



Chemicals, Plastic and Paints

High Risk Sector



Processing raw materials from the petroleum industry, mining or agriculture into new products for direct use (i.e. fertilizers, paint, soap, plastics) or further processing in other industries (i.e. pharmaceuticals).

Related Sectors:

- Pharmaceuticals
- Oil and Gas
- Printing



Production Processes

The chemical industry includes industries supplying agrochemicals, plastics, synthetic fibers, paints and detergents – among a wide range of other substances. The processes applied in this sector include the mixing of substances, distillation, filtration, heating and cooling, solvent extraction, centrifugation and application of pressure.

Plastics, synthetic fibers and rubber are one of the primary product categories of the chemical industry. Plastics describe a range of synthetic or semi-synthetic polymers – long chains of bonded atoms. The main raw materials are natural gas, crude oil and chlorine or chlorinated organic substances. The key step in plastics production is referred to as polymerization, polycondensation or polyaddition. The desired end product, the processes and additives involved, plasticity, hardness, heat tolerance, resilience and other properties can be defined according to the raw material used. Further processing of plastics includes extrusion, injection molding, supercalendering and foaming.

Paints and dyes are a second important category of products from the chemical industry. The ingredients that give these products their color may be of mineral, synthetic, vegetal or animal origin. **Paints** are mainly emulsion pigments and fine colored powders in a liquid. The pigments are mixed with a film former (binders, resins and polymers) which binds the particles together and allows them to adhere to a surface. Solvents and additives (thickeners, biocides, antifreeze, etc.) are added to obtain certain properties such as color, viscosity, gloss and durability. As opposed to paints, which are mechanically applied to surfaces, **dyes** are absorbed by and chemically react with substrates such as textiles.

Agrochemicals such as fertilizers and pesticides are specialist chemical industry outputs. Fertilizers contain nitrogen and phosphorus used to promote the growth of plants, while pesticides serve to protect these plants from fungi and insects.

Sustainability Issues

M	Energy
M	Water Use
H	Emissions to Water
H	Waste
H	Emissions to Air
M	Ecosystems
H	Workplace Health & Safety
H	Disaster Risk
H	Site Contamination

Sector Rating

- H High risk issue
- M Medium risk issue
- L Low risk issue

Risks & Opportunities

- **Wastewater and liquid waste may contain toxic chemicals and lead to environmental pollution.**
Water used in production processes and for cleaning may contain solvents, various types of salts and a wide range of chemical substances as well as by-products. The impact on water quality and the resulting risks for human health, the environment and other uses can be mitigated by the appropriate treatment of wastewater.
- **The main risks to workers are: Toxic substances and processes involving high temperatures and high pressure.**
Chemical products are often highly reactive and therefore toxic. Production processes may involve hazardous reagents and solvents, high pressures and temperatures and lead to toxic by-products. Risks to workers may be mitigated by training, protective equipment, low-risk process design and substitution of hazardous substances.
- **Emissions to air can be a nuisance in the areas surrounding chemical plants and entail material risks to human health.**
Chemical production may emit (highly) toxic substances to the air, which can negatively affect the health of residents in the areas surrounding chemical plants. Examples are solvents, dust and vapors from chemical products, as well as exhaust gases and fumes from on-site waste incineration.
- **The main disaster risks in chemical plants are fires, explosions and the accidental release of toxic chemicals to the environment.**
Chemical production may involve high-temperature and high-pressure processes as well as toxic and flammable substances. A disaster in a chemical plant may cause physical damage over large areas (fires, explosions) and present a health risk for residents in the surrounding areas (release of toxic chemicals).