Project description

Background

Electricity generation has left a problematic environmentally legacy in the form of polychlorinated biphenyls (PCBs), which were widely used as coolants in transformers and dielectrics in capacitors until they were banned in most jurisdictions in the 1970s and 1980s. Between 1929 and 1989, total world production of PCBs (excluding the Soviet Union) was 1.5 million tonnes - an average of about 26 000 tonnes a year. Even after the US banned the manufacture, sale, and distribution of PCBs except in "totally enclosed" systems in 1976, world production continued at 16 000 tonnes per year from 1980-1984 and 10,000 tonnes per year from 1984-1989.

PCBs are persistent organic pollutants that bio accumulate and are linked to negative reproductive and immunotoxic effects in humans and wildlife, amongst other environmental problems. The value of PCBs derives from their chemical inertness, resistance to heat, non-flammability, low vapour pressure and high dielectric constant. PCB-filled electrical equipment needs to be decontaminated so that it can be re-used. Waste oil from electrical equipment also needs treatment, as do other contaminated waste types such as capacitors, soil, debris and textiles.

Objectives
The project aimed to develop a technology that could decontaminate PCB transformers for subsequent re-use, independent of their original PCB content. Such technology would significantly reduce the volume of hazardous waste for disposal; protect nature from damaging pollution by allowing the rapid replacement of dangerous chemicals (PCBs) with safe alternatives, and save resources by extending the lifetime of existing equipment.

The technology was to be based on a proven technology already used by Envio Germany and ultimately transferred to Poland and Greece who would pilot the technology by installing a small-scale semi-mobile facility in each country.

Results

Three of the four project goals were achieved: a) The development of a technology to decontaminate PCB transformers for re-use b) The demonstration of a technology capable of decontaminating other PCB containing equipment and waste c) The significant reduction of the volume of PCB waste, along with the replacement of PCBs with safer alternatives.

The fourth goal, the installation of small-scale semi-mobile pilot facilities in Poland and Greece as part of the technology transfer aspect of the project, could not be achieved within the timeframe of the project.

The German plant is currently running at full capacity, after the completion of the LIFE project.

The new technology, LTR², permits the decontamination of a large number of PCB transformers without disassembly, allowing their subsequent re-use. All process steps are performed in closed-circuit operation. PCB-free transformers are prepared for re-use by draining (separation of PCB liquid and solid parts, which are then treated by sodium de-chlorination or alternative processes) and the decontamination of solids (rinsing with cleaning fluid and drying). These steps are followed by the recovery of the cleaning fluid (extraction of PCB liquid by distillation) and the de-chlorination of PCB liquid (cleavage of C-Cl bond and formation of NaCl and polymers).

For technical reasons, however, the replacement of old transformers may be advisable, meaning that not every PCB transformer should be returned to service. For transformers that need to be disposed of, LTR² is one of the safest and most efficient technologies available to date.

The typical cost of replacing one 630kVA transformer (a small to average-sized transformer) using the conventional process is €8 500 (€3 000 for disposal, €500 for transport to the disposal facility and €5 000 for a new unit), whereas the total cost under the LTR² process is approximately €4 000 (€3 000 for decontamination and €1 000 for maintenance and re-filling with fresh oil). The technology thus cuts replacement costs by more than 50%. The investment costs of a facility employing LTR² technology are moderate, meaning that commercially viable plants can be erected and operated even in those countries (or regions) that dispose of PCB equipment in quantities of no more than several thousand tonnes.

The technology can be applied in semi-mobile facilities, so that it can be
deployed in different regions or countries, thereby minimising the need for transport and associated costs even further. Thus, the new LTR² technology could be used to phase out PCB equipment at a much lower cost than solutions involving the transport of PCB waste abroad. Beyond the PCBs, there are other environmental benefits: resources needed for the manufacture of a new transformer are saved, and the solvent in the LTR² plant is also re-cycled within the process.

The first foreign implementation is due to take place in Korea. Construction started in October 2007, with full operation expected from early 2008 onwards.

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Environmental issues addressed:

Themes

Industry-Production - Electric - Electronics - Optical Waste - Hazardous waste

Keywords

electrical industry, hazardous waste, decontamination, alternative technology

Target EU Legislation

- Waste

Natura 2000 sites

Not applicable

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Beneficiaries:

Coordinator Envio Recycling GmbH & Co. KG
Type of organisation International enterprise
Envio Germany GmbH & Co. KG – Envio Germany (the German subsidy of Envio Group) is a provider of recycling services for PCB-free transformers. The company has successfully decontaminated or recycled more than 30,000 transformers at its treatment facility in Dortmund, Germany and has also carried out decontamination and clean-up projects worldwide. Envio provides comprehensive elimination and replacement packages including such services as disposal, delivery, logistics and project management.

Partners

SARP Industries, France

Administrative data:

- **Project reference**: LIFE04 ENV/DE/000041
- **Duration**: 01-MAR-2004 to 30-OCT -2008
- **Total budget**: 4,896,464.00 €
- **EU contribution**: 853,939.00 €
- **Project location**: Nordrhein-Westfalen(Deutschland) Attiki(Ellas) Associated Poland (PL)(Poland Polska)

Read more:

- **Project web site**: Beneficiary's webpage (DE)