

PROCESS DESCRIPTION

The production of industrial equipment and machinery involves the manufacture and assembly of the final product from a number of metallic, plastic and electrical components. Therefore a wide range of industrial processes may be involved including metal cutting, pressing, polishing, grinding, plating, painting etc. These processes are described in detail in separate guidelines i.e. Foundries, Metal Surface Engineering, and Metal Fabrication.

These process and activities may utilise hazardous materials such as machine and cutting oils, and solvents for degreasing applications, paints, lubricants etc.

Auxiliary operations may include storage, boiler plant for energy production, de-emulsification plants for oil recovery, wastewater treatment plants and ventilation systems for welding fumes and solvent emissions.

KEY ENVIRONMENTAL, HEALTH AND SAFETY RISK/LIABILITY ISSUES

Hazardous Materials Storage

Considerable quantities of oils, solvents, paints and other hazardous substances could be utilised in the process. Typical storage may include underground storage tanks, above ground storage tanks, tank farms (multiple tanks) and drums of assorted compounds.

Hazardous chemicals and process gases should be labelled with the appropriate internationally recognised diamond shaped hazard symbol¹. Chemicals with different hazard symbols should not be stored together - clear guidance on the

¹ United Nations 2007 (see references)

compatibility of different chemicals can be obtained from the Materials Safety Data Sheet (MSDS) which should be readily available from the manufacturer and on site.

Air Emissions

Typical atmospheric emissions include

- Particulates;
- Gaseous emissions from energy generation, i.e. carbon monoxide, sulphur dioxide, nitrogen oxides;
- Solvent emissions;
- Fumes from welding.

Wastewater and Liquid Wastes (Effluent)

Liquid wastes are predominantly waste oils, solvents and wastewater from rinsing and cleaning operations. Discharges of wastewaters include organic compounds, suspended solids and some inorganic material.

Depending on the nature and volume of wastewaters and local regulations, facilities may require an on-site wastewater treatment plant.

Wastewater discharges to sewer and surface waters are likely to require discharge consents from the regulatory authorities. In many instances, it may be illegal to operate without a valid discharge consent.

Solid Wastes

Typical wastes include oil impregnated metal cuttings, wastewater treatment sludge, degreasing bath sludges, paint sludges and packaging. If recovery of the metals is not possible, hazardous wastes must be consigned for disposal in compliance with national legislation.



Additional wastes arise from general operations, cleaning and maintenance and the disposal of faulty equipment and parts.

Packaging

Large quantities of packaging may be used. Reusable packaging, e.g. metal racks, bins and containers is returned to suppliers when empty. Disposable packaging including wood pallets, cardboard, plastic, polystyrene and polythene film, should be recycled wherever possible

Companies operating with the European Union (either as a manufacturer or as a supplier into European Union countries) will be subject to the European Union Packaging and Packaging Waste Directive (94/62/EC), which aims to reduce the amount of packaging that is being introduced into waste.

Permitting

A manufacturer placing machinery on the market and putting into service anywhere in the UK or the rest of the European Economic Area (EEA) for the first time must comply with the requirements of the Machinery Directive (98/37/EC) (and from 29 December 2009 these requirements will be updated by the new Machinery Directive (2006/42/EC)). This requires products with higher than normal safety risk to the operator require third party testing carried out by an appointed Notified Body (which will have been assessed for its technical competence to carry out this work) unless they have been manufactured in accordance with transposed harmonised standards. Such products must have a declaration of conformity and bear the CE marking.

Painting operations may be subject to the requirements of the Solvent Emissions Directive (1999/13/EC).

Fire & Explosion

Oxy/fuel gas equipment may be used for welding, cutting, heating, straightening, descaling etc. Improper use can cause fire and explosion, for example:

- Using the blowpipe too close to combustible material;
- Cutting up or repairing tanks or drums which contain or may have contained flammable materials;
- Gas leaking from hoses, valves and other equipment;
- Misuse of oxygen;
- Backfires and flashbacks from defective or incorrectly operated equipment.

OTHER ENVIRONMENTAL, HEALTH AND SAFETY RISK/LIABILITY ISSUES

Energy Consumption

Manufacturing plants use energy throughout the plants for many different end-uses. The main energy types used on-site are electricity, steam, gas, compressed air, emissions abatement and ventilation.

Sharp Edges & Machinery

Injuries resulting from the manual handling of objects and materials with sharp edges and from entanglement and entrapment in the moving parts of machinery are common in the engineering industry, particularly

- Where people are involved in handling sheet or strip metal;

- During work at presses, where small pieces of metal with sharp edges are handled frequently;
- Following accidental contact with scrap metal, banding or swarf, principally during cleaning and disposal;
- By contact with machinery blades, cutters or tools during use and when fitting, removing, cleaning or storing).

Working practices of these employees should be examined carefully to determine the level of risk and a hierarchy of control measures implemented to reduce the risk:

- Avoid direct handling of sharp edged items;
- Engineer out sharp edges and access to dangerous parts of machinery through a hierarchy of controls:
 - Permanently fixed physical barrier
 - Interlocked physical barrier
 - Physical barrier
 - Presence sensing system
- Remove sharp edges by machining;
- Cover or otherwise protect sharp edges;
- Use personal protective equipment.

Noise and Vibration

Noisy processes range from individual machines, such as metal cutting saws, to whole factories or departments. Portable, power-operated tools and hand tools can sometimes produce as much noise as fixed machines. Those at risk include machine operators and those working nearby, e.g. maintenance staff, cleaners, forklift truck drivers and shop floor supervisors. Temporary, partial loss of hearing, which may persist for

several hours, can be caused by brief exposure to high noise levels. Such exposure if repeated or prolonged may lead to permanent hearing damage.

Hand-arm vibration syndrome from the prolonged use of vibrating tools and machinery causes effects on the body's blood circulation known as 'vibration white finger' (VWF). Other damage may be caused to the nerves and muscles of the fingers and hands causing numbness and tingling, reduced grip strength and sensitivity. Pain and stiffness in the hands, and joints of the wrists, elbows and shoulders are other possible symptoms.

Appropriate PPE should be provided and good occupational health systems are required to monitor and control employee long-term exposure to noise and vibration.

Polychlorinated Biphenyls (PCBs) & Asbestos

- PCBs are a group of substances which are good electrical insulators. Typically, PCBs may be present as constituents of hydraulic oils or dielectric fluids in electrical switchgear, transformers and fluorescent light starters. PCBs are extremely toxic and become concentrated within the food chain. Any products that may contain PCBs must be disposed of by licensed contractors in accordance with national regulations.
- Asbestos was used on a large scale for many years as a fire proofing and insulation materials and may be encountered in a wide range of forms within the fabric of older buildings. Asbestos fibres, which are extremely hazardous when inhaled (causing mesothelioma and fibrous thickening in the lungs), may be released when the asbestos

containing material is disturbed during maintenance or demolition.

Particular attention should be given to buildings constructed before the 1980s.

Respiratory Hazards & Dermatitis

Various organic solvents are used in degreasing. The most commonly used are chlorinated solvents such as trichloroethylene, dichloromethane (methylene chloride) and perchloroethylene. These substances may be harmful to health if inhaled. The ill-health effects from inhalation would depend on the substance in use and the concentration and length of exposure. At high concentrations all organic solvents exert a strong narcotic effect and can be fatal. Skin exposure can cause irritation and dermatitis.

Different coating powders may affect worker health in different ways causing irritation of lungs, eyes and skin and allergic skin reactions.

Some components of coating powders can also cause long-term health effects. Some agents may cause asthma. Other curing agents may damage genetic material, which could cause some diseases including cancer and impaired fertility.

Collision

Collision may occur due to presence of moving equipment and vehicles. A lack of designated vehicle and pedestrian paths can result in collision.

Heavy loads may be lifted and moved using fork lift trucks and at elevated heights using hydraulic platforms, and cranes presenting a serious safety hazard.

Ejected parts from computer controlled turning machines may cause serious injury. These are most frequently caused by operator/setter error and failure to properly maintain work-holding devices.

Manual Handling and Repetitive Work

Lifting, repetitive work, poor posture and carrying heavy or awkwardly shaped objects, such as awkward and heavy items and equipment can result in injuries.

Slips, Trips and Falls

These often occur on the same level and are primarily caused by uneven surfaces, inappropriate footwear, lighting, and trailing cables especially during maintenance and cleaning activities.

KEY SOCIAL, LABOUR AND COMMUNITY RISK/LIABILITY ISSUES

Machinery Design

Under the Machinery Directive, machinery must be constructed so that it is fit for purpose and can be adjusted and maintained without putting persons at risk during normal uses and uses, which could reasonably be expected. The machinery must be designed to prevent abnormal use if such use would engender a risk. In other cases, the instructions must draw the user's attention to ways (which experience has shown might occur) in which the machinery should not be used.

Under the intended conditions of use, the discomfort, fatigue and psychological stress faced by the operator must be reduced to the minimum possible taking ergonomic principles into account and the constraints to which the operator is subject as a result of the necessary or



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foreseeable use of PPE (such as footwear, gloves, etc).

Machinery must be supplied with all the essential special equipment and accessories to enable it to be adjusted, maintained and used without risk.

OTHER SOCIAL, LABOUR AND COMMUNITY RISK/LIABILITY ISSUES

Transport

Transport of products by road can be a significant issue. This might lead to road noise and traffic congestion.

FINANCIAL IMPLICATIONS

- Many countries are signatories to the Kyoto Protocol and have adopted targets for the reduction of CO₂ emissions. Where Governments have set up carbon emission reduction programmes industrial processes have been required to reduce their CO₂ emissions through the setting of targets. This can result in a need for substantial investment in new/clean technologies to achieve the emission targets. These targets may be reflected in environmental permits;
- Injuries may lead to increased payroll costs to replace skilled workers and lost production time;
- Capital investment may be required to comply with new environmental, health and safety requirements;
- Fines, penalties and third party claims may be incurred for non-compliance with environment, health and safety regulations.

IMPROVEMENTS

Environmental, Health and Safety Improvements

General

- Environment, health and safety training for all employees and contractors;
- Good housekeeping should be maintained at all times in all areas to reduce the likelihood of incidents and accidents;
- Systems should be subject to frequent and proper inspection
- Routine plant maintenance to keep small leaks and spills to a minimum and maintain plant efficiency;
- Controls should be implemented to minimise the exposure to gases, fume, dust, noise and vibration.

Airborne Emissions

- Installation or upgrade of abatement technology to minimise exposure to hazardous substances and to control the release of emissions, e.g. enclosure of equipment, use of appropriate ventilation with filters, gas balancing systems, cyclones, and wet or alkali scrubbers.

Noise & Vibration

- Enclosure of noisy machines to isolate people from the noise where practicable;
- Reduction of exposure times for people working near noisy machinery and provide personal protective equipment where people have to enter noisy areas;

Water and Wastewater

- Consider feasibility of substitution of hazardous chemicals such as solvent based paints with less hazardous alternatives;
- Consider upgrades to wastewater treatment facilities;
- Recycle treated wastewater where possible back to the processes or to secondary uses such as for cleaning;
- Maintain on site abatement equipment and wastewater treatment plant.

Storage

- Bulk containment must be:
 - Inspected regularly to prevent leakage;
 - Provided with secondary spill containment;
 - Installed with automatic alarms and shut off systems.

Waste

- Return empty containers to the supplier for reuse.

Health & Safety

- Provision of personal protective equipment (PPE) that is fit for the task to prevent injury and maintain hygiene standards. Staff should be trained in the correct selection, use and maintenance of PPE.
- Redesign manual processes to avoid heavy lifting/repetitive activities;

- Install mechanical lifting aids where possible and rotate work tasks to reduce repetitive activities;
- Separate people from vehicles and machinery where practicable;
 - Ensure that the process layout reduces opportunities for process activities to cross paths;
 - Installation of safeguards on moving parts of conveyor belts to reduce risk of entrapment of employees;
 - Install walkways and signage to separate people from vehicle movements to reduce risk of collision;
- Route cables and pipework under walkways to prevent slips, trips and falls;
- Construct walkways of non-slip materials;
- Provide the local fire department with a list and volume of products stored on the premises.

Social Community and Labour Improvements

- Implement a grievance/dispute resolution mechanism for workers and members of the community to raise issues with the Company.

GUIDE TO INITIAL DUE DILIGENCE SITE VISITS

During the initial site visit, the issues will vary according to the type of process being used and product being produced and depending on the level of environment, health and safety management already introduced.

General

- Confirm organisational responsibilities and systems for environment, health, safety and social matters; confirm that this extends to employees and sub contractors.
- Note signs of poor housekeeping, such as signs of spillages and high numbers of empty drums. Particularly note any recent spills.
- Check the condition of any assets, facilities, equipment and production areas. What systems are in place to monitor and maintain physical assets? What investment in asset management is planned? Look for wear and tear and poor maintenance.

Air Emissions Management

- Are there any fume control measures? Do these work and are these used? Is there any build-up of dust on machinery or other surfaces?

Noise

- Note the noise levels at the site. Is there any evidence of noise abatement measures deployed?

Waste Water Management

- What liquid effluents are produced? What discharge control measures are employed?
- Is effluent and wastewater treated before discharge? If so, check the condition of the treatment plant and location of discharge points for effluent and wastewater from the facility.
- What does the quality of these discharges look like? Note the colour and appearance

of adjacent watercourses;

- Note whether the wastewater treatment plant discharges to ground, a local watercourse or the municipal wastewater treatment works. Higher environmental risks will be associated with facilities discharging to water courses without adequate treatment;
- Is the water quality tested? What are the waters tested for? Where are the samples taken from, how often? Do the discharges have to meet set standards?

Solid Waste Management

- Note nature of solid waste disposal;
- Check that solid waste storage equipment is in a good condition;
- Check that waste storage areas are clear of debris and that skips are covered to prevent waste escaping, for example, check that waste containers have lids or are stored in an area with a roof;
- Check for flora/vegetation zones near storage sites that are not growing very well as this will indicated the possibility of pollution.

Transport of Finished Product from the Site

- Is this by rail, road or water or a combination of these?
- Does road haulage cause excessive traffic through any neighbouring residential areas?

Fuel and Bulk Material Storage Arrangements

- What fuels and materials are stored in bulk on site?

- To gauge the potential for spillages and leaks consider the following:
 - Are there any underground storage tanks?
 - Are surface storage tanks and usage areas hard surfaced and bunded? Are these in good condition or are cracks present? Are these regularly tested for leakages?
 - Is the size of the bunding adequate for the volume of the materials stored?
 - Are the bunds regularly cleaned out to avoid loss of capacity due to holding rainwater etc?

Health & Safety

- Are staff wearing PPE?
- Check signage around the site:
 - Does it convey the health and safety risks?
 - Are fire exits and/or evacuation routes clearly marked?
 - Are there demarcated routes for pedestrians and vehicles?
- Check for automatic safeguards on machinery to prevent accidental injury

Incident Management

- Is fire fighting and first aid equipment available?
- Have there been any recent (within the last three years) incidents on site such as fatalities, fires/explosions, spills?

- Assess emergency response to fires, major spills, etc;

Inspections & Regulation

- Check the conditions and duration of validity for all permits;
- What systems are in place to check and maintain assets and infrastructure?
- Has the organisation been subject to environment, health and safety or quality audits by customers/insurers? What was the outcome of these audits?
- Find out what insurances are in place (health, hygiene, fire etc). Identify number and type of claims against insurance. Have insurers made any environment, health and safety audits of the facility? What were there findings and actions taken by management to address these;
- Have the premises been inspected recently (within the past 2 years) by the regulatory authorities for health, hygiene and environment? What were their findings?

Investment

- Review budgets for capital expenditure (capex) and operational expenditure to cover environment, health, safety and labour matters. Does the business plan have line items for environment, health, safety and social improvements as well as asset management and maintenance?
- If investment or refinancing will lead to restructuring of the organisation what will be the potential impacts on health and safety at the operation and wider community? Have

these been considered and assessed by the company?

- If the company plans to invest in new technology, what will be the impacts and benefits for human resources?

Social, Labour and Community

- Check that labour standards, contracting and remuneration are in line with national law and are consistent with the average for the sector;
- Check that hours worked, including overtime, are recorded and staff should receive written details of hours worked and payment received;
- Check that wages and working hours are consistent with the average for the sector and national standards;
- Has the Company received inspections from the local labour inspectorate in the previous three years? Have these resulted in any penalties, fines, major recommendations or corrective action plans?
- Does the organisation have a grievance mechanism which allows employees to raise workplace concerns?
- Are employees free to form, or join, a worker's organisation of their choosing?

Take note/ask questions relating to any activities that address the improvements listed in the improvements section of this document

ACTION PLANS

Dependent on the individual business, select appropriate improvements from the list above to

include in the action plan. As a minimum, any business should be required to have the following in place:

Environmental, Health and Safety

- Operational procedures to manage environmental, health, safety and social risks;
- Monitoring programmes;
- Improvement objectives, targets and project plans;
- Training for personnel;
- Regular inspections, checks and audits with records to demonstrate achievement of the required level of performance against legal requirements and improvement action;
- Operational procedures to manage environmental, health, safety and social risks;
- Emergency plans for environment, health and safety accidents;
- Waste management plan (waste minimisation, re-use, recycling, monitoring);
- Senior management review/demonstrated involvement in environment, health, safety and hygiene management.



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REFERENCES AND ADDITIONAL SOURCES

European Bank for Reconstruction and Development (EBRD). Environmental and Social Policy May 2008. Performance Requirement 2: Labour and Working Conditions.

<http://www.ebrd.com/enviro/tools/index.htm>

European Union 1999, Council Directive 1999/13/EC of 11 March 1999 on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations,

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31999L0013:EN:HTML>

International Organisation for Standardisation (ISO) 2004, ISO14001:2004: Environmental Management Systems – Requirements with Guidance for use. www.iso.org

United Kingdom Department for Trade and Industry 1995, Product Standards: Machinery, Guidance Notes on the UK Regulations, May 1995, <http://www.berr.gov.uk/files/file11274.pdf>

United Kingdom Health and Safety Executive, Health and safety in the engineering industry <http://www.hse.gov.uk/engineering/index.htm>

United Nations 2007, Globally Harmonized System of Classification and Labelling of Chemicals (GHS), Second Revised Edition, available at

http://www.unece.org/trans/danger/publi/ghs/ghs_rev02/02files_e.html