UNEP Global Mercury Partnership
Waste Management Area

Catalogue of Technologies and Services on Mercury Waste Management

2024

This catalogue has been compiled by Professor. Misuzu Asari, Research Institute for Humanity and Nature and Ministry of the Environment, Japan, the leads of the Waste Management Area (WMA) under the UNEP Global Mercury Partnership in cooperation with the partners of the WMA, with a view to disseminate information of technologies, products, services related to mercury waste management owned by partners.

March 2024

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APPELGLOBAL

Last Update: March 2021

Tags: recovery, removal, decontamination, monitoring, amalgam, mining residue, mercury-free gold extraction

1. Profiles

Appelglobal (http://appelglobal.com/) is a Danish-based company created ten years ago with the aim of reducing global mercury pollution from small-scale gold mining taking an integrated, three-pronged project:

1. Mercury clean-up from tailings and rivers polluted by ASGM across the planet Earth. Funded by the Danish government in Nicaragua (2019) and in Honduras (work begins in April 2021). This includes disposal and storage.
2. Teaching mercury-free gold extraction to small-scale gold miners. Current projects are located in Mauritania, Bolivia, Uganda and fully financed by German by Danish sources. Work will resume when COVID restrictions are lifted.
3. Real–time M&E that measure the effectiveness of our approaches in reducing mercury that debilitates ecosystem service resilience and human health and provide evidence for inform policy recommendations based on context-specific best practices .

Appelglobal partners include the Danish Ministry of Environment and Food, the Danish Ministry of Environment, Honduran Ministry of Environment (www.miambiente.gob.hn), Ensome, S.A. (www.ensomeinfo.com), Elplatek (www.Elplatek.dk), FLSmidt.dk (www.FLSmidt.dk) and the Danish NGO Dialogos (https://dialogos.dk/). Main sponsor is the Danish Ministry of Foreign affairs.

2. Overview of technology/product/service provided

Cleaning tailings from small-scale gold mining for mercury - Appelglobal and partners received a grant from the Danish Ministry of Environment in 2018 to carry out successful test runs on cleaning tailings from small-scale gold mining for mercury flour (https://www.impopen.com/tosf-toc/19_9) and in 2020 the Danish Ministry donated a US$ 1 million grant to clean mercury from one of many of the Honduran rivers and adjacent soils that small scale gold miner are polluting daily. The project will extract mercury from river sediments using Peter Plates and it will also clean some of the mine tailings in close proximity to the pilot river to be cleaned. The miners who make the tailings will be taught to extract gold without using mercury (see below). We also neutralize the captured Hg as cinnabar and ship it to Switzerland for safe storage.

Mercury-free gold extraction method - we have adapted invented in Philippines more than thirty years ago, and used today by >30,000 Filipino miners to teach small-scale gold miners to go mercury-free. The initiative has been implemented on three continents where miners have adopted mercury-free gold extraction to recover up to 50% more gold than they do with using mercury and they save considerable amounts of money by not needing to buy mercury. The only drawback is that this mercury-free gold extraction takes about ten percent longer processing time. Educational videos describing the method can be viewed on: http://youtu.be/X6Sawj0HyF0 (English version); and https://www.youtube.com/watch?v=-3uiKeCBkjk (Spanish Version). Both videos have been viewed by over 1.8 million viewers. Videos in French and Bahasa Indonesia are also available, while versions in Pemba and Swahili will be available soon.

Processing station for Mercury-free gold Extraction

Real time M&E – Another added value of our integrated approach is the ability to track changes through a real-time monitoring and evaluation platform that measure environmental and human health outcomes over time. We have an occupational health team of medical doctors, an ESIA and SEA team led by a tropical ecologist with experience working with river, estuarine and marine biodiversity impacts driven by unsustainable practices.

3. Strengthening/Advantage

Our approach offers several benefits to our partners:

1. Mercury clean-up from tailings and rivers
-Reduced human health risks from eating mercury-contaminated aquatic resources;
-Diminished ecosystem health risks due to removal of mercury from environmental compartments;
-Reduced inputs into estuarine nursery areas for fish, shrimp and IUCN Red-listed species;
-Neutralization of mercury by conversion to cinnabar and deep storge in a Swiss safe disposal area;

2. Mercury-free gold extraction
-Reduced health and environmental risks due to the elimination of mercury in small-scale gold mining activities
-Lowered cost to miners due to eliminating the need to purchase mercury
-User-friendly, easy operation after training
It is not always easy to convince people to change their habits. However, teaching and training small-scale gold miners to extract gold mercury-free has the immediate advantage that they do not need to buy mercury which is not only very expensive but also illegal. Next advantage is that they will recover more gold and finally, they and their families are no longer exposed to this potent neurotoxin.

4. Applicability

1. Mercury clean-up from tailings and rivers
Most small-scale gold miners mill their gold ore in metal drums together with mercury. The mercury-gold amalgam is then recovered after milling. The recovered amalgam is heated, forcing mercury to evaporate, while the gold remains behind. However, many miners do not realise that a large part of auriferous mercury ends up in tiny droplets (mercury flour) which they have no way to recover. The adjacent photo shows a spoon of tailings with mercury flour (small shiny dots). Appelglobal together with Leoncio Na-Oy, a small-scale Filipino gold miner invented a gadget called Peter Plates that can recover a large part of mercury flour. The captured mercury flour is then distilled, and the residual gold is recovered. We have applied this successfully in Nicaragua and will imitative a new pilot project in Honduras in April 2021


Mercury flour in tailings
Scale 2 cm

2. Mercury-free gold extraction
Our work spans countries across three continents (see map) and we continue to receive requests for assistance in new countries .

5. Further information

Additional information can be found at our website www.appelglobal.com

Or by writing us at:

Peter Appel appelglobal@gmail.com

Joe Ryan jryan@ensomeinfo.com

Association of Lighting and Mercury Recyclers (ALMR)

Last Update: February 23, 2023

Tags: separation, recovery, mercury product waste, engineering design, fluorescent lamps, mercury abatement in developing countries and SIDs

1. Profiles

The Association of Lighting and Mercury Recyclers is a non-profit organization comprised of recycling firms and others engaged in recycling, who operate from over 60 locations throughout the U.S. and in Europe. Some members provide technology and recycling equipment throughout the world. Since its formation in 1999, the ALMR has become the educational and informational resource to government agencies, municipal authorities, industries and business entities, waste handlers, generators, environmental groups, industry trade organizations, and the public at large. The ALMR assists government agencies at all levels to establish and implement programs, rules and regulations which encourage and promote the recycling of all mercury containing products and waste materials. The ALMR received a grant from the USEPA to develop and manage the Lamp Recycling Outreach Project, resulting in hundreds of millions of lamps recycled. The details and scope of this program have been shared with UNEP in the Success Stories. We have developed technology to reclaim Rare Earth Elements from lamp phosphors for strategic and industrial uses. We have started The Mercury Abatement Project to assist SIDS and developing countries collect used lamps to keep mercury from the environment and stimulate local economies through improved tourism.
Locations of our member's company operations are found at www.almr.org, and each member's web links describe more about their individual activities and locations throughout the world. Since 2011 the ALMR has provided the Global Mercury Project with details of our technologies, reverse distribution systems, Success stories, information for the Sourcebook, attendance at COP and partnership meetings.

2. Overview of technology/product/service provided

The ALMR has provided the project with technical details with photo sand descriptions of the methods for recycling light bulbs and recovering mercury.
To summarize:

1. Lamps are collected from any location in a country where they used and stored. Historically we have collected about 500 million lamps per year.
2. Lamps are disassembled in a negative pressure system, where components are mechanically separated and isolated from each other. Clean (mercury free) components are recovered and sent for reuse in any process needing glass, aluminum, tungsten, or other raw materials found in lamps.
3. The Phosphor component is heated in a vacuum distillation system to isolate mercury for reuse or sequestering depending on location.
4. The mercury-free phosphors are then concentrated to remove any remaining impurities and then subjected to a thermal or chemical process (patented and proprietary technologies) to recover pure Rare Earth Oxides for reuse by governments and industry. The principle Oxides produced are Terbium, Europium, Yttrium, Cerium and Lanthanum.
5. Thus, nearly all of the materials comprising lamps are rendered non-hazardous, mercury is reclaimed and the critical minerals needed for strategic applications are produced.

3. Strengthening/Advantage

The principle advantages are the protection of human health and the environment from the toxic affects of mercury, and the reclamation of rare and valuable minerals for alternative energy, industrial, aircraft and defense applications. We are the only organization in the world that is performing all of these activities.
We have offered to share all information we have developed for public education and outreach to businesses and individuals with any member of the GMP at no cost. We have offered to assist anywhere in the world to set up a reverse distribution network and arrange for the recycling in the most appropriate location. Further described in the next section.

Drum-Top Crushing Device for Pre-recycling consolidation Courtesy of Terracycle Inc.

Integrated Lamp Recycling System used throughout the world Courtesy of Balcan Ltd.

4. Applicability

Our industry has been operating and performing the activities described here for approximately 25 years. Physical operations are primarily in North America and Europe. Our member companies also provide engineering and technology to establish commercial operations worldwide. Recycling locations are available in Asia, Middle East, South Africa and Australia. Currently, there is a complete lamp recycling system in Manila, Philippines that is not being used due to public and private infrastructure problems.
Recently, we arranged for the collection of large quantities of lamps from Sri Lanka and the recycling of these lamps in Dubai. This project was outside the scope of our membership, yet we are committed to networking with any legitimate participant to keep lamps and mercury out of the environment. We have also assisted in similar projects in Central America.
We have described a plan in detail to the GMP members to integrate lamp collection and recycling in Developing Countries and Small Island Developing States where improper management practices lead to mercury pollution in nearby marine environment. We submitted proposals to the 10 YFP Trust Funds Project, and we have submitted preliminary proposals to the Regional Center in the Caribbean and to GEF. We continue to seek UN/GEF support for setting up local infrastructure to collect lamps and ship them to integrated recycling facilities in nearby countries. We continue to offer this approach and we welcome all advice on finding funding sources to support local efforts.

5. Further information

For additional information visit www.almr.org
- Contact information: Paul Abernathy, Executive Director mail@almr.org

BATREC Industrie AG

Last Update: March 02, 2023

Tags: stabilisation, Chlor-alkali, mining, recovery, disposal, sorting, product waste, decontamination, adsorbent, amalgam, mining residue, mercury compounds, oil & gas

1. Profiles

BATREC is a Swiss company specialised in hazardous waste treatment and recovery.

1991: year of Foundation

88 employees

2022 Turnover: 18 Mio €

ISO 9001, ISO 14001 & OSHAS 18001

BATREC, a subsidiary company of the Veolia group, part of Sarp Industries, is a leading specialist in the treatment and recycling of industrial hazardous wastes, particularly those containing Mercury.

5 Core Activities: Mercury stabilisation, Mercury contanining waste treatment, Oil and Gas adsorbents recycling, Activated Carbon reactivation, and battery recycling.

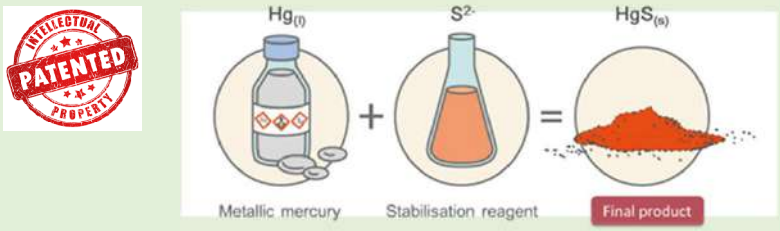
2. Overview of technology/product/service provided

The company provides mainly 2 services in terms of mercury waste handling:

Hazardous waste containing mercury → Extraction of Mercury enabling recycling of other compounds → Stabilisation of Mercury / Recycling of other compounds and Mercury*

Stabilisation

BATREC has BATREC has developed a patented solution to stabilize metallic mercury (Hg) to mercury sulfide (HgS) for a permanent and safe disposal in a salt mine



Or

Recovery

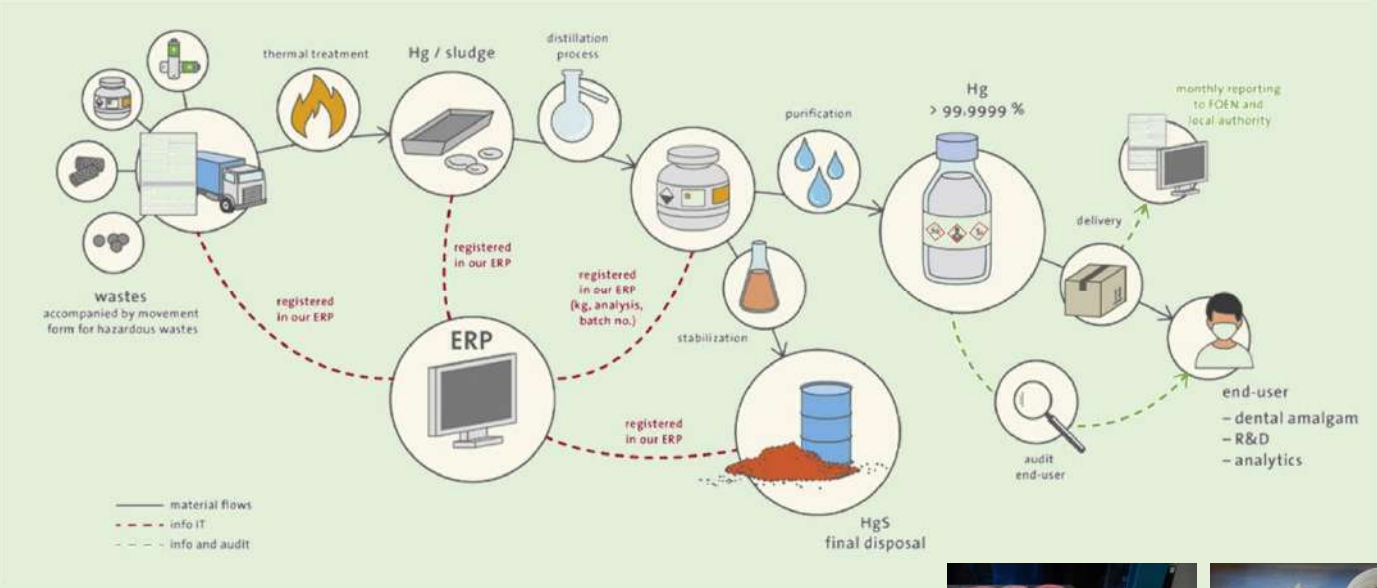
(ultra purification of Hg with a purity > 99.9999%)*

* In accordance with Minamata – limited applications

BATREC can manage any type of mercury waste such as Liquid mercury, Hg guards, AC contaminated with Hg, sludge, contaminated soils, contaminated PPE, filters, thermometers and other Non Electronic Measuring Devices, dental wastes (amalgams)...

3. Strengthening/Advantage

BATREC provides safe and traceable treatment services for Liquid mercury and waste containing mercury in compliance with regulations as the Minamata and Basel Conventions.



Compliance	BATREC provides services with high quality Swiss standards
Experience	BATREC develops its mercury handling services since 1992
Expertise	BATREC handles any types of mercury wastes
Worldwide	BATREC offers a turnkey solution within a real-world context

4. Applicability

- Decommissioning of Hg based Chlor-Alkali plants.

Europe: more than 1'800 T as of 2016 (Spain, Belgium, France, Italy, Hungary, Slovakia, Czech Republic, Switzerland).

- Industrial gold mines. Continuous production worldwide.

More than 500 T as of 2016 (Latam Region).

- Oil and Gas Industry
- Clients who request a safe disposal of the Hg recovered from their wastes

Case Study Mine Industry: BATREC offers to the mining industries its door-to-door services consisting of on-site supervision for packing, labelling, stuffing into maritime containers and international transport, following Basel Convention for Transboundary movement of waste, prior to Hg stabilization and final disposal

5. Further information

Contact details

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E-Mail batrec@batrec.ch
URL Website http://www.batrec.ch/en/
Managing Director – Philippe ZANETTIN
Commercial Manager – Angels CASTELLNOU

Treatment facilities

Niesenstrasse 44
3752 Wimmis
SWITZERLAND

EAM Environmental, Inc.

Last Update: 14 March, 2024

Tags: reduction, collection, separation, storage, removal, recovery, stabilization, solidification, disposal, decontamination, product waste, adsorbent, amalgam, mining residue, mercury compounds, mass flow analysis, monitoring, policy study, spill, spill kit, recycling, retort

1. Profiles

EAM Environmental is a United States company focusing on manufacturing and e-commerce of hazardous spill control products

History-Founded in 2016
Our business- Manufacturer of unique magnetic amalgamation powder for all forms of mercury bearing wastes.
-Strategic partners with THIS to manufacture flocculent /solidification agents for effluents containing heavy metals

2. Overview of technology/product/service provided

- Elemental mercury spill clean up
- Final amalgam is collected and shipped to a mercury recycling facility for retort
-Final amalgam is a solid, non vaporizing solid that can be picked up with a magnet

3. Strengthening/Advantage

-Breaks down easily in the retort process compared to other amalgams

-Due to the chemical formulation of Mercury Magnet®, vapor suppression is complete when amalgam forms

-Inert metal powders form magnetic amalgam after small application of water to product

-Very user friendly and simple to use

-No use of hazardous chemical / substance

-Affordable and low cost method of mercury spill clean up

4. Applicability

Mercury Magnet® has been used in Azerbaijan for mercury waste clean up in gold refining. In addition, Mercury Magnet® has been used in the remediation of the Thomas Edison museum in Edison, NJ, United States and in the oil & gas sector in the Far East.

It is our intention to provide spill control kits to developing countries to assist in their mercury bearing waste generation, such as laboratories and artisanal gold mining.

5. Further information

- URL: www.eamenvironmental.com
- (Tele) +1 (570)-848-4186
- Email: info@eamenvironmental.com

ECOCYCLE PTY LTD

Last Update: March 2021

Tags: mining residue, recovery, separation, product waste, distillation, crushing, oil & gas

1. Profiles

Ecocycle Pty Ltd is and Australian mercury recycling company founded in 1996.
Head Office and main processing capability is located in the State of Victoria at Campbellfield.
National coverage is serviced through additional facilities located in Perth - Western Australia, Adelaide – South Australia, Sydney – New South Wales, Brisbane – Queensland and Rocherlea – Tasmania.
Agents also represent the company in Darwin – Northern Territory, New Zealand, Indonesia, Papua New Guinea and New Caledonia.
Ecocycle Pty Ltd employ highly experienced staff committed to servicing industry and protecting the environment fully supporting the values and vision of both Minamata Convention and UNEP Global Mercury Partnership.

2. Overview of technology/product/service provided

Ecocycle Pty Ltd have installed high volume crush and separation plant across the country with European distillation facilities located at the Head Office.
The company processes all mercury wastes from a wide range of industry including Mining, Oil & Gas, Lighting, Dental and the general public.
All materials received into our facilities are 100% recycled.
Ecocycle Pty Ltd has specific interest in recycling Dental Amalgam and has invested heavily in process and awareness on this subject across the industry.

3. Strengthening/Advantage

Ecocycle Pty Ltd utilize the latest technology for the safe processing of mercury wastes in an highly efficient and environmentally sound manner.
Our company is fully accredited to the following standards:

- ISO 9001:2015
- ISO 14001:2015
- AS/NZS 4801:2001
- AS/NZS 5377:2013
- OHSAS 18001:2007

4. Applicability

Ecocyle Pty Ltd have sort out and assisted mercury recycling programmes in South Pacific countries and Indonesia.
The company has a broad reach as member of industry bodies such as:

- Waste Management Association of Australia
- Victoria Waste Management Association
- Australian Battery Recycling Initiative (ABRI)
- Fluorcycle
- Exitcycle

5. Further information

- Further details and extensive information can be found at www.ecocycle.com.au/ and we encourage visitors to our web pages to sign up to our regular and informative newsletter.
- All enquiries can also be directed to:

- Mr Daryl Moyle, Business Development Manager
- daryl.moyle@ecocycle.com.au
- Telephone 61 432732735 / 61 394089415
- Fax 61 394089416

Ecologic, S.A.
Urban Mining and special waste management company

Last Update: February 16, 2022

Tags: mercury waste recovery, disposal, circular economy, e-waste, secondary raw material

1. Profiles

- Started operations in August 2008 and Valued at US$200K
- Urban Mining & special waste management company, locate it in Panama City, Panama
- Partner of the UNEP Global Mercury Partnership´s waste management and disposal areas since 2008
- With national operation permit from Health and Environment´s Secretaries since 2012
- Recycling and final disposal of containing and contaminated mercury waste.
- UNIDO´s mercury waste workshop participant.

ecologic s.a.
servicios ambientales estrategicos

2. Overview of technology/product/service provided

- Lightning fixture, medical equipment, e-waste, electrical waste, reduction, collection, separation & storage.
- Copper cable, Lightning fixtures and E-waste recycling.
- Gold, copper, aluminum and bronze removal & recovery.
- Copper, aluminum and bronze melting and ingot production.
- Steel scrap recycling & export.
- Plastic waste, mercury containing waste final disposal in secured landfills (special engineer landfill)

3. Strengthening/Advantage

- Higher recycling efficiency, higher quality of raw material for up and downstream use.
- Lower risk of contamination
- resources recovery for circular economy
- No use of hazardous or chemical substances
- Inverse manufacturing & manual wire stripping
- User-friendly & easy melting operation
- Co-benefit
    - Higher prices for recovered metal
    - More recycled material for industrial use
    - Less waste to municipal landfills
    - Less pollution due to no plastic burning

Small batch´s melting process

Copper ingots

Small furnace melting at 1,200 C °

99.99% copper recovered

4. Applicability

Circular economy in the waste management had been one way to increase their incomes, but mainly in the aluminum, glass, plastic and cardboards, but not in the special electric & electronic waste. All metals, especially iron/steel, had been send to larger recycling operations to receive residual incomes, less than the actual metal recovery cost.

Since the e-waste and lightning and electrical waste include an important metal footprint and the melting technology is getting more accessible in terms of size and price, there is a convergence to add value and increase general incomes to urban mining & special waste management companies.

Urban Mining, Circular Economy as well as a Better Design for better recyclability in consumer products, will increase the recycling rate, recycled material participation in industrial process and the success of recycling operation around the world.

5. Further information

- https://www.facebook.com/ecologicpanama
- https://www.ecologic-panama.com

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servicios ambientales estrategicos

econ industries services GmbH

Last Update: February 21, 2023

Tags: recovery, stabilization, gold tailings, mining residues, oil & gas, catalysts, chlor-alkali, chemical, mercury waste, removal, decontamination, on-site conversion, engineering design, solidification, soil remediation, waste management

1. Profile

Founded in 2003, econ industries is a German-based cleantech company serving the oil & gas, chemical, mining, and chlor-alkali industries by delivering turn-key equipment for the recovery of resources from industrial hazardous wastes worldwide. Its core technology, called VacuDry®, uses indirect heat and a vacuum to separate mercury from the wastes.

econ industries offers on-site mercury waste treatment equipment as well as mercury conversion services for companies of all sizes. Since 2006, econ industries has been delivering solutions for the treatment of mercury waste. These include, for example:

- The first mercury recycling facility of the southern hemisphere
- A VacuDry® plant for the remediation of a large mercury contaminated area in the Indian mountains.
- econ's own operation of a mercury stabilization plant, so called MMCU plant, in Europe.
- econ's vision: zero industrial waste – Our goal is to enable local partners to treat mercury waste on-site or locally with Best Available Technology (BAT) to avoid transboundary waste shipment.

econ INDUSTRIES
Zero industrial waste … !

2. Overview of technology/product/service provided

econ industries offers a broad portfolio of technologies for the treatment of mercury waste, being able to handle all major mercury waste streams in quantities small and large and giving a complete solution to the client, from extracting the mercury from the waste to the stabilization of the recovered mercury to mercury sulphide (HgS).

VacuDry® Vacuum Distillation - The VacuDry® process is a specially designed vacuum distillation. The material is continuously mixed and heated under a controlled vacuum to safely evaporate water, hydrocarbons and mercury. It can be utilized for all waste streams containing metallic mercury and mercury compounds with a boiling point of up to 450 ° C.
Capacity: up to 100 t/day. In combination with soil washing: up to 500 t/day are possible.

Mobile Mercury Conversion Unit (MMCU) - The MMCU is designed for on-site mercury conversion. Mercury is converted to stable and non-toxic HgS and packed for final disposal.
Capacity: 0.5 to 5 tons per day

High Temperature Treatment Unit (HTTU) – The HTTU is designed for industrial scale treatment of spent catalysts and other mercury and sulphur containing wastes. In the HTTU, mercury sulphide (HgS), and other mercury compounds are decomposed at high temperatures. Hydrocarbons and sulphur are oxidized. SO_2 created by the process is neutralized in the off-gas treatment system.
Capacity: 100 kg to 2.5 tons per hour

3. Strengthening/Advantage

econ has more than 20 years experience in industrial and recycling plant construction. Its VacuDry® technology is able to recover 100 % of mercury wastes. Tailor-made research, development, consulting, engineering, delivery and commissioning are econs core competencies. As an owner-managed independent company econ guarantees the individual support for each customer.

Advantages of econ‘s mercury treatment plants:

- Highest flexibility - every mercury waste stream can be treated
- On-site treatment of mercury wastes - reduce transport emissions/hazards
- Full transparency of the waste handling process
- Safest technology - due to closed vacuum system
- Physical separation through vacuum distillation – no incineration!
- Renewable energy supply system: CO_2 – emission free operation
- Flexibility to switch between different energy resources
- Best Available Technology (BAT)
- Turn-key solution - including setup of material handling and safety regulations

4. Applicability

econ industries offers solutions for all types of industrial scale mercury wastes from various industrial sectors such as the oil & gas industry, chlor-alkali industry, chemical industry, recycling and waste management industry, mining industry, and soil remediation.

Typical applications that contain mercury:

- Spent catalysts
- Contaminated soil and building rubble
- Filter cakes
- Sludges
- Oily wastes containing mercury
- NORM / TENORM waste containing mercury
- Surplus mercury for conversion as preparation for final safe disposal

econ provides solutions for the on-site mercury waste treatment and mercury conversion for final disposal. Given the local treatment of these wastes, especially developing countries benefit from the knowledge transfer and job creation as well as the health and safety improvements resulting from the use of this technology.

5. Further information

For further information please visit www.econindustries.com or contact us directly

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International Dental Manufacturer's Association

Last Update: March, 2023

Tags: amalgam, collection, separation

1. Profiles

- IDM is the global body for National Dental Industry Associations, functioning for 25 years.
- IDM is domiciled in Switzerland
- IDM has been represented at the Minamata INC 4 and 5 and COPS 1 & 2.
- IDM participated in the East African Dental Amalgam Phase Down Project in Tanzania, Kenya and Uganda
- IDM has also attended phase down meetings in London, Johannesburg and Sao Paulo, Brazil
- IDM works with FDI – the World Dental Federation and with UNEP and WHO on the Minamata Convention

2. Overview of technology/product/service provided

- Dental equipment manufacturers developed dental amalgam separators over 30 years ago.
- The ISO 11143 Amalgam Separator standard was published in 1999.
- No technical changes have been made to the document at the customary 5 year reviews.
- Dental amalgam separators are placed after the dental suction machine and in front of the waste water outlet of the dental surgery capturing a minimum of 95% amalgam waste.
- Amalgam waste is generated when the dentist either removes an old amalgam restoration or places a new amalgam restoration and the amalgam is polished at high speed.
- If an amalgam separator is not installed the amalgam waste goes into the municipal drains and eventually out to sea or landfill.
- Amalgam separators capture the waste amalgam and this is then collected/sent for recycling.
- The extracted mercury is then sequestered or on sold for permitted uses.
- There are several technologies available including centrifuge models, sedimentation models, filtration models and units range in capacity from large hospitals to single surgery dental practices.
- The well known brands include Durr, Metasys, Cattani, Solmetex, and other brands can be found with a simple google search on dental amalgam separators.
- The existing dental companies in the country will have the knowledge of what is available in each jurisdiction.
- As well as the installation of the amalgam separator attention should be paid to the following,
- The primary filter located in the dental chair will hold amalgam waste and this needs to be collected /stored in a separate container for recycling. This is considered contact waste and the amalgam and bodily fluids, blood, saliva, teeth may be present. This waste should be immersed in a non chlorine disinfectant and covered with a tight fitting lid.
- The non contact amalgam – what the dentist has left over and not used on the patient should also be stored in a separate container for re-cycling.
- If plumbing pipes between the chair and the amalgam separator are replaced the pipe should be capped off at both ends and sent to the recycler.
- Because of the weight of amalgam particles they may settle in the pipe between these two points.

3. Strengthening/Advantage

- The use of amalgam separators greatly reduces the amalgam waste burden in the oceans.
- Figures from the recycler in Australia show that from July to September 2018,
- 1,021 kg. of amalgam sludge was collected in 671 ISO 11143 certified Amalgam Separators and from this sludge 382 kg. of mercury was extracted.
- Furthermore 5.1 kg. of contact amalgam was collected and 1.8 kg. of mercury was extracted.

4. Applicability

The technology of amalgam separators has been in use for around 30 years and the separators are widely used In Europe.
As a participant in the East African Dental Amalgam Phase Down Project, I supplied a sedimentation type of separator that relied on gravity feed, not electricity.
Some of the models are computer driven and not suitable where power outages may occur.
Discussions with waste collectors and mercury recyclers are very important in the beginnings of such a program as this.
A plan on the handling of the waste should be in place.

5. Further information

- Contact information
- Mrs Pam Clark, AO
- IDM Ambassador,
- Cattani Australia Pty Ltd,
- 280 Dundas Street,
- Thornbury 3071
- Australia.

- https://cattani.com.au/products/amalgam-retention
- E-mail pam@cattani.com.au
- Phone + 61 403244456

Mekatronika Ambiental

Last Update: March, 2022

Tags: separation, recovery, mercury product waste, engineering design, fluorescent lamps, oil waste

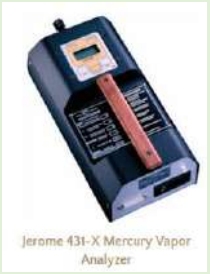
1. Profiles

Mekatronika is a company legally established in 2007, located in the Santivañez Industrial Park in the department of Cochabamba - Bolivia. It is observed and recognized as a Green company, for its scientific and technological contributions in the processing of waste containing mercury (Swisscontact). Winner of a national award for excellence in 2017, in the green entrepreneurship category.
Mekatronika has on-site mercury waste treatment equipment, as well as processes for converting mercury into artificial cinnabar. Since 2017, Mekatronika has developed its equipment and adsorbents for the treatment of mercury waste.

2. Overview of technology/product/service provided

The process is divided into the following stages:

- Survey of the place and/or warehouse
- Waste inventory, identification, type, etc.
- Collection of the material to be treated (waste)
- Reduction by grinding controlling mercury vapors through filtration systems
- Waste decontamination system in a vacuum reactor
- Automatic condensation system for mercury recovery
- Gravimetric processes for the separation of glass, brass, plastics from the decontaminated waste


Jerome 431-X Mercury Vapor Analyzer




3. Strengthening/Advantage

Mekatronika has been present in the Bolivian market for more than 14 years. With vast experience in R&D, calculation, design, equipment manufacturing and industrial plants in the recycling area. These capacities were added to start a new business division called Mekatronika Ambiental, which through the technology developed is capable of processing and recovering 100% of the waste that contains mercury.
Mekatronika manufactures its adsorbents, which after a validation process are currently being used in all its processes.
Advantages of our processes

- All mercury waste streams can be treated.
- Waste collection service and monitoring of areas contaminated with mercury.
- Decentralized treatment of mercury waste, as required since Mekatronika has mobile equipment.
- Total transparency in waste management, through an automated information management system for continuous traceability, ensuring the client a real-time verification of the process.
- The processing system through a high vacuum and high-temperature reactor guarantee a safe process.
- Best Available Technology (BAT).
- Complies with all national and international occupational safety standards and environmental regulations.

4. Applicability

Currently, our technology/service has not been introduced or used in developing countries. But now we are in a position to do so since it can be easily adapted to different requirements and or capacities. Focused on developing countries due to their cost/benefit. Through agreements for the transfer of technology or export of equipment and procedures.

In situ reduction process, San Cristobal Mining, Potosí - Bolivia
https://drive.google.com/file/d/1zE1X3M8R68HWcpF7f-Vi19-bjPkWxm1u/view?usp=sharing

5. Further information

https://www.facebook.com/maquinariaindustrialcbba

Contact information

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If you have any question, feel free to contact us!

Nomura Kohsan Co., Ltd

Last Update: March 1 2022

Tags: stabilization, solidification, recovery, disposal, product waste, oil & gas

1. Profiles

Head Office :1-3, Nihonbashi Horidomechou 2-chome, Chuo-ku, Tokyo, 103-0012 Japan
Itomuka Plant : 271-1, Fujimi, Rubeshibe-cho, Kitami-shi, Hokkaido, 091-0162 Japan
Kansai Factory : 2-4-143 Nakajima, Nishi-Yodogawa-ku Osaka-shi, Osaka, 555-0041 Japan

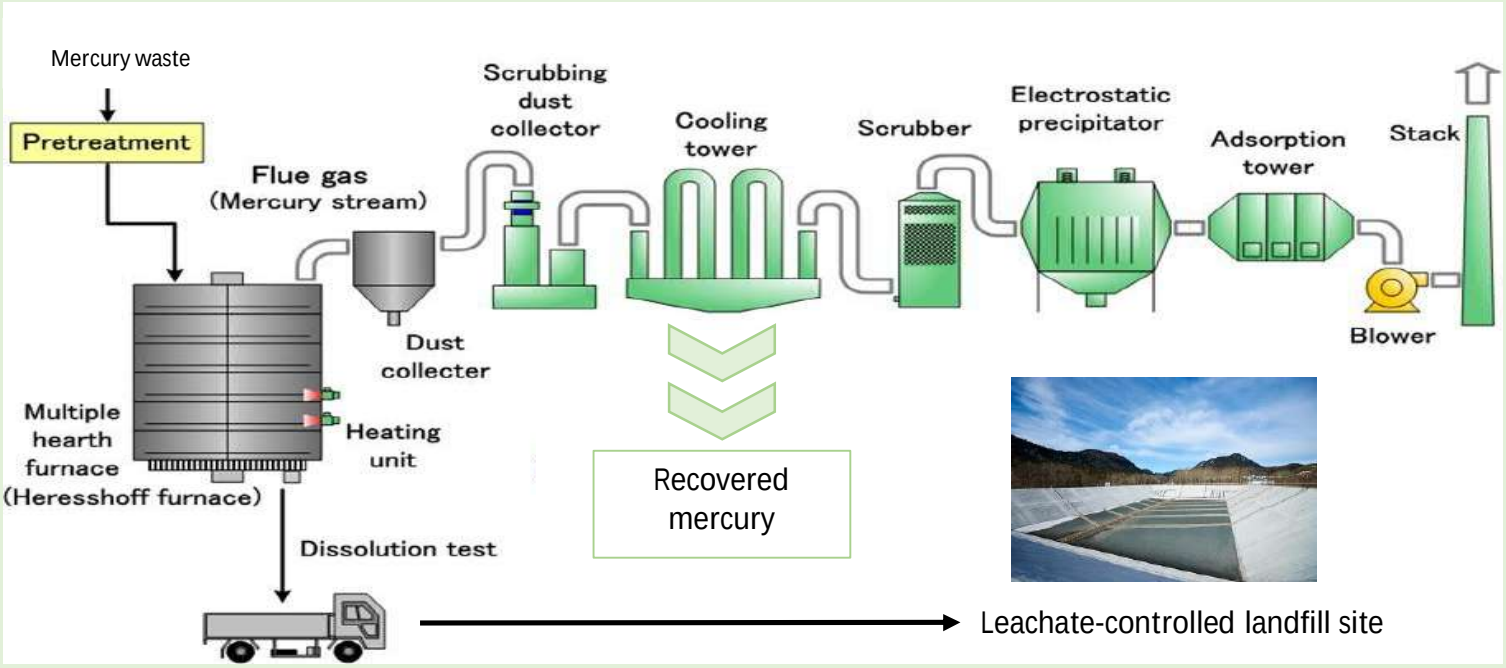
History:

1973	Nomura Kohsan Co., Ltd. was established
1974	Nomura Kohsan started mercury waste management business
2002	Nomura Kohsan started to treat mercury wastes from abroad under the Basel Convention.
2014	Nomura Kohsan joined the Waste Management Partnership and the Supply and Storage Partnership of the UNEP GMP. Nomura Kohsan signed a MOU with UNIDO

Our businesses
- Collection, transportation and disposal of mercury waste
- Recycling, including the production and sales of raw material
- Measurement certification and analysis business

2. Overview of technology/product/service provided

At Nomura Kohsan, we treat mercury wastes through a roasting process. Mercury wastes are heated at a temperature of around 600℃ to 800℃ in order to evaporate the mercury. The evaporated mercury then flow into the exhaust gas channel and be collected in the scrubber and cooling tower. In order to prevent the remaining mercury from discharging into the atmosphere, the plant is equipped with a mercury absorber at the final stage of the process. After roasting, we safely manage residues at our leachate-controlled landfill site.



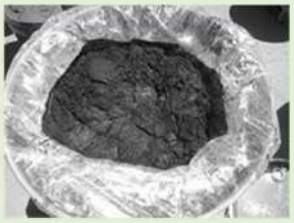
3. Strengthening/Advantage

Any and all types of mercury wastes covered

Fluorescent lamp, Dry Cell Battery, Sphygmomanometer, Catalyst, Activated carbon, Oil sludge etc.







Stabilization and Solidification

Nomura Kohsan has established a safe and reliable way to produce mercury sulfide(HgS) using the mechanochemical reaction. HgS is very stable with very little risk of volatilization and elution of mercury. Dissolution tests conducted on mercury sulfide produced using this method have shown less than o.oo5mg/L. Additionally in order to minimize mercury from coming into contact with the environment and reduce the risks of mercury sulfide converting into other forms, HgS is solidified. This is an important barrier that prevents mercury release to the environment. The solidified HgS will be dispose in leachate-controlled final landfill site.

4. Applicability

Developed the collection scheme for used fluorescent lamps in the Philippines

Export to Japan

Nomura Kohsan has installed an intermediate fluorescent lamp processing system for local company. By working hand in hand with local company who crushes the lamps on their premises, this system will reduce inefficiencies by only requiring the remaining mercury waste to be sent to Japan for final treatment.

5. Further information

CONTACT INFORMATION

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Email :info@nkcl.jp
Home Page :http://nkcl.jp

If you have any question, feel free to contact us!

REMONDIS QR

Last Update: March 2021

Tags: recovery, disposal, stabilization, distillation, Basel export license

1. Profiles

REMONDIS QR is the REMONDIS Group's expert for safe disposal of metallic mercury and mercury containing wastes.

REMONDIS® WORKING FOR THE FUTURE

The REMONDIS Group is Europe's biggest family-owned wastemanagement company with over 36,000 employees and nearly 1.000 business locations.

REMONDIS QR commenced its operations in Germany in 1989 and is waste management partner for chemical industry as well as for multi-national oil & gas explorers and mining companies. REMONDIS QR operates two plants in Germany, both equipped with an excellent logistical infrastructure and direct access to European shipping ports.
With its longstanding experience and know-how REMONDIS QR is the partner for trans-frontier waste shipments of metallic mercury and mercury containing waste – from nearly all places of the world.

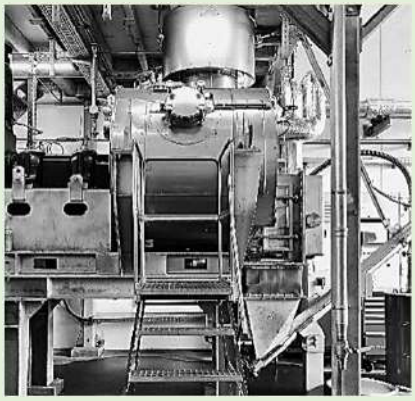
2. Overview of technology/product/service provided

REMONDIS QR is specialised in disposing of two types of mercury waste:
1) metallic mercury (Hg)
2) mercury containing waste



Mercury containing waste – such as spent catalysts, activated carbon, soil and sludge – is being distilled in our rotary kiln. By heating up the waste in the kiln, the mercury is being transformed into gas phase and removed from the waste. Later the recovered mercury is being converted into mercury sulfide (HgS) in our vacuum mixer and finally disposed of in a German underground mine. We also accept and transform metallic mercury directly into HgS in our REMONDIS QR plant, in Dorsten.


rotary kiln


vacuum mixer (Hg → HgS)

REMONDIS QR assists with application for export license under the Basel Convention and provides special containers for transport and short-term storage of metallic mercury. REMONDIS QR of course complies with all current laws and regulations – such as German Waste Law, European Mercury Regulation, Minamata Convention as well as Basel Convention.

3. Strengthening/Advantage

REMONDIS QR is Mercury waste management "Made in Germany" - committed to stringent safety and environmental policies.

REMONDIS QR offers an all-in package for waste producers – "collect waste local – dispose of central"

REMONDIS QR does not set any quantity limits – we care about smallest amounts as well as several hundred tons of waste. Our approved storage capacity is bigger than 4.000 tons.

REMONDIS QR has reliable partners - mobile field service teams for on-site-projects as well as proven shipping companies and ocean carriers.

4. Applicability

REMONDIS QR is a waste management specialist and a complete-service provider. In most of the world's countries metallic mercury and mercury containing waste only occurs in smaller amounts – mostly not on an regularly basis.

REMONDIS QR is serving several customers and handling successfully projects with less quantities and in the world's inhospitable areas such as Central America, the MENA region and South-East Europe.

REMONDIS QR promotes Mercury waste management "out of sight, out of mind" – the waste producer and its country can co-benefit and rest assure: the mercury waste is neither longer in the country any more nor being handled there. It will be "Disposed of in Germany".

5. Further information

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46282 Dorsten

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+49 (0) 2362/ 60 70 – 25

www.remondis-qr.de

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Bei der Gasanstalt 9
23560 Lübeck

TerraCycle Regulated Waste, LLC

Last Update: March 2021

Tags: separation, recovery, product waste, fluorescent lamps

1. Profile

TerraCycle Regulated Waste (TCRW) has a mission to develop tools and services that are easy to use, save money, are environmentally protective and produce effective results. Currently we work out of our offices located in Trenton, NJ and Lisle, IL.

TCRW is a result of TerraCycle Inc's acquisition of the AirCycle corporation in 2017. AirCycle was founded in 1978 and since then has been providing various storage and recycling solutions for regulated waste.
Currently we have over 12,000+ Bulb Eaters® in use world wide and since 2017 we have sold over 150+ units internationally.

2. Overview of technology/product/service provided

Currently, our most noteworthy product is our Bulb Eater ® The Bulb Eater® 3L is the latest generation of the Bulb Eater®. The award-winning fluorescent lamp crusher helps facilities save time, space, and money over other bulb disposal solutions. We also provide mail back programs and bulk – recycling pick up services domestically. Our EasyPak™ recycling containers provide a safe and easy way to recycle fluorescent bulbs, batteries, ballasts sharps and electronics. Our boxes utilize VaporShield® technology that contains the release of mercury vapor should the contents break. Customers order the containers, fill them with their items and then send them back to be recycled

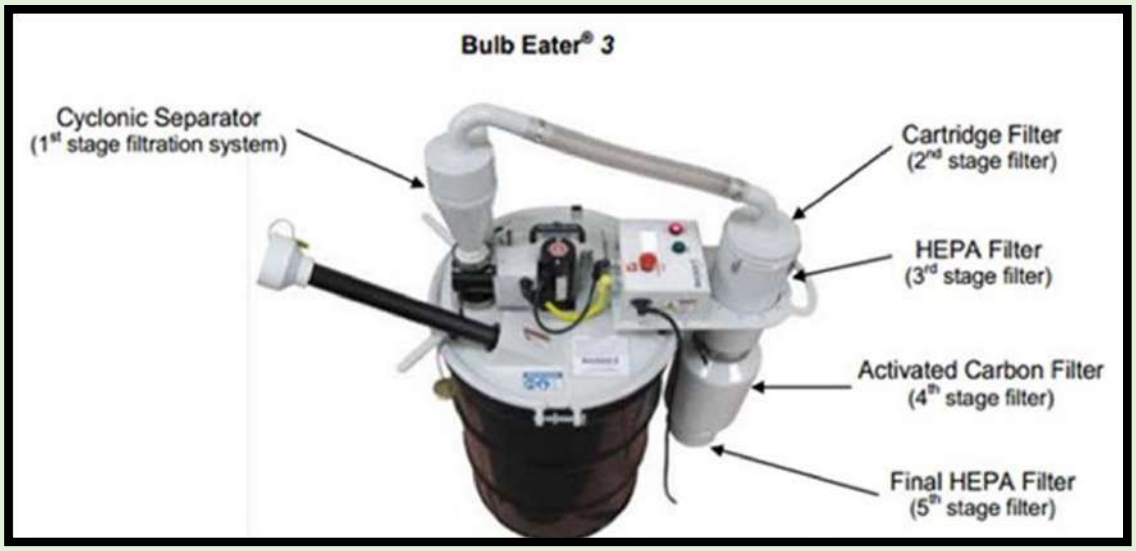
We currently offer our Bulb Eater ® internationally however we still have yet to develop our serviced based solutions outside of the US. As a result, we are interested in and actively pursuing new partnerships that may allow us to do so.

3. Strengthening/Advantage

SAFETY – 99.99% of vapors , including mercury vapor emission, are captured with our system. Our highest quality HEPA filter works in conjunction with an activated carbon filter that neutralizes the mercury vapor released during crushing. REDUCE STORAGE & HANDLING – Minimize storage space by up to 80% by using the lamp crusher and crush up to 1350 T8 4' per 55 – gallon drum. By handling all the spent bulbs at once, facilities can save up to 20 hours of labor per 1000 lamps by crushing rather than boxing the lamps! COST SAVINGS – Save up to 50% on recycling costs. By pre-crushing lamps facilities are able to save money on their recycling costs. Savings can reach up to 1$ per lamp.

How it works:

- One size entry tube fits all lengths and diameters of linear lamps
- Powerful DC motor crushes lamps which are then filtered and sealed in drum
- 4– stage filter system (5 stage in 3® model) collects vapors
- Sensors detect when drum is full and prevent further crushing



4. Applicability

TCRW has a global market and we are constantly looking to develop our operations around the world. We have currently sold our Bulb Eater ® technology into a variety of locations including, Suriname, Ethiopia, India, Malaysia, Panama, Trinidad and Tobago and many other countries.

Our technology is well suited for use in the developing world because it is easy to use and provides a quick and simple solution to safely storing fluorescent lamps in an environmentally friendly way. Each unit sold increases the likelihood that mercury from spent fluorescent lamps will be contained and recovered in an environmentally sound manner rather than disposed of in a landfill and subsequently released into the environment. We currently plan on expanding our collaboration with the UN and we hope to work with its various initiatives.

There are numerous UN procurement opportunities we hope to be a part of. One initiative we are particularly keen on collaborating on is the United for Efficiency initiative aimed at implementing a broader use of LED's as a lighting source and standard in developing nations. As a result, a safe and environmentally friendly solution for the end of life management of spent fluorescent lamps is required and we hope to work with the UN and be a part of this solution. Additionally we hope to continue our participation in the Global Mercury Partnership to find solutions to safely handling and storing mercury around the world.

5. Further information

- For more information please visit our websites at:
- AirCycle: https://www.aircycle.com/
- TerraCycle: https://www.terracycle.com/en-US/
- International Distributors: https://www.aircycle.com/international-distributors/
- General Manager: Joe Day -- Joe.Day@terracycle.com

Related Technologies and Services

CURIUM

Last Update: February 2024

Tags: dismantling, decontamination, engineering design, monitoring, contaminated sites, chlor-alkali

1. Profiles

CURIUM is a French company founded in 1994, specialized in the management of hazardous products and wastes. CURIUM works with toxic, corrosive, flammable, explosive, radioactive, and infectious substances.

We deploy a wide range of services for projects involving chemical and radiological risks:

- Technical studies, Consulting;
- Project Management: specifications drafting, site supervision with a focus on Health & Safety procedures;
- Contamination analysis of production and research units, equipment, processes;
- Works on site: remediation, decontamination, gas transfer, hazardous waste management;
- Chemical emergency response team to intervene 24/7.

CURIUM's expertise includes contamination assessment and decontamination operations, as well as project management for large-scale operations (dismantling, demolition, remediation) for industries using mercury. CURIUM is involved in mercury decontamination and chlor-alkali mercury cells dismantling in Europe and Africa.

2. Overview of technology/product/service provided

MERCURY CONTAMINATION DIAGNOSTICS

The contamination diagnosis is the first essential step before the start of the works. It allows to map the presence and quantity of liquid mercury and vapours on surfaces and/or within a process, in order to determine the most appropriate decontamination methods. The contamination diagnosis includes:

- Evaluation of the contamination on surfaces, in ducts, HVAC, and extraction systems,
- Definition of a decontamination process appropriate for mercury,
- Decontamination validation protocol for all areas.

MERCURY ELECTROLYSIS DISMANTLING

CURIUM has experience in providing support to industrial clients for the dismantling of facilities and processes using mercury, such as mercury electrolysis plants. Our services include:

- The contamination diagnostics;
- Selection and management of subcontracting companies;
- Liquid mercury repackaging, transport and disposal.

3. Strengthening/Advantage

CURIUM's personnel regularly undergoes state-of-the-art training on the use of portative devices to measure mercury vapours and surface mercury contamination.

After complete contamination diagnosis performed by CURIUM, a detailed report is issued to the client presenting the mapping of the contamination and indicating:

- The contaminated areas,
- The contamination levels,
- The threshold to reach to validate the non-contamination.

Based on this report, appropriate decontamination methods are defined. The decontamination operation can then be performed by CURIUM's experienced chemists.

When decontamination is not possible, CURIUM suggests appropriate hazardous waste treatment facilities. CURIUM has an index of all mercury treatment facilities in the world.

Point n°	Mercury vapour measurement results (µg/m³)	Mercury Vapour measurement results (µg/m³)	Picture	Comment
1*	77 at first >1000 after	18 at first		A number of small mercury droplets presence (visible)
2	2	<2		
3	8	2		Probably mercury droplets presence (not visible)

Example of excerpt from contamination report delivered by CURIUM

4. Applicability

CURIUM's contamination diagnosis is relevant in case of:

- Chemical spill or accident involving mercury
- Laboratory or production equipment transfer
- Dismantling operations
- Soil contamination
- Management of radioactive waste containing mercury

We intervene for the following industrial sectors:

- Pharmaceuticals
- Chemicals
- Semiconductors
- R&D centers

Our application areas include but are not limited to: production processes, laboratories, cleanrooms, HVAC systems, laboratory equipment (hoods, autoclaves, etc.), pipework and other networks.

5. Further information

Further details and additional information can be found at www.curium.world
You can send your enquiries to :
contact@curium.world
Phone: +33 (0)4 72 90 95 09

SICK AG

Last Update: March 2021

Tags: reduction, removal, adsorbent, mercury compounds, engineering design, monitoring

1. Profiles

- SICK is a leading manufacturer of intelligent sensors and sensor solutions for industrial applications. The company was founded by Dr. Erwin Sick more than 70 years ago.
- Today SICK has more than 9000 employees and over 50 subsidiaries worldwide. The company has extensive experience in various industries and understand the processes and requirements.
- Our devices are used for emission monitoring as well as for monitoring the effectiveness of pollution abatement systems. We have installations of continuous Mercury monitoring systems in over 40 countries around the world.
- Our contribution to the UNEP Global Mercury Partnership is our expertise in continuous on-line monitoring of gaseous mercury compounds. We support with training, consulting and wherever possible providing data for use in minimizing gaseous Mercury emissions.

2. Overview of technology/product/service provided

The MERCEM300Z extractive gas mercury analyzer monitors total Hg in flue gases.

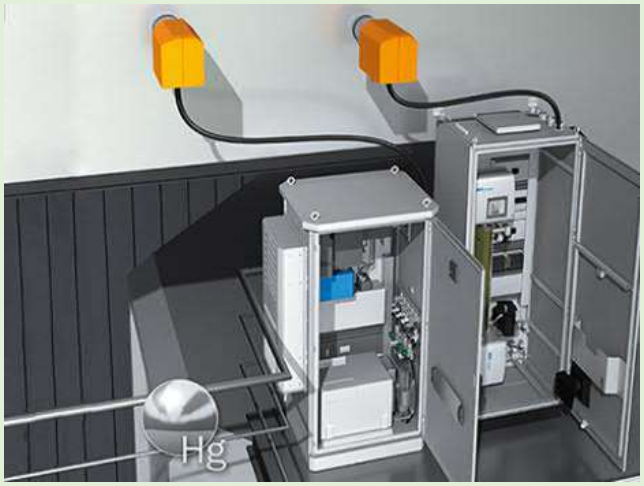
- Applications include:
  * Emissions monitoring in flue gas from Waste incineration plants, in combustion of sewage sludge or hospital waste.
  * Flue gas monitoring upstream of a scrubber or flue gas treatment, to aid in the control of Mercury abatement systems.

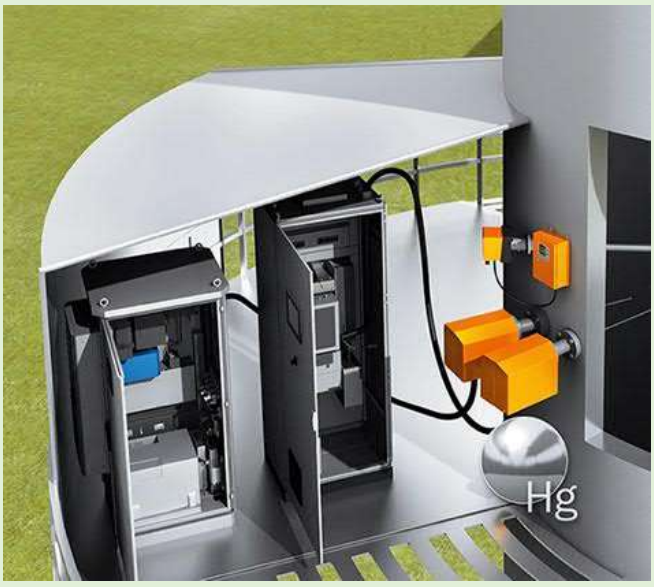
3. Strengthening/Advantage

- Advantages of the MERCEM300Z include:
  * Reliable results for the actual measured values of elemental and chemically bound Hg in gases
  * Measuring ranges from 0 – 10 µg/m3 up to 0 – 1000 µg/m3 without any change of hardware
  * Smallest certified measuring range of 0 – 10 µg/m3 compliant with the newest regulations
  * Rapid response can be used for control purposes especially with rapid variation of concentration values
  * Measuring operation without using consumables for ease of use
  * Extremely low operating cost
  * Self-adjusting gas analyzer provides high long-term stability with low maintenance
  * Convenient, quick access for easy service and user-friendly remote diagnostics

4. Applicability

The MERCEM300Z has been installed in 40 countries around the world especially in Europe but also in Asia and America. The MERCEM300Z has most recently been installed in Indonesia and India to comply with the emission limits from coal fired power plants in those countries. Local service technicians perform the start-up services and can help with initial field calibration and periodic maintenance of the systems.





5. Further information

For more information about SICK AG and to find your local contact, please visit SICK.com

- https://www.sick.com/de/en/contact/worldwide
- https://www.sick.com/de/en/gas-analyzers/extractive-gas-analyzers/mercem300z/c/g175658

SICK
Sensor Intelligence.