

International Hazard Datasheets on Occupation



Chemical reactor operator


Who is a chemical reactor operator?








A worker who controls equipment units or systems that process chemical substances into specified industrial or consumer products, according an understanding of operating procedures, chemical reactions, laboratory test results and correlation of process instrumentation.





What is dangerous about this job?

- Explosions from uncontrolled chemical reactions due to overpressure or due to release of energy from exothermal reactions (a result of mechanical damage or corrosion).
- Exposure to hazardous substances due to a sudden release of toxic materials from a reactor due to the work-related accident or as a result of human error.
- Exposure to high temperatures and heat-stress from chemical reactors.
- Exposure to carcinogenic, mutagenic and teratogenic substances present in the reactor, or released from the reactor during cleaning and maintenance work.
- Exposure to substances that can harm the nervous system
- Exposure to suspended dust PM₁₀ can give rise to respiratory diseases.
- Musculoskeletal problems related to fixed working positions such as prolonged standing.
- Musculoskeletal injuries related to awkward working postures during inspections and/or maintenance works.

Hazards related to this job

Specific preventive measures can be seen by clicking on the respective  in the third column of the table.

Accident hazards 	<ul style="list-style-type: none">• Falls, slips, and trips on the level on floors made wet and slippery as a result of leaks or the spilling of chemicals	
	<ul style="list-style-type: none">• Falls from height during maintenance work in chemical reactors piping, or from ladders	
	<ul style="list-style-type: none">• Body injuries caused by clothes being caught by grinding and mixing equipment and feeding hoppers, during work with conveyors and other machines, etc.	
	<ul style="list-style-type: none">• Electrocution from defective portable electric equipment, or due to work with defective electrical installations	
	<ul style="list-style-type: none">• Burns caused by contact with hot surfaces, hot water and/or suddenly released steam; "freeze burns"	
	<ul style="list-style-type: none">• Fires during work with flammable substances and/or due to release of flammable gases during chemical reactions	

	<ul style="list-style-type: none"> Explosions from uncontrolled chemical reactions due to overpressure or heat release from exothermal reactions as a result of mechanical damage or corrosion 	5 6
	<ul style="list-style-type: none"> Exposure to hazardous substances due to a sudden release of toxic materials from a reactor, whether accidental or because of human error 	6
	<ul style="list-style-type: none"> Acute poisoning and/or chemical burns from extensive use of solvents, acids, bases, and other corrosive chemicals 	6
Physical hazards 	<ul style="list-style-type: none"> Exposure to high temperatures from chemical reactions 	5
	<ul style="list-style-type: none"> Exposure to high levels of noise especially during grinding, milling, crushing and mixing operations 	3
	<ul style="list-style-type: none"> Exposure to ionizing radiation during work with radioactive materials and/or defective equipment with radioactive sources 	7
Chemical hazards 	<ul style="list-style-type: none"> Exposure to a large variety of corrosive, irritating and suffocating chemicals 	5 6
	<ul style="list-style-type: none"> Exposure to carcinogenic, mutagenic and teratogenic substances 	5 6
	<ul style="list-style-type: none"> Exposure to substances that can harm the nervous system 	5 6
	<ul style="list-style-type: none"> Exposure to chemicals, which may cause different allergic reactions: respiratory tract irritations, asthma, eye irritations and skin rash 	5 6 8
	<ul style="list-style-type: none"> Exposure to suspended dust PM₁₀ can give rise to respiratory diseases 	5 9
Biological hazards 	<ul style="list-style-type: none"> Exposure to various plants, during processing in the reactor, may cause serious allergic reactions, resulting in irritation of the respiratory tract, eyes and skin 	8
	<ul style="list-style-type: none"> Health hazards due to exposure to biological solutions, used in chemical reactor processes 	
Ergonomic, psychosocial and organizational factors 	<ul style="list-style-type: none"> Musculoskeletal problems related to fixed working positions such as prolonged standing 	
	<ul style="list-style-type: none"> Musculoskeletal injuries related to awkward working postures during inspections and/or maintenance works 	
	<ul style="list-style-type: none"> Overexertion during lifting and moving of heavy loads can cause cumulative trauma disorders, in particular back pain 	10
	<ul style="list-style-type: none"> Discomfort and physiological problems related to unpleasantly-smelling substances present in the chemical processes 	

- Fatigue and nervousness due to shift and overtime work

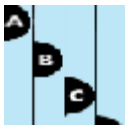
Preventive measures

- 1 Use safety shoes with non-skid and chemical-resistant soles
- 2 Use ladders in good repair; make sure that ladder is in required position with no possibilities of displacement or collapse; inspect ladder before use
- 3 Use suitable protective clothing: appropriate headgear, goggles, earmuffs, gloves, boots, etc.
- 4 Check periodically electrical equipment for safety before use and call a qualified electrician for testing and repair of faulty or suspect electrical equipment
- 5 Install effective exhaust ventilation and air conditioning, especially in the operator's workstation, in order to prevent air contamination and heat stress; if necessary use chemicals to eliminate odours
- 6 Apply chemical safety rules when handling or working with hazardous chemicals; read MSDS and consult a safety supervisor regarding specific chemicals
- 7 Instruct workers on basic safety rules of radiation; check periodically devices for safety through standard rations inspection methods
- 8 Apply medical aid if skin rashes develop; consult an allergy specialist on how to deal with sensitivity to solvents, metals etc.
- 9 Wear a respirator to avoid inhalation of dust or aerosols
- 10 Learn and use safe lifting and moving techniques for heavy or awkward loads

Specialized information

Synonyms Chemical reactor worker; inspector of chemical reactor.

Definitions and/or description



Controls equipment units or system that processes chemical substances into specified industrial or consumer products, according to knowledge of operating procedures, chemical reactions, laboratory test results, and correlation of process instrumentation. Reads plant specifications to ascertain product, ingredients, and prescribed modifications of plant procedures. Starts automatic feed of solid or semisolid materials through equipment units, such as heating vessels and mixing tanks; or dumps pre-weighed ingredients into tanks, hoppers, or onto conveyor. Moves controls to regulate feed of liquids and gases through equipment in specified timing and sequence, or starts automatic feed. Sets up and adjusts indicating and controlling devices, such as gas analyzers, recording calorimeters, and radiographic detecting or gauging instruments to facilitate simultaneous analysis and control of process conditions. Observes gauges, signals, and recording instruments, turns valves, and moves controls to regulate temperatures, pressures, and flow of steam, coolant, and chemical constituents through system to effect prescribed reaction within critical limits, according to knowledge of equipment and process. Draws samples of product at specified stages of synthesis and performs litmus, titration, refractometer, gas-analyses, or other standard tests to determine if reaction is proceeding efficiently and in conformity with plant standards. Observes colour or consistency of product through sight glasses, and correlates observations with test results, laboratory analyses, and instrument readings to facilitate regulation of process and production of standardized product. Maintains log of gauge readings, shift

production, and equipment malfunctions. May patrol area to inspect equipment for leaks and hazards and to record gauge readings. May direct activities of other workers assisting in control or verification of process. May be designated according to equipment or system controlled as Caustic-Purification Operator (chemical); Gas-Generator Operator (chemical); Lanolin-Plant Operator (pharmaceut.); Sulfonator Operator (chemical); or according to product produced as Alkylation Operator (chemical; petrol. refin.); Ethylene-Oxide Panel board Operator (chemical); Polymer Operator (plastic-synth.); Sodium-Chlorite Operator (chemical) [DOT 559.382-018].

Related and specific occupations Chemical practical engineer ; chemical technician; manufacturing engineer; chemical engineer; engineer of chemical processes; chemical laboratory assistant; analytical chemist; polymer chemist; petrochemical chemist; chemical engineer of textile.

Tasks Adapting; adding; adjusting; analyzing; application; arranging; assisting; calculating; calibrating; changing; classifying; cleaning; comparing; connecting; consulting; controlling; contacting; counseling; description; determining; developing; dismantling; examining; explanation; feeding filling; following-up; identification; inspecting; installing; investigating; keeping; loading; locating; managing; matching; mixing; monitoring; moving; observing; operating; opening; ordering;; performing; planning; preparing; preventing; processing; promising; protecting; reading; recommending; recording; registering; regulating; removing; reporting; researching; sampling; searching; strengthening; supposing; supplying; surveying; taking; transferring; treating; updating; using; weighing; writing.

Primary equipment used centrifuges; compressors; computer; control and marked devices; control panel; control systems; conveyor; gas detectors; grinding-mill; feeding hopper; furnaces; heater; mixing tank; pump; reaction vessels; sensors; system of pipes; valves; x-ray tester.

Workplaces where the occupation is common Chemical industry; drug industry; paper plants; cosmetics plant; petrochemical industry; army industry; etc.

Notes 1. Chemical reactors operate at high pressures and temperatures, so that special consideration must be given to their safety during both the planning and operating stages. In order to minimize any chance of vessel rupture, each reactor is protected by a rupture disc. In addition, electronic overload protection is used to ensure that electrical heaters are switched off automatically in the event of unexpectedly high temperature or pressure.



2. Corrosive chemicals pose a hazard by contributing to fire and explosion hazards; they have high toxicity and as a result can cause serious injury and even death. All workers required handling corrosive chemicals or likely to come into contact with these chemicals shall be informed of the hazards involved and trained accordingly.

References 1. ILO Encyclopaedia of Occupational Health and Safety, 3rd Ed., Geneva, 1983.



2. ILO Encyclopaedia of Occupational Health and Safety, 4th Ed., Geneva, 1998.

3. Kirk-Othmer, Encyclopedia of Chemical Technology, 4th Ed., 1992.

4. U.S. Department of Labor: Dictionary of Occupational Titles – DOT, 2 Vol., 1991.
