



Education and Culture DG

Lifelong Learning Programme



TATA STEEL

GT VET

**Greening Technical VET – Sustainable Training
Module for the European Steel Industry**



Work Package 2

Industry Driven Analysis of Job Requirements

National Report

**Environmental Legislation, Policy and Practice:
The UK Steel Industry**

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United Kingdom

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1.0 Introduction

The purpose of this report is to identify and describe the environmental legislation that pertains and applies to the UK steel industry. Arguably, environmental protection and preservation, essential elements in programmes of ‘sustainable development’¹, presents particular challenges for primary industries such as steel production, because environmental sustainability requires the conservation and prudent use of non-renewable resources, as well as the management of environmentally damaging impacts associated with the extraction (the mining of iron ore and coal) and – crucially for our purposes - processing of these resources. The challenges arise, in part, because iron and steel production is intrinsically carbon-intensive (EEF, 2009) as well as energy-intensive (e.g. the electricity required to create the ‘arc’ in an electric arc furnace is enough to power a town with a population of 100,000 (EEF, 2011)); utilises large amounts of finite raw materials, such as coal and iron ore; releases significant amounts of emissions (Environment Agency, 2004); and the production process creates high levels of waste, some of which is hazardous (Environment Agency, 2004: 8).

However, such challenges must be addressed, not just as a matter of corporate social responsibility, but because regulation of environmental issues and concomitant ‘punishment for polluters’ (Eur-Lex, 2005), although a relatively recent policy direction, is an arena that is growing in both importance and scope. As it is estimated that approximately eighty per cent of UK legislation on environmental affairs originates from the EU (Civitas, 2007: EEF, 2010a), a primary focus of this report will be the implementation of these EU-initiated directives and regulations at the national level. Thus the report will identify the specific pieces of UK legislation that have been enacted in order to ensure compliance with the European directives. Furthermore, given that the ultimate aim of the project is the ‘greening’ of VET programmes for skilled

¹ Sustainable development has been defined as ‘development that meets the needs of present generations without jeopardising the ability of future generations to meet their own needs’ (European Commission, 2011a).

technicians (mechanical/maintenance and electrical) employed within the UK steel sector, the implications of each piece of legislation for these two occupational groups will be examined. The relevant environmental legislation can be divided into five key areas:

- generation of waste;
- generation of emissions to the atmosphere;
- generation of emissions to water;
- contamination of land and groundwater; and
- climate change and energy efficiency

Thus, this structure will be adopted in the subsequent text. After this review, a discussion of policy and initiatives in evidence at both sectoral and company levels will be provided.

In order to contextualise the report, a brief overview of some key statistical data pertaining to the UK steel industry will be provided, and subsequently, a concise discussion of the origins and principles of EU environmental policy.

1.1 The UK Steel Industry

Steel is one of the commonest structural metals in the UK (Dahlstrom et al, 2004). In 2009, the UK steel industry produced 10.1 million tonnes of crude steel (with 8 million of this being produced through the blast furnace/basic oxygen steelmaking process and the remaining 2.1 million tonnes produced through electric arc steelmaking) (EEF, 2010a: 2). Total output has been in decline since 1990 (when total production of crude steel stood at 17.7 million tonnes (ibid.)); a decline of 42%. In 2009, the industry directly employed 23,000 workers, a fall from 58,000 in 1990 (ibid.); a percentage decrease of 60%. Despite these reductions, the UK sector is the sixth largest manufacturer in the world, contributing a substantial £7 billion to GDP in 2009 (EEF, 2010b). It provides £3 billion per annum to the UK trade balance, with approximately half of UK steel production being exported) (EEF, 2010b).

1.2 The European Union and Environmental Policy

To reiterate, environmental policy is a relatively recent EU policy area. The issue of environmental protection was not included within the founding Treaty of Rome (1957) and it was the early 1970s before the first of a series of European Environmental Action Plans (EAPs) were launched (Civitas, 2011).

The passing of the Single European Act (1986) entailed a more prominent role for environmental protection in EU policymaking, introducing the principle that it should be considered in all new Community legislation (ibid.). The policy area was substantially expanded by the Treaty of Amsterdam (1997), which made sustainable development one of the EU's core objectives (Eur-Lex, 2005). In 2001, the EU adopted its Sustainable Development Strategy (SDS) in Gothenburg (ibid.), making environmental protection part of the Lisbon Strategy (Schauer, 2006). In 2006, the European Council adopted a comprehensive and renewed SDS for the enlarged Europe (European Commission, 2011a). The strategy outlines a stated commitment to gradual change of current unsustainable consumption and production alongside the creation of 'sustainable communities, able to manage and use resources efficiently.' Environmental protection is re-affirmed as a key Union objective therein (Eur-Lex, 2005), with all subsequent EU policy incorporating a commitment to:

- Ensuring a high level of protection and improvement of the quality of the environment
- Preventing and reducing environmental pollution
- Promotion of sustainable production and consumption, in order to break the link between economic growth and environmental degradation

Concomitantly, the EU pledged that polluters will be made to pay for damage to human health and the environment (ibid.), the 'polluter pays' principle.

The stated commitment to sustainable development was reinforced in the ‘Europe 2020’ strategy (European Commission, 2010), with sustainable growth, incorporating efficient resource use and the prevention of environmental degradation, as one of three stated priorities. ‘Resource-Efficient Europe’ is one of seven flagship initiatives, aimed at building a resource efficient and low-carbon economy (ibid.). The aim is to decouple economic growth from resource and energy use, reduce CO₂ emissions, enhance competitiveness and promote greater energy security.

To achieve the complementary aims of sustainable development and environmental protection then, the EU has passed legislation aimed at improving the quality of water, tackling air and noise pollution, assuring the safety of chemicals, setting standards for waste disposal and protecting the EU’s wildlife and plants (Civitas, 2011). The current EAP, which runs from 2002-12, identifies four environmental areas for priority action:

- climate change;
- nature and biodiversity;
- environment, health and quality of life, and
-
- natural resources and waste (e.g. the EU Landfill Directive requires states to reduce landfill waste by 50% from 1995 levels by 2013 and 65% by 2020).

This latter will be the first area of environmental legislation (i.e. waste management, disposal and reduction) to be considered in this report: the salient EU directives on this matter, how such legislation has been enacted in the UK context, alongside a consideration of the specific implications for the steel industry and the two technical occupations therein will now be discussed.

2.0 Generation of Waste

2.1 Background

Three billion tonnes of waste are generated each year in the European Union; some ninety million tonnes of which are hazardous (European Commission, 2011b). Manufacturing activity is estimated to account for three hundred and sixty million tonnes (European Union, 2010). According to the OECD (2002), the amount of waste produced in Europe increased by ten per cent between 1990 and 1995. Furthermore, the OECD estimates that by 2020, Europe will be generating forty five per cent more waste than in 1995.

The treatment and disposal of such vast amounts of waste, in a way that does not have a detrimental impact on the environment, is obviously an issue of major importance. The majority of waste is disposed of through incineration or landfill, both of which create environmental damage.²

To reiterate, the EU's Sixth Environment Action Programme identifies waste prevention and management as one of four top priorities. Its primary objective is to decouple waste generation from economic activity. The aims are to achieve a significant cut in the amount of rubbish generated, through new waste prevention initiatives, better use of resources, and encouraging a shift to more sustainable consumption patterns.

The European Union's approach to waste management is based on three principles:

Waste prevention: The aim is to reduce the amount of waste generated in the first instance and to reduce its hazardousness through decreasing the presence of dangerous substances in products. Thus, its disposal will automatically become simpler. Waste prevention is closely linked with improving manufacturing methods.

² For instance, landfilling takes up more and more valuable land space, and moreover, it also causes air, water and soil pollution, discharging carbon dioxide (CO₂) and methane (CH₄) into the atmosphere and chemicals and pesticides into the earth and groundwater.

Re-use and Recycling: If waste cannot be prevented, as many of the materials as possible should be recovered, preferably by re-using the waste without physical and chemical processing, followed by recovery through recycling. The European Commission has defined several specific 'waste streams' for priority attention, the aim being to reduce their overall environmental impact. This includes packaging waste, end-of-life vehicles, batteries, electrical and electronic waste. As will be detailed below, EU directives now require Member States to introduce legislation on waste collection, reuse, recycling and disposal of these waste streams.

Improving final disposal and monitoring: Where possible, waste that cannot be reused or recycled should be safely incinerated, with landfill only used as a last resort. Both these methods need close monitoring because of their potential for causing severe environmental damage. As such, the EU has recently approved a directive setting strict guidelines for landfill management. Certain types of waste are prohibited and targets have been set for the reduction of quantities of biodegradable rubbish. Another recent directive lays down stringent limits on emission levels from incinerators.

2.2 Relevant EU legislation regarding the Management of Waste and the UK Legislation that has transposed these Directives into UK law

Specifically, the relevant EU legislation regarding the management of waste is as follows:

- The **Waste Framework Directive (Directive on Waste)** of 2008 is a legal framework aimed at the waste cycle in entirety, from generation to disposal,

which places a strong emphasis on recovery and recycling.³ It is described as the ‘cornerstone of EU waste policy’ (European Union, 2010). This framework directive repealed a number of earlier Directives, namely 75439/EEC, 91/689/EEC and 2006/12/EC, with a view to streamlining waste legislation. It incorporates rules on a number of issues such as the management of hazardous waste and waste oils (European Union, 2010).

The framework directive introduced and promotes the waste hierarchy. This is a five-stage waste hierarchy where prevention is the best option, followed by re-use, recycling and other forms of recovery, with disposal such as landfill as the last resort. Moreover, it represents a step-change in the conceptualisation of waste, from a burden to a potentially valuable resource (EU, 2010).

- The **Landfill Directive (Landfill of Waste)** - Council Directive [1999/31/EC](#) of 26 April 1999, entered into force on the 16 July 1999. The deadline for implementation in the Member States was 16 July 2001. The objective of the Directive is to prevent or reduce, as far as possible, the negative effects on the environment from land-filling of waste, by introducing stringent technical requirements for waste and landfills. The Directive is intended to prevent or reduce the adverse effects of the landfill of waste on the environment, in particular on surface water, groundwater, soil, air and human health.

The Directive defines the different categories of waste (municipal waste, hazardous waste, non-hazardous waste and inert waste) and applies to all landfills, defined as waste disposal sites for the deposit of waste onto or into land. Landfills are divided into three classes:

- landfills for hazardous waste;
- landfills for non-hazardous waste;
- landfills for inert waste.

³ Directive [2008/98/EC](#) of the European Parliament and of the Council of 19 November 2008.

The Directive lays down a standard waste acceptance procedure, so as to avoid any risks:

- waste must be treated before being landfilled;
- hazardous waste within the meaning of the Directive must be assigned to a hazardous waste landfill;
- landfills for non-hazardous waste must be used for municipal waste and for non-hazardous waste;
- landfill sites for inert waste must be used only for inert waste;

Certain categories of waste, including liquid waste, flammable waste, explosive or oxidising waste, may not be accepted in a landfill. Finally, the Directive sets up a system of operating permits for landfill sites.

In England and Wales, the ongoing requirements of the Directive are applied under the **Environmental Permitting (England and Wales) Regulations 2010** (Environment Agency, 2011a) (previously the **Landfill (England and Wales) Regulations 2002 (SI 2002 No 1559)**, the **Environmental Protection (Duty of Care) Regulations 1991** and the **Environmental Protection Act 1990**.

- The **Controlled Management of Hazardous Waste** - Council Directive [91/689/EEC](#) of 12 December 1991 on hazardous waste (OJ L 377 of 31.12.1991). This is a framework for the management, recovery and correct disposal of waste considered to be hazardous. Currently, around 5 million tonnes of hazardous waste are produced in England and Wales every year (AEA Technology, 2004). Roughly, 43% of hazardous waste goes to landfill; the rest is either destroyed or recycled. The Hazardous Waste Directive aims to control the movement and handling of this type of waste. It requires the recording and tracking of waste moving from producer to final disposal site. The scope of the directive is defined by the Hazardous Waste List, which has re-

cently been amended to include televisions, computer monitors and fluorescent tubes.

The Directive was transposed into UK legislation through the **Hazardous Waste (England and Wales) Regulations 2005 SI 894** and the **List of Wastes (England) Regulations 2005 SI 895** (Environment Agency, 2011b).

Moreover, implementation of the revised Waste Framework Directive entailed some changes to the Hazardous Waste Regulations. These changes have been brought in by the **Waste (England and Wales) Regulations 2011** and the **Waste (Miscellaneous Provisions) (Wales) 2011 Regulations** (ibid.).

- The **Waste from Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC)** introduces, amongst other things, requirements on selective treatment of collected WEEE with the aim that hazardous materials and components are removed and for some particular items are specially treated. These operations are to be performed in such a way that environmentally-sound reuse and recycling are not hindered.⁴

The WEEE Directive was transposed into UK law in January 2007 by the **Waste Electronic and Electrical Equipment Regulations 2006** (Environment Agency, 2011c).

⁴ One possible application is the use of Refractory Ceramic Fibres (RCFs). Total usage of RCFs in the UK is around 8000 tonnes per annum with *50% of the material being used for furnace/heater/kiln linings*. Domestic appliances account for a further 20%, and metal processing, such as steel foundry and forging use, about 10%. Automotive use, fire protection and general industrial processes make up the remaining 20%. It is possible that building heating appliances may contain RCFs. Respirable RCFs are classified as category 2 carcinogens. Any work with RCF is thus subject to stringent controls. CHECK

- o **Packaging and Packaging Waste**

Packaging was identified as a priority waste stream in the European Commission's Fifth Environmental Action Programme (DEFRA, 2007).⁵ As such, the European Parliament and Council **Directive 94/62/EC** on packaging and packaging waste was agreed on 20 December 1994. The Directive is aimed at preventing excessive production of packaging waste, promoting the re-use of packaging where possible, and increasing the recovery and recycling of packaging waste (ibid.). The Directive also set obligatory target levels of packaging waste recovery and recycling for member states to achieve by 31 December 2008 (DEFRA, 2007).⁶

Moreover, Articles 9 and 11 provide for certain 'essential requirements' that packaging must meet if it is to be placed on the market within the European Community.

The provisions of this Directive are implemented in the UK through two sets of regulations:

- o **The Producer Responsibility Obligations (Packaging Waste) Regulations 2007** (the 'packaging regulations') (**SI 2007, No. 871**) and
- o **the Producer Responsibility Obligations (Packaging Waste) (Amendment) Regulations 2010** (**SI 2010, No. 2849**)

⁵ Packaging, together with end of life vehicles, waste electrical and electronic equipment and batteries, was identified as a priority waste stream because of the amounts of waste arising, the trend for these to continue to rise and concern about the impact of these waste streams on the environment (DEFRA, 2007).

⁶ The Directive targets that the UK had to meet by 31 December 2008 were 60% recovery of packaging waste; 55% recycling of packaging waste; 60% recycling of glass packaging waste; 60% recycling of paper/board packaging waste; 50% recycling of metals packaging waste; 22.5% recycling of plastics packaging waste; and 15% recycling of wood packaging waste (DEFRA, 2007).

- the **Packaging (Essential Requirements) Regulations 2003** (as amended) (the ‘Essential Requirements Regulations’).

The UK has taken a producer responsibility approach to managing packaging waste, whereby the regulations require producers of packaging waste to contribute towards recovering and recycling a proportion of the packaging produced (NetRegs, 2011a). The regulations apply to businesses that produce packaging and a) have an annual turnover of more than £2 million and b) produced or handled packaging weighing over 50 tonnes in the preceding year (ibid.). Such businesses are required to register with the Environment Agency and certify that their obligations have been met.

The Essential Requirements Regulations aim to ensure that:

- packaging volume and weight must be the minimum amount to maintain necessary levels of safety, hygiene and acceptance for the packed product and for the consumer;
- packaging must be manufactured so as to permit re-use or recovery in accordance with specific requirements;
- noxious or hazardous substances in packaging must be minimised in emissions, ash or leachate from incineration or landfill (DEFRA, 2007).

2.3 Specific application to the work of mechanical and electrical engineering technicians at plant level

Maintenance technicians are able to influence the generation of waste and its subsequent disposal, which has an impact on both the environmental and economic sustainability of the business. The technicians would have an influence on the waste hierarchy (to prevent, reduce, reuse or finally dispose of waste); classifying the waste and ensuring the waste is stored in a suitable manner; ensuring the waste is disposed of in accordance with the relevant legislation.

Thus, when the stipulations of the Waste Directive are followed by plant level technicians, this should reduce the volumes of waste generated at steelworks and the associated disposal costs.

The Landfill Directive means that the waste generated by electrical and mechanical technicians needs to be classified as hazardous, non-hazardous or inert, and this dictates where waste may be sent for landfill.

The Controlled Management of Hazardous Waste Regulations is relevant as maintenance activities are likely to generate waste classified as hazardous, and additional measures are therefore required for its management and disposal.

Both the Waste Electrical & Electronic Equipment (WEEE) and Packaging Regulations will greatly impact upon the daily duties of mechanical and electrical technicians in how they consign waste packaging and electrical / electronic equipment to meet the requirements of their company and legislation.

3.0 Generation of Emissions to Atmosphere

3.1 Background

Air pollution has been one of Europe's main political concerns since the late 1970s (European Commission, 2011c). European Union policy on air quality aims to develop and implement appropriate instruments to improve air quality. This includes controlling emissions from industrial installations/operations (ibid.).

To reiterate, the contemporaneous Sixth Environment Action Programme includes 'Environment and Health' as one of the four main target areas, with air pollution being one of the issues included under this auspice (ibid.). The Thematic Strategy on Air Pollution includes clear objectives for the reduction of a number of important air pollutants in order to achieve levels of air quality that do not give rise to significant negative impacts on, and risks to, human health and the environment.

The Community's averred focus for the next decade will be the implementation of air quality standards and coherency of all air legislation and related policy initiatives.

3.2 Relevant EU Legislation regarding Air Pollution and the UK Legislation that has transposed these Directives into UK law

- o **Integrated Pollution Prevention and Control (IPPC Directive) - Directive 1996/61/EC** and codified in 2008 **2008/1/EC** of the European Parliament and of the Council of 15 January 2008.

Through this Directive, the European Union (EU) defined the obligations – in terms of pollutants released - with which industrial (and agricultural) activities with a high pollution potential must comply (Europa, 2010; European Commission, 2011c).⁷ This directive represents an integrated approach to the control of all environmental impacts of certain listed industrial activities (Environment Agency, 2004).⁸ It involves determination by the Regulator (i.e. the Environment Agency in the UK) of the appropriate controls, aimed at the protection of all environmental media, for specified industries, which are to be implemented, maintained and monitored through a single permitting process. This unified approach should ensure that all of the salient environmental issues for an installation are considered in an integrated way.

⁷ The IPPC concerns new or existing industrial and agricultural activities with a high pollution potential. These are defined in Annex I to the Directive (energy industries, **production and processing of metals**, mineral industry, chemical industry, waste management, livestock farming, etc.) (Europa, 2011).

⁸ The integrated approach means that the permits must take into account the whole environmental performance of the plant, covering emissions to air, water and land, generation of waste, use of raw materials, energy efficiency, noise, prevention of accidents, and restoration of the site upon closure. The purpose of the Directive is to ensure a high level of protection of the environment as a whole (European Commission, 2011d).

In order to gain a Pollution Prevention and Control (PPC) Permit, an operator has to systematically demonstrate in its application that the techniques it is using (or is proposing to use) both represent the use of Best Available Techniques (BAT) and take account of relevant local factors. This would be in addition to meeting any other relevant statutory requirements. Gaining and operating under a permit means compliance with the following mandatory obligations (Europa, 2011).

- use all appropriate pollution-prevention measures, namely the Best Available Techniques (which produce the least waste, use less hazardous substances, enable the substances generated to be recovered and recycled, etc.);
- prevent all large-scale pollution;
- prevent, recycle or dispose of waste in the least polluting way possible;
- use energy efficiently;
- ensure accident prevention and damage limitation;
- return sites to their original state when the activity is over.

In sum, the aim of the IPPC Directive is thus to prevent or reduce pollution of the atmosphere (as well as water and soil, and the quantities of waste arising from industrial installations) so as to ensure a high level of environmental protection.

- **Industrial Emissions Directive - Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) (Recast)**

More recently, on 21 December 2007, the Commission adopted a Proposal for a Directive on industrial emissions. The Proposal recasts seven existing Directives related to industrial emissions into a single clear and coherent leg-

islative instrument – the Industrial Emissions Directive. The recast includes the IPPC Directive (European Commission, 2011c).

The review was undertaken with all stakeholders to examine how the IPPC and related legislation on industrial emissions could be improved so as to offer the highest level of protection for the environment and human health, whilst simplifying the extant legislation and cutting unnecessary administrative costs (ibid.).

The Industrial Emissions Directive entered into force on 6th January 2011 and EU member states have two years to implement it into national legislation.

See Environment Agency (2004; 12-15) for a summary of the key IPPC issues in the coke, iron and steel industries.

- **Best Available Techniques (BAT) Reference Documents for the Steel Industry (Iron & Steel BREF)**

Best Available Technique (BAT) is defined in the IPPC Directive as the most effective techniques to achieve a high level of environmental protection, taking into account the costs to operators and the environmental benefits (Environment Agency, 2004). BAT not only refer to the technology used at an installation, but also to the way the installation is designed, built, operated and maintained.

In the determination of the Best Available Techniques, the authorities that issue permits have to take into account the BAT Reference Documents (BREF) adopted by the European Commission. The BREF documents are based on an exchange of information through technical working groups consisting of experts from industry, Member State authorities, research institutes and NGOs (European Commission, 2011d). The BREF describe what is considered to be BAT at EU level for each activity covered by the directive.

With specific regard to the steel industry, the relevant BREF documents are:

- **Best Available Techniques Reference Document on the Production of Iron and Steel, December 2001**
- **Reference Document on Best Available Techniques in the Ferrous Metals Processing Industry, December 2001**

Documents are in the final review stages and newer versions are imminent.

- **Pure Air for Europe - Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008** on ambient air quality and cleaner air for Europe.

This Directive revises European legislation relating to ambient air quality with the aim of reducing pollution to levels which minimise the harmful effects on human health and on the environment and improving information to the public on the risks involved (European Commission, 2011d). This is relevant to the air quality issues surrounding many steelworks, as iron and steel-making works are significant emitters of SO₂, particulate matter (PM₁₀ and PM_{2.5} – fine particulate), NO_x, CO, iron and its oxides, heavy metals and organochlorides including dioxins and furans (PCDD/F). Coke works emit dust and VOC (volatile organic compounds), including benzene and polycyclic aromatic hydrocarbons (PAH) (Environment Agency, 2004).

The Pure Air for Europe Directive merges the majority of the extant legislation (with the exception of the Fourth Daughter Directive) into a single directive with no change to existing air quality objectives (European Commission, 2011d). This incorporates the Air Quality Framework Directive (Council Directive 96/62/EC) on ambient air quality assessment and management; the First Daughter Directive (Council Directive 1999/30/EC) relating to limit values

for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air; the Second Daughter Directive (Directive 2000/69/EC) of the European Parliament and of the Council relating to limit values for benzene and carbon monoxide in ambient air; and the Third Daughter Directive (2002/3/EC) of the European Parliament and of the Council relating to ozone in ambient air. The Directive also incorporates new air quality objectives for PM_{2.5} (fine particulate).

- The Fourth Daughter Directive (2004/107/EC) of the European Parliament and of the Council relates to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air (ibid.).

UK Legislation embodying these Directives

- **The Environmental Permitting Regulations (England and Wales) 2010 SI 2010/675**

The regulations provide a consolidated, single regulatory system for environmental permits (and exemptions) for industrial activities, through streamlining and integrating:

- Waste Management Licensing,
- Pollution Prevention and Control,
- Water discharge Consenting,
- Groundwater Authorisations, and
- Radioactive Substances Regulation (DEFRA, 2011).

It also sets out the powers, functions and duties of the regulators including the control of pollution from water discharge activities (Business Link, 2011).

- **Clean Air Act 1993**

The Clean Air Act gives powers to local councils to control domestic and industrial smoke to improve local air quality and meet EU air quality standards for sulphur dioxide and particulates. It enables local councils to create 'smoke control areas' and order the use of cleaner fuels in these areas (NetRegs, 2011b).

Part 1 bans the emission of dark smoke from chimneys and industrial or trade premises; Part II requires new furnaces to be as smokeless as possible, limits emissions of smoke, grit, dust and fumes, as well as specifying chimney heights; Part III authorises local councils to declare 'smoke control areas' in order to improve air quality, where only 'authorised fuels, can be used (with limited exceptions). The Clean Air Act is enforced by local councils, largely through abatement notices. Businesses found responsible for producing dark smoke can be fined up to £20,000 (ibid.).

3.3 Specific Application to the work of mechanical and electrical technicians at plant level

Technicians should be aware of the requirements of the Environmental Permit so as to ensure that no uncontrolled releases to atmosphere occur. Technicians have the potential to cause the uncontrolled release of emissions to atmosphere through maintenance activities (welding, burning, degassing, re-gassing) or

through the setup of control instrumentation, monitoring systems or pollution abatement plant such as scrubbers, electrostatic precipitators (ESPs) or bag filter units.

4.0 Generation of Emissions to Water

4.1 Relevant EU Legislation regarding Water Pollution and the UK Legislation that has transposed these Directives into UK law

- **Water Framework Directive (Water protection and management)**

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (**OJ L 327 of 22.12.2000**)

Amending Acts: Decision 2455/2001/EC; Directive 2008/32/EC; Directive 2009/31/EC.

The European Water Framework Directive came into force in December 2000 and became part of UK law in December 2003. It aims to deliver a better water environment, and has a strong focus on ecology (Environment Agency, 2011d).

The Directive has established a framework for the protection of:

- inland surface waters ;
- groundwater;
- transitional waters; and
- coastal waters.

The objectives of the Framework-Directive are to prevent and reduce pollution, promote sustainable water usage, environmental protection, improve

aquatic ecosystems as well as mitigate the effects of floods and droughts. Its ultimate objective is to achieve “good ecological and chemical status” for all Community waters by 2015 (Eur-Lex, 2010).

Member states were charged with the responsibility of analysing each national river basin district by 2013 (to be revised every six years thereafter). On the basis of these analyses, management plans were produced in 2009, to be implemented in 2012. These plans should aim to:

- prevent deterioration, enhance and restore bodies of surface water, achieve good chemical and ecological status of such water by 2015 at the latest and to reduce pollution from discharges and emissions of hazardous substances;
- protect, enhance and restore the status of all bodies of groundwater, prevent the pollution and deterioration of groundwater, and ensure a balance between groundwater abstraction and replenishment;
- preserve protected areas (Eur-Lex, 2010).

Member States must introduce arrangements to ensure that effective, proportionate and dissuasive penalties are imposed in the event of breaches of the provisions of this Framework Directive.

A list of priority substances selected from among the ones which present a significant risk to the aquatic environment has been drawn up at European level. This list is set out in Annex X of the Framework-Directive.

- **Integrated pollution prevention and control (IPPC Directive)**

Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control.

See above.

With specific reference to the steel industry, the key issues to be addressed regarding water management include the following (Environment Agency, 2004):

- consumption levels
- monitoring and management of mass flows of individual pollutants
- management of surface water run-off and treatment facilities
- security of underground drains
- pollution prevention systems and contingency arrangements

- **Industrial Emissions Directive**

Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) (Recast).

See above.

UK Legislation:

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- Radioactive Substances Regulation (DEFRA, 2011b).

It also sets out the powers, functions and duties of the regulators including the control of pollution from water discharge activities (Business Link, 2011).

- **Water Industry Act 1991 SI 57**

This Act consolidates existing legislation on water supply and sewerage services. It introduces a framework that requires industrial sites that discharge process effluent to water and sewers to have formal trade discharge consent for such activities.

- The **Water Resources Act 1991** established the National Rivers Authority (now replaced by the Environment Agency), and regulates water pollution (NetRegs, 2011c). The Act defines the Environment Agency's role in water pollution, water resource management, flood defence, fisheries and navigation. It covers discharges to controlled waters (including surface and ground waters), including rivers, lakes, estuaries and coastal waters, and controls abstracting and impounding water.

Industrial operators are liable for costs incurred through the repair of damage caused by their polluting discharges, largely by reimbursing the Environment Agency for the anti-pollution works it has carried out (ibid.).

Businesses must not cause, or knowingly permit, any poisonous, noxious or polluting material or solid waste to enter controlled water without consent from the Environment Agency. Penalties for failure to take adequate care to prevent unauthorised discharges to controlled waters include fines or imprisonment (ibid.).

- **Control of Pollution (Oil Storage) Regulations SI 2001/2954**

These regulations impose general requirements for the prevention of pollution of surface water and groundwater from oil storage, including from fixed tanks, drums and mobile bowsers. The regulations include requirements for ensuring that oil tanks, drums, pipes and pipelines including fill-points are within sec-

ondary containment. The regulations make contravention a criminal offence (Business Link, 2011).

4.2 Specific Application to the work of mechanical and electrical engineering technicians at plant level

Technicians have the potential to cause the uncontrolled release of contaminants to controlled waters through maintenance activities (replacement of fluids such as coolants/oils etc, blowdown of cooling towers, chemical storage etc) or through the setup of control instrumentation and monitoring systems. They therefore need to be cognisant of the implications of their activities, which have the potential to cause pollution of drains and watercourses. As such, technicians should be aware of the requirements of the site's Environmental Permit relating to effluent, as well as the requirements of the Oil Storage Regulations.

5.0 Contamination of Land and Groundwater

5.1 Relevant European Legislation regarding Land and Groundwater Pollution and the UK Legislation that has transposed these Directives into UK law

- **Integrated pollution prevention and control (IPPC Directive)**

Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control.

See above.

- **Industrial Emissions Directive**

Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) (Recast).

See above.

UK Legislation:

- **The Environmental Permitting Regulations (England and Wales) 2010 SI 2010/675**

The regulations provide a consolidated system for environmental permits and exemptions for industrial activities, water discharge activities and groundwater activities. It also sets out the powers, functions and duties of the regulators including the control of pollution from water discharge activities (Business Link, 2011).

- **Environment Protection Act 1990 (Part IIA)**

The Environmental Protection Act 1990 establishes businesses' legal responsibilities for the duty of care for waste, contaminated land and statutory nuisance in England, Scotland and Wales (NetRegs, 2011d).

Part IIA sets out businesses' 'duty of care' responsibilities for producing, collecting, disposing of or treating controlled waste. It also creates the legal basis for requiring businesses to identify and remedy contaminated land, which was then brought into force by the Environment Act 1995 (NetRegs, 2011d).

- **Environmental Damage (Prevention and Remediation) Regulations 2009 SI 153**

These regulations establish liability for polluters to prevent and remedy environmental damage that they have caused - the 'polluter pays' principle (NetRegs, 2011e). If an individual or a business carries out an activity that causes environmental damage, then that person/entity is responsible for the remedy of the damage. If there is a risk of damage from business activities, the business must act so as to prevent such damage occurring.

Under the regulations, environmental damage is defined as:

- serious damage to surface or ground water
 - contamination of land where there is a significant risk to human health
 - serious damage to EU protected natural habitats and species, or damage to Sites of Special Scientific Interest (SSSIs).
-
- **Control of Pollution (Oil Storage) Regulations SI 2001/2954**

These regulations impose general requirements for the prevention of pollution of surface water and groundwater from oil storage, including from fixed tanks, drums and mobile bowsers. The regulations include requirements for ensuring that oil tanks, drums, pipes and pipelines including fillpoints are within secondary containment. The regulations make contravention a criminal offence (Business Link, 2011).

5.2 Specific Application to the work of mechanical and electrical engineering technicians at plant level

Technicians have the potential to contaminate land through maintenance operations (replacement of fluids, storage of oil and chemicals, repair of leaks, secondary containment, refuelling of vehicles etc).

Technicians should therefore be aware of the requirements of the site's Environmental Permit relating to the storage and handling of oils and chemicals which could potentially contaminate land, as well as the implications that their activities may have on meeting these requirements.

6.0 Climate Change

6.1 Background

EU publications aver that ‘combating climate change is a top priority’ (European Commission, 2011e). The European Union has taken a leading role in the international negotiations that led to agreement on the two United Nations climate treaties, the UN Framework Convention on Climate Change (UNFCCC) in 1992 and the Kyoto Protocol in 1997.

The Kyoto Protocol requires that the 15 countries that were EU members at the time (the EU-15) reduce their collective emissions in the 2008-2012 period, to 8% below 1990 levels. Emissions monitoring and projections show that the EU-15 is well on track to meet this target (European Commission, 2011e).

In 2007, EU leaders endorsed an integrated approach to climate and energy policy and committed to transforming Europe into a highly energy-efficient, low carbon economy. They made a unilateral commitment that Europe would cut its emissions by at least 20% of 1990 levels by 2020 (as well as for 20% of energy to come from renewable sources and a 20% reduction in primary energy, to be achieved by improving energy efficiency – ‘the 20:20:20 targets’ [Civitas, 2011]). This commitment is being implemented through a package of binding legislation, known as the ‘climate and energy package’. This was agreed in 2008 by the European Parliament and Council and became law in June 2009 (see below).

The EU has also offered to increase its emissions reduction to 30% by 2020, on condition that other major emitting countries in the developed and developing worlds commit to do their fair share under a future global climate agreement. This agreement should take effect at the start of 2013 when the Kyoto Protocol's first commitment period will have expired (European Commission, 2011e).

The Cancún Agreement, a package of decisions adopted at the end of the UN Climate Conference in Mexico (December 2010), represents an important step on the road to building a comprehensive and legally binding framework for climate action for the period after 2012.

6.2 The European Emissions Trading System

Directive 2009/29/EC amending **Directive 2003/87/EC** so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community; OJ L 140/63.

The EU ETS commenced in 2005 and is the largest multi-national, multi-sector greenhouse gas emissions trading system in the world. It includes around 11,000 installations, accounting for about 45 per cent of EU carbon dioxide (CO₂) emissions (Environment Agency, 2011e).

The EU ETS operates by the allocation and trading ('cap and trade' principle) of greenhouse gas emissions allowances throughout the EU - one allowance represents one tonne of carbon dioxide equivalent (ibid.). The Governments of member states have to set a 'cap', or limit, on the total amount of certain greenhouse gases that can be emitted by the factories, power plants and other installations in the system. Within this cap, companies receive emission allowances, which they can sell to or buy from one another as needed. The limit on the total number of allowances available ensures their value (European Commission, 2011e).

To elaborate, at the end of each year, each company must surrender enough allowances to cover all its emissions, otherwise heavy fines are imposed. If a company reduces its emissions, it can keep the spare allowances to cover its future needs or else sell them to another company that is short of allowances. The capacity for businesses to buy additional allowances (on top of their free allocation), or to sell any surplus allowances generated from reducing their emissions, means that this is a flexible compliance regime for operators that concomitantly ensures that emissions are effectively capped across the EU (Environment Agency, 2011e).

The scheme currently has two operating phases (ibid.):

- **Phase I** ran from 1 January 2005 to 31 December 2007 and was a 'learning by doing phase';
- **Phase II** runs from 1 January 2008 to 31 December 2012 and includes revised monitoring and reporting rules, more stringent emissions caps and additional combustion sources;

Phase III will run from 1 January 2013 to 31 December 2020. A single EU-wide cap on emission allowances will apply from 2013 and will be cut annually, reducing the number of allowances available to businesses to 21% below the 2005 level in 2020. The free allocation of allowances will be progressively replaced by auctioning, and the sectors and gases covered by the system will be expanded (European Commission, 2011e).

Installations covered by the EU ETS are those which carry out activities listed in Annex I of the EU ETS Directive. These include electricity generation and the major energy-intensive industries – power stations, refineries and offshore, **production and processing of ferrous metals** (i.e. iron and steel production), cement and lime, paper, food and drink, glass, ceramics, engineering and the manufacture of vehicles. In combination, these sectors account for approximately 48% of UK carbon dioxide emissions (DECC, 2011a).

The EU ETS Directive requires all installations carrying out activities listed in Annex I to hold a greenhouse gas emissions permit. The conditions of the permit will require installations to monitor and report emissions in accordance with the Commission's guidelines for monitoring and reporting.

Each year emissions data must be verified, and the equivalent number of allowances surrendered. All transactions and surrendering of allowances take place on a national registry.

- **The Carbon Capture and Storage Scheme (CCS)**

The EU has also established a legal framework to promote the development and safe use of carbon capture and storage (CCS). CCS is a family of technologies that capture the carbon dioxide emitted by industrial processes and store it in underground geological formations where it cannot contribute to global warming. Although the different components of CCS are already deployed at commercial scale, the technical and economic viability of its use as an integrated system has yet to be shown. The EU therefore plans to set up a network of CCS demonstration plants by 2015 to test its viability, with the aim of commercial update of CCS by around 2020. Revised EU guidelines on state aid for environmental protection, issued at the same time as the legislative package was proposed, enable governments to provide financial support for CCS pilot plants (European Commission, 2011e).

6.3 Relevant UK Legislation

- **Climate Change Act**

The UK has passed legislation which introduces the world's first long-term, legally binding framework designed to tackle the dangers of climate change. The Climate Change Bill was introduced into Parliament on 14 November 2007 and became law on 26 November 2008 (DECC, 2011b).

The Act sets 2050 as the target year for a legally binding 80% reduction in greenhouse gas emissions. An interim target of a reduction in emissions by at least 34% by 2020 has also been set (with both targets set against a 1990 baseline) (DECC, 2011b). In order that these targets are achieved, the Act outlines a carbon budgeting system which caps emissions over five-year periods, greenhouse gas emissions trading schemes as well as financial incentives for businesses to reduce waste and recycle more.

- **The Climate Change Levy (CCL) Regulations 2001 (SI 838)**

The CCL Regs (and Climate Change Agreements Regs – see below) were passed under the Finance Act 2000. The CCL is a tax on the use of energy (coal, gas, electricity, lignite and non-transport LPG), in industry, commerce and the public sector (DECC, 2011c; EEF 2010d). Its aim is to encourage businesses to become more energy-efficient and to reduce their greenhouse gas emissions, thus playing a central role in assisting the UK meet its targets for such emissions reductions. According to Government publications, all revenue raised through the levy is recycled back to business through a 0.3 percentage point cut in employers' national insurance contributions, introduced at the same time as the levy, as well as support for energy efficiency and low carbon technologies (DECC, 2011c cf. EEF, 2010d)⁹.

- **.Climate Change Agreements (Eligible Facilities) Regulations 2001 (SI 662); 2006 (SI 60); (Amendment) 2006 (SI 1931); Climate Change Agreements (Energy-intensive Installations) Regulations 2006 SI 59**

These sets of regulations identify the types of energy-intensive business activities and sites that can claim a discounted rate of climate change levy, provided that energy-efficient targets or carbon-reduction targets negotiated with the government are met (EF, 2010d; NetRegs, 2011f). Businesses have the option of choosing to reduce their carbon emissions or to reduce energy use relative to production (EEF, 2010d). Performance against targets is assessed every two years – if targets are not met, the business is not eligible for a discount for the following two years. The discount rate was set at 80% until April 2011; it has now fallen to 65% (EEF, 2010d).

⁹ The EEF claim that the levy introduced 15% to the energy bill of a typical UK business. In 2007-8, £716 million was raised via the levy. The EEF also point out that NI contributions have continued to rise, thus any offsetting reductions have been cancelled out.

A Negotiated Agreement has been made between the UK Steel Association and the Government concerning a rebate of the Climate Change Levy (CCL). Signatories will be subject to a reduced level of site specific regulation on energy efficiency matters, in particular capital expenditure is not required on energy efficiency improvements beyond baseline measures (Environment Agency, 2004).

6.4 Specific Application to the Work of Mechanical and Electrical Engineering Technicians at Plant-level

Technicians have the potential to impact upon the emissions and energy performance of the plants in which they operate, through maintenance activities (replacement of drives/motors, balancing of extraction systems, furnace combustion optimisation) or through the setup of control instrumentation and monitoring systems.

Technicians should be aware of the mechanisms of climate change in relation to the steel industry, of the existence of the EU Emissions Trading Scheme, as well as an understanding of energy efficiency.

7.0 Sectoral Level

(EEF) UK Steel is the trade association for the British steel sector and is a division of EEF, the manufacturers' organisation. Its members include every steel producing company in the UK, as well as many steel-processing companies (EEF/UK Steel, 2011).

The body represents the interests of the UK steel industry to government at all levels, promotes the industry and the importance of steel to the public. In addition, it provides information and services to its members. This latter includes informing members of relevant developments in European, UK and other legislative or statutory bodies. The association also seeks to influence those developments to the benefit

of its members, so as to try to ensure that they are not disadvantaged compared with their competitors in world steel markets or in other industries (ibid.).

The association also promotes and develops standards within the industry. UK Steel is one of the major representational bodies at BSI (the British Standards Institution) and provides expertise in all the standards-making fora. It is also active in promoting the use and assessing the wider impact of modern standards (ibid.).

Finally, UK Steel has two subsidiary companies, which provide specific services to members and to other companies within the wider steel sector. These are firstly, the Iron and Steel Statistics Bureau (ISSB Ltd), which offers both standard and tailor-made statistical services to the steel industry, governments and international organisations.

The second subsidiary company, and of particular relevance here, is UK Steel (Environmental) Ltd. This company was established in 2000 so as to facilitate UK Steel's management and administrative activities on behalf of the industry. These duties pertain to the sector's collective commitments to reduce energy consumption under the steel industry's Climate Change Levy agreements.

The association also negotiated an agreement (CCA) for a rebate of the Climate Change Levy.

8.0 Tata Steel

8.1 Background

Tata Steel Europe (formerly Corus) is the second largest steel producer in Europe, with major steelmaking operations located primarily in the UK and the Netherlands (Tata Steel, 2011a). It is a subsidiary of Tata Steel Group, one of the world's top ten

steel producers. The combined Group has an aggregate crude steel capacity of more than 28 million tonnes and approximately 80,000 employees across four continents (ibid.).

Tata Steel supplies a broad range of products to a variety of markets, including the construction, automotive, packaging and mechanical engineering sectors.

8.2 Tata's Position on the Environment

The Tata website states that 'respecting and safeguarding the environment is a fundamental principle held by all Tata Group companies' (Tata Steel, 2011b). Its' Corporate Citizenship Report 2009/10 states the Group's commitment to respecting and safeguarding the natural environment and the biodiversity of areas in which it currently operates or seeks to expand in. Responsibility (including responsibility for the environment) is one of the Group's five core values (Tata Steel, 2011c).

In its published material on its environmental responsibilities, the Group focuses mainly on climate change, reducing carbon dioxide emissions and energy consumption, improving air and water quality and material efficiency. The Group's statements on each of these aspects will now be detailed.

- **Position on Climate Change**

Reducing Carbon Dioxide Emissions and Energy Consumption

A perusal of the 2009/10 Corporate Citizenship Report indicates a strong Group focus on tackling climate change. The Group concedes that the global steel industry is a significant generator of CO₂ emissions but also emphasises its belief that the Group has a positive contribution towards addressing the problem of climate change, in part because its products (i.e. high-strength steels) are making it possible to design and produce lighter and more fuel-efficient vehicles, including hybrid and electric vehicles, and buildings that are more energy efficient and less material intensive (ibid.).

Moreover, over the last forty years, the Group has halved the energy required to make a tonne of steel and the Group is committed to making further substantial reductions in its total CO₂ emissions. The Group had made the reduction of carbon dioxide emissions to less than 1.7 tonnes per tonne of crude steel by 2012, with a longer-term target to reduce CO₂ emissions to less than 1.5 tonnes for every tonne of crude steel produced by 2020.

(ibid.). However, due to the difficulties associated with the economic downturn of 2008/09, the Group has since declared these targets to be unattainable, and will be issuing revised targets later this year (ibid.).

The Group has identified five strategic priorities that underpin its vision with regard to climate change (ibid). These priorities remain:

- To continue to achieve emission reductions
- To invest in longer-term breakthrough technologies for producing low-carbon steels
- To develop new products and services that generate lower CO₂ emissions through the life cycle
- To actively engage its entire workforce in this challenge, and
- To lead by example within the global steel industry.

The strategies for achieving these aims include making ongoing improvements to current manufacturing processes as well as investment in longer term breakthrough technologies. The Group states that “The scope for achieving further substantial CO₂ emission reductions from conventional iron and steel-making processes is limited. The production of hot metal via the blast furnace route must therefore be placed on a completely new technological path if a step change in emissions is to be achieved” (2011: 18).

As such, Tata Steel Europe is a leading member of ULCOS (Ultra-Low CO₂ Steelmaking), a pioneering partnership of 48 companies and organisations from 15 European countries, established in 2004. ULCOS is engaged in a €59 million (US\$79 million) co-operative research initiative to achieve just such a step change. The ultimate and ambitious aim of the ULCOS project, which is supported by the European Commission, is to reduce CO₂ emissions per tonne of steel produced by at least 50% by 2050.

On the subject of carbon emissions, Tata Steel Europe is required to participate in the EU Emissions Trading Scheme (EU ETS). Phase II of the scheme began on 1 January 2008, and during 2010, the business emitted fewer tonnes of CO₂ than its total allocation of emission allowances. This is at least partly attributable to the impact of the economic downturn on production levels and output (UK Steel EEF, 2011). At normal production levels, the Group states that it would expect to be in balance or slightly short of its allowances overall.

The steel industry in Europe, along with various other sectors of industry, faces further tightening of emission allowance allocations from 2013, when the EU ETS enters its third phase (Phase III). The European Commission has identified the iron and steel sector, among others, as an energy-intensive sector that is exposed to international competition. As such, it is recognised that without free allocation of emission allowances to steel companies in the EU, there is a risk of a shift in global production trends towards countries applying a lower level of carbon constraint – something often referred to as ‘carbon leakage.’

Tata Steel signed a Climate Change Agreement with the UK government to achieve reductions in energy consumption equivalent to 15.8% by the end of 2010 compared to the 1997 level, and the company is on course to achieve this.

In April 2010, at the Port Talbot facility, the company commissioned a £60 million (US\$91 million) energy efficiency scheme. UK. This investment has already begun to reduce the site's CO₂ emissions through the re-use of gases from the Basic Oxygen Steelmaking (BOS) plant. The BOS gas generated from the process is recovered and is being used to generate an extra 15MW of power – 10% of the facility's total electricity needs. This in turn is allowing the higher quality coke oven gas to be utilised more effectively in the hot strip mill, reducing natural gas consumption at the mill by approximately 60%. Overall, the scheme will reduce CO₂ emissions from the steelworks by 297,000 tonnes per year, which in turn will reduce the total carbon footprint of Tata's European operations by 1% – equivalent to the national emission reduction target for Wales (ibid.).

Air Quality

The company identifies its other most significant releases to air (in addition to carbon dioxide) as being particulate material (including fine particulate such as PM₁₀), sulphur dioxide (SO₂) and oxides of nitrogen (NO_x). The Group utilise measurement and modelling around its steelmaking facilities, in order to analyse its contribution to airborne levels of pollutants. The Group states that, with the exception of PM₁₀, air quality limits are currently being met in the areas around all of its major facilities (Tata Steel, 2011c: 18).

The company recognised that, with regard to PM₁₀, point source and diffuse releases from integrated steelworks can make a significant contribution to airborne concentrations. As such, air quality management areas have been declared in the vicinity of the Group's operations at Port Talbot and Scunthorpe in the UK (Tata Steel, 2011c: 19).

Tata Steel Europe has established an Air Quality Strategy Group, in order to share good practices, identify and coordinate improvement activities, and direct a strategic

R&D programme focused on increasing understanding of the sources and effects of particulate emissions, and identifying the best means of abating them, across European operations. Each of the Group's European integrated steelworks has developed an emission reduction strategy for diffuse emissions of PM10, which sets out short, medium and long-term improvement measures, with progress reviewed on an annual basis.

Water Quality

The Group states that it deploys a wide range of techniques in order to reduce water consumption and to prevent water pollution. Most of the water utilised in the steel-making process is used for non-contact cooling and is returned directly to the watercourses from which it is taken, with no deterioration in quality. In order to minimise the impact of its process effluents, the Group reports that it has installed a complex range of biological, chemical and physical effluent treatment technologies across its sites, with systems in place to monitor effectiveness..

The company is also looking to systematically substitute hazardous substances utilised within its manufacturing processes with safer alternatives, so as to reduce risk of harm to natural watercourses. At the Orb site in South Wales, Tata implemented a project that, by the end of 2009, completely eliminated acid pickling on the site's two thermal flattening lines by introducing an alternative mechanical cleaning system for steel strip prior to thermal flattening. The new system has significantly reduced the risk to the local surface water and groundwater environment, while also reducing energy consumption associated with heating the pickling bath.

In recognition of the fact that fresh water is a finite and increasingly valuable resource, the Group is working to develop a water foot-printing tool that will provide a more accurate measure of fresh water consumed per tonne of steel produced. This

will enable the company to target additional water saving schemes where they are most needed.

Material Efficiency

Steelmaking is reliant on large amounts of virgin and increasingly costly raw materials such as iron ore and coal (2011c: 21). The Group therefore recognises that it must optimise its consumption of these materials, by minimising waste and ensuring that by-products meet tight quality control standards, in order that they can be used in other industry sectors and processes.

Tata identifies its most significant by-product, in terms of volume, as being blast furnace slag. This has now become a valuable raw material for the concrete industry, where it is used as a clinker substitute, thereby simultaneously reducing mineral extraction and CO₂ emissions. Steelmaking slags are also used extensively in civil engineering and agricultural applications, and tar and benzole from Tata's coke-making processes are used within the chemicals industry (2011c: 21).

Tata (2011c) states that it already applies advanced techniques at all its integrated steelworks in order to extract valuable components such as iron and carbon, through the re-use of most of the residual materials through sinter plants, BOS plants and coke ovens.

In 2009-2010, the Group internally re-used over seven million tonnes of residual materials, replacing primary raw materials and reducing overall CO₂ emissions (2011c: 22). The Group aims to ensure that as much waste product generated by its processes as possible can be re-used, recycled or recovered by third parties.

The report cites an example of a project launched at Port Talbot in 2008, aimed at reducing waste disposed of at landfill. Through the application of a number of innovative recovery processes, ranging from thermal desorption of oil to the establish-

ment of a state-of-the-art waste slag recovery facility, waste to landfill from the site was reduced by over 50% within a year (ibid.). By redirecting materials back into the steelmaking process, raw material consumption and CO₂ emissions have also been reduced. The project has proved so successful, that the relevant authorities have granted permission for the extraction of existing land-filled materials so that the useful constituents of these can be recycled back into the process (ibid.).

In another example of applying a systematic approach to reducing waste disposal, Tata Steel Tubes at Hartlepool established a recovery project that has resulted in only 7% of all waste from the site now being land-filled, compared to 90% previously (ibid.).

9.0 Conclusions

The aim of this report was to review environmental legislation at supranational and national level, as it pertains to the steel industry. Thus, relevant European environmental directives have been identified and described. EU legislation in this area can be categorised into five principal areas: generation of waste; generation of emissions to atmosphere, as well as to water; contamination of land and groundwater and finally, climate change. As such, this was the structure adopted within this document and within each category, a review of the salient European directives was provided, followed by an identification and discussion of the specific UK legislation that transposed these directives into the UK. Each of these sections culminated in an examination of how this legislation applies to and impacts upon the work of mechanical and electrical engineering technicians at plant level.

In general, the legislation has been framed so as to protect different aspects of the environment (ie air, water) and minimise the impact of activities with the potential to cause harm to these environmental media (ie generation of waste; storage of oil). As such, a review of the legislation did not identify any legislation that was specific to

the steel industry. Thus, the discussion of sectoral-level initiatives focused on the activities of (EEF) UK Steel, the British steel sector's trade association.

Finally, Tata Steel's environmental policy and practice was outlined. This was discussed with specific regard to the company's position and initiatives on climate change, air and water quality as well as materials efficiency.

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