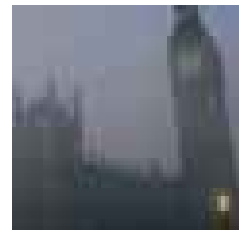
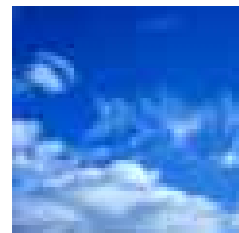


Air quality management

The intellectual John Evelyn, in 1661, published his seminal work “Fumifugium or The Smoake of London Dissipated”, expressing concern over air quality in London.

However, legislation to control air pollution did not appear until the late 19th century in the form of the Alkali Act 1863. Following the Great London Smog of December 1952, the Clean Air Act of 1956 was introduced to effect controls upon the burning of solid fuels in urban areas. The regulatory regime for air quality within the UK today is one of the most stringent in the world and has been promulgated through the concerted action of the European Union over the last 20 years. There are now legally enforceable ambient air quality standards and industry is subject to tight controls over emissions to atmosphere, as are motor vehicles. It is now accepted that poor air quality affects health and the quality of life and it is also symptomatic of inefficient resource use, as materials and energy are lost to the atmosphere.



Capability statement

Entec

Entec is one of the UK's largest environmental and engineering consultancies. Our technical and business skills are dedicated to delivering strategic, technical and engineering solutions which bring commercial benefit to customers at home and overseas. This know-how is based on over 60 years' consulting experience in the public and private sectors.



Certificate No. EMS 69090

Certificate No. FS13881

Entec operates a Quality Management System in accordance with the latest requirements of the international standard BS EN ISO 9001 and an Environmental Management System compliant with BS EN ISO 14001. Both are audited by BSI Management Systems.



Why is there concern over air quality?



In simple terms, pollutants discharged into the atmosphere can have local, regional, national and transboundary effects upon life forms, the natural and man-made environment and, in the case of greenhouse gases, can cause climate change. The scientific recognition of these issues, underpinned by legislation and international agreements, are the driving forces behind the desire to improve air quality.

Local Authorities are charged with Local Air Quality Management (LAQM) duties under the Environment Act 1995, which obligate them to review and assess air quality within their administrative areas. If, on the basis of ambient monitoring and predictive modelling, air quality objectives are at risk of being infringed in the future, Air Quality Management Areas (AQMAs) have to be established and measures implemented to improve air quality. They are also responsible for regulation of some industrial processes under the Pollution Prevention & Control Act, 2000.



Industry, under the IPPC Regulations (and formerly under the Environmental Protection Act 1990), is required to meet emission standards for air pollutants and to demonstrate the application of Best Available Techniques (BAT) in reducing emissions to air. Implicit in these requirements are efficiency in the use of energy, resource and raw material use. On a planetary scale, there is a pressing need to reduce emissions of greenhouse gases in order to decelerate global warming.

In addition to regulatory compliance, **Utilities** have social and environmental responsibilities to deliver public services in a sustainable manner, whether in the transportation, wastewater treatment or waste management sectors.

Developers are required to provide assessments of the impact of planned infrastructure developments on air quality, from all significant industrial, commercial and residential projects.





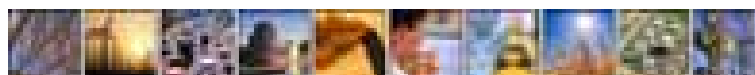
*Entec's
approach*

Entec's air quality expertise and experience is grounded upon our involvement over many years in consultancy work for private industry, policy and regulatory impact assessment work for government departments such as DEFRA and DTI, the European Commission and advisory work for local government.

Our approach to each commission is to analyse the specific business needs of the client organisation and then, in partnership, to develop solutions that are appropriate, cost-effective and sustainable.

We use the latest technical tools to help us in delivering the optimum solutions and, where these don't exist, take part in research to develop the best procedures to service the need.

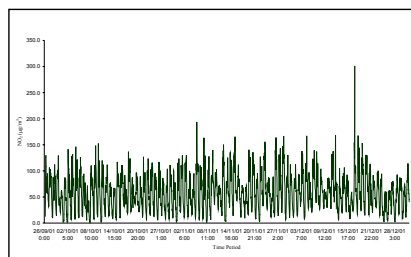
Entec's range of services has been formulated to match the needs of industry, utilities and institutions in the 21st century. These services are under continuing review and development in response to rapidly-changing circumstances and market requirements.



Air quality management

Emission monitoring

In partnership with approved laboratory we undertake quality assured sampling and analysis of emissions to atmosphere from regulated process industries. This is to assess and demonstrate compliance with emission standards and for the purposes of process optimisation and abatement plant evaluation.



Ambient monitoring

We carry out monitoring of ambient air pollutants (for example, SO₂, NO₂, PM10) for local authorities to assist with their reviews and assessments of air quality. Monitoring is also conducted for process operators to check compliance at process boundaries with ambient air quality objectives.

Odour assessment and control

This area of our work enables the sources of odorous emissions to be identified, the scale of impact evaluated and appropriate control strategies to be developed. Projects have been conducted for process industries, waste management facilities and for the wastewater treatment sector.



Modelling and impact assessments

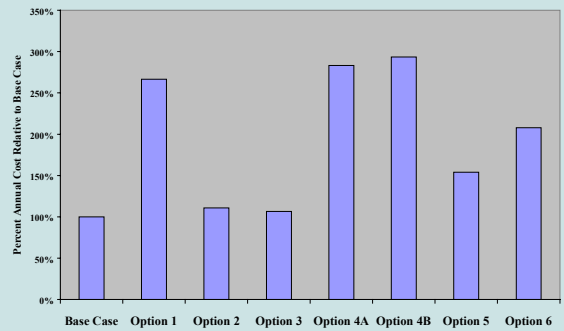
Entec has extensive experience in the modelling and prediction of air pollution arising from both static and mobile sources. We use the most up-to-date, approved dispersion models, from UK and US sources, and have extensive experience of applying them to simple, localised problems, as well as modelling of pollutants on a national scale.



Air quality management

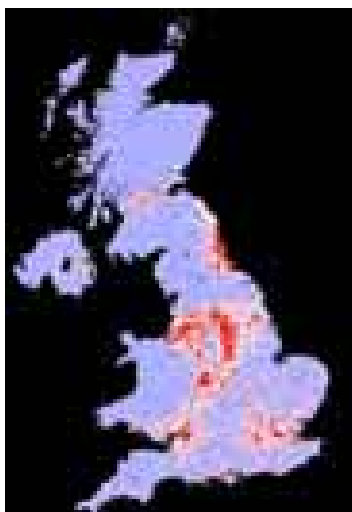
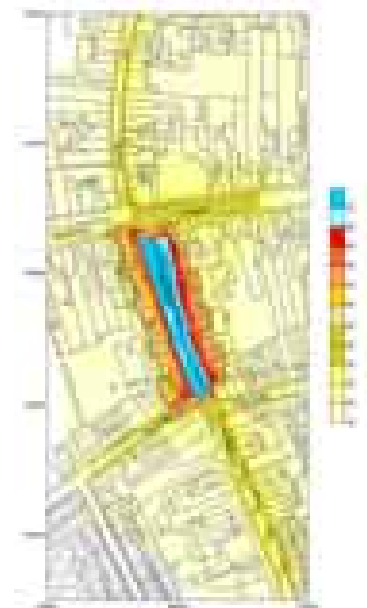
IPPC and process regulation

Entec is able to undertake comprehensive air quality impact assessments for PPC applications in accordance with the requirements of the regulatory agencies (Environment Agency/local authorities). We have developed a standardised approach to such applications, which provides an efficient a cost-effective response to our clients' needs. Additional services include BPEO and BAT assessments for pollution abatement technologies.



Local air quality management (LAQM)

We assist local authorities with their review & assessments of air quality, using a combination of screening, monitoring, emission inventories and advanced dispersion modelling techniques. In this way, the requirement for Air Quality Management Areas and Action Plans can be assessed.



Policy and regulatory impact assessments

Working for organisations such as DEFRA, DTI, the Environment Agency and the European Commission, Entec has undertaken environmental cost/benefit studies on options for abatement of pollutant emissions on a National and EU-wide scale. On behalf of our industrial clients, we have also assessed the potential for new regulatory regimes to impact upon their businesses and have assisted them in developing response strategies.

Case studies

The following pages demonstrate Entec's capabilities in the area of Air quality management, using case study examples. ►



Stage Two and Three Local Air Quality Review and Assessment West Berkshire Council

The Environment Act (1995) requires local authorities to periodically review air quality within their individual areas. 'Review and assessment' of local air quality aims to identify areas where national policies to reduce vehicle and industrial emissions are unlikely to result in air quality meeting the government's air quality objectives set for seven pollutants.

To carry out a review and assessment the government recommends a three-stage approach. This phased process initially uses simple screening methods, and progresses through to more detailed assessment methods of modelling and monitoring in areas identified to be at potential risk of exceeding the objectives.

Following the successful completion of their stage one review and assessment, West Berkshire Council was seeking to contract a consultant to undertake on their behalf, a stage two assessment of air quality within their area.

Through the use of air quality screening methods, Entec was able to rule out the majority of sources within the district as unlikely to contribute to exceedences of the government objectives. In total, three sensitive areas were identified for further investigation. A more detailed stage three assessment would be required at these locations to fully investigate the impact of road traffic sources upon local air quality.

Following the appraisal and acceptance of the stage two report by the DETR, Entec was commissioned by West Berkshire Council to undertake the stage three assessment of emissions from road traffic sources. Using advanced dispersion modelling software, validated against continuous monitoring, Entec was able to conclude that exceedences of the air quality objectives for all local air pollutants were unlikely to occur.



*Assessing local air
quality in the context
of national objectives*



Flue Gas Desulphurisation at Eggborough Power Station Kvaerner



Reducing environmental emissions in North Yorkshire

Entec was commissioned by Kvaerner (who are acting as owner's engineer to British Energy) to undertake two major items of work in relation to the plan to install flue gas desulphurisation at British Energy's Eggborough power station. These were a BATNEEC/BPEO assessment to identify the most appropriate means of reducing emissions from the power station, in line with its integrated pollution control (IPC) authorisation requirements; and secondly, as the extension to the power station requires consent from the Department of Trade and Industry under the Electricity Act, to prepare an environmental impact assessment of the chosen option to accompany the Section 36 application.

British Energy purchased Eggborough in early 2000 in order to increase its generating flexibility which consisted of a 10 gigawatt (10GW) nuclear base load. Coal fired generation, as at Eggborough, emits large quantities of sulphur dioxide and this is the key pollutant requiring abatement. The BATNEEC/BPEO review identified wet limestone flue gas desulphurisation (FGD) as the appropriate technology and the EIA was carried out on that basis.

The EIA involved a detailed scoping exercise in consultation with the county and district authorities. This identified that the full range of environmental issues required consideration in the EIA,

although not all at the same level of detail. A comprehensive environmental statement was prepared which covered sourcing of the limestone raw material and removal of the waste product (gypsum), traffic and transportation, air quality, noise, water quality, ecology, landscape and visual impacts, contamination, health and safety and cultural heritage.

The application has been submitted to the DTI and Section 36 consent has been awarded.



Fuel Mix Flexibility at Trombay Power Station Tata Power Company

Tata Power Company Ltd (TPCL) operates the Trombay Thermal Power Station on the outskirts of Mumbai in India. The station itself comprises four generating units, each with a different generating capacity and fuel mix capability. It is of strategic importance to the whole area and has a total generating capacity in the region of 1.4GW.

TPCL wished to improve the station's fuel mix flexibility to take better advantage of world markets, in particular, the market for low sulphur coals. TPCL wanted to increase the quantity of coal burned from 1400 Te/day to 5200 Te/day and to add a further 250MW of gas-fired capacity to one of the units. However, environmental consents placed restrictions on the quantity of coal that could be burned in addition to placing restrictions on dust and SO₂ releases.

Entec and TPCL developed a strategy involving three main elements to gain statutory approvals for the proposals:

- Generating and emissions profiles were prepared to demonstrate that, provided a degree of management on the sulphur content of coal and oil was exercised, the coal-burn limit could be immediately raised to 3000 Te/day without breaching the plants emission limits for dust or SO₂.
- An environmental impact assessment and risk assessment was prepared for the proposed increase in generating capacity to demonstrate the minimal impact of the proposal.
- A feasibility study was prepared that demonstrated the ability of the plant to burn up to 5200 Te/day of coal with appropriate modifications to the flue gas desulphurisation system.

The case for raising the coal limit to 3000 Te/day and the assessments for the proposed increase in generating capacity were approved by the relevant authorities. TPCL has retained the feasibility study internally to assist in future strategic decisions on the fuel and generating mix.



*Helping achieve an increase in
electrical generation capacity*



Tyne Tunnel Air Quality Monitoring Tyne & Wear Passenger Transport Authority

Based on the successful completion of a previous Entec study into the exposure levels of air quality pollutants to the toll booth operators at the Tunnel, Entec was commissioned to repeat the investigative study one year on.

The occupational air quality monitoring undertaken by the Tunnel operator (The Tyne & Wear Passenger Transport Authority) was a proactive approach for the group towards assessing and bringing about improvements in the health and safety of its employees.

The Tyne Tunnel experiences problems of very heavy traffic congestion all year round, the employees particularly affected by this are the toll booth operators. The monitoring programme put forward by Entec involved occupational level monitoring of the key air pollutants associated with vehicle exhaust emissions (nitrogen oxides, carbon monoxide, particulates and sulphur dioxide). Monitoring was undertaken within the booths for the duration of operational shifts, and personal monitoring devices used by staff operating within the tunnel environment further assisted the assessment.

The Entec report provided evidence for The Tyne & Wear Passenger Transport Authority that its staff were not being exposed to levels of vehicle pollutants exceeding the occupational exposure levels set by the Health & Safety Executive (HSE). The work also provided the Authority with information to assist in improving work condition for its employees.



Measuring toll booth operators' exposure to vehicle exhaust emissions



Heathrow Terminal 5 Inquiry BAA

*Preparation and
presentation of
air quality evidence
at Terminal 5 Inquiry*



Photo courtesy of BAA picture library of BAA plc

BAA is the largest operator of airports in the UK. To meet the increasing demand for air travel, BAA planned to expand the capacity of Heathrow airport by 30 million passengers per annum through the provision of a new terminal with supporting infrastructure. The planning application for the development became the subject of the UK's longest running planning inquiry.

Entec headed the team that assessed the air quality impacts arising from the proposed development and its construction. The work focused on the assessment of existing air quality at, and around, the airport and the modelling of atmospheric emissions nitrogen oxides, carbon monoxide, sulphur dioxide, volatile organic compounds and particulate matter, (specifically PM₁₀) from four source regions, the airport, the near Heathrow region, Greater London and the remainder of the UK in a base year (1993) and two future cases - 2016 with and without the terminal. Modelling of the base year was undertaken to compare the predicted results against measurements at a number of monitoring sites in the near

Heathrow region. Modelling of future air quality allowed the potential change in air quality both with and without the new terminal to be assessed. In examining the future air quality consideration was given to the predicted increase in both air and road traffic in the area around the airport as well as forecast changes in other emissions from road transport, domestic, commercial and industrial.

The individual air quality assessments were published in a series of reports covering for example the terminal, modelling sensitivity and uncertainty tests, construction, calculation of short period concentrations and model and monitoring comparisons. The assessments of existing and future air quality were used as the basis of evidence prepared and presented at the inquiry.

The assessment for the construction of Terminal 5 concentrated on nitrogen oxides, PM₁₀ and nuisance dusts following the change in emissions and concentrations in five years. The assessment showed the impacts of construction against a no Terminal 5 case.

Entec presented evidence at the inquiry in both the air quality and construction topics. Other projects were undertaken by Entec including contaminated land/groundwater assessments, development of a construction waste minimisation strategy and a demographic study. Entec presented evidence on the demographic study.

The early publication of the air quality assessment facilitated extensive discussions with the local planning authority and other interested parties which enabled the preparation and agreement of joint position statements on much of the technical detail of the monitoring and modelling studies. Entec lead these discussions on behalf of BAA and prepared the position statements. The submission of the agreed position statements to the inquiry provided a focus to the issues between the parties thereby reducing inquiry time on the air quality topics.



Cost-benefit Analysis of Reducing VOC Emissions in the EU Vehicle Refinishing Sector Carried out for the European Commission

Entec was appointed by the European Commission to investigate the costs and benefits of a product-based approach for reducing volatile organic compound (VOC) emissions from the EU vehicle refinishing sector. This investigation was to support the Commission's consideration of alternative policy measures for the vehicle-refinishing sector in comparison with site specific regulation of VOC emissions.

The study involved:

- a market assessment into the current and projected profile of vehicle refinishing in each Member State;
- a technical and cost assessment of alternative vehicle refinish coatings with lower VOC emissions;
- an economic assessment of the impact on the vehicle refinishing sector and other affected sectors; and
- a quantification of human health and environmental benefits due to reduced VOC emissions and ozone concentrations.

Our work provided a rigorous basis to inform the Commission's policy development in this area.

*Informing the
EC policy
development
process*



Management of Process Emissions from Food Processing Facility Confidential Client



The food processing facility is one of the largest in Europe. As such, the client wanted to measure all pollutant discharges from the site and employed Entec to undertake monitoring.

During the sampling phase Entec monitored 45 stacks for over 130 organic compounds, particulates, combustion

gases, halogens, and metal emissions. The results were provided to the client in two parts, firstly as a full reference document, for the technical library and secondly as a presentation pack for Board members. Subsequently, Entec completed the inventory of sources and releases for the company to submit to the Environment Agency.

*Stack emission
monitoring*



Research Project into the Monitoring Protocol for Emissions from Landfill Gas Utilisation Systems Environment Agency

Ongoing R&D contract aimed at a greater understanding of emissions and creation of a standard set of monitoring protocols

This research project aims to develop a greater understanding of such emissions and produce a standard set of monitoring protocols to allow the collection of data in a consistent manner. The project will provide a guidance document on the best practice for monitoring emissions to atmosphere from landfill gas utilisation systems and record appropriate emission standards.

Objectives are:

- to review recent research and available literature on existing monitoring protocols and emission standards for landfill systems;
- to identify key pollutant emissions that have the potential to have the most significant environmental impacts;
- to identify best practice protocols for the monitoring of pollutant emission and run verification trials on operating landfill gas utilisation systems;
- to produce a guidance document containing details of the best practice monitoring protocols and the results of the field trials; this document will also cover health and safety issues, quality control and quality assurance and a monitoring strategy to record appropriate emission standards which could be used for possible future regulation; and
- to develop a training package based on the guidance document.



Biodegradable wastes in landfill sites decay under anaerobic conditions to produce leachate and landfill gas. This gas is composed mainly of methane and carbon dioxide, although depending on the type of waste in the site, other gases such as sulphurous and halogenated compounds and hydrocarbons may be present.

Operators are required to manage sites safely to control gas migration and explosion risks. This control often consists of gas venting or collection for flaring, or,

a landfill gas utilisation system. The increasing importance of landfill gas utilisation systems is reflected by the fact that this process now generates more energy than any other National Fossil Fuel Obligation scheme. The last 10 years has seen a rapid expansion in landfill gas schemes, with some 300 currently in operation or in the planning stage. At present however, there is a lack of information regarding the atmospheric emissions from these systems.



Assessment of the Effect of Climate Change Policies on Industrial Energy Use DEFRA

Entec has been commissioned to carry out this important project for the Global Atmosphere Division of DEFRA. The project will use and develop an existing model to assess energy use, the uptake of energy saving technologies and the resulting profile of energy use and carbon dioxide emissions from nineteen industrial sectors (e.g. water sector, chemical industry, iron & steel industry) up to 2020. Entec has teamed up with Cambridge Econometrics to deliver the project.

The effect of implementing all cost effective and all technically feasible energy efficient technologies within the sectors on energy demand and carbon dioxide emissions will be investigated. In addition, the effect of the various climate change policies (i.e. emissions trading, climate change levy, negotiated agreements, the Carbon Trust and capital allowances for energy efficient technologies and combined heat and power) will be modelled to establish their influence on energy use and carbon dioxide emissions. The effect of fuel price sensitivities will also be examined together with the overall effect that the policies may have on industrial output.

The results of the work will have a number of uses. Whilst primarily enabling the UK to meet its reporting obligations to the UN Framework Convention on Climate Change and the EU Monitoring Mechanism, the results of the work will also enable the UK to assess the anticipated impact of the Climate Change Programme.

*Helping enable the UK
to meet international
climate change
obligations*



Assessing Air Quality Impacts of Proposed Cement Kiln Campaign Against the New Kiln (CANK)



*Detailed dispersion
modelling challenges
conclusions reached
in the Environmental
Statement*

A proposal by Castle Cement to construct a new cement kiln capable of burning waste derived fuel was opposed by a local pressure group known as CANK. This group included both local landowners and residents in the areas. Acting through legal firm Wake, Dyne, Lawton, Entec was appointed to undertake the detailed assessment of the Environmental Statement and Integrated Pollution Control authorisation application for the proposal with regard to engineering design and emissions to atmosphere.

Entec carried out detailed dispersion modelling of routine and abnormal emissions to air from the kiln(s), to estimate the ground level concentrations of a range of air pollutants covered by the National Air Quality Strategy and other specific pollutants (e.g. dioxins) of potential concern due to health effects.

Based on the outcome of this modelling and an evaluation of the operational reliability of the proposed design, Entec presented air quality and engineering evidence on behalf of CANK at the planning appeal held to consider whether the consent for the new kiln should be granted.

The objections advanced at the public inquiry were rejected and appeal was upheld by the Welsh Assembly and planning permission granted for the new kiln.

A separate, but related, modelling study was undertaken for Grosvenor Estates into the proposals to examine the potential effects of the development on extensive agricultural holdings



Air quality management

Sample client list

<i>Service</i>	<i>Sector</i>			
	Water Companies	Waste Management	Industry	Public Sector
Odour Measurement & Dispersion Modelling	Wessex Water Northumbrian Water Southern Water Scottish Water Essex & Suffolk McAdam Design MBRTech	Thames Waste Management Cumbria Waste Management Caird Hall Aggregates Onyx RMC Hills Waste Management Surrey Waste Management	Cadbury GE Plastics Synpac Chemicals Contract Chemicals Millenium Organics AMEC British Gypsum Scottish Power Technip Geoprod Total Fina Elf	Suffolk Coastal DC Wokingham BC S. Oxfordshire BC West Berkshire DC Environment Agency Corby BC Wyre Forest DC
Expert Witness	Southern Water	Thames Waste Management Cumbria Waste Management	Alba Proteins NIPA Laboratories	Poole BC Environment Agency Mendip DC
Abatement Studies	Southern Water Wessex Water	Shanks SITA Caird Bardon	Leo Sawrij Ltd Muraspec Sun Valley Ltd	Suffolk Coastal DC
Engineering Design	Northumbrian Water Southern Water United Utilities Yorkshire Water	Shanks RMC Viridor SITA	Roche Vitamins Texaco	Environment Agency
Performance Testing	Northumbrian Water Southern Water Wessex Water	Thames Waste Management	Cadbury Forrest & Sons	Environment Agency



Entec

*For further details on
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