

MACHINE SAFETY



**Department of Chemical Engineering,
Birla Institute of Technology, Mesra, Ranchi-835215, India.**

Introduction

- In the Unit operation laboratories many experimental setups contain Pumps, motors, Compressors etc. which has moving parts.
- Unguarded moving parts of machines/equipment and the sudden or uncontrolled release of their power systems can result in serious injuries.
- Students working with machines must be aware of the risks involved and follow safe work practices.

HAZARDS

1. Rotating machine parts give rise to nip points. Examples are
 - Rotating gears
 - Belt and its pulley
 - Chain and sprocket
 - Between grinding wheel and tool rest
 - Between rotating and fixed parts

2. Rotating parts operating alone
 - Shafts
 - Couplings-Reciprocating and sliding motions

3. Reciprocating and sliding motion

Hazards continued

- Running nips between parts rotating in opposite directions, for e.g., gear wheels



- Rotating parts operating alone e.g., couplings



DANGEROUS PARTS OF MACHINES

- Between rotating and tangentially moving parts e.g., belt drives.
- Reciprocating and sliding motions



Safety precautions while working with machinery

- Ensure that the guards are in position and in good working condition before operating
- The keys and adjusting wrenches must be removed from the machine before operating it.



HAZARDS WITH COMPRESSED AIR

- Compressed air in various equipment is provided using Compressors.
- When using a compressed air line, an isolating valve and a regulating valve with a pressure gauge must be part of the installation. All air or gas connections must be undertaken by qualified trained Department of Chemical Engineering Safety Manual (Version 8.0) 31 maintenance staff. If a gas connection or fittings are required, seek advice and assistance from the technical staff or SO
- Compressed air must not be used to clean machines, as this can force small particles to fly off and can cause injury

Hot surface.

- Distillation Plant
 - Heat Exchanger
 - Heating in agitated vessel
 - Steam distillation
 - Furnace/ hot air oven
 - Injection moulding
 - Blow moulding
- Thermal Burns First degree burns are characterized by redness or discoloration of the skin, mild swelling and pain. These can be treated by rinsing or immersing in water for at least 10 minutes and applying a skin cream as appropriate, and seeking further medical treatment as needed. Second and third degree burns are characterized by red or scalded skin with blisters (second degree), white or charred skin (third degree). Immediate first aid is to clean the area if possible and keep it dry and call Health Centre (South Side) for medical help immediately.

Steam Boilers in the Laboratory

- **The following equipment : Steam Distillation, Heating in Agitated vessel, Evaporator Crystalliser**
- **Safety valves.** The safety valve is the most important safety device in a boiler or domestic hot-water system. It is designed to relieve internal pressure if a range of failures occur within the system. Although it is simple in design and straightforward in operation, something as simple as corrosion or restricted flow within the valve and its related piping can affect its operation.
- **Water-gauge glass.** Even with a functioning water-level-control system, operators must verify the actual level of water in the system. Here, too, a build-up of sludge and scale can give false level indications.

General safety rules

- There must be enough space around the machine to do the job safely
- The person working with the machine must not be distracted.
- Machines must not be left unattended. Switch off the machine before leaving.
- Rotating parts of machines must not be stopped with hands after switching off.
- Ear protection must be worn for protection from noise
- Safety shoes must be worn if there is handling of heavy materials
- Hand gloves must not be used while working with machinery due to the chances of getting caught in the nip point.
- Safety glasses must be used

General Safety rules continued

- No Loose clothing, hair, jewelry being caught in moving parts.
- Work carefully so that you do not Slip and fall into an unguarded nip.
- Avoid Contact with sharp edges, e.g., cutting blade.
- Do not make adjustments while the machine is operational.
- No Unauthorized operation of machines.
- Regular preventive maintenance.