



## **MUNICIPAL SOLID WASTE INCINERATION**

### **Introduction**

The Health Protection Agency supports Primary Care Trusts and Local Health Boards in their role as 'Statutory Consultees' for the Pollution Prevention Control (PPC) regime. Statutory Consultees are considered to have special knowledge or expertise. Guidance is available at (<http://www.hpa.org.uk/hpa/chemicals/IPPC.htm>).

Municipal Solid Waste Incineration is subject to regulation under Pollution Prevention and Control (PPC sector 5.1) and is likely to be a source of considerable public concern. Consequently the Chemicals Hazards and Poisons Division have produced this position statement on the public health consequences of these processes in order to help inform the debate.

### **Waste Management**

The introduction of the European Union Landfill Directive (1999/31/EEC) will fundamentally change the way waste is managed in the UK, with the most significant requirement being the progressive reduction in the amount of waste permitted in landfill. For example, by 2020 no more than 35% of the amount of biodegradable municipal solid waste produced in 1995 can be disposed of in landfill sites. This may place a greater emphasis on incineration as a means of waste disposal.

### **Pollution potential**

The by-products of the incineration process may contain hazardous or toxic pollutants and emissions will contribute to background pollution levels. Since 1996 there have been significant cuts in emissions from incinerators in order to meet strict European Union legislation. This has led to the phasing out of the older, more polluting plants as new emission and operation standards were introduced. As a result contemporary facilities are substantially less polluting and modern abatement technology will help reduce the hazard from emissions provided that the facilities are properly operated at all times.

The European Union Waste Incineration Directive (often termed 'WID') 2000/76/EC will further reduce the potential to pollute. This was transposed into UK law on 28 December 2002 and all new incinerators already have to comply with the tighter provisions of this directive. Previous existing incinerators have until 28 December 2005 to meet these standards. This new Directive aims to reduce and/or prevent possible negative effects on the environment caused by emissions into air, soil, surface water and groundwater, and thus lessen the risks which these pose to human health. Compliance will mean further significant reductions in the emissions of key air pollutants (such as nitrogen oxides, sulphur dioxide and hydrogen chloride, as well as dioxins and furans). As well as stricter emissions limits, this Directive also requires better management systems and increased monitoring of emissions.



The Waste Incineration Directive will therefore impose stricter operating conditions and emissions standards and so further reduce the potential human health impact. This should ensure that public health effects are unlikely. Pollution Prevention and Control permits will require immediate reporting of breaches of emission standards and the stopping of the waste feed should the abatement technology fail. These requirements will further reduce the potential for incinerators to cause significant pollution.

The incineration process can result in three main sources of emissions, (1) gaseous to the atmosphere, (2) via solid ash residues, and (3) via cooling water. Provided that solid ash residues and cooling water are handled and disposed of appropriately, atmospheric emissions remain the only significant route of exposure to humans.

### **Public Health Impact**

The general public can be exposed to atmospheric emissions associated with incinerators through a number of routes; by direct inhalation and/or by indirect entry via the food chain being of particular importance. (For many pollutants including some of the trace metals, and carcinogenic organic compounds (such as dioxins and furans), the major route of exposure is through the food chain.)

There is no doubt that air pollution (from all sources) can have an adverse effect on the health of susceptible people (i.e. young children, the elderly and particularly those with pre-existing respiratory disease). The adverse effects of airborne particles on health have been established through epidemiological studies and include increases in hospital admissions for both respiratory and cardiovascular disease, increased mortality and, when exposure is over long periods, reductions in life expectancy. There are also less severe but nonetheless important effects, such as increased symptoms in asthma sufferers. Other pollutants may have similar effects.

However, there is little evidence to suggest that incinerators are associated with increased prevalence of respiratory symptoms in the surrounding population. Modern, well-managed waste incinerators will only make a very small contribution to background levels of air pollution. Air-monitoring data demonstrate that emissions from the incinerators are not a major contributor to ambient air pollution. However, the contribution to local pollutant levels should be assessed on a site specific basis.

The Health Protection Agency recognises that there are particular concerns over emissions of dioxins and furans from incinerators. The following opinion on the health effects of these compounds, and of tolerable daily intakes, i.e. the amount that can be ingested daily over a lifetime without appreciable health risk, is informed by the advice of the independent expert advisory Committee on the Toxicity of Chemicals in Food, Consumer Products and the Environment<sup>1</sup>. This Committee has recommended a tolerable daily intake of 2 picogrammes

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<sup>1</sup> Available at <http://www.food.gov.uk/science/ouradvisors/toxicity/>



TEQ/kg body weight/day<sup>2</sup> based on a detailed consideration of the extensive toxicological data available on dioxins and identification of the most sensitive effect, namely, adverse effects on the developing fetus resulting from exposure *in utero*. As this was the most sensitive effect it will protect against the risks of other adverse effects including carcinogenicity. The advice of two other independent expert advisory committees, the Committee on the Carcinogenicity of Chemicals in Food, Consumer Products and the Environment<sup>3</sup> and the Committee on Mutagenicity in Food, Consumer Products and the Environment<sup>4</sup>, informed the conclusion, namely that dioxins do not directly damage genetic material and that evidence on biological mechanisms suggested that a threshold based risk assessment was appropriate.

The majority (more than 90%) of non-occupational human exposure to dioxins occurs via the diet, with animal-based foodstuffs like meat, fish, eggs, and dairy products being particularly important. Limited exposure may also occur via inhalation of air or ingestion of soil depending on circumstances. Provided that strict emissions limits are adhered to, inhalation is not a significant source of exposure for the general public.

Atmospheric emissions are also important through deposition to growing crops and pasture grass from which they can be incorporated into foodstuffs, either directly into edible crops or, indirectly into animals that graze on the pastures. It is therefore possible that people who consume produce from local food-chains within the area affected by emissions from the incinerator could receive a relatively higher exposure. However, current levels of dioxins emissions from incinerators are unlikely to increase the human body burden appreciably as incineration of municipal solid waste accounts for less than 1% of UK emissions of dioxins.<sup>5</sup>

However, dioxins and furans are highly persistent pollutants and we strongly support the Government policy to reduce dioxin exposures further by all practicable means and welcome the stricter emission limits applied under Waste Incineration Directive.

### **Health studies**

Studies in the UK have principally focused on the possible effects of living near to the older generation of incinerators, which were significantly more polluting than modern plant. The Agency has considered studies examining adverse health effects around incinerators and is not aware of any consistent or convincing evidence of a link with adverse health outcomes. However it is accepted that the lack of evidence of adverse effects might be due to the limitations regarding the available data.

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<sup>2</sup> TEQ refers to Toxic Equivalents and is an internationally recognized method for considering the toxicity of mixtures of dioxins and furans based on considering their relative potencies compared to the most potent dioxin (tetrachlorodibenzodioxin, or TCDD)

<sup>3</sup> Available at <http://www.advisorybodies.doh.gov.uk/coc/index.htm>

<sup>4</sup> Available at <http://www.advisorybodies.doh.gov.uk/com/index.htm>

<sup>5</sup> Available at <http://www.defra.gov.uk/corporate/consult/dioxins-two/report2.pdf>



A number of comprehensive reviews on incineration have been published. The Department for Environment, Food and Rural Affairs <sup>6</sup> have recently commissioned a review of the effects of waste management, which was peer reviewed by the Royal Society. Cancer, respiratory disease and birth defects were all considered, and no evidence was found for a link between the incidence of the disease and the current generation of incinerators. It concluded that although the information is incomplete and not ideal, the weight of evidence from studies so far indicates that present day practice for managing solid municipal waste has, at most, a minor effect on human health and the environment, particularly when compared to other everyday activities.

An earlier report by the Medical Research Council's Institute for Environment and Health on the "Health Effects of Waste Combustion Products"<sup>7</sup> also concluded that 'epidemiological studies on people who work at or live near incinerators have shown no consistent excess of any specific disease'.

The Committee on the Carcinogenicity of Chemicals in Food, Consumer Products and the Environment <sup>8</sup> has reviewed a large study by the Small Area Health Statistics Unit that examined 14 million people living within 7.5 km of 72 municipal solid waste incinerators, which operated up to 1987. The Committee concluded that, 'any potential risk of cancer due to residency (for periods in excess of ten years) near to municipal solid waste incinerators was exceedingly low and probably not measurable by the most modern techniques'. We agree with this view.

## **Conclusion**

Incinerators emit pollutants into the environment but provided they comply with modern regulatory requirements, such as the Waste Incineration Directive, they should contribute little to the concentrations of monitored pollutants in ambient air. Epidemiological studies, and risk estimates based on estimated exposures, indicate that the emissions from such incinerators have little effect on health. The Agency, not least through its role in advising Primary Care Trusts and Local Health Boards as statutory consultees for Pollution Prevention and Control (PPC), will continue to work with regulators to ensure that incinerators do not contribute significantly to ill-health.

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<sup>6</sup> Review of Environmental and Health Effects of Waste Management; Municipal Solid Waste and Similar Wastes, published May 2004. Available at <http://www.defra.gov.uk/environment/waste/research/health/>

<sup>7</sup> Available at <http://www.le.ac.uk/ieh/pdf/R7.pdf>

<sup>8</sup> The full statement can be found at <http://www.advisorybodies.doh.gov.uk/coc/munipwst.htm> .