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Sub-sectoral Environmental and Social Guidelines: Paint & Allied Products

PROCESS DESCRIPTION

The paint and coatings manufacturing industry produces a variety of products that preserve, protect and beautify the objects to which they are applied. These coatings include:

- Architectural Coatings, e.g. exterior and interior waterborne latex, exterior and interior solvent-borne paints, architectural lacquers and wood and furniture finishes;
- Industrial Coatings, e.g. vehicle finishes, wood and composition board flat stock finishes, machinery and equipment finishes, paper and paperboard coatings, electrical insulating varnishes and magnetic wire coatings;
- Special Purpose Coatings, e.g. industrial maintenance paints, marine coatings, traffic paints, metallic paints, multi-colour paints;
- Miscellaneous Paint Products e.g. paints used for graphic and artwork.

Paints are usually manufactured in a batch process with batches ranging from 3 to 25,000 litres. The process involves combining the following raw materials in one or more stages:

- Resins (organic or inorganic polymers)
- Pigments (colours, extenders/fillers)
- Carriers (solvents, water, non-volatile liquids)
- Additives (to provide particular properties during manufacture, storage, application, life etc) e.g. antifreeze, dispersing agents, wetting agents, thickeners, biocides, ammonia and antifoaming agent

The traditional process of manufacture involves 4 steps:

- *Pre-assembly and premixing* - the products are dispensed from storage and the blending of the liquid products into a viscous material to which the pigments are added known as the base or mill base;
- *Pigment dispersing and grinding/milling* - the pigment particle size is reduced to achieve a fine particle dispersion using a high-speed rotating disk. To achieve a finer grind the material may be diluted and passed through a mill;
- *Product adjustment (letdown, tinting and finishing)* – This step is normally carried out under slow speed stirring:
    - *Letdown* – various resins, carriers etc are added to achieve the desired composition;
    - *Tinting* – final adjustment of the colour due to raw material and batch processing variations;
    - *Finishing* – addition of specific components or adjustment of viscosity just before filling.
- *Filtering/Filling* – removal of oversize or undispersed particles and filling of containers.

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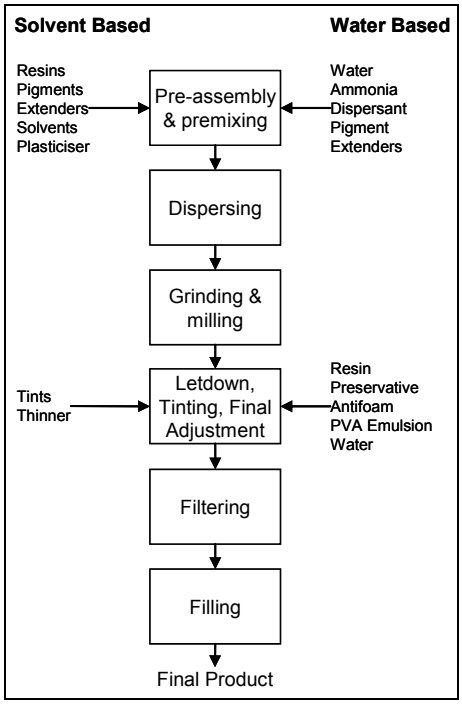

KEY ENVIRONMENTAL, HEALTH AND SAFETY RISK/LIABILITY ISSUES

Air emissions

Two major types of air emissions occur in paint manufacturing:

- Volatile organic compounds (VOCs) which are a health hazard, destroy atmospheric ozone and contribute to global warming and to photochemical ozone creation at ground level;
- Pigment dusts which may contain elevated concentrations of heavy metals and other hazardous materials, depending on the pigments used and may cause a nuisance to neighbours.

The principal sources of these emissions are fugitive emissions from:

- Bulk storage of resins and solvents;
- Storage, handling and dispensing of dry pigment powders;
- Open processing equipment, e.g. mix tanks;
- Vessel cleaning and filtration activities;
- Leakages releases from seals, gaskets and valves in pipework and process vessels;
- Filling operations.

Wastewater

Cleaning of process equipment and pipework, which normally occurs between different paint colours, generates an effluent contaminated with solvent and high levels of suspended solids, often coloured, which requires treatment. Wastewater may also be contaminated with products and by-products of the production process. In most cases, it is possible to recycle wash water into the process. Dedicating equipment to a particular product or product family or scheduling from light to dark products can reduce the need for cleaning.

The wastewater may discharge to a treatment plant on-site, settlement tanks or to the sewer (and subsequently to a municipal treatment plant). If this is discharged to a municipal waste water treatment plant or to an on site operated waste water treatment plant a permit for control is likely to be required.

Solid Wastes

The major wastes are raw material packaging, dust from abatement equipment, spent filters, off-specification product, spills and sludges from wastewater treatment.

Residual batch sludges may contain VOCs and heavy metals as do many of the by-products, e.g.

off-specification paint, or clean-up materials. These wastes are hazardous and must be disposed of at approved landfill sites or waste management facilities. Inadequate on-site disposal may lead to significant groundwater pollution.

Fire and Explosions

Paint production typically utilises a range of extremely flammable products. There will often be large quantities of solvent vapours within the production areas, which can explode if ignited.

OTHER ENVIRONMENTAL, HEALTH AND SAFETY RISK/LIABILITY ISSUES

Hazardous Materials

Considerable quantities of oils, gases and chemicals may be utilised and stored in paint production. Typical storage containers include the following:

- Silos;
- Raw material containers varying in size from 5l to 250l drums to 1000l Intermediate Bulk Containers (IBC);
- Fixed or floating roof bulk storage tanks in a tank farm (multiple tanks) containing finished product and large volume usage liquids such as solvent and resins;
- Palleted bags of powdered raw material, e.g. pigment;
- Finished product in retail sized containers.

Secondary containment (bunds etc.) should be installed for all storage areas to reduce the risk of ground contamination and pollution of surface waters. Cover should be provided for all materials stored outdoors to reduce rainwater access. Further measures include regular integrity testing of underground storage tanks and bulk storage tanks, accident/fire/explosion precautions and emergency procedures and records of the testing pressurised vessels.

As a hazardous material, paint will be subject to national and international regulation regarding the transport of dangerous goods, for example the European Union Directive 2008/68/EC.

Energy Consumption

Emissions from the fuel used to heat the process vessels may also be significant depending upon the fuel type used (coal, oil or gas).

Chemical Exposure

The major toxic hazard is inhalation of solvent vapours. Many solvents are carcinogenic. An acute narcotic effect may be observed and dermal contact may result in as dermatitis.

Pigments may contain a wide variety of toxic and carcinogenic substances, that may be inhaled or ingested.

Some polyurethane paints contain isocyanates, the vapours of which can cause asthma-like symptoms. They can also give rise to skin irritation and sensitisation.

Packaging

A variety of containers is used to transport raw materials and product, for example. drums, intermediate bulk containers (IBC), small plastic and metal containers. Large quantities of packaging may be used. 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 streams.

Permitting

Large chemical storage facilities in the EU will be subject to national regulations under the Seveso II (1996/82/EC) which aim to control the major accident hazard from dangerous substances. Operations outside the EU will still be subject to local regulation but this will generally set less stringent requirements on the techniques to be adopted.

Chemical products placed on the market or used within the EU will be subject to the REACH Regulations (1907/2006) and may be subject to other regulations depending on the nature and intended uses of the chemical.

Noise

Mixing equipment, vats and transfer operations create high levels of noise. Noise induced hearing loss can occur from working in noisy areas.

Manual Handling and Repetitive Work

Lifting and carrying heavy or awkwardly shaped objects, such as bags, can result in manual handling injuries.

Confined Spaces

Storage silos are dangerous confined spaces and entry to them must be strictly controlled and avoided wherever possible.

Machinery

All equipment should have safety guarding and workers should be issued with appropriate personal protective equipment to protect against unavoidable sharp items and edges. Particular attention should be paid to conveyors, mixers, grinders and packaging machinery.

Collision

This often takes the form of people being hit by moving, flying or falling objects.

Slips, Trips and Falls

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

KEY SOCIAL, LABOUR AND COMMUNITY RISK/LIABILITY ISSUES

Public concerns

Public concerns, particularly from neighbouring residents, can be caused by a lack of knowledge regarding the nature of the chemicals being stored on the site, odours from the site, the potential for fires and explosions and the action that will be taken in the case of an accidental release. This public anxiety can result in significant planning constraints being imposed on this type of facility.

OTHER SOCIAL, LABOUR AND COMMUNITY RISK/LIABILITY ISSUES

Air Emissions

Public/environmental health and nuisance issues associated with dust, fumes and odour can arise from production activities and may have a significant impact on neighbouring locations. This may be important if there are neighbouring residential and industrial activities in the area.

Transport

Transport of raw material products by road can be a significant issue. This might lead to road noise and traffic congestion in the area local to the site.

Leftover Paint

Paint manufacturers that are members of the international Coatings Care programme have identified an Extended Product Stewardship responsibility for enabling the correct disposal by consumers of potentially hazardous leftover or obsolete paint and containers. Consideration should be given to the product care issues regarding leftover paint which can be hazardous if incorrectly disposed.

FINANCIAL IMPLICATIONS

- Many countries are signatories to the Kyoto Protocol and have adopted targets for the reduction of CO_2 emissions. Where Governments have set up carbon emission reduction programmes industrial processes have been required to reduce their CO_2 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;
- If the products are to be sold or used within the EU they must be registered under the REACH regulations. This may represent a substantial cost and will be particularly significant to manufactures producing small quantities of a large range of chemicals;
- 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

- Reformulate products to reduce toxicity:
  - Convert to using water-based paints or low solvent content paints.
  - Avoid using pigments containing lead, cadmium, mercury-based bactericides and methylene chloride.
- Replace dry powder pigments with pastes;
- Minimise dust production through extraction systems, management and procedures for transfer of dry materials.
- Install air pollution control devices, such as vapour recovery systems, cyclones, filters, and wet scrubbers to control the release of volatile or dust emissions;

- Maintain on site abatement equipment and treatment plant;
- Enclose open process equipment and storage areas to reduce dust and VOC emissions;
- Re-use heated wastewater to warm cold water supply.
- Provide pipe insulation, for process vessels, both heating and cooling systems.
- Change to cleaner fuel sources.
- Recirculate cooling water in a closed non-contact system.
- Reduce the need for cleaning by dedicating equipment to a particular product or product family or scheduling from light to dark products;
- Use non-stick lined tanks to reduce paint adhesion to tank walls;
- Use mechanical devices, for example, rubber wipers to reduce paint clinging to tank walls and a "pig" to clean paint from pipes before cleaning;
- Use counter-current rinse methods, i.e. use a recycled dirty solution for initial cleaning, followed by a recycled clean solution to rinse;
- Use high pressure spray hoses for cleaning;
- Reuse wash solvent and wash waters in subsequent formulations and for countercurrent rinsing;
- Re-use collected pigment dust into product;
- Rework off-specification materials into new products;
- Recondition and reuse solvents (distillation on site or off site);
- Increase use of reusable and recyclable containers for raw materials and finished product;
- Use reusable screens and filters;
- Minimise leakages and fugitive release from pipework through use of appropriate corrosive resistant materials and leak proof valve and pump design.
- Use brushes, scrapers and vacuums to remove dry spilt product prior to washing;
- Regular inspection should be carried out of all bulk containment on site to prevent leakage and product loss;
- Provide secondary spill containment for bulk storage tanks, silos and other chemical storage areas;
- Delivery, handling and transfer or decanting areas should be designated, marked as such and isolated from the surface water drainage system using ramps, sumps or drainage shut-off valves;
- Delivery and handling areas should be impermeable to the products handled and covered to minimise ingress of rainwater;
- Good housekeeping should be maintained at all times in all areas;
- 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;

- Train workers in correct use of machinery and safety devices;
- 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 moving equipment:
    - 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;
- To reduce the risk of noise exposure isolate noisy equipment and rotate tasks to minimise time spent in a noisy area over an eight hour period and provide personal protective equipment where people have to enter noisy areas;
- Route cables and pipework under walkways to prevent slips, trips and falls;
- Construct walkways of non slip materials;
- Provide a good standard of lighting;
- Install automatic alarms and shut off systems;
- Installation or upgrade of abatement technology to minimise exposure to toxic raw materials and products, such as enclosure of equipment, appropriate ventilation with filters, gas balancing systems;
- Maintain an up-to-date inventory of all substances present or likely to be present which could be hazardous to health or the environment;
- Provide the local fire department with list of products stored on the premises;
- Emergency storage lagoons may be needed to prevent contaminated firewater reaching controlled waters;
- Control the effect of fires and explosions by segregating distancing of process, storage, utility and safe areas;
- Avoid potential sources of ignition including banning smoking in and around facilities;
- Use explosion-proof equipment and conductive materials and ensure that equipment is grounded and bonded;
- Explore manufacturer willingness/capability to "take-back" damaged products.

Social, Labour and Community Improvements

- Implement a programme of assessment of routine monitoring of worker health;
- Involve the neighbouring community in the creation and practice of plans to respond to major incidents at the installation.

GUIDE TO INITIAL DUE DILIGENCE SITE VISITS

Environmental, Health and Safety

During the initial site visit, the issues will vary according to the type of paint product being stored and distributed and depending on the level of environment, health and safety management already introduced. While visiting the site it is important to discuss and review the following:

- Confirm organisational responsibilities and systems for Environment, Health and Safety;
- Check the condition of the wastewater treatment plant and location of discharge points for wastewater from the facility. Note the colour and appearance of adjacent watercourses;
- Note whether the wastewater treatment plant discharges to a local watercourse or the municipal wastewater treatment works. Higher environmental risks will be associated with facilities discharging to water courses;
- Check the condition of storage facilities for raw materials and finished products;
- Discuss procedures to check the source of raw materials and/or materials for waste incineration;
- Check for automatic safeguards on machinery to prevent accidental injury;
- Note any odours that might cause a nuisance;
- Note the noise and dust levels at the site to determine whether abatement equipment is in use or might be required;
- What is the standard of "housekeeping" on site? Do areas look clean and tidy? Look for evidence of any recent spills or releases of raw materials/product;
- Are staff wearing Personal Protective Equipment?
- 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?
- Is site safety equipment clearly signed and readily available, for example, fire extinguisher(s), eye wash, safety shower, first aid equipment, emergency escape routes, emergency stop, decontamination equipment, and absorbent materials?
- Check the age and condition of equipment. Look for signs of wear and tear, degradation, leaks and breaks;
- Check that solid waste storage and disposal (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;
- Have the premises been inspected recently by the regulatory authorities for health, hygiene and environment? What were their findings?

- Check for automatic safeguards on machinery to prevent accidental injury;

- Does the organisation have insurance in place to cover the recall of contaminated/faulty products? Have there been any recent product recall incidents?

- Have there been any recent incidents on site such as fatalities, fires/explosions, spills? Is insurance in place to cover such incidents?

- Does the business plan have line items for Environment, Health and Safety improvements?

- 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?

- Check the conditions and duration of validity for all permits.

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

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.

- 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?

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 and safety 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;

- Emergency plans for environment, health and safety accidents or hygiene non-compliance;

- Management review/demonstrated involvement in environment, health, safety and hygiene management.

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