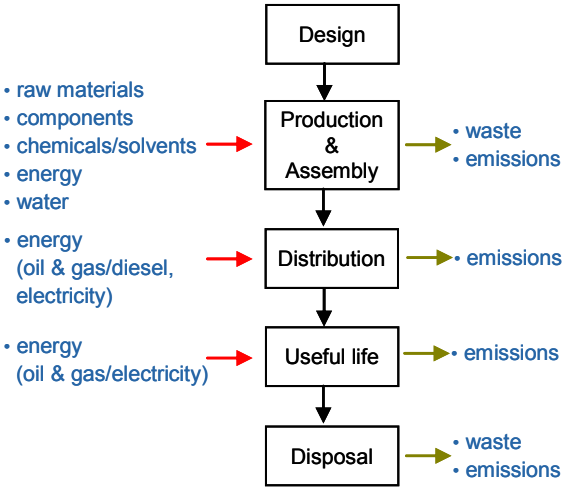
European Bank
for Reconstruction and Development

Sub-sectoral Environmental and Social Guidelines: ELECTRICAL EQUIPMENT & MACHINES (including transformers, switchgear, motors, generators)

PROCESS DESCRIPTION

The production of electrical equipment and machines involves the manufacture and assembly of the final product from a number of components ranging from printed circuit boards to large scale metal transformers. Often, some of these components are produced by the company responsible for the assembly of the final product itself. Below is a generic production process flow diagram for manufacture of electrical equipment and machines.



Due to the wide range of component parts and final products a variety of industrial processes are often involved in the production of electrical equipment and machines. These processes make use of inputs such as machine and cutting oils, solvents for surface treatment/degreasing applications, paints, lubricants and dielectric oils that may, due to the compounds they contain, have a negative impact on the environment and/or human health.

Harmful compounds that may come into human contact through the production of electrical equipment and machines and some of their effects on human health include:

- trichloroethylene (TCE) – liver and lung damage, abnormal heartbeat, likely human carcinogen;
- trichloroethane (TCA) – loss of consciousness, reduced blood pressure, potential respiratory and liver damage;
- perchloroethylene (PCE) – liver and kidney damage, memory loss, likely human carcinogen;
- Dielectric oils containing polychlorinated biphenyls (PCBs) or chlorinated benzenes – human carcinogen, developmental effects during pregnancy, impacts on endocrine and immune systems.

Facilities that produce electrical equipment and machines may also have on-site auxiliary operations such as boiler plants for energy production, de-emulsification plants for oil recovery, re-distillation units for solvent recovery, water and wastewater treatment plants and ventilation systems for welding/solvent fumes.

KEY ENVIRONMENTAL, HEALTH AND SAFETY RISKS/LIABILITY FACTORS

Soil and water contamination

The contamination of soil, groundwater and surface water due to the historical and/or present use and storage of substances such as machine and cutting oils, chlorinated and non-chlorinated solvents, paints and dielectric oils, pose risks not only to the natural environment but to human health amongst employees and to local communities. Sites where PCBs have been

used in the manufacture of transformers, capacitors, switching gear, etc., are of particular environmental, health and safety concern.

As a result, there is the potential for regulatory action, liability claims and litigation risk. Companies may also be held responsible for the remediation of decommissioned sites at significant cost.

Regulations such as the US EPA's Hazardous Waste Program, the EU Integrated Pollution Prevention and Control (IPPC) Directive and the Basel Convention have helped to limit the use and impacts of harmful compounds in North America and Europe. Similar legislation is likely to be implemented in developing countries (e.g. in Central Asia) as understanding of the EHS risks of these compounds improves.

North American and European companies are also increasingly concerned about the impacts of their supply chains and have already begun to demand that their suppliers' operations meet strict EHS and social standards.

Spills

Major spills of hazardous chemicals may result in significant risks to human health, clean up costs and substantial liability claims or regulatory enforcement action. Sites or companies with a history of incidents may also experience negative press and reputational impacts.

Hazardous Waste Disposal

The manufacture of electrical equipment and machines results in the production of a number of hazardous wastes including:

- degreasing bath sludge
- wastewater treatment sludge
- waste oils and solvents
- metal cuttings (often impregnated with oil)
- paint sludge

Regulations such as the EU Hazardous Waste Directive and the US EPA's Hazardous Waste Program are among the leading global command and control mechanisms in this area. These represent examples of the "stand out" legislation that is only a part of a wider regulatory trend geared towards reducing the volume of hazardous waste entering the natural environment.

End of Life Product Disposal and Recycling

The safe disposal of electrical equipment and machines is growing in importance and increasing responsibility is being placed on manufacturers to put systems in place for the collection and disposal/recycling of their products.

Legislation such as the EU Waste Electrical and Electronic Equipment (WEEE) and Landfill Directives are among the drivers increasing the visibility of end of life issues. Numerous countries around the world, including China, have either adopted or drafted legislation similar to the WEEE Directive and the trend may be expected to continue.

REACH, the European Union Regulation covering the Registration, Evaluation, Authorisation and Restriction of Chemicals, is not applicable to materials that are classed as waste under relevant EU law. However the

regulation may cover used electrical equipment and machines that are not classed as waste. For example, this may include used or reconditioned equipment imported for sale in the EU.

In this instance the importer may be required to notify the European Chemicals Agency if the materials contain concentrations of Substances of Very High Concern (SVHC) which are greater than those defined by the regulators. In some circumstances, importers may need to submit full registrations for substances in electrical equipment.

OTHER ENVIRONMENTAL, HEALTH AND SAFETY RISK/LIABILITY ISSUES

Atmospheric Emissions

Like any sector that requires a significant input of energy, the production of electrical equipment and machines results in atmospheric emissions, including greenhouse gases (GHGs). Typical emissions include:

- carbon dioxide (CO_2) and carbon monoxide (CO) from on-site combustion processes;
- a range of volatile organic compounds (VOCs) from surface cleansing solvents and coating activities;
- sulphur dioxide (SO2), oxides of nitrogen (NOx) etc. from on-site boilers;
- fumes from welding processes and volatile chemicals, and;
- particulate matter.

Many of these emissions can have a negative impact on air quality. GHGs are the key driver of climate change and SOx and NOx in the atmosphere contribute to acid rain which results in the acidification of soils and water courses, damage to plants, trees and crops and damage to buildings made from limestone and carbonate stones.

There is also the potential for both acute and chronic employee and community health impacts in the form of asthma and other respiratory diseases.

Future regulation in the emerging economies of Central Asia may be based on existing legislation such as the US EPA Clean Air Act and the EU IPPC Directive and may control the levels of emissions that companies can produce without being subject to fines or penalties.

Water Supply and Wastewater Management

Manufacturing facilities may require significant volumes of water for process uses such as cooling, cleansing and painting and for human use. These applications, in addition to stormwater runoff from rainfall, will result in wastewater that must be collected and treated.

Depending on the size and age of the facility this treatment may take place onsite or the water may be channeled through the local sewer system to a nearby public water treatment plant. Once treated, this water is usually returned to the natural environment via a nearby watercourse. As discussed previously in this document, sites used for the manufacture of electrical equipment and machines are potential sources of soil and water contamination if spills, leaks, wastewater and stormwater runoff are not carefully managed.

Key regulations governing water quality include the Water Framework Directive and the US EPA Clean Water Act. As more countries begin to experience water stress and water shortages the regulation of water will become increasingly stringent. This will become more important in developing countries where water resources have historically been poorly managed.

Energy Consumption

The production of electrical equipment and machines requires a substantial input of energy. This energy requirement will also represent a significant component of the producer's total operating costs. It may be possible to reduce energy consumption through improvements in operational efficiency and use of energy efficient technologies.

In general, high energy consumption usually corresponds to high carbon emissions. Current regulatory (EU Emissions Trading Scheme, UK Carbon Reduction Commitment) trends indicate that companies will increasingly be held accountable for reducing their climate change impacts.

Energy spend will also be important in regions exposed to energy price increases.

Asbestos and PCBs

While no longer produced or used in many developed countries, asbestos and PCBs, both of which are known carcinogens, may need to be removed from older sites. This can involve a costly and time consuming clean up process.

Asbestos is found in building materials, pipework, and insulation as well as in electrical equipment. PCBs can be found in transformer/hydraulic equipment oil, capacitors etc. This is a major issue at sites where transformers or other electrical equipment are manufactured using PCB dielectric fluids.

Raw Material/Supply Chain Issues

The global production of electrical equipment and machines requires significant amounts of raw materials such as metals that are obtained through mining and metal foundry processes. These mining activities will have their own environmental, occupational health and community health and safety issues that are discussed in the EBRD Mining and Mineral Processing sub sector guidelines.

Noise

In large manufacturing facilities, noise may reach or exceed regulated nuisance and safety levels. If this is the case, the company's HSE Policy must specify the correct form of personal protective equipment that employees and visitors would be required to wear.

General Health and Safety Risks

In addition to the exposure to harmful substances and materials as previously discussed, there is a range of generic health and safety risks that will apply to a manufacturing facility such as this. These include:

- slips, trips and falls;
- accidents resulting from the misuse of industrial machinery and tools;
- electrical shocks;

- burns from welding and heating activities;
- fires and explosions.

KEY SOCIAL, LABOUR AND COMMUNITY RISK/LIABILITY ISSUES

Community Exposure to Contaminated Land and Water

If the facility's activities result in the contamination of the surrounding land and water resources this may have a negative impact on the health of the local community, exposing the company to significant liability risk.

OTHER SOCIAL, LABOUR AND COMMUNITY RISK/LIABILITY ISSUES

Labour Standards

Labour standards are rules that govern working conditions and industrial relations. They may be formal, such as national level regulation and international agreements, or informal, expressed through norms and values. In general, developed countries have more robust labour standards than developing countries where the associated risks are higher. The commonly accepted rights and principles, enshrined in the International Labour Organisation Conventions, are the right to collective bargaining, elimination of forced or compulsory labour, abolition of child labour and elimination of all forms of discrimination. In addition, fair wages and working hours and acceptable working conditions should be expected.

Labour standards should apply to the company's own employees as well as to all contractors and sub-contractors engaged. In addition, labour standards should be expected to be enforced by key suppliers.

Raw Materials/Supply Chain Issues

The manufacture of electrical equipment and machines requires significant amounts of raw materials that are obtained through mining. The potential negative impacts of mining activities on local communities are well documented in the EBRD Mining and Mineral Processing sub sector guidelines.

Air Quality

If the site's activities result in localised air pollution this may have a negative impact on the health of members of the local community, particularly that of infants, the elderly and those with existing respiratory conditions. This may expose the company to significant liability risk.

FINANCIAL IMPLICATIONS

- Potential high cost of contaminated land and groundwater remediation;
- Costs related to the upgrade of hazardous material storage areas and site infrastructure (sewers, fuel supply, etc.);
- Costs related to the upgrade of pollution abatement equipment and procedures;
- Potential high cost of asbestos and PCB removal;
- Regulatory penalties/fines or business interruption related to land, water and air pollution;

- Litigation risk from affected employees and local communities;
- Reputational risk of poor environmental and social performance and potential loss of customers/market share.

IMPROVEMENTS

- Evaluate potential for material substitution wherever feasible (e.g., water-based compounds for degreasing, painting, etc.);
- Introduce good environmental engineering practices and spill response procedures to prevent or minimise the release of harmful substances into the natural environment;
- Develop and implement a clear environment, health and safety management system, including policy, objectives/targets, performance measurement, training and auditing;
- Upgrade material storage areas and site infrastructure;
- Switch to cleaner fuel sources such as natural gas or renewable energy;
- Develop processes for proper disposal of both general and hazardous wastes;
- Develop an environmentally responsible process for product end of life disposal;
- Remediate contaminated land, groundwater and surface water courses upon site decommissioning or where significant risks are present;
- Work together with local communities to identify potential risk areas and address the issues identified;
- Maintain good human resource systems covering key labour standard issues included in the ILO base code and national regulations.
- In the event of trading difficulties, explore all ways of limiting company redundancies.

GUIDE TO INITIAL DUE DILIGENCE SITE VISITS

The issues and risks associated with a site will vary depending on factors including the type and size of the operation, site location, and quality of management. However, due diligence visits should consist of a tour of the entire site, including, for example, production facilities, offices, raw material storage areas, waste storage and treatment facilities and boiler houses.

When visiting the sites of potential borrowers or during loan supervision, financial intermediaries can use the following suggestions to guide the initial due diligence process. This does not represent an exhaustive list of issues for consideration.

Environmental Health and Safety

- Perform a complete tour of the site compound if possible;
- Determine whether transformers or other electrical equipment are (or have been) manufactured using dielectric oils containing PCBs or other hazardous materials;

- Look for signs of poor housekeeping, unsecured storage areas, poor drum labeling and the availability of material safety data sheets;
- Look for localised spills or leaking pipes and evaluate the potential for spillages to enter the soil or stormwater drainage system;
- Observe functioning of the wastewater treatment facility if there is one on site;
- Note procedure for waste disposal (solid waste, hazardous waste etc);
- Review on site emergency/accident response facilities including first aid equipment and identification of trained personnel;
- Review historical and projected trends for environmental fees and fines;
- Review EHS procedures and activities. This may include the emergency response to fires (including the availability of sealed lagoons for fire fighting water run off), major spills and accidents, machine guarding, and maintenance procedures etc;
- Review utility bills (water, electricity, gas) to identify potential areas for efficiency gains;
- Review health and safety incident log;
- Interview key EHS personnel;
- Interview employees to get their impression of the company's EHS performance.

It is also suggested that contact is made with local regulatory agencies to determine the company's compliance record and whether complaints have been made by the public.

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 that staff receive written details of hours worked and payment received;
- 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?
- Note working conditions through process and document review and by interviewing staff;
- Observe waste disposal procedures to identify potential soil, water or air contamination pathways that may affect local communities;
- Review the company's history of community engagement and look for evidence of meaningful dialogue that takes into consideration the community's concerns about human health impacts of the facility.

ACTION PLANS

Environmental, Health and Safety Action Plan

An environmental action plan should consider the above stated environmental, health and safety improvements. At a minimum, electrical equipment and machine manufacturers should develop policies covering environmental, health and safety issues. Key aspects of these action plans include:

- Maintaining legislative compliance at the facility;
- Clearly stating the procedures to be followed for different events, for example in the case of chemical spills, fire or serious injury;
- Identifying key performance indicators and facilitating the monitoring of performance against these indicators;
- Maintaining records of all environmental, human health and community related incidents and putting a system in place to investigate the cause and impacts of the incident;
- Tracking regulatory developments (applicable environment, safety, product standards).

Social, Labour and Community Action Plan

- Design and communicate an appropriate code of business conduct that considers concerns of key stakeholders (shareholders, employees, government bodies, NGOs);
- Implement best-practice labour standards (in line with ILO principles);
- Consider signing up to international frameworks such as the UN Global Compact;
- Implement a process to assess labour and human rights conditions for contractors and sub-contractors;
- Design a robust and on-going community engagement process to measure and report on impacts (positive and negative) on local communities;
- Consider measuring and communicating wider socio-economic impacts (such as job creation or infrastructure development) – for example using the WBCSD Measuring Impact Framework.

REFERENCES AND ADDITIONAL SOURCES

Agency for Toxic Substances and Disease Registry - http://www.atsdr.cdc.gov/

European Union environmental legislation - http://europa.eu/scadplus/leg/en/s15000.htm

International Finance Corporation Environmental, Health and Safety Guidelines - http://www.ifc.org/ifcext/sustainability.nsf/content/EnvironmentalGuidelines

Inter-governmental Panel on Climate Change - http://www.ipcc.ch/

International Labour Organisation - http://www.ilo.org/global/lang--en/index.htm

United States Environmental Protection Agency - http://www.epa.gov/