

How to comply with your environmental permit
Additional guidance for:

Hot Rolling of Ferrous Metals (EPR 2.04)



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Introduction

Introduction

In “*Getting the basics right – how to comply with your environmental permit*” (GTBR) we described the standards and measures that we expect businesses to take in order to control the risk of pollution from the most frequent situations in the waste management and process industries.

This sector guidance note (SGN) is one of a series of additional guidance for Part A(1) activities listed in Schedule 1 of the Environmental Permitting Regulations (the Regulations). We expect you to use the standards and measures in this note **in addition** to those in GTBR to meet the objectives in your permit.

Sometimes, particularly difficult issues arise such as problems with odour or noise. You may then need to consult the “horizontal” guidance that gives in depth information on particular topics. Annex 1 of GTBR lists these.

The IPPC Directive requires that the Best Available Techniques (BAT) are used. When making an application, explain how you will comply with each of the indicative BATs in this sector guidance note. Where indicative BAT is not included, where you propose to use an alternative measure or where there is a choice of options you should explain your choice on the basis of costs and benefits. Part 2 of Horizontal Guidance Note H1 Environmental Risk

Assessment (see GTBR Annex 1) gives a formal method of assessing options which you should use where major decisions are to be made.

We will consider the relevance and relative importance of the information to the installation concerned when making technical judgments about the installation and when setting conditions in the permit.

Modern permits describe the objectives (or outcomes) that we want you to achieve. They do not normally tell you how to achieve them. They give you a degree of flexibility.

Where a condition requires you to take appropriate measures to secure a particular objective, we will expect you to use, at least, the measures described which are appropriate for meeting the objective. You may have described the measures you propose in your application or in a relevant management plan but further measures will be necessary if the objectives are not met.

The measures set out in this note may not all be appropriate for a particular circumstance and you may implement equivalent measures that achieve the same objective. In cases where the measures are mandatory this is stated.

Introduction

In response to the application form question on Operating Techniques, you should address each of the measures described as indicative BAT in this note as well as the key issues identified in GTBR.

Unless otherwise specified, the measures and benchmarks described in this note reflect those of the previous Sector Guidance Note. They will be reviewed in the light of future BREF note revisions. In the meantime we will take account of advances in BAT when considering any changes to your process.

Installations covered

This note applies to activities regulated under the following section of schedule 1 of the Regulations:

Section 2.1, Ferrous Metals, Part A(1),

- (c) Processing ferrous metals and their alloys by using hot-rolling mills with a production capacity of more than 20 tonnes of crude steel per hour.

Directly associated activities

As well as the main activities described above, the installation will also include directly associated activities which have a direct technical connection with the main

activities and which may have an effect on emissions and pollution. These may involve activities such as:

- surface rectification and conditioning of feedstock
- pre-heating and re-heating furnaces
- de-scaling and edging
- roughing
- cooling
- water management systems
- cold finishing operations including cold rolling
- pickling and recovery of pickle liquors
- tempering and annealing
- all handling and storage of raw materials, wastes and products
- effluent treatment
- engineering workshops.

Introduction

Key issues

The key issues are:

Energy efficiency

There is a substantial requirement for fuel to heat stock in the reheat furnace and a lower, but still significant, requirement for heating of stock for annealing.

Power requirements for both hot and cold rolling are substantial.

Energy efficiency impacts directly on the potential for significant impact upon air quality both locally and at remote electricity generating plant.

Even if you have a Climate Change Agreement (CCA) or an EU Emissions Trading Scheme (EU ETS) permit, you must still consider energy efficiency as part of your overall assessment of BAT for your installation, especially where these considerations may have an impact on other emissions.

Water efficiency

This sector uses large amounts of water, for example:

- to remove scale during hot rolling
- for cooling purposes
- as a basis for emulsions used during cold rolling.

You need good water management to avoid cross contamination of oily and clean streams.

Generation and disposal of solid wastes and by products

By products and waste streams with a high potential environmental impact include

- mill scale
- pickle acid recovery and reclamation wastes
- roll shop wastes
- scrap from trimming and finishing.

Factors that affect waste generation and disposal include:

- water management (to avoid contaminating mill scale with oil)
- pickling and acid recovery (the acid used and the recovery system will define the waste which will be generated)
- lubricant selection (chlorinated cutting oils used in engineering workshops are potential sources of dioxins wherever the scrap is fed to a furnace).

Releases to air

Emissions, in particular from combustion activities and pickling activities, may include:

- oxides of nitrogen
- oxides of sulphur (except where gas firing is employed)
- particulate matter (except where gas firing is employed).

Introduction

Releases to water

Releases to water may include materials arising from:

- oil spillages
- oily water streams and run-off from oily mill scale
- water contaminated with metals
- discharges from effluent treatment systems.

Noise

The potential for noise is substantial, the main sources including:

- powerful motors being used to force steel into new shapes
- metal in process moving quickly over steel rollers
- large fans moving substantial quantities of air
- moving product in stock yards, loading vehicles, vehicle movements
- descaling feedstock or product by shot blasting, grinding or scarfing.

Pickling and pickle acid recovery or reclamation

This is a complex process issue for this sector and the cost elements of the recovery or reclamation operation may be a significant factor in deciding what is BAT. Aspects of environmental significance include:

- water usage
- generation of wastes and by-products
- emissions to air.

Ground contamination and site restoration

Most rolling mills are operating on sites that have been used for similar purposes for many years. Where this is so, there is a high probability that earlier operations will have caused ground contamination that could at a future date be confused with contamination caused by operation of the process. To avoid future liability at closure of the site, you are required to assess the current degree of contamination in order to establish baseline conditions for the site.

1

Managing your activities

1.1 Energy efficiency

1.2 Efficient use of raw materials and water

1.3 Avoidance, recovery and disposal of wastes

Energy efficiency

1. Managing your activities

1.1 Energy efficiency

Hot rolling mills are major energy users. Fuel is used directly to heat the steel stock prior to rolling and electrical energy is used to move and re-shape the product. You should decide which of the following techniques is BAT for your installation by carrying out cost benefit appraisals using the methodology given in Appendix 4 of the Horizontal Guidance Note H2 Energy Efficiency for EPR.

At integrated iron and steel works significant energy can be saved by using “hot connect”. This saves the heat and energy required to re-heat cold billet prior to rolling. From an energy efficiency viewpoint, coupled casting and rolling (“hot connect”) is an environmentally desirable development because it significantly reduces inter-process stock reheating requirements.

Indicative BAT

You should where appropriate:

1. Use waste heat boilers, hot exhaust gases for feedstock pre-heating, insulating boxes and covers for materials in transit between hot processes and hot charging/direct rolling.
2. Use continuous processing instead of batch processes wherever possible.
3. Use primary industrial fuel gases (notably coke oven and blast furnace gas) available at integrated iron and steel works, in reheating for hot rolling.

Efficient use of raw materials and water

1.2 Efficient use of raw materials and water

Water is used extensively for cooling and cleaning throughout the process. All activities raise the water temperature, and wherever the water comes into contact with rolled material or rolls, it will become contaminated with mill scale or oil, or both.

You should identify and evaluate opportunities for the recycling or reuse of water and raw materials.

Indicative BAT

You should where appropriate:

1. Avoid the use of chlorinated oils, particularly chlorinated cutting oils in roll re-grinding and other machine shop activities.
2. Use alternatives such as:
 - biodegradable hydraulic oils.
 - aqueous de-greasing systems in preference to solvent based de-greasing.
 - Where solvent based de-greasing is necessary, then use non-chlorinated solvents.
3. Provide water for indirect cooling by dedicated closed loop systems.
4. Wherever practicable, avoid using process waters contaminated with hydrocarbons to remove or transport mill scale from oil free areas. Oily and oil free waters should be recycled in separate closed loop systems to avoid contaminating scale with oil. Recycle rates of greater than 95% are achievable.
5. Minimise water drag out from tanks in the pickling train by use of squeeze rolls and wiper rolls on cold rolling systems.
6. On cold rolling plant, integrate the liquor flows between drag out tanks, acid vapour absorption column serving tanks and regeneration or recovery plant.
7. Where available and suitable, use industrial fuel gases available on site in preference to imported fuels.

Avoidance, recovery and disposal of wastes

1.3 Avoidance, recovery and disposal of wastes

The most significant waste stream is mill scale (oily and oil-free). The options for handling oily waste will be dependant upon the existence of other activities capable of recycling it, treated or otherwise.

Other wastes may include:

- scrap metal such as offcuts, downgraded material and trimmings
- oily turnings and millings from the machine shops
- oil-free scale from scarfing and reheating
- oxide dust from air filtration systems
- oils, grease and other spent machine lubricants
- oily scale and wet sludges, such as from water treatment plant and spent lubricating emulsions from cold rolling
- acid liquors, dusts or sludges from the acid recovery system
- engineering and civil wastes arising from major maintenance activities.

Indicative BAT

You should where appropriate:

1. Minimise the quantity and environmental impact of waste by the recovery and preparation for reuse of mill scale.
2. Mill scale recovered from recycled water at integrated sites should normally be recycled to the sinter plant. On non-integrated sites mill scale can be:
 - recycled via the sinter plant at another site
 - sold on to another industry, for example, cement/concrete production, or,
 - recycled via the electric arc furnace (EAF) route.
3. Minimise the generation of oily scale by good oil management systems and do not mix oily scale with oil free scale.
4. Minimise the generation and disposal of waste, taking into account the following:
 - the likelihood and potential impact upon disposal options of oil contamination of mill scale
 - the recovery of waste oil
 - disposal routes for by-products from pickle acid recovery / regeneration and their sensitivity to external factors.

Avoidance, recovery and disposal of wastes

5. Avoid the use of chlorinated solvents and cutting oils in the roll shop. The presence of chlorinated hydrocarbons in millings and turnings will affect the recycling potential of machine shop wastes.
6. Consider the following in a waste audit:
 - the match between cast shape and final product
 - input surface quality and its impact upon waste arisings
 - process control in descaling operations
 - edging and width control
 - cropping
 - work roll lubrication systems and work roll cooling
 - finishing train automation
 - oil contamination of scale
 - management of roll shop wastes to avoid cross contamination

2

Operations

2.1 Hot rolling mills

2.2 Fully integrated casting and rolling

2.3 Cold rolling

2.4 Pickle acid reclamation and recovery systems.

Hot rolling mills

2. Operations

2.1 Hot rolling mills

Operations include:

- surface treatment of feedstock cast material, including scarfing, grinding and cutting to size
- re-heating
- de-scaling
- the rolling track for hot rolled strip, including edging, roughing and strip rolling
- plate production
- rolling rod and bar
- tube and pipe mills, including extruded tube, welded tubes and pipe

Aspects of environmental significance are:

Air

Potential emissions to air arise from re-heat furnaces (products of combustion), scarfing and other flame cutting activities

(products of combustion and oxide fume) and pickling.

Noise

Finishing operations and product handling can be significant sources of noise.

Hot rolled steel strip travelling at 20 m/sec over steel rollers prior to coiling is a potentially challenging source of noise.

Cooling banks and primary shear lines are also potentially very noisy.

Impact noises arising from the movement of large diameter pipes, or of heavy plate, are intermittent.

Drive motors for rolling mills.

High pressure descaling is another potential source of noise, as are the ID fans associated with re-heat furnaces.

Other plant items with substantial noise potential include vehicles used for materials handling.

Indicative BAT

You should where appropriate:

1. Minimise air pollution by:

- minimising the need for surface rectification by effective quality assurance and liaison with suppliers or supply departments
- enclosure of scarfing or grinding operations with extraction to appropriate gas cleaning plant. For hand grinding enclosure is not usually necessary.

Hot rolling mills

2. Minimise energy requirements, and hence most emissions to air arising from fuel use, by employing as appropriate:
 - waste heat recovery on reheating and heat treatment furnaces
 - automated fuel:air ratio control
 - recuperators or regenerative burners
 - oxy fuel burners.
 3. Minimise emissions of NO_x by:
 - use of low NO_x burners
 - selective non catalytic reduction (SNCR)
 - external flue gas recirculation
 - selective catalytic reduction (SCR).
- Automated burner control and oxy fuel burners may also offer reductions in NO_x emissions.
4. Note that both selective and non selective catalytic reduction of NO_x involve the use of ammonia with an attendant risk of ammonia release through the system, and also the introduction of a significant accident hazard in the form of storage facilities for aqueous ammonia. Energy efficiency may also be adversely affected by measures designed to reduce formation of NO_x.
 5. Achieve further reductions in energy consumption by the use of:
 - waste heat boilers
 - hot exhaust gases for feedstock pre-heating
 - insulating boxes and covers for materials in transit between hot processes
 - hot charging / direct rolling.
 6. In assessing BAT for any furnace system, consider the significance of energy efficiency and greenhouse gas emissions.
 7. Drain oil free scale from scarfing and grinding operations or dry, as appropriate. (Do not mix oily scale with oil free scale).
 8. The direct use of oily scale is restricted by the oil content. Coarse scale with an oil content of less than 1% can be recycled to the sinter strand which precedes the iron making process. Use alternative methods for handling oily scale such as:
 - briquetting with dry materials to improve ease of handling
 - washing to remove oil
 - flotation
 - heat pre treatment to burn off oil
 - modifications to sinter strands or blast furnaces to enable them to accept oily scale.

Hot rolling mills

9. The Best Available Technique (BAT) is to minimise the generation of oily scale by good oil management systems. BAT for handling oily waste will be dependant upon the existence of other activities capable of consuming oily waste, treated or otherwise.
10. Avoid the use of chlorinated solvents and cutting oils in the roll shop. The presence of chlorinated hydrocarbons in millings and turnings will affect the recycling potential of machine shop wastes.
11. Prevent contamination of ground, groundwater and storm water run off by:
 - bunding all oil storage tanks, transfer pumps and pipework correctly
 - inspection and maintenance procedures to minimise the risk of accidental loss caused by overflows or spillages from seals, gaskets pumps and pipelines
 - instrumentation and operating procedures to detect overfilling or leaking.
12. Prevent noise by:
 - incorporating noise attenuation measures at the design stage
 - locating potentially noisy operations away from residential areas.

Fully integrated casting and rolling

Cold rolling

2.2 Fully integrated casting and rolling

The technology described above involves the manufacture of discrete slabs (or billets) which are then subject to the hot rolling process. The continuous casting process is functionally separate from the mill line. Direct integration of casting and rolling is well established internationally and it is reasonable to surmise that any future hot strip mill and possibly rod mills within the UK may adopt this process variant.

In terms of potential to pollute, the significant differences relating to these process variants are the use of very long tunnel reheaters and in some cases in-line welding of stock to produce a continuous output. Surface treatment of the cast feedstock is also absent in such plant and is to some degree compensated by increased descaling intensity.

2.3 Cold rolling

On an integrated site where hot and cold rolling are carried out sequentially on the same material, the cold rolling may be considered to be “directly associated” and “having a technical connection”. If this is so, then the cold rolling mill is part of the installation.

A typical layout will comprise:

- a pickling line, where the oxide layer formed during hot rolling is removed by acid pickling
- a cold rolling mill, where the steel is rolled to reduce its thickness, typically by 50% to 80%
- annealing furnaces to restore the ductility lost during cold rolling
- temper mills to reharden the product to the customer's requirements

- where coil is being processed, slitting and recoil facilities.

Engineering facilities, and in particular the roll shop where rolls for the rolling mills are prepared and resurfaced, are also of significance.

Operations include:

- pickling
- cold rolling
- annealing
- temper rolling of cold rolled strip

Aspects of environmental significance are:

Water

Potential sources of waste water include:

- spent pickle liquors
- drag out from pickling tanks
- pickle tank exhaust air scrubbers

Cold rolling

- rolling emulsions
- water used for cooling purposes
- waste liquors from alkaline washing

Wastes and by-products

The range of solid wastes and by-products may include:

- metallic wastes including off cuts, downgraded materials and trimmings
- spent emulsions and cutting fluids from engineering shops
- oils and greases and other spent or contaminated lubricants
- paper used to protect stainless steel surfaces

Air

Potential sources of emissions to air are:

- acid vapours from pickling tanks
- products of combustion from annealing furnaces
- oil mists from rolling activities

Noise

There are many potential sources of noise, including:

- finishing operations, especially where strip is cut into sheet on shearing lines
- rolling mill drive motors
- exhaust fans serving annealing furnaces

Indicative BAT

You should where appropriate:

1. Optimise the use, recovery and recycling of water by:
 - using a dedicated closed loop system to provide cooling water
 - use of squeeze and wiper rolls to minimise drag out from tanks in the pickling train
 - integrating liquor flows between drag out tanks, acid vapour absorption columns serving both tanks and the regeneration plant, and the regeneration or recovery plant.
2. Minimise the quantity and environmental impact of waste by:
 - employing pickling solutions which permit recovery of the acid
 - avoiding the use of chlorinated solvents and cutting oils in the engineering shop
 - selling on spent liquor for use as a water treatment chemical, for example.
3. Prevent contamination of ground, groundwaters and storm water by:
 - proper bunding of all storage tanks and process vessels to contain any accidental spillage of pickle acids, lubricants, fuels, or any other fluids
 - inspection and maintenance procedures to minimise the risk of accidental losses caused by overflows or leaks from seals, gaskets, pumps and pipelines
 - installing instrumentation to detect overfilling or leakage.

Cold rolling

4. Minimise air pollution by:
 - effective collection and treatment of acidic vapours released during pickling
 - minimising fuel consumption, and therefore emissions to air from annealing furnaces, by using:
 - automated burner controls
 - programmed heating cycles for batch annealing
 - recuperative or regenerative burners to recover heat from exhaust gases
 - employing low NO_x burners
 - collecting and treating oil mists generated during rolling, if significant.
5. Minimise energy consumption by:
 - incorporating where appropriate the energy saving measures identified in point 4 above. Additionally use waste heat boilers to recover heat from annealing furnaces.
6. Prevent noise by:
 - incorporating noise attenuation measures at the design stage
 - location of potentially noisy operations away from neighbouring residential areas.

Pickle acid reclamation and recovery systems

2.4 Pickle acid reclamation and recovery systems

There are many techniques for recovering pickle acid. These include

- crystallisation of sulphate based liquors
- pyrohydrolysis of chloride liquors
- ion exchange adsorption (retardation)

which can be recycled to the steel making process

- acid recovery or regeneration from spent alloy steel pickle liquors will contain mixtures of metals which may not be amenable to separation and re-use

Aspects of environmental significance are:

Water

The combined pickling and recovery processes are normally net consumers of water. Designed water emissions are not great, being limited to alkaline discharges from tail gas scrubbers. These will contain sodium chloride, fluoride, nitrate or sulphate as dictated by the primary process.

Wastes and by-products

The primary source of wastes and by-products is the metal removed from the steel during pickling:

- from the simpler acid recovery processes treating liquors from low alloy steels, this waste will be in the form of ferrous sulphate crystals or ferrous chloride
- acid regeneration processes employed on similar liquors will yield iron oxide

Air

Potential sources of emissions to air are:

- acid gases from the decomposition of metal salts
- dusts arising from handling recovered oxides

Accident

Accidents which could give rise to significant abnormal releases into the environment include:

- mechanical failure of vessel pumps or pipework causing loss of liquid
- process control failure causing overflow from vessels
- electrical or process control failure causing or allowing uncontrolled discharges into the air
- mechanical failure at the pickle plant preventing removal of material (if associated with overheating of the liquor could give rise to excessive emissions to air).

Pickle acid reclamation and recovery systems

Indicative BAT

You should where appropriate:

1. Minimise air pollution by:
 - avoiding air in-leakage, and thus excessive air flow through reactors and scrubbing systems, by attention to design and maintenance
 - where dry solids are produced, attention to procedures and systems involved in their removal.

3

Emissions and monitoring

3.1 Emissions to air

3.2 Emissions to water

3.3 Fugitive emissions to air

3.4 Monitoring

Emissions to air

3. Emissions and monitoring

3.1 Emissions to air

Emissions to air are likely to include:

- products of combustion (NO_x, SO_x, CO_x) in exhausts from reheat and annealing furnaces, process liquor heating plant and boiler plant
- fine particulate and metallurgical fume in exhausts from scarfing machines
- coarser particulate in exhausts from grinding and descaling activities
- sulphuric acid mist from pickle tanks where sulphuric acid is in use
- hydrogen chloride from pickle tanks where hydrochloric acid is in use
- NO_x and hydrogen fluoride from pickling plant employing mixed nitric and hydrofluoric acid systems
- acid gases from acid reclamation activities
- oil mist from rolling mills
- fine dust and oxide fume from rolling mills
- ammonia where SCR or SNCR is used.

Indicative BAT

You should where appropriate:

1. Filter exhausts from machine scarfing or grinding before discharge. Where the moisture content is such as to prevent the use of fabric filters, then electrostatic precipitators should be employed.
2. Control oxides of nitrogen in exhausts from large reheat furnaces by fitting SCR or SNCR. For other furnaces low NO_x burners are required.
3. Control emissions of sulphur dioxide by restricting the sulphur content of fuel.
4. Where the concentration of pollutants from exhaust systems on the finishing train exceeds the emission benchmarks, filter before discharge.
5. Where mixtures which contain nitric acid are used for pickling, minimise NO_x releases by using hydrogen peroxide or urea in the mixture
6. Scrub pickle tank and degreaser exhausts before discharge.
7. Pass wet temper rolling mill and finishing end boiler exhausts through mist eliminators or electrostatic precipitators before discharge.

Emissions to water

Fugitive emissions to air

3.2 Emissions to water

Indicative BAT

You should where appropriate:

1. Supply indirect cooling water for motors, etc., through a closed loop circuit.
2. Use a separate, oil free circuit to remove and transport mill scale.
3. As far as is practicable, design the storm water system to retain and store clean water for subsequent use and to avoid contamination of excess storm water before discharge.
4. Design your effluent system to accommodate the blending of acidic discharges (e.g., from drainage around pickle systems) with alkaline discharges (e.g., from caustic degreasing) to minimise the requirement for pH adjustment prior to final discharge. It should also be designed to prevent effluent by-passing the effluent treatment plant.
5. With regard to biological oxygen demand (BOD), take into account the nature of the receiving waters. However, under the Environmental Permitting Regulations, the prevention or reduction of BOD is subject to BAT and any further reductions which you can achieve at reasonable cost should be applied. Irrespective of the receiving water, you should consider whether your treatment plant is adequate for minimising the emission of specific persistent harmful substances.

3.3 Fugitive emissions to air

Indicative BAT

You should where appropriate:

1. Fugitive emissions to air are unlikely to be of major significance, however attention should be given to the following:
 - containment around scarfing machines and grinding booths
 - hot rolling mill finishing operations
 - hot rolling mill levelling and welding stations
 - cold rolling mill decoiling stations
 - pickle tank containment and extraction
 - storage tanks for volatile acids
 - rolling and temper mill extraction to remove oil mist
 - acid reclamation plant
 - handling of wastes.

Monitoring

3.4 Monitoring

Indicative BAT

You should use the following where appropriate:

1. When you release process effluents to controlled waters you should monitor the parameters in the table below. The appropriateness of the frequencies suggested in the table will vary depending upon the sensitivity of the receiving water and should be proportionate to the scale of the operations. Note: your permit may require you to monitor other parameters as well, for example metals and metal compounds.

Parameter	Monitoring frequency for typical effluent treatment plant
Flow rate	Continuous and integrated daily flow rate
pH	Continuous
Temperature	Continuous
COD/BOD	Flow weighted sample or composite samples, weekly analysis, reported as flow weighted monthly averages.
Turbidity	Continuous
Oil	Weekly

4

Annexes

Annex 1 Emission benchmarks

Annex 2 Other relevant guidance

Annex 1-Emission benchmarks

4. Annexes

Annex 1- Emission benchmarks

Emissions to air associated with the use of BAT

The emission benchmarks quoted below are daily averages based upon continuous monitoring during the period of operation.

Where emissions are expressed in terms of concentrations and where continuous monitors are employed, it is recommended that limits are defined such that:

- Not more than one calendar monthly average during any rolling twelve month period shall exceed the benchmark value by more than 10%; and
- Not more than one half hour period during any rolling 24 hour period shall exceed the benchmark value by more than 50% (for the purpose of this limit half hourly periods commence on the hour and the half hour).

Where spot tests are employed:

- The half hour limit shall be applied over the period of the test; and
- The mean of three consecutive tests taken during a calendar year shall not

exceed the benchmark value by more than 10%.

Reference conditions for releases to air

The reference conditions of substances in releases to air from point-sources are:

- Temperature 0°C (273K)
- Pressure 101.3 kPa
- No correction for water vapour or oxygen

To convert measured values to reference conditions, see the Monitoring Guidance¹ for more information.

¹ • MCERTS approved equipment link via http://www.sira.co.uk/services_mcerts.html
Guidance on monitoring can be downloaded free from <http://www.environment-agency.gov.uk/business/1745440/444671/466158/>
Information about direct toxicity testing of effluent can be downloaded free from http://www.environment-agency.gov.uk/business/1745440/444671/466158/1208802/1222740/?version=1&lang=_e

Annex 1-Emission benchmarks

Table 1 Furnace emissions

Emission	Benchmark Level	Techniques which may be considered to be BAT	Comment
Oxides of nitrogen	400mg/m ³	Low NOx burners	BREF ref A 4.1.3.7
	350mg/m ³	SCR	BREF ref A 4.1.3.8
	250mg/m ³	SNCR	BREF ref A 4.1.3.9
Oxides of sulphur	100mg/m ³	Use natural gas as fuel	Control emissions of sulphur dioxide by removing sulphur from fuel gases and restricting oils to <1% sulphur. BREF A 4.3.1.3
	400mg/m ³	Other gases including cleaned blast furnace gas	
	1700mg/m ³	Use oils with less than 1% sulphur	

Table 2 Emissions from scarfing, rolling, coiling, welding, shot blasting and finishing

Emission	Benchmark Level	Techniques which may be considered to be BAT	Comment
Particulate matter including metallurgical fume	10mg/m ³	Fabric filters	BREF ref A 4.1.2.1
	50mg/m ³	Wet electrostatic precipitators where emission is too wet to use fabric filters	
Oil mists	15mg/m ³	Mist eliminators	BREF ref A 4.2.3.9

Annex 1-Emission benchmarks

Table 3 Pickling, including pickle acid recovery or reclamation systems

Emission	Benchmark Level	Techniques which may be considered to be BAT	Comment
Hydrogen chloride	10mg/m ³	Counter current packed tower with final alkaline scrubber	BREF ref A 4.2.2.7
Sulphur dioxide	100mg/m ³	Counter current packed tower with final alkaline scrubber	BREF ref A 4.2.2.10
Sulphuric acid mist	5mg/m ³	Mist eliminators	BREF ref A 4.2.2.10
Oxides of nitrogen	350mg/m ³	Scrubbers or adsorption towers	BREF ref A5.2
	200mg/m ³	SCR	Used at one installation in South Yorkshire, close to an Air Quality Management Area
Hydrogen fluoride	2 mg/m ³	Scrubbers and adsorption towers	BREF ref A5.2
Particulate	50mg/m ³	From the wet scrubber	BREF ref A5.2

Annex 1-Emission benchmarks

Emissions to water associated with the use of BAT

Where automatic sampling systems are employed, limits may be defined such that:

- Not more than 5% of samples shall exceed the benchmark value;
- Where spot samples are taken, no spot sample shall exceed the benchmark value by more than 50%

Table 4 Examples of emissions to water associated with the use of BAT

Substance	Benchmark release concentration, mg/litre
Total hydrocarbon oil	5 mg/litre
Suspended solids	20 mg/litre
Dissolved iron	10 mg/litre
Total chromium	0.2 mg/litre (0.5mg/litre where stainless steel is processed).
Dissolved nickel	0.2 mg/litre (0.5mg/litre where stainless steel is processed).
Zinc	2 mg/litre

Annex 2- Other relevant guidance

Annex 2- Other relevant guidance

For a full list of available Technical Guidance and other relevant guidance see Appendix A of GTBR (see <http://publications.environment-agency.gov.uk/pdf/GEHO0908BOTD-e-e.pdf?lang=e>).

In addition to the guidance in GTBR the following guidance is relevant to this sector:

1. IPPC Reference Document on Best Available Techniques in the Ferrous Metal Processing Industry European Commission <http://eippcb.jrc.es/pages/FActivities.htm>

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