

environment briefing04

polychlorinated biphenyls (PCBs)

Introduction

PCBs are a class of organic man-made chemicals which were used extensively in a wide range of products because they are chemically inert, stable at high temperatures and flame resistant. They accumulate in the fatty tissues of animals and humans via the food chain and toxic effects have been reported in wildlife.

Because PCBs are fire-resistant, they've been used widely in electrical equipment as fluids in electrical capacitors and specialised transformers. In the past, they've also been used in some wire/cable coatings and in insulation. Using PCBs to make these products is now banned.

Effects of PCBs on the Natural Environment

PCBs evaporate very slowly and they do not readily mix with water. Nevertheless, they have dispersed widely through both atmospheric processes and watercourses and trace amounts are found in soils and oceans throughout the world. Whereas their stability was a welcome feature for industrial use, their resistance to degradation means that they have accumulated in the environment and their presence will persist long after their use has been phased out.

PCBs are toxic to fish and other aquatic organisms. Reproductive and developmental problems have been observed in fish at low PCB concentrations with the early life stages being most susceptible. There is growing evidence linking PCBs and similar compounds with reproductive and immunotoxic effects in wildlife.

The ability of PCBs to persist in the environment and to travel long distances through the atmosphere, together with their ability to concentrate through the food chain and exert toxic effects on wildlife and humans has made them a matter of global concern and legislation has been introduced both to prevent further use and to phase out existing use.

Legislation

From the early 1970s the use of PCBs was progressively restricted in the UK. By the end of 1972 sales of PCBs for open applications were discontinued and sales of UK manufactured material ceased in 1977.

The main legislation relating to the phase out and disposal of PCBs is The Environmental Protection (Disposal of Polychlorinated Biphenyls and other Dangerous Substances) Regulations 2000.

The regulations are mainly aimed at people who have PCB contaminated equipment. There are four main legal requirements around PCBs:

- registration
- labelling
- disposal
- decontamination

PCB-contaminated equipment is any equipment which contains, or might contain unless it is reasonable to assume the contrary, more than 5 litres of PCBs or fluid contaminated by PCBs to 50 parts per million (ppm) (0.005% by weight). All contaminated equipment containing more than 50 parts per million (ppm) and more than five litres of PCB material must be individually registered on an annual basis with the Environment Agency (EA) or the Scottish Environmental Protection Agency (SEPA).

Examples of types of equipment which might contain PCBs have been listed by the EA and SEPA and include:

- Electrical transformers
- Power Factor capacitors
- Heat transfer equipment
- Process heating equipment
- Vacuum pumps
- High temperature hydraulic systems
- Some electrical resistors
- Fluorescent lighting ballasts
- Hospital diagnostic equipment

Implications for the Electricity Industry

A small quantity of contaminant PCB has been found dissolved in the mineral oil in transformers and some other oil-filled equipment. Contamination of the oil may have arisen at the manufacturers, on-site when filling or topping-up with recycled oil or through transporting oil in contaminated tankers.

Comprehensive surveys of PCB contamination have been conducted across the electricity industry. These reveal that most of the contaminated oil has already been removed and only a tiny proportion of small transformers contain levels of PCBs above 50 mg/kg (50ppm). The average level of contamination is around 7 mg/kg, with a maximum of a few hundred mg/kg which amounts to about a tea spoon full.

The UK Action Plan on PCBs (issued by the Government in 1997) allows transformers with a PCB content below 500 mg/kg (500ppm) to remain in service until the end of its useful life. The electricity industry will apply this provision only to small volume units such as distribution transformers.

Inevitably, there are occasional leaks from oil-filled equipment, but the electricity industry has well developed methods for containing any spills and for rectifying any consequent contamination.

Any waste oils, or equipment, contaminated with PCBs are disposed of by approved methods to sites authorised by the EA or SEPA. The normal precautions for handling hazardous waste are taken when transporting material containing more than 50 mg/kg (50ppm) PCBs.