



Pharmaceuticals

High Risk Sector



Processing chemical base materials into drugs for humans or animals.

Related Sectors:

- Chemicals, Plastic and Paints
- Health Services



Production Processes

The pharmaceutical industry delivers medication for human and animal health. In addition to manufacturing, research – which includes year-long clinical trials – is a key activity in the pharmaceutical sector.

The production of pharmaceuticals starts from a wide range of chemicals. As opposed to the chemical industry, small amounts of highly reactive substances are produced from large amounts of raw materials and auxiliary substances, such as solvents.

At the heart of these production processes is the chemical reactor, usually a vessel containing between a few kilograms and a few tonnes of material. In the chemical reactor, the mixture of substances is stirred and heat and pressure may be applied. Additional reagents may be added and unwanted by-products removed or extracted. Producing pharmaceutical products may involve numerous steps, many of them required to ensure a high purity. Before it is sold, the active substance is converted into its final dosage form, such as tablets, syrups or creams, and then packaged.

Sustainability Issues

M	Energy
M	Water Use
H	Emissions to Water
M	Waste
M	Emissions to Air
L	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

- **The main risks to workers are: Toxic and highly active substances, processes at high temperatures and under high pressure.**
Pharmaceutical products per se are highly active and may therefore be toxic. Production processes may involve hazardous reagents and solvents, high pressures and temperatures and involve toxic by-products. Risks to the health and lives of workers may be mitigated by training, protective equipment, low-risk process design and the substitution of hazardous substances.
- **The main disaster risks in chemical plants are fires, explosions and the accidental release of toxic chemicals to the environment.**
Pharmaceutical 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 presents a health risk for residents in the surroundings (release of toxic chemicals).
- **The contamination of property presents a risk to its value, to human health and to the environment.**
Spills of liquids in production, leaks in tanks or pipes, and the disposal of liquid waste may contaminate buildings and the ground. This may present a risk to groundwater resources or to human health. Clean-up costs may be considerable. The market value of contaminated property may be impaired. Contaminations can be avoided by training of staff and technical measures such as sealed ground and catchment tanks.
- **Wastewater and liquid waste may contain toxic substances 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 appropriate (pre-)treatment of waste water.
- **A reliable and sustainable supply of high-quality fresh water is essential.**
The production of pharmaceuticals may require large amounts of fresh water for cooling and heating and as solvents or reagents in chemical processes themselves. A reliable supply is essential for ensuring continuity of production. Fresh water of high quality could be required in order to meet quality standards for products.