BASEL CONVENTION

Technologies for environmentally sound mercury recycling and recovery of mercury-containing electrical and electronic equipment in the Russian Federation

Case study

Based on the information presented at the Regional workshop on enhancing capacities for the environmentally sound management of waste electrical and electronic equipment through the regional delivery in Eastern Europe and Central Asia, Bishkek, Kyrgyzstan, 6—8 July 2016

Background

The Russian Federation has recently introduced a system for collection and disposal of mercury-containing wastes. Among the key features of this system are the active engagement of the private sector and strengthening of the regulatory and legal framework. The objectives of the system are to reduce the mercury releases into the environment and ensure the environmentally sound disposal of mercury-containing waste, which are significant steps towards the implementation of multilateral environmental agreements, such as the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal and the Minamata Convention on Mercury.

To date, there are 92 enterprises in the Russian Federation that are equipped to recovery mercury contained in lamps. The recovered mercury is then transferred to specialized facilities for further recycling with the objective of producing commodity metallic mercury. However, as an example, no more than 40% of one lamp would reach factories for mercury recovery. Moreover, very little is collected from households: the share of lamps received does not exceed 2%. As much as 36 million lamps[1] end up in landfills — they contain more than 2,400 kg of mercury, and about 7 million medical and industrial thermometers — containing approximately 14,000 kg of mercury.

The **Federal Law on Production and Consumption Waste** requires each province (or region) in Russia to have developed a regional

[1] These are often low-pressure mercury lamps which contain between 40 and 120 ml of mercury.

system and programme on waste management by September of 2016. The Russian Federation Government Decree № 197 of 16th March 2016 specifies the requirements for such systems. There are ongoing discussions regarding the main technologies to be employed in these systems.

As of June 2016, 25 categories of electronic and electrical wastes have been registered in the Federal Waste Classification Register, including non-functioning accumulators and batteries as well as 28 types of mercury-containing wastes, rated according to their hazard-level.

Partnership on mercury recycling and recovery in Russia: objectives and key activities

There is a non-profit partnership for mercury recycling and recovery in Russia called the "Association of Enterprises for Handling of Mercury Containing and other Hazardous Wastes" (ARSO) established in Moscow in May 2012.

The overall goal of ARSO is the prevention and elimination of mercury contamination and any other types of pollution and the environmental safety of Russia. Its principal objectives are to coordinate activities of enterprises engaged in recycling and recovery of mercury containing wastes and other hazardous wastes, including the development and manufacturing of de-mercurizing and other technologies for environmentally sound management of mercury, de-mercurization drugs and mercury analyzers. ARSO also seeks to provide support to organizations and entrepreneurs engaged in regulatory, technical and methodological activities to address challenges and to create optimal conditions for the development of the national industry related to the management of mercury-containing and other hazardous wastes.

Member organizations of the partnership have the capacity to process, recover and dispose of almost all kinds of mercury-containing wastes: various types of mercury lamps, mercury-containing devices and equipment, the breakage of mercury lamps and mercury thermometers, secondary mercury and commodity mercury (expired), mercury compounds and mercury-contaminated soils, materials and products, and others.

Members also undertake such activities as collection, transport, recycling and disposal of other types of wastes, such as medical and bi-

ological waste, office equipment waste, household appliances and electronic equipment, solid municipal waste, and others.

A number of member organizations specialize in design and manufacture of de-mercurization plants, waste containers, de-mercurization articles, as well as the production of secondary mercury, various mercury compounds and extra pure grade mercury. They conduct environmentally sound planning and environmental assessments and develop technical, analytical and awareness raising materials on environmentally sound mercury management.

The members of the association often serve as the main service providers for mercury waste management in the regions where they are located.

ARSO's activities

Enterprises which participate in ARSO have developed various efficient and environmentally friendly de-mercurization products and technologies, which have found their practical application in the elimination of mercury contamination in various facilities. The areas which are annually de-mercurized across Russia extend across a number of square kilometers.

De-mercurization installations which are designed and manufactured by these enterprises were supplied to the Ministry for Civil Defense, Emergency Management and Natural Disasters Response of the Russian Federation, medical and education institutions as well as specialized laboratories. Special de-mercurization kits were developed for the general public and they are already in demand. Such kits are designed to eliminate mercury contamination in the case of mercury thermometer breakage, and/or for removing mercury contamination of atomic mercury from the phosphor as a result of the destruction of fluorescent lamps in offices, schools, in hospitals or at home.

In recent years the partnership has focused on the collection of mercury-containing wastes from households, in particular end-of-life energy-saving fluorescent lamps used by consumers. The volume of such wastes is continually growing. In the past two - three years, the market for such lamps in Russia was estimated to be 50-60 million units a year.

The above-mentioned activities are carried out in close cooperation with regional, city and municipal authorities. For example, in Moscow, approx. 1,300 mercury lamp-collecting points were established with support of the company "Ecotrom". In Vladivostok, a project "Proper disposal" was launched by the Environmental Protection Office of the Vladivostok municipality with support of the company "Primtekhnopolis". Now the capital of region Primorye is equipped with collection points for end-of-life mercury lamps, thermometers and batteries. Similar activities are carried out in other regions, including mobile stations for collection of end-of-life mercury lamps from consumers.

ARSO developed and published "Guidelines for collection of used and end-of-life energy-saving fluorescent lamps from consumers", in which the importance for separate collection and subsequent disposal of end-of-life mercury lamps was highlighted. The guidelines set out the

method to determine the volume of used fluorescent lamps per year and described legal and regulatory framework required for the effective collection of used and end-of-life mercury lamps.

Technologies for environmentally sound mercury recycling and recovery

Enterprises of the partnership employ domestic technologies for decontaminating mercury-containing wastes. One of them is an installation "Ecotrom-2" which is an effective, energy efficient and environmentally sound technology for the recycling of fluorescent lamps. "Ecotrom-2" has the capacity of recycling and disposal of up to 85% of end-of-life fluorescent lamps collected from the Moscow region or above 10 million units per year. It is also used in other cities across Russia as well as in other countries, such as Belarus, Poland, and Ukraine. A new version of "Ecotrom" is currently being developed.

Another widely used installation is the small-sized "URL-2m" used for recycling and recovery of a broad range of mercury containing wastes. This installation is used in many Russian cities as well as in other countries, including Colombia, Latvia, Poland, and South Korea.

Of particular practical interest is the combined use of "URL-2m" and "Ecotrom-2" installations. Their availability and practicality allows for the use of entirely domestically-produced technology.

The member organizations of the partnership also develop, produce and use containers serving for the collection, temporary storage and transportation of various types of mercury-containing wastes. The transportation of wastes to the location of their recycling and disposal is carried out by specialized transport which fully meets the requirements of existing national and international road safety requirements.

Laboratory units located at the Enterprises of the partnership are equipped with domestic mercury analyzers, including analyzers of widely used "Lumex". Each year, the members of the partnership in different cities examine tens of thousands of square meters of premises and facilities for mercury contamination. For example, in the Saint Petersburg and Leningrad regions, 2,000 square meters of premises are monitored annually; and in Moscow annual monitoring amounts to more than 13,000 square meters.

***

One of the leading enterprises in recycling mercury-containing wastes in the Russian Federation, acting as a member of ARSO, is LLC "Merkom". It was founded in 1992 on the basis of a scientific research institute (Lytkarino). Annually it produces roughly 5 to 20 tons of commodity mercury, mainly for the production of lamps and chemicals manufacture in the Russian Federation.

Each year, Merkom neutralizes 300,000 to 600,000 lamps; 8 to 10 tons of industrial waste arising from the production of thermometers, mercury switches, medical blood pressure monitors, ignitrons and other devices; and up to 20 tons of solid waste containing mercury. Mercury recovered from waste supplies the production of commodity mercury. Between 1992 and 2015, Merkom produced and sold 253 tons of commodity mercury.