



Briefing : Volatile Organic Compounds

- Under international agreements the UK agreed to a 30% cut in its emissions of VOCs by 1999 with a further cut of 35% by 2010.
- The UK met the 1999 target with VOC emissions of 1744 ktonnes/year, a cut of 34%.
- The oil industry has contributed towards this by:
 - halving the total emissions of VOCs from refineries since 1993;
 - reducing emissions from fuel distribution by 80% over the past decade; and
 - introducing unleaded petrol to enable the use of catalytic converters.
- Unleaded petrol has helped the motor industry halve the emissions of VOCs from road transport over the past decade and these are continuing to decline.

Background.

Volatile organic compounds (VOCs) are a large group of hydrocarbon compounds found in air. VOCs are from a wide variety of sources both natural and man made, including; trees; motor vehicles; solvents; industrial processes; food manufacture; oil refining, storage and distribution.

Effects of VOCs

Most VOCs contribute to the formation of ground level ozone and also make an indirect contribution to global warming. In addition, some of them are toxic or carcinogenic.

Ozone is a strong oxidising agent and at high concentrations it can affect human health. It is also known to damage building materials and adversely effect plant growth. Ozone is not emitted as a pollutant but its atmospheric concentration is raised by a photochemical reaction involving VOCs and oxides of nitrogen.

Air Quality Control Measures.

In order to reduce the emission of VOCs the following initiatives have been introduced.

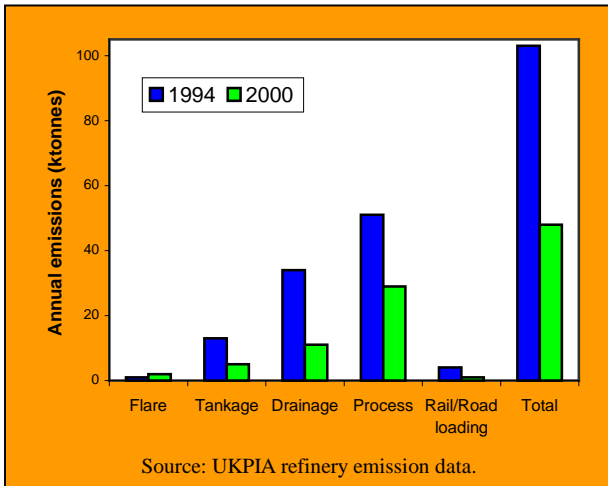
1991 & 1999 UN/ECE Protocols	UK agreed to cut VOC emissions in 1999 to 1848 kilotonnes/year and to 1200 kilotonnes/year by 2010.
2001 National Emissions Ceiling Directive	Imposes the same VOC emission limits as the 1999 UN/ECE Protocol

Refinery Emissions.

The oil industry has more than halved the emission of VOCs from UK refineries over the past decade by minimizing their escape through the main mechanisms described in the table below. The effects of these measures on the emission of VOCs from refineries are shown in figure 1.

Origin	Release mechanism	Control methods
Tankage	Emissions from tanks. (Breathing losses and vapours released during water drainage).	Better roof seals and secondary rim seals, improved care of tanks, etc.
Drainage	Evaporation of VOCs from drainage and effluent systems.	Good housekeeping and improved standards of maintenance.
Process	Small leaks in valves, pumps seals etc.	Improved leak detection and repair systems.
Rail/road loading	Vapour losses during delivery and handling of fuel.	Vapour recovery systems due to be completed by 2004.

Fig. 1. Trends in refinery VOC emissions.

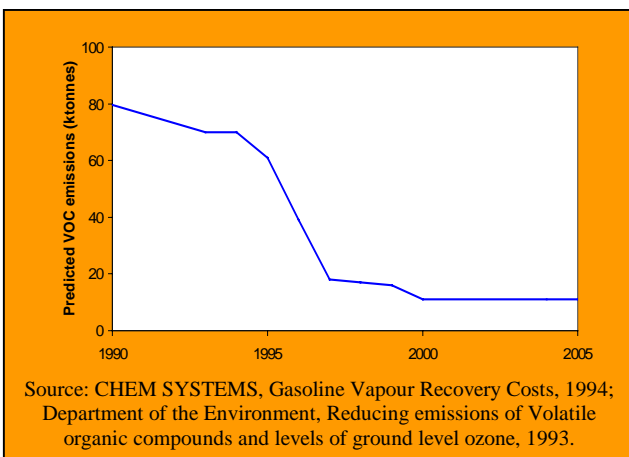


Petrol Distribution Emissions.

The oil industry is fitting vapour recovery equipment on the petrol distribution chain up to and including service station storage tanks (Stage I) by 2004. This has cut VOC emissions from petrol distribution by nearly 80%, figure 2.

In 2002 consultation is expected on fitting vapour recovery systems to petrol pumps (Stage II). This would decrease the emissions of VOCs further.

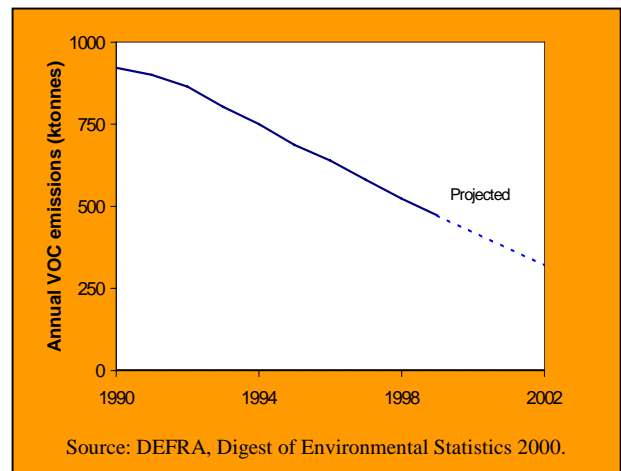
Fig. 2. The effect of Stage I vapour recovery on VOC emissions from fuel distribution.



Vehicle Emissions.

Emissions from road transport have virtually halved since 1990, figure 3. This is mainly due to three factors. Catalytic converters which reduce the exhaust tailpipe emissions from petrol vehicles require unleaded petrol, this was introduced in 1986. The introduction of low sulphur diesel enabled oxidation catalysts, PM traps and improved engine designs to reduce the emissions from diesel vehicles. Additionally carbon canisters were added to vehicles to trap hydrocarbons released by the evaporation of petrol from the fuel system.

Fig. 3. The UK emission of VOCs from road transport, 1990 to 1999.



Conclusions.

The oil industry is successfully reducing the emissions of VOCs by tackling refinery and distribution emissions. Over the past decade the emissions from vehicles and refineries have halved and are likely to continue falling whilst the introduction of Stage I vapour recovery has cut the distribution emissions by nearly 80%.