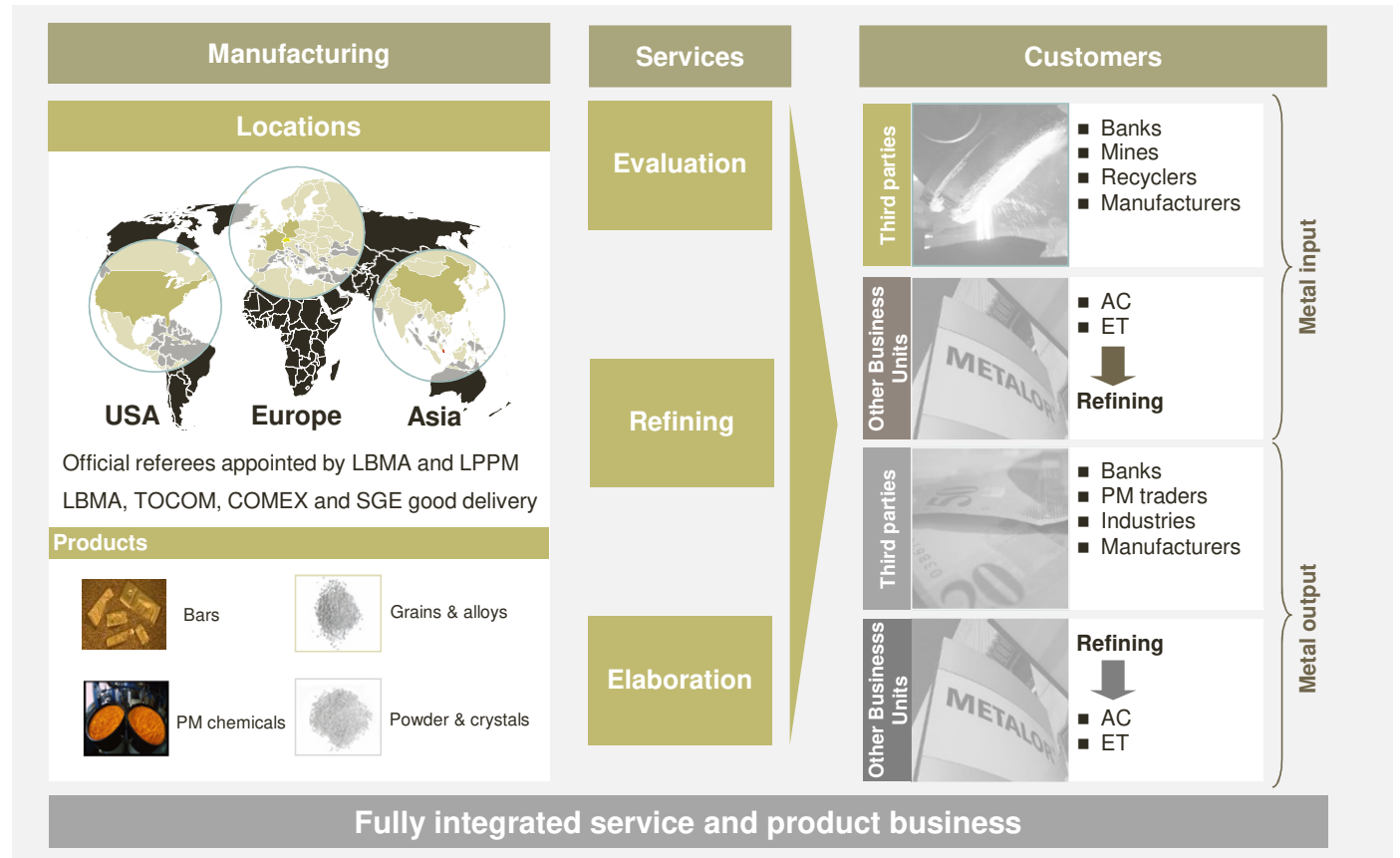
- Manufacture of electrical contacts for use in low voltage applications
- Products developed for customer specific applications (Siemens, ABB, Schneider etc.)
- Long qualification periods followed by long product lifecycles

Complementary but distinct businesses

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Metalor Refining

Products and Market Description



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PGM Catalysts in Fine Chemical Industry

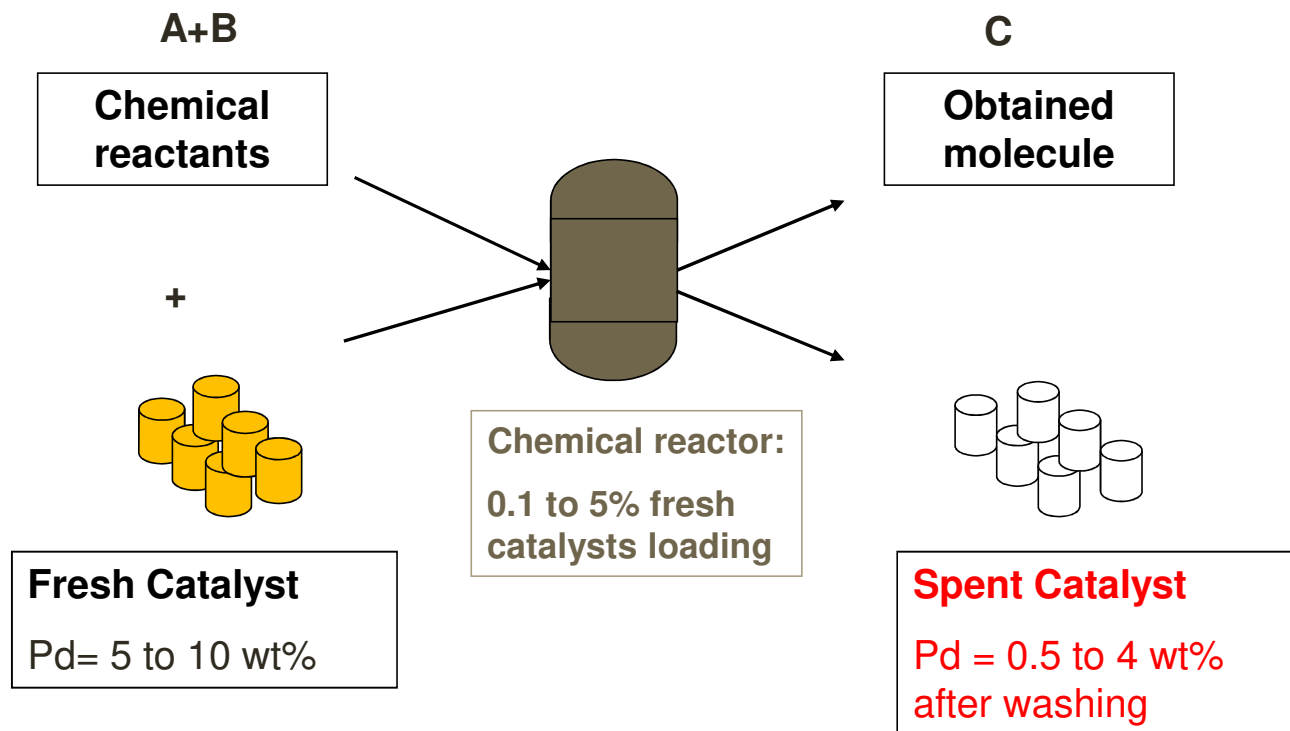
PGM catalysts, particularly Pt, Pd and Rh, are widely used in organic synthesis in the fine chemical, pharmaceutical and agro-chemical industries. These catalysts are categorized as :

- **Heterogeneous catalysts:** the catalyst belongs to a different phase to the reactants. The precious metal is supported or not (as Pd on charcoal, Pt/C, Rh/C, Pd black, Pt black, PtO₂...)
- **Homogeneous catalysts:** The catalysts and the reactants are soluble in the same phase. The precious metal is in a salt or complex form (as Pd acetate, Pd(dba)...))

Palladium on charcoal (Pd/C) is the most commonly and widely used catalyst for catalytic hydrogenation in organic synthesis.

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PGM Spent Catalysts



Why to recycle PGM Spent Catalysts

- **Economic aspects**
- **Recycling rare natural sources**
- **Reducing the catalysts waste to prevent environmental pollution**
- **PGM Raw Material available to produce fresh catalysts**

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How To Recycle: 1- collect the spent catalyst

Heterogeneous catalyts



Fresh Catalyst



Collected by
filtration



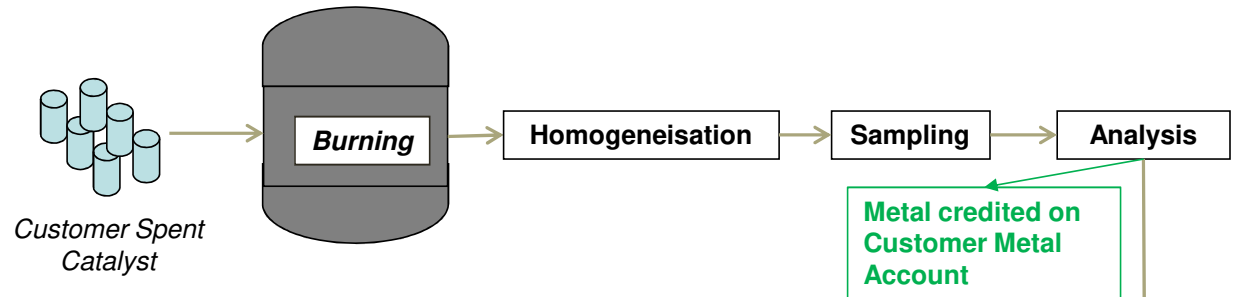
Spent Catalyst + Filters/Solvents
/Water/organic
traces

Homogeneous catalyts

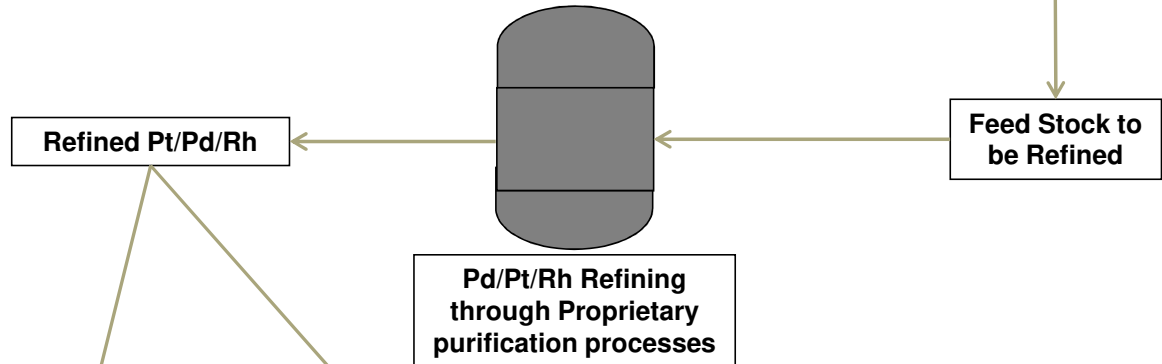
- Precipitating the metal as an insoluble salt -> filtration
- Phase separation and/or extraction
- Anchor the catalyst to an insoluble support ->filtration
- Using resins for extraction

How To Recycle: 2- Refining

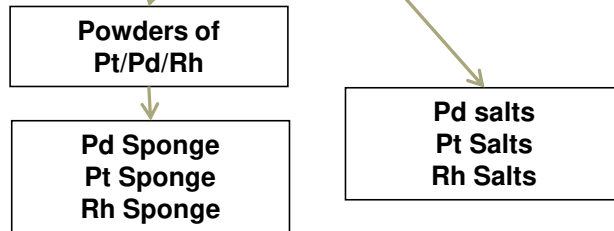
Evaluation



Refining



Elaboration



Main concerns for the spent catalysts supplier

- **Reputation risk**
- **Respect of regulation**
- **Minimum exposure**
- **Minimum paperwork**
- **Complete service (transport, documentation, regulation...)**
- **Metal management**
- **Price**

Where to recycle

Because of the chemical content, the majority of spent catalysts are classified as hazardous and by consequence fall under «amber» list as per the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal.

Abroad:

- Notify to the local authorities
- Notify the authorities of the country where the spent catalysts will be treated.
- Find the transporter company



Long and complex

Locally (in the same country where the spent catalysts is generated)

- No need of notification
- Easy transportation and service: close to the customer facility
- Easy metal management

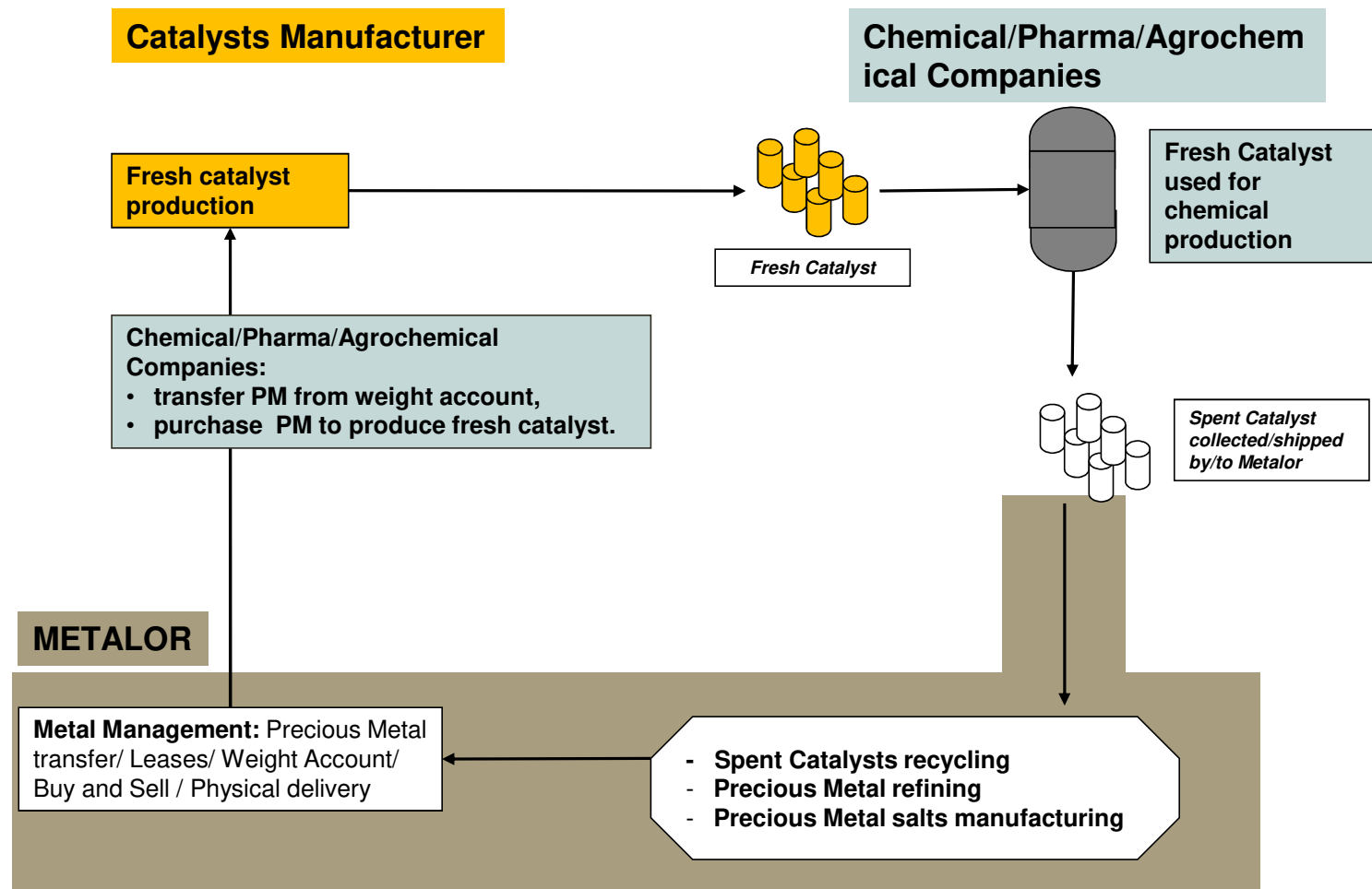


Quick and straight forward

METALOR®

Metalor
Service to the
fine chemical
industry

in
Switzerland,
France,
USA



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Metalor Refining Services

Worldwide Presence

