Environmental legislation in the United Kingdom

U.K. Legislation and Regulations
The relevant legislation covers, in general, **Energy, Water** and **Waste**.

Environmental Law affects industry in three ways:
(1) Certain activities must be authorised by a regulatory agency before they are undertaken. Action without the requisite authorisation is usually a criminal offence and may receive penalties of fines and/or imprisonment.
(2) Duties are imposed upon industrial operators. Failure to fulfil these duties is usually a criminal offence with the above penalties.
(3) Legal liabilities for damage, etc., may be imposed.

In 1987, **Her Majesty's Inspectorate of Pollution** (**HMIP**) was created in order to provide more cost-effective control of major industrial processes.

The U.K. Environmental Protection Act 1990
(http://www.hmso.gov.uk/acts/acts1990/Ukpga_19900043_en_1.htm)

- tightened waste disposal standards through a *Duty of Care* on all those who handle waste, with respect to safe treatment and the prevention of losses. Breach of the Duty of Care constitutes a criminal offence.
- separated the roles of local authorities so that waste disposal operators are no longer responsible for checking their own standards. Thus the functions of **Waste Regulations Authorities** and **Waste Disposal Authorities** were separated.
- enabled those who save disposal costs by ***recycling*** to earn financial credits.
- introduced **Integrated Pollution Control**

The **Environmental Protection (Prescribed Processes and Substances) Regulations 1991** (http://www.hmso.gov.uk/si/si1991/Uksi_19910472_en_1.htm) lists the processes for which an authorisation from HMIP is required (cf. MODULE 2). HMIP may then set conditions for emissions from the process to air, land and water. One objective is that the Best Available Techniques Not Entailing Excessive Costs (**BATNEEC**) are used to prevent or minimise pollutant releases to the environment.
Also established under the Environmental Protected Act is Local Authority Air Pollution Control (**LAAPC**), which regulates lighter industrial processes which emit pollutants to the air.

Statutory Nuisances are defined as accumulations, deposits, fumes, smells, etc. which constitute a nuisance or which are prejudicial to health. Local authorities may serve abatement and clean-up notices on persons responsible for the

nuisance. Failure to comply with such a notice constitutes a criminal offence. Best Practical Means (**BPM**s) should be taken to prevent to nuisance occurring.

A duty was imposed upon local authorities to inspect land for accumulations of noxious gases and liquids caused by the deposit of controlled waste. Where such concentrations are found, the waste regulation authority must clean up the area in question and may recover the costs involved from the owner of the land.

In 1989, the U.K. **Water Act** created the **National Rivers Authority** (**NRA**), as a water pollution "watch-dog". This authority controls pollution of rivers, estuaries and bathing waters and manages water resources. It protects against floods, supervises fisheries, nature conservation and recreation for inland waters. Privatised Water Companies with responsibility for the quality of drinking water, rivers and bathing waters were also created and maximum fines for water pollution offences were increased.
In 1991, the **Water Resources Act** introduced substantial provisions for public registers to list consents authorised by the NRA to discharge into controlled waters. The NRA was also given the power to clean up contaminated controlled waters and then recover the costs involved from the polluter.
The **Water Industry Act** 1991 requires that consent be obtained from a water company to discharge trade effluent to sewers.

In 1996, HMIP and NRA were amalgamated into The UK Environment Agency (http://www.environment-agency.gov.uk/)

Penalties

The consequences of pollution offences can be

- criminal liability
- civil liability
- liability for clean-up costs

The maximum fine in magistrates courts for most offences is now £20,000. If the prosecuting authority (The Environment Agency) brings proceedings in the Crown Court, then the fine is unlimited. Civil liability with respect to damaged caused is also unlimited and may result in an injunction being granted against a polluting company. Failure to comply with a court order can result, on conviction on indictment, in imprisonment for a term not exceeding two years.

Liability can now be imposed upon company directors and others at a personal level. The Act lists directors, managers, secretaries and similar officers purporting to act for the company and where there is consent, connivance or neglect.

PRESCRIBED SUBSTANCES

Release into the Air
Oxides of sulphur and any sulphur compounds.
Oxides of nitrogen and any nitrogen compounds.
Oxides of carbon.
Organic compounds and partial oxidation products.
Metals, metalloids and their compounds.
Asbestos (suspended particulate matter and fibres), glass fibres and mineral fibres.
Halogens and their compounds.
Phosphorous and its compounds.
Particulate matter.

Release into Water
Mercury and its compounds.
Cadmium and its compounds.
All isomers of hexachlorocylohexane.
All isomers of DDT.
Hexachlorobenzene.
Hexachlorobutadiane.
Aldrin.
Dieldrin.
Endrin.
Polychlorinated Biphenyls.
Dichlorvos.
1,2-Dichloroethane.
All isomers of Trichlorobenzene.
Atrazine.
Simazine.
Tributyltin compounds.
Triphenyltin compounds.
Trifluralin.
Fenitrothion.
Azinphos-methyl.
Melathion.
Endosulfan.

Release into Land
Organic Solvents.
Azides.
Halogens and their covalent compounds.
Metal carbonyls.
Organo-metallic compounds.
Oxidising agents.
Polychlorinated dibenzofuran and any congener thereof.

Polychlorinated dibenzo-p-dioxin and any congener thereof.
Polyhalogenated bipheyls, terphynyls and napththalenes.
Phosphorous.
Pesticides.
Alkali metals and their oxides and alkaline earth metals and their oxides.

GENERAL BATNEEC

The specific quidance booklets should be consulted for the full and comprehensive details of the pollution abatement techniques. There follows here a general list of pollutant emissions to air, water and land, some common BATNEEC clean-up techniques and measurements required to verify compliance.

Releases into Air

General Principles

The foremost requirement to minimise releases into air is containment. Particulate matter should be collected and ducted to an efficient arrestment system, such as bag or ceramic filters, electrostatic precipitators or multicyclone separators. Damping may help the containment of dust but makes ducting difficult and may result in clogged filters. Acid gases may be removed by wet scrubbing using neutralising alkaline slurries, which may be evaporated to dryness and ducted to downstream particulate matter abatement plant. Pollutants may be adsorbed on to a solid matrix or absorbed into a liquid, or incinerated out.

GENERAL BATNEEC - releases into air.

Substance	BATNEEC
Acid Gases	Wet Scrubbing (e.g. venturi or packed or tray tower): Lime or Sodium Carbonate Slurries (with pH control). Evaporated to Dryness. Dry Scrubbing: Powdered Lime Injection. Downstream Particulate Matter Abatement Plant (fabric or ceramic filters) is Necessary.
Asbestos	Containment and Dampening.
Cadmium	Sulphide Precipitation. See Particulate Matter.
Carbon Dioxide	See Oxides of Carbon.
Carbon Monoxide	See Oxides of Carbon.
Condensate Droplets	See Particulate Matter. Maintain Temperatures above Dew-point.
Dioxins	Carbon Injection in a Dry Scrubber (Adsorption by Carbon).
Fumes	Fume Arrestment Plant Usually Scrubs the Gas using a Water-irrigated Candle Mist Arrester or a High Pressure Drop Venturi Scrubber.
Gaseous Organic	Condensation.

Pollutants	Adsorption (on to a solid matrix) (e.g. activated carbon, bauxite, magnesia). Absorption (into a liquid). Combustion (flaring or controlled incineration.
Halogens and their compounds	Wet Washing of Combustion Gases.
Hydrocarbons	Use Clean Raw Materials and Careful Combustion Conditions.
Hydrogen Chloride	Insufflation of Ground Limestone.
Hydrogen Fluoride	Remove hydrogen fluoride by contact with lime or limestone dust which may be insufflated into the gas flow upstream of a bag filter.
Lead	See Particulate Matter.
Metals, Metalloids and their compounds	Pulverised Coal Firing. Electrical Precipitators. Fabric Filters.
Mercury	Carbon Injection in a Dry Scrubber (Adsorption by carbon). Sulphide Precipitation.
Nitrogen Oxides	Burner/Combustion Chamber Design. Combustion Control. Gasification Techniques. Selective Catalytic Reduction (SCR) (using Ammonia gas). Combined SO_2/NOx Processes. Advanced Combustion Technologies. Steam Injection. Water Injection. Urea Injection (Check Ammonia produced). Control the Combustion at a Lower Temperature by Staged Combustion Techniques.
Odours	Regular Cleaning and Disinfection. Limit Waste Accumulation. Air Extraction. Wet Scrubbing with Alkaline Sodium Hypochlorite. Biological Scrubbing: the Suspension of Micro-organisms in an Aqueous Solution or as a Growing Culture on a Solid Carrier. Biofiltration: involves Absorption, Condensation and Biological Oxidation. Use of Afterburners.
Organic Compounds	Proper Combustion Control. Combustion Zone Design.
Oxides of Carbon	Absorption/Desorption Techniques (not currently a practicable option). CO should be reduced to CO_2 by good combustion practice. Increase thermal efficiencies to reduce CO_2 production.

Oxides of Nitrogen	See Nitrogen Oxides.
Particulate Matter, Ash Particles	Contain Sources.. Pulverised Coal Firing. Collect dust or fume and duct to an efficient arrestment system: Bag Filter. Ceramic Filters (for high temperatures corrosive gases). Electrostatic Precipitator. Multicyclone Separators. Bag 'blinding' or filter fires may be prevented by the insufflation of ground limestone. Wet Scrubber Water Sprays. Gravel Bed Filter.
Smoke	Adopt Careful Combustion Conditions. Incinerate at a Temperature Exceeding 800^{o}C in Oxidising Conditions. Use Clean Raw Materials. Filtration (may cause filter bag blinding or jet blockages) . Wet Scrubbing (may cause filter bag blinding or jet blockages).
Sulphur Dioxide	Flue Gas Desulphurisation Equipment. Use lime or Caustic Scrubbing. Convert to Sulphuric Acid. Use gas or Low Sulphur Content Oil.
Wet, hot or aggressive gases	Venturi Scrubbers. Impeller Disintegrators.

Notes:
Venturi Scrubber: In this device, the gas is forced through a Venturi throat in which the gas is mixed with high-pressure liquid sprays.

Insufflation: blowing in of dust

'Blinding': filling up the pores

Releases into Water

General Principles
Suspended solids may be removed by settlement and/or filtration. Effluents may need chemical treatment for neutralisation. Heavy metals may by removed by chemical precipitation or flocculation followed by settlement and/or filtration. The solids collected may be recycled. Highly contaminated effluent may be combusted.

GENERAL BATNEEC - releases into water.

Substance	BATNEEC
Ammonia	Aluminium Drosses Should Not be Allowed to become Wet before Processing for the Removal of Aluminium as they may emit Ammonia.
Arsine and Stibine	May be Avoided by Not Using Reducing or Damp Conditions.
Asbestos	Filtration.
Ash Quenching Water	May need Chemical Treatment before Discharge. Two-stage Hydrogen Peroxide Precipitation at Different pH Values. Sulphide Precipitation to Remove Cadmium and Mercury.
Blow-down Water	Normally has No Environmental Significance, although may Contain Phosphates, Alkalis, Hydrazine, Ammonia etc., used for pH Control, De-aeration, etc.
Cadmium in water	Precipitation by the Use of Lime or Caustic Solution followed by Flocculation-enhanced Settlement and a Filtration or Polishing Process. Recycle the Solids Collected.
Chlorine and its compounds	Scrub out with Water or Caustic Solutions.
Cleaning Liquids	All these should be Neutralised ot Treated Produce an Acceptable Waste before Discharge or Disposal.
Cooling Tower Water Purge	Various Substances are Available to Prevent the Formation of Slime and Other Organisms.
De-ionisation Effluent	This should be Neutralised (pH, soluble sulphates) before Discharge.
Fluorides	Water Scrubbing.
Lead	Precipitation and Filtering.
Liquid Effluent	May need Chemical Treatment before Discharge. Two-stage Hydrogen Peroxide Precipitation at Different pH Values. Sulphide Precipitation to Remove Cadmium and Mercury.
Liquid Effluent from Gas Treatment Plant	Filtration. Chemical Treatment. Two-stage Hydroxide Precipitation at different pH Values. Sulphide Precipitation to Remove Cadmium and Mercury.
Metals	Chemical Precipitation Processes followed by the Removal of Suspended Particulate Matter . Acid Neutralisation and Precipitation with Calcium Hydroxide can remove up to 90% of most Heavy Metals but probably less than 70% of Cadmium and Nickel.
Mercury in water	React with Sodium Sulphide Followed by Flocculation-enhanced Settlement and a Filtration or Polishing Process. Recycle the Sulphide for Recovery of the Metal. Specialist Precipitation Agents can remove up to 99% of the

	metal.
Odoriferous Compounds	See Sulphides.
Phosphorous and its compounds	Avoid Alloys above 15% Phosphorus. Scrub using a Water-irrigated Candle Mist Arrester or a High Pressure Drop Venturi Scrubber.
River Water	cf. WP 2.2.3
Sulphides	Containment and Incineration. Scrubbing with Reactive Liquor.
Surface Water	May need Treatment in Separation/Interceptor Systems to Remove Dissolved Hydrocarbons. Effluent Suspended Solids Interceptor System. Treatment to Remove Dissolved Pollutants.
Suspended Particulate Matter	Settlement, Filtration, Centrifuges. (a preliminary chemical precipitation process may be required).
Tap Water	cf. Chapter Six.
Waste Water (Heavily Contaminated)	Oil/Water Separation. Neutralisation. Heavy Metal Removal. Solids Removal. Incineration.

Releases into Land

General Principles
Solid Waste should be rendered harmless, packaged and clearly labelled and passed over to a registered waste disposal contractor.

GENERAL BATNEEC - releases into land

Substance	**BATNEEC**
Asbestos	Render Harmless: Packaging, Labelling and Notification.
Dust	Containment, Bag Filter.
Heavy Metals	Require Special Handling.
Solid Matter:	(may be saleable).
Fly Ash	Collect in Dry Arrestment Plant.
Bottom Ash	Quenching into Tanks with Scraper Conveyers.
Slag	Containment (may be saleable).
Sludges	Incineration. Stabilisation and Solidification Prior to Disposal. Direct Disposal to a Licensed Site.
Sulphur or Gypsum	(may be saleable).

Waste Catalyst	(may be saleable).