Exploring
Umicore Precious Metals Refining
An experienced key player in the non-ferrous recycling business, committed to a tradition of quality, reliability and respect for the environment.

Recyclability is a key feature of non-ferrous metals – in fact they can be used over and over again! Umicore Precious Metals Refining, a business unit of Umicore, is a world market leader in recycling complex materials containing precious metals. It provides refining services to an international customer base.

The plant near Antwerp is the world’s largest, cleanest and most advanced precious metals recycling unit. It is both 9001 and 14001 certified. It is designed to recover precious and other non-ferrous metals from a wide range of complex raw materials in an efficient and environmentally friendly manner. These materials mainly consist of industrial by-products and secondary precious metal bearing raw materials from sectors such as electronics, photography and catalysts (oil refining, petrochemical and automotive).

The leading precious metals recycler

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Processes that contribute to cleaner production

Umicore is an environmental pace-setter

As a world-class player in the non-ferrous metals sector, Umicore assumes its full responsibilities towards the environment. Its commitment to ecological protection is set out in an Environmental Charter, laying down the principles to be respected by every member of staff at every level of the organisation. Environmental management objectives are regularly reviewed and documented, and progress towards attaining them is monitored through regular dedicated audits.

Pledge to continuous improvement

The Hoboken plant has to comply with the conditions laid down in different permits issued by the Flemish authorities. They include comprehensive rules and standards for emissions into the air, soil and water, as well as noise and waste regulations. Commitment to continuous improvement, together with investments to anticipate future environmental legislation, have made Umicore Precious Metals Refining one of the cleanest metallurgical sites of its kind. Its processes more than comply with the stringent environmental regulations on emissions in air and water of hazardous substances.

Focus on metallurgical process, including gas cleaning and waste water treatment

The entire process is designed as a closed circuit with maximum internal recycling of residues and by-products, resulting in minimum waste for final disposal. Impurities are recovered and recycled into valuable products, and even the slag is re-used. All process and hygiene gasses are captured and systematically cleaned. In addition, the pyro-metallurgical process and the gas-cleaning equipment guarantee dioxin-free emissions by converting the organic material contained in the feed into water vapour and carbon dioxide. The sulphur dioxide contained in the smelter off-gasses is converted into sulphuric acid.

Umicore is an active and reliable partner in environmentally sound recycling, working with society and industry

Its environmental knowledge and skills allow Umicore Precious Metals Refining to close the loop of non-ferrous metals recycling, taking into account the safety, health and welfare of its employees and its neighbourhood. The plant is fully approved to treat and stockpile the various types of incoming materials in an environmentally sound way. Its legislation-compliant processes and precautionary, self-regulating approach, such as continuous sprinkling of roads and stockpiles, mean that Umicore Precious Metals Refining minimises the impact of its operations on its surroundings.

Processes that contribute to cleaner production

Umicore Precious Metals Refining closes the loop of non-ferrous metals recycling
Umicore Precious Metals Refining

A wide range of complex raw materials from a variety of world-wide sources

Each year Umicore Precious Metals Refining receives around 250,000 tonnes of about 200 different raw materials containing lead/copper/nickel and precious metals. The fully integrated, multiple input flow sheet allows Umicore Precious Metals Refining to process these complex precious metal bearing products coming from all types of industries. Increasingly there is a special focus on new sources of feed such as electronic scrap and spent catalysts.

Waste products ... ?
No, at Umicore these are known as secondary raw materials

Recycling is of vital importance to the environment. There are basically two different categories of raw materials treated at the Hoboken plant:
(1) By-products from other non-ferrous smelting and refining operations.
(2) Consumer and industrial recyclable products.
Overall, these form the market of secondary raw materials for precious and other non-ferrous metals.

By-products from other non-ferrous operations

Umicore Precious Metals Refining is the major market player for treating drosses, mattes and speisses from lead and copper smelters; tankhouse slimes from copper refiners; precious metal bearing residues from nickel, silver, gold and platinum group metal refiners; slag, flue dusts, lead sulphates and copper cement from silver, gold, nickel and zinc refiners.

Wide range of consumer and industrial recyclable products

Spent catalysts from the oil refining, petrochemical and automotive sectors, residues from the photographic industry, electronic and computer scrap, as well as sweeps and bullions are an increasingly valuable supply for Umicore Precious Metals Refining. Using an environmentally friendly, efficient recycling technology, Umicore Precious Metals Refining offers a reliable, safe way to recover all valuable non-ferrous metals contained in this feed, whether it is production or end-of-life scrap.
Sampling and assaying are the critical steps in proper material assessment

Umicore Precious Metals Refining sampling department produces representative samples of each lot of incoming material. These will be used to determine the metals content of the entire lot. The diversity, complexity and often varying precious metals content of the several thousand incoming lots per year mean sampling and assaying are essential in determining the customers’ financial yield. To ensure the best possible return for its customers, Umicore Precious Metals Refining dedicates more than 15% of its operating budget to this unrivalled service. The sampling site, which is the largest and best equipped in the world, is recognised internationally as a reference for sampling and assaying of complex materials, even with extremely low metal content.

Umicore Precious Metals Refining continuously invests in state-of-the-art sampling processes

Correct, accurate and as a result dedicated sampling is the first step towards the exact determination of the precious and non-ferrous metals content of the delivered material. Umicore Precious Metals Refining, committed to in-house development of process technology, has used its vast experience to combine traditional methods and state-of-the-art technologies into comprehensive, largely automated sampling programmes for all its business lines. Sampling of electronic scrap, catalysts, electrolytic slimes, metallic material, sweeps and bulk material has to a large extent been automated, minimising human intervention, that could affect the results. This part of the plant is located in a secured area with restricted access: an absolute guarantee against potential fraud.

Maximum accuracy, irrespective of the material type or its complexity

The samples are subsequently sent to the in-house analytical laboratories where a combination of advanced instrumentation and conventional fire assays contribute to the accurate identification and assessment of the metals contained in the sample. This is one of the world’s best equipped and most experienced laboratories in precious metals assaying.
A comprehensive and unique composition of complex lead/copper/nickel metallurgy ... the key to efficient, flexible operations

A high-tech undertaking

A unique process ensures the efficient refining of the wide range of complex and valuable raw materials. More than €100 million were invested in the development and installation of this new metallurgical process. The process is based on complex lead/copper/nickel metallurgy, using these base metals as collectors for precious metals and other “impurities”, such as antimony, bismuth, tin, selenium, tellurium and indium. The main advantage of the new process is increased flexibility combined with greater efficiency, which results in maximum metal recovery rates, and generates optimum precious metals yield.

The smelter

Lead/copper matte and complex materials containing copper and precious metals are the basic feed to the smelter, which uses the ISA smelt technology. The bath smelting uses submerged lance combustion technique, which involves injecting air, oxygen and fuel beneath the surface of a liquid slag bath. Umicore Precious Metals Refining is the only company to use this technology on such a large scale with a variety of feedstocks. The smelter’s role is to separate lead slag and impure copper. The latter will be sent to the leaching and electrowinning plant. The slimes originating in this process and containing precious metals are subsequently fed to the precious metals concentration for further treatment. Lead and other impurities that tend to associate with it are collected in a lead slag that will be treated in the blast furnace.

The lead blast furnace

Lead and lead/copper-rich materials are transformed into impure lead bullion, speiss and copper matte. Impure lead bullion, collecting silver, gold and some palladium is sent to the lead refinery. Speiss containing platinum group metals is sent to the Olen plant for processing. The precious metals will be separated out in a leaching residue that will be returned to Umicore Precious Metals Refining. The copper matte is returned to the smelter and the depleted slag is processed for use in the construction industry.
The lead refinery

The lead bullion is refined to produce pure lead. During this process, precious and other metals contained in the bullion are recovered. Antimony and tin are recovered using the Harris process. During the Parkes lead de-silvering process, the precious metals are concentrated in a skimming (lead/silver/zinc alloy). A silver bullion is produced after zinc removal in a vacuum induction-furnace, that is sent to the cupellation furnaces. Bismuth is separated as an alloy.

The precious metals concentration

Slimes and residues from the speiss treatment containing precious metals, together with silver bullion and other high-grade raw materials are fed to the cupellation furnaces. All non precious metals are slagged down and returned to the lead blast furnace. The precious metals are collected as doré silver that is processed in the precious metals refinery.

The precious metals refinery

The precious metals refinery was recently completely renewed. It is one of the world’s largest and most efficient refining facilities. All the processes used were developed in-house by Umicore Precious Metals Refining.
Umicore Precious Metals Refining

Silver

Umicore Precious Metals Refining has a production capacity of more than 2400 tonnes per year of high purity silver, which makes it the world’s largest silver refinery. In addition to jewellery, silver and silver compounds are used in several major industrial applications, of which the photographic, mirror and electronics industries are by far the most important. Silver is also used in catalysts, bearings, soldering material, coinage, batteries and dental alloys. Umicore Precious Metals Refining produces silver as granules in different grades (99.9% and 99.99%) and as silver nitrate.

Gold

As the most malleable of all metals, gold’s primary use is still the jewellery industry. An increasingly important area is electrical contacts and connectors for telecommunications and electronics. Since gold never corrodes or tarnishes, it is perfect for conducting (even a very weak) electric current. Umicore Precious Metals Refining produces high-purity ingots and grains of minimum 99.99% per year.

Platinum group metals

The platinum group metals are a group of six rare metals – platinum, palladium, rhodium, ruthenium, iridium and osmium – which are mined in ore deposits in South Africa, Russia, Canada and the USA. By virtue of their unique chemical properties, platinum group metals are often used as a chemical catalyst in industrial processes and automotive and industrial pollution abatement. Resistance to corrosion and tarnishing, combined with mechanical strength and hardness, make the platinum group metals suitable for highly demanding applications, such as glass fibre and high purity glass industries, surgical instruments, electrical contacts and laboratory equipment. Platinum is also one of the most precious jewellery metals. Umicore Precious Metals Refining is Europe’s largest producer of rhodium and palladium, and second largest of platinum, with production capacities of 2.5, 25 and 15 tonnes per year respectively. All of these metals are produced in the form of a high purity (minimum 99.95%) powder, known as sponge.

Quality products serving the world market’s requirements

1 Silver-based photographic film
2 Car catalyst with a PGM coating
3 Selenium

Courtesy of AGFA-GEVAERT n.v.
Umicore Precious Metals Refining also produces a substantial amount of refined lead: its capacity exceeds 125,000 tonnes per year and different grades are available. The excellent ability to store chemical energy, which, in turn, can be converted into electrical energy, made lead the leading energy storage material used in batteries. Other applications are in construction, as PVC stabilisers and in TV-screens. Lead is easily recyclable. Today already 60% of the world’s needs comes from recycled lead and this percentage is growing.

Selenium is often present in copper ore and is predominantly recovered from electrolytic slimes. It is a semi-conductor with an electrical resistance that decreases with exposure to light, a property that makes it ideal for photo-electric cells. Selenium is also used in pigments and animal feed. Umicore Precious Metals Refining has a production capacity of 600 tonnes per year.

Tellurium is a rare element, obtained mainly as a by-product of copper and lead metallurgy and is then recovered mainly from electrolytic slimes. Tellurium is used in rubber vulcanisation and catalysts, as well as in metallurgical applications. Umicore Precious Metals Refining has an annual production capacity of 150 tonnes.

Indium was named after the blue-indigo colour in its spectrum. The metal is not found in the native state, but is associated with lead and zinc in many ores. Applications include low melting point alloys, control rods for nuclear reactors, electronics, etc. Umicore Precious Metals Refining has a capacity of 30 tonnes per year.

Sulphuric acid is produced from the sulphur contained in the raw materials supply. Sulphuric acid is used primarily in the paper and pulp industry, and in the production of artificial fertilisers. The capacity is about 100,000 tonnes per year.

Sodium antimonate is produced as a powder. Antimony is found in nature in the form of oxides and sulphides, or in association with other metals. It is employed in alloys or in the form of oxides. Its main applications are as a flame retardant in textiles and plastics or as a fining and de-colouring agent in glass. Umicore Precious Metals Refining has a production capacity of about 6000 tonnes per year of sodium antimonate, which is produced as a powder.

All metals in the feed supply are recycled and transformed into valuable products.
Differentiation through distinctive services

Umicore Precious Metals Refining aims to be recognised as a world-class player. Both for the quality of technologies and products, as well as for the quality of services, out-performing the established standards. It uses expertise and drive for excellence in processes and services to respond to customers’ needs and exceed their expectations. Umicore Precious Metals Refining aims to be their preferred partner.

Strategic location and global experience as logistical assets

Umicore Precious Metals Refining plant is centrally located in Europe, near world’s second largest port Antwerp, allowing fast in- and outgoing transportation. A complete inward and outward logistical assistance for raw materials and for refined metals is provided to its customers including transport in compliance with the Basel convention. It comprises the follow up of all relevant environmental legislation with regard to the shipment of waste within, into and out of the European Union and the control of cross-border movements of waste intended for recovery operations (OECD). For our customers this yields a reduction of costs and capital employed.

Metals management completes the supply chain

Umicore Precious Metals Refining often acts as a toll refiner, where all or part of the metals contained in the raw materials is returned to the supplier. Alternatively Umicore Precious Metals Refining also purchases the raw materials or the metals contained and uses its expertise to sell the valuable metals at the best available market conditions. Another possibility is to keep them on customers’ metals account, where the metals can be used for trading purposes. The clients can also optimise their operations by using other services offered, such as leasing, metal transfer or other techniques to reduce their capital employed.

Total Quality as a strategic vehicle for improvement

For Umicore Precious Metals Refining, Total Quality is a long-term programme aimed at creating and reinforcing a culture of business excellence in all processes, products and services.
Continuous expansion over the years

1887
Start of a lead de-silvering operation in Hoboken

1919
Société Générale Métallurgique de Hoboken becomes an integrated lead smelter

1945
Development into a complex lead/copper smelter

1975
Major investments to reduce environmental impact

1985
Investment programme to increase refining capacities for precious metals

1985 - 1998
Investment programme to re-engineer the complete metallurgical flow sheet, including the commissioning of the new smelter and a new silver and gold refinery, accompanied by a substantial capacity increase for platinum group metals. Through the development and implementation of this state-of-the-art technology, Umicore Precious Metals Refining consolidated its position as the world’s leading precious metals recycler

1999
Commissioning of new equipment for dedicated sampling of catalysts and electronic scrap

2000
Start of the site rehabilitation project

2001 - 2003
Building and start of a new leaching & electrowinning plant in Hoboken

2003
Integration Precious Metals Group (PMG)