

In this issue...



▶ The Role of UK Oil Refining in a Changing Climate



▶ Buncefield: five years on



▶ Interview with Iain Grime

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The Role of UK Oil Refining in a Changing Climate

UK **pia**
Refining Britain's fuels



The UK oil refining industry is a valuable asset. Despite the many challenges the industry faces, it can continue to play a pivotal role in the future as a reliable, resilient and secure source of transport fuels.

Amid changes in market dynamics, a fast evolving regulatory environment coupled with an uncertain financial background and increased competition from large export refineries, the UK's downstream oil industry continues to play an essential role in the nation's security of supply. It provides a wide range of consumers with high quality fuels at competitive prices and contributes to the UK's industrial base by providing important feedstocks for other industries to manufacture, for example, plastics, chemicals, sealants, adhesives and rubber compounds.

The crucial role and continuing importance of the UK's downstream oil industry sector, along with the challenges and changes it now faces, have been highlighted within UKPIA's forthcoming publication on the role of UK refining in a changing

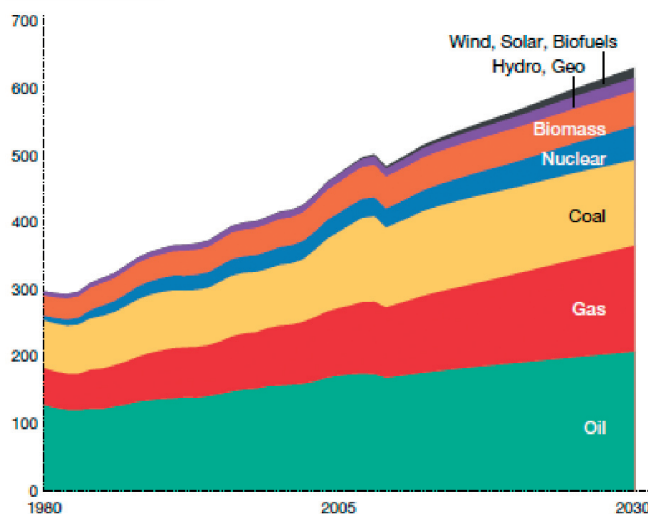
climate, due to be published in the early part of 2011. The publication will focus on the challenges to provide secure and affordable sources of energy supply in the future, whilst meeting substantial carbon reduction targets aimed at stabilising the level of atmospheric greenhouse gases.

The UK accounts for around 2% of global oil demand, with final consumption spread across a wide range of fuel and non-energy products. Looking to the future, by 2020, overall oil product demand in the UK, including biofuels, is projected to remain relatively stable in comparison with 2000 - albeit with a change in product mix: less gasoline and more jet and diesel. However, despite recent economic conditions that have weakened primary energy demand globally, a number of forecasts predict a return to growth. Under the International Energy Agency's new reference scenario, which takes into account both existing policies and declared intentions and national pledges to reduce greenhouse-gas emissions, global primary energy demand is projected to increase by about 36% between 2008 and 2035. The IEA indicates, even within the 450ppm scenario, that conventional fossil derived fuels will continue to satisfy as much as 80% of the EU's transport needs in 2030. Whilst a diverse energy mix will be forming part of the response to global growth in energy demand, and alternative energies will make an important contribution to the transition to a lower carbon economy, even in the most aggressive scenarios put forward, modern renewable energy - including wind, solar, geothermal, marine, modern biomass and hydro - is estimated to meet no more than around 14% of the total demand in 2030.



by energy type

Quadrillion BTUs



Source: ExxonMobil - *Outlook for Energy - A View to 2030*

Fuel Demand, Investment and Security of Supply

In the UK, overall road and air transport fuel demand is expected to increase to around 50 million tonnes per year in 2020, from the current 48 million tonnes. Particularly significant is the projected growth in demand for diesel - also driven by a growing 'dieselisation' of the UK's passenger car fleet - and jet fuel/kerosene. The demand for distillate products with a sulphur level below 10ppm is also being increased from 2011 by the introduction of a 10ppm specification for non road mobile machinery. This is also likely to increase imports of diesel.

The implications of this variation in demand are considerable, particularly as the UK and the EU are currently reliant on other countries for imports of diesel and diesel manufacturing components - mainly from Russia - and jet fuel - mainly shipped from the Middle East. Refiners are constantly working towards improving the diesel yield from existing production capacity although, to further boost this capacity in order to meet current and future demand, substantial long-term investments will be required. According to the Europa's *White Paper on EU Refining*, European Union's refiners have been investing on average ~£4bn per year over the past 20 years.

In the UK, most recent investment has been aimed at meeting environmental standards, tighter fuel specifications and enhanced process safety. Yet, this investment has not significantly increased refinery capacity or improved profitability of UK oil refineries relative to EU competition. Furthermore, major refinery projects take years to plan, build and commission: the lead time for a new project is typically around 5 to 8 years. Given the long investment cycle in refining, a stable and clear policy background is a key part to making these investments possible even in a favourable commercial climate.

At the same time, UK refineries are facing increased competition from large scale refining capacity coming on stream, particularly in Asia, geared to meeting fuel demand abroad. These are not the only challenges to be met. Indeed, the industry is adapting to a number of regulatory changes, such as the Industrial Emissions Directive, the Fuel Quality Directive, the Renewable Transport Fuels Obligation, the Renewable Energy Directive, the EU ETS, more stringent safety regulations and the rising requirements and revision of the Compulsory Stock Obligation. Each has implications for the industry's infrastructure and other operational requirements.

Given the strategic role of oil refining, legislation and policy requirements would have to consider the UK's downstream oil industry competitiveness at a global level, its sustainability and the pivotal role it plays, and will continue to play, in producing the high quality hydrocarbons required to meet demand in a secure and affordable way. A healthy and robust UK downstream oil industry will also continue to represent a crucial constituent to the nation's supply chain as a reliable partner to other industries and high technology sectors - including chemicals, plastics, automotive and transport - and a substantial contributor to the wider UK economy, including the regional economies in which refiners and distributors operate.

For more details visit www.ukpia.com - Industry Issues

.....and the CRC Energy Efficiency Scheme

The CRC Energy Efficiency Scheme, formerly known as the Carbon Reduction Commitment, is the UK's mandatory climate change and energy saving scheme. The scheme started in April 2010 and is administered by the Environment Agency.

The CRC Energy Efficiency Scheme is a mandatory cap and trade scheme which targets carbon emissions from large businesses and public sector organisations. It applies to all downstream activities outside of the EU Emissions Trading Scheme and Climate Change Agreements, such as refineries' own power supply, pipeline and terminal operations, filling stations and offices. Originally, the concept was for proceeds from auctioning of allowances to be recycled to participants. However, following the Spending Review 2010, proceeds for auctioning under the scheme will be used to support the public finances, which will add onerous additional costs to refineries, which are already impacted by multiple legislation - EU and UK - and facing considerable incremental cost demands in terms of operational and other requirements.

With revenues going to HM Treasury, the scheme is now looking like a burdensome additional tax that does little to encourage energy efficiency beyond what prudent businesses do already. With a consultation announced on 17th November, UKPIA would like to see the scheme simplified and reviewed or re-designed before Phase II in 2013-17.

Buncefield: five years on



The UK Petroleum Industry Association and its member companies are strongly committed to the health and safety of their workforce and the public and to improving process safety in the downstream oil industry.

Petroleum products play a central role in day-to-day life and confidence in the industry's operations is paramount. To this end, the UK's downstream oil industry has worked tirelessly since the Buncefield incident in December 2005 to address all key areas of design and operation of fuel storage sites, whilst developing key guidelines on delivering best performance through culture and leadership.

UKPIA and its members have confirmed their commitment to process safety by signing the *Process Safety Leadership Commitment* in April 2008. The *Commitment* recognises that strong performance is key to protecting people and the environment and that a spirit of co-operation is pivotal in the pursuit of sector process safety excellence in all areas, and at all levels.

In order to meet the need for an effective framework for interaction between industry, the Competent Authority (CA), trade unions and other expert organisations, the Process Safety Leadership Group (PSLG) was established in September 2007, as the successor organisation to the Buncefield Standards Task Group (BSTG).

The close and dynamic collaboration between industry and regulators culminated with the publication of the Buncefield Standards Task Group's Report, published in December 2008, and with the Process Safety Leadership Group's report on '*Safety and Environmental Standards for Fuel Storage Sites*', which was published in December 2009.

The two reports directly address the Buncefield Major Incident Investigations Board's (MIIB) 25 recommendations on the design and operation of fuel storage sites.

Furthermore, they provide authoritative guidance on leadership and key tools to address, document and deliver best practice aimed at improving safety within the industry's operations.

In parallel with the BSTG and the PSLG, UKPIA has worked with the

American Petroleum Institute (API) to develop a comprehensive system of performance indicators for the refining, oil storage and petrochemical industries. In collaboration with the Environmental Agency and the Scottish Environment Protection Agency, the industry has also completed a gap analysis (commonly referred to as a 'score card') against the Competent Authority's Containment Policy on secondary and tertiary containment measures.

Likewise, UKPIA's Process Safety Leadership Network (PSLN) continues to work towards delivering the pledges of the *Process Safety Leadership Commitment* by taking a lead on developing measures to promote the sharing of good practice and performance improvements in process safety - both at oil refineries and fuel storage facilities - with the aim of ensuring that the sector becomes a leader in process safety excellence.

Response to the Buncefield Standards Task Group's Report

Much has been done to ensure the safety, reliability and continuous improvement of the industry's operations. New guidance has been developed on systematic assessment of safety integrity levels and on many aspects relating to leadership and high reliability organisations, such as: human factors, contractors, product transfer procedures and shift working arrangements. A review of procedures has also been carried out to ensure that fuel transfers, between sites and from ships, are sufficiently controlled.



ROSOV valve

Further improvements have also been made at a number of sites in protection against loss of primary containment, using high integrity systems, and in engineering against loss of primary and secondary containment. This has been done, for example, by installing Remotely Operated Solenoid Valves (ROSOVs) - which ensure rapid isolation of finished gasoline storage tanks - and through improvements to bund walls and floors.



Containment improvement using bund liners

Response to the Process Safety Leadership Group's Report



Radar level measurement as part of an overfill protection system

The PSLG completed the work of the BSTG and issued a comprehensive guidance on the design and operation of fuel storage sites. Work on the implementation of this guidance is an ongoing and long term initiative, but much progress has already been made on safety assessments and primary containment.

In addition, the formation of the Process Safety Forum provides a framework for the sharing of high level learnings and initiatives with other high hazard sectors.

For sector level process safety performance indicators, UKPIA members have adopted Tier 1 and Tier 2 metrics from API RP 754.

What they say

"Our dedication to continuous safety improvement is being supported by making our Process Safety Leadership Commitment and its 7 key objectives a reality through the development of tools mapping excellence in key areas for use by member companies, the sharing of incidents and learnings through the Process Safety Forum, the implementation and motoring of the Process Safety Leadership Group Final Report's recommendations and the development of competency skills and leadership training for the sector. This is an ongoing and long-term process that has total support and engagement from UKPIA members."

Chris Hunt, Director General, UKPIA

"I am immensely proud of what the PSLG, and beforehand the BSTG, have achieved. In early 2006, when we started to craft and deliver a credible and robust response to the Buncefield incident, I knew that we had a long and difficult road ahead of us. As a detailed analysis started on the key issues and critical things to get right at fuel storage depots and facilities, the enormity of the task became much clearer. To have got through this, and set out the framework which will hopefully prevent another disaster, is extremely satisfying. The shared vision of both industry and the regulators, coupled with the hard work that the teams working on individual topics applied to determining good practice, were the vital elements to the success of the PSLG. It was also extremely pleasing to find no shortage of volunteers from the industry who stepped forward to develop and draft the PSLG Final Report.

In one sense, we have done the easy part: writing the standards. The real challenge will be to maintain the momentum to implement the improvements we have collectively set out, and turning the concepts into reality. I see no sign of any let-up in the pace of improvements being delivered on the ground, and I would encourage everyone involved to stay focused on delivery and to not lose sight of the

lessons from Buncefield and the sheer devastation which occurred there in December 2005. The PSLG showed the way forward on leadership and the shared benefits of collaboration between duty holders in identifying good practice in the control of major hazards. Controlling risks within these enterprises requires a robust process safety management system. This can only be maintained and driven forward by high standards of leadership, and through effective feedback mechanisms using key performance indicators to monitor achievement of critical control measures. It also allows board and executive business decisions to be based upon honest and accurate process safety information. I would look to the PSLN to carry this forward on behalf of the refinery industry both within the UK and internationally."

**Ian Travers, Head of Chemical Industries Strategy Unit,
Hazardous Installations Directorate, HSE**

"Tank Storage Association's (TSA) members believe that the joint work undertaken by industry and the COMAH regulators to address the issues raised by the Buncefield fire and explosion has proved to be very effective. TSA's members were proactive participants from the very start, contributing to the work of both the BSTG and PSLG steering and working groups. Our member companies appreciated the opportunity to be part of the solution. We are committed to continuing to contribute in this way to ensure that the sector builds on this success."

Martyn Lyons, Chairman, Tank Storage Association

"The implementation of the 25 recommendations of the MIIB report on the design and operation of fuel storage sites is an ongoing and long term commitment for both industry and the Competent Authority. It is important to understand the significant and very real progress that is being made. The close working relationship between industry, the CA and other stakeholders, through the BSTG and PSLG, is an important factor in the success of this process."

Peter Davidson, Process Safety Programme Manager UKPIA

Interview - Iain Grime

The UK's Fuels Landscape at a glance and changing Gas Oil Specifications

Nunzia Florio interviews Iain Grime, Technical Services Manager for Petroplus. Iain is based at the company's Teesside facility and has particular responsibility for the compliance with the requirements of the UK's Renewable Transport Fuels Obligation. He has been involved with the company's UK biofuels planning since 2006 and sits on the UK Petroleum Industry Association's Fuels Committee and Biofuels Working Group.

How is the UK's downstream oil industry meeting the challenges associated with greater use of biofuels in road transport fuels and their integration into the UK's supply infrastructure?

Over the last few decades, significant progress has been made in reducing emissions from vehicles and the downstream oil industry has played an important part in this achievement by investing considerably in producing cleaner road fuels. These have also enabled new engine and exhaust clean up technologies in vehicles.

As ever, we have worked hard to support the Government's objective, and associated legislation, to further improve air quality. Further ways to reduce CO₂ emissions now include incorporating a proportion of biofuels to standard petrol and diesel, as set out in the UK's Renewable Transport Fuels Obligation (RTFO). Today, we are obliged to add 3.5% by volume on average to road transport fuels, which is equivalent to around 1.25 million tonnes of biofuels per year.

The increasing use of biofuels does present some technical challenges, particularly the blending process with fossil fuels. For instance, various feedstocks can be used to produce FAME (Fatty Acid Methyl Ester), which is used to blend with standard diesel, and although these are compliant with one single approved standard, they vary in terms of properties - such as density and cold flow properties. Therefore, it is not a case of turning on the



flow and hitting the percentage: the fuel has to be blended consistently with the properties of the FAME used.

Also, while biodiesel can be blended at the refinery using current quality controls and the existing fuel distribution system, bioethanol - which is added to standard petrol - will require blending at terminals due to its affinity to absorb water.

The downstream oil industry has invested greatly to produce new cleaner fuels, such as sulphur-free road fuels, and to allow for the introduction of biofuels. In order to do this, we have made substantial investments not only on plant and additional infrastructure to blend, store and distribute fuels, but also in the various control mechanisms to track and report other aspects associated with the use of biofuels under our obligation for sustainability and greenhouse-gas requirements set out in the RTFO. As an industry, we have had to learn about and understand the performance of these new products. This has been done seamlessly from a consumer's perspective.

At present, the UK supplies two 'diesel' grades: road diesel and gas oil. What is gas oil supplied for?

Gas oil is supplied, for example, for commercial heating applications, inland waterway vessels and coastal

Continued overleaf..

shipping, and stationary and non-road mobile machinery such as: agricultural and forestry tractors, construction equipment, forklifts and railway locomotives.

To differentiate from road fuel, gas oil is supplied with a red excise marker dye and is commonly known in the UK as 'red diesel'.

The EU's Fuel Quality Directive introduces a new grade of Gas Oil, fuel supplied to Non Road Mobile Machinery, commencing on 1st January 2011. What is the nature of this change?

The European Union has recognised that one of the major remaining sources of air pollution comes from off-road vehicles, and the Fuel Quality Directive introduces a requirement for all gas oil for use in non-road mobile machinery (NRMM) to be virtually sulphur-free. This means that gas oil for non-road mobile machinery must not contain more than 10 milligrams of sulphur per kilogram of fuel, reduced from 1000 mg/Kg.

Sulphur-free road diesel has been with us for a while now, and this brings the bigger proportion of emitting machinery in line with that aspect. Fuel for NRMM has to meet 10ppm by 1st January 2011, but there is derogation for rail locomotives until 1st January 2012.

The UK's gas oil standard BS2869 has also been updated to reflect these changes.

Will legislative requirements also apply to Gas Oil for other purposes other than Non-Road Mobile Machinery?

Regulations on the sulphur content of gas oil used for heating and in static machinery are not changing.

Will these changes affect marine Gas Oil?

No. The EU's Fuel Quality Directive does affect gas oil used for inland waterway vessel, but regulations on sulphur content of gas oil for sea-going vessels are not changing. Marine fuels have a different specification and are covered by the ISO 8217 standard.

Road diesel contains up to 7% biodiesel. Will there be any biofuel in Gas Oil?

FAME has been allowed in gas oil since 2006, but it is not mandated. The existing standard reflects the current allowable FAME content in road diesel (up to 7%). Again, there is no current mandate to add it under the RTFO but,

going forward, there may be. Therefore, the standard is set up to allow it, should that happen. Historically, gas oil was segregated from road diesel to allow for the distinction in duty rates and sulphur values. However, now that the NRMM's grade has the same sulphur level, it may be that suppliers can satisfy the demand by "marking" road diesel which may already contain FAME. So, it is best to assume that FAME could be present in gas oil.

Will sulphur-free Gas Oil be compatible with modern off-road equipment?

Yes. Sulphur free gas oil will be suitable for modern off road equipment.

Because of these changes in fuel quality, will there be any changes to supply & storage procedures?

The new BS 2869 specification came into force on 15th November. We are now in the changeover phase and extra diligence will be required to ensure that there is no cross contamination between old stock and new sulphur-free stock. After the changeover is complete, the supply chain will be at 10ppm. Though, there is an allowance in the standard that allows the final consumer to receive up to 20ppm to allow for any small contamination in the distribution chain.

Will there be any changes in duty rates?

There are no changes in fuel duty rates.

Will there be any other impacts as a result of these changes to refinery operators in the UK?

If usual maintenance procedures are observed, the storage properties of the new grade gas oil are likely not to be affected.

For more details visit www.ukpia.com

Information on the Fuel Quality Directive can be found at www.dft.gov.uk/pgr/roads/environment/fuel-quality-directive

For the British Standard BS2869 visit www.bsigroup.com

For the ISO 8217 Standard visit www.iso.org

EVENTS

All Party Parliamentary Group on Oil and Gas

The remit of the APPG on British Offshore Oil and Gas Industry has been extended to include downstream industry topics, with two meetings per year dedicated to this segment of the oil industry. The first of these meetings was held on 16th November 2010 at Portcullis House. At the meeting, UKPIA's President, Brian Worrall, and UKPIA's Director General, Chris Hunt, presented on the future role of the refining industry in the UK.

Conferences

On 28th September, UKPIA's Director General, Chris Hunt, presented at the *Platts European Refining Conference in Brussels*. The conference provided attendees with an overview of the refining industry, from product shifts to legislative developments, while highlighting key challenges and changes for UK and EU refiners.

Chris Hunt also spoke at the *Tank Storage Conference 2010* in Istanbul in November.

UKPIA's Process Safety Programme Manager, Peter Davidson, presented the industry's work on process safety and sharing of high level learnings at the *HazardEx Conference* in Aberdeen on 22nd September.

Refinery Visits

On 23rd August DfT and DECC officials joined UKPIA's Director General, Chris Hunt, and Technical Director, Hugh Tucker, for visits to Total's Lindsey Oil Refinery and ConocoPhillips's Humber Refinery. These visits were particularly aimed at highlighting the complexities of meeting the Fuels Quality Directive's reduction targets.

On 6th October, INEOS hosted a visit to the Grangemouth refinery for DECC's Permanent Secretary, Moira Wallace.

UKPIA thanks ConocoPhillips, INEOS and Total for hosting these useful and informative tours.

For more information visit www.ukpia.com - Industry Information - Refining & UK Refineries

PEOPLE

UKPIA welcomes **Bryan Kelly** as Council representative for Murco, replacing **Charles Ganus**, who retired in July. We thank Charles for his contribution to Council.

UKPIA also welcomes **Robert Lanyon** as new Council representative for ExxonMobil. He takes over **Nick Thomas**, who retired in August. We thank Nick for his invaluable work over the years as Council member and President of UKPIA.

Walter Williamson of Cogent will also retire at the end of the year. After 41 years in the industry and 18 years' association with UKPIA's HR Refinery Managers committee, Walter will concentrate on his voluntary work with young people in the UK and a charity in South America.