

## Study of Machinery Safety in Industries: A review

**Mr. Alok Pathak**, B.E (Mech.), PGDIS from Patna University, PGDM from IGNOU, PGPPT, PDIPC, IOSH-MS, SMISE & HOD Safety, UltraTech Cement Limited, (GCW) Gujarat.

**Email id:** alok.r.pathak@adityabirla.com

**Abstract:** In industries numbers of injury or fatality occur due to several reasons in which one is machine related accident. Any machinery or parts of machinery that have potential to cause injury or death is one of cause of industrial accident. Un-guarding to rotating parts of machine, electricity, Hot surface of machinery, Fire, Noise, Temperature etc. are different types of machine related associated hazard in industries but in this study, Machine guarding and similar safety devices that help to prevent machine related incident is considered. Rotating parts of machines has potential to cause injury or fatality. Objective to publish this paper is to know machinery safety principle and protect to workmen/ supervisors from exposure of mechanical hazards. This paper is very helpful to control machine related incident.

### .Keywords:

Machine Guarding, Machinery Safety, Risk Control, Types of Guard, Machinery related incident prevention method.

### Objectives

- Ensuring Compliance to fulfil statutory requirements as per Section 21 of Factories Act 1948 (India) or respective state & country law and regulation, In India.
- Eliminate/substitute or reduce to machinery related risk.
- Protect to person from potential source of incidents through engineering control.
- Enhance & sustenance organisation reputation and morale of employees.

**1. Introduction:** Machinery Safety is very important to protect to workers from exposure of potential sources of harm of machinery or their parts. In Industries different types of potential sources of injury or death found in which one is concern with machinery that is known as Mechanical hazard. Mechanical hazard has potential to cause of injury such as cut, bruises, crushed or fatality. In Industry Numbers of Injury occurred every day due to unavailability of guard on rotating parts of Machines. Nip point is main source of machinery related accident.

Human and mechanical failures are causes of Accidents in industries. In other way we can say that unsafe act and unsafe conditions are cause of machine related accident. Unguarded

rotating parts or sharp edge of any parts of machinery or any particles that are ejecting during machine operation and harmful for human are potential sources of machine accident. Person sustained injury or fatality occur when expose with mechanical hazard such as Machinery Traps, entanglement, contact, ejection, unexpected start-up of machinery etc. Younger and older person are particularly vulnerable.

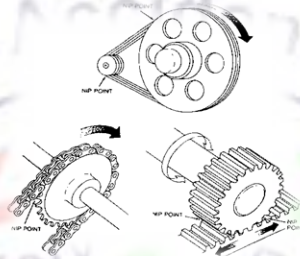


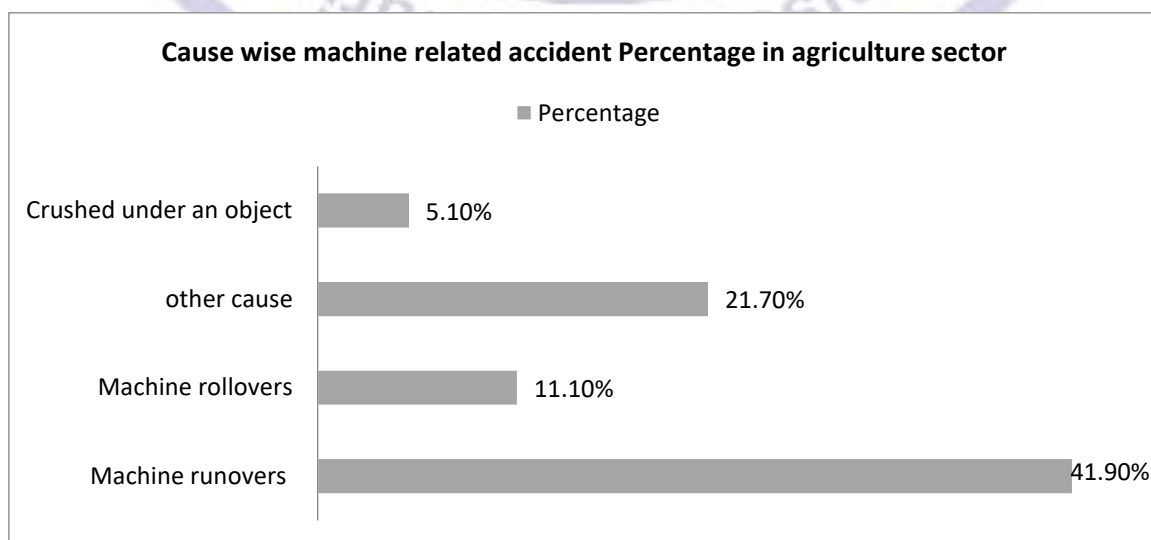
Fig. 1, Nip point

In year 2014, As per National Crime Records Bureau (NCRB) total number of deaths by factory/machine accidents in **India was 797**. The top 10 states of factory/machine related accidents in India were Gujarat, Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh, Tamil Nadu, Punjab, Haryana, Chhattisgarh and Delhi.

As per EUROSTAT report in year 2003-2005, 500 machinery related fatal accident occurred in EU. Machine related accident caused more than 3-day work absences in the EU more than 170,000 times in year 2005.

As per ILO, 2.3 million person including workers around the world succumb to work related accident or diseases every year in which 600 deaths occurs in single day.

As per Farm Injury/ Fatality Statistics of Canada, 1769 Fatalities occurred during year 1990-2005 in which 70.9 percent fatalities occur during agriculture machine operation.



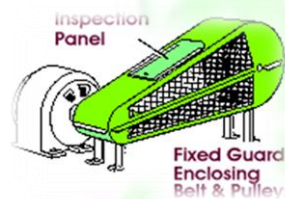
Farm injury/ Fatality Statistics of Canada, Year 1990-2005

## 2. Principle of Machinery Safety

Machine guarding and safety devices such as Trip Devices, Two Hand control Device and over run device are a precautionary safety feature on engineering equipment or machines. Machine guarding is safety device that covers hazardous parts or areas of machine to prevent contact with person body parts. There are four basic types of machine guards:

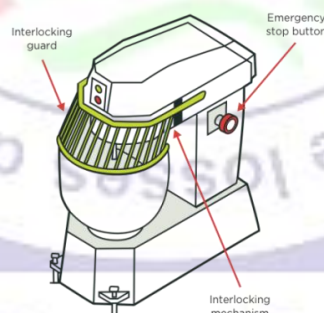
- Fixed guards
- Interlocked guards
- Adjustable guards
- Self-adjusting guards

**Fixed Guard:** Fixed guards are most common types of safety device due to its simplicity and effectiveness. Such guards are fixed permanently to equipment and can only be removed during maintenance or other work as per need with small effort.



Fixed guard, Fig. 2

**Interlocked Guard:** Such guard shuts down the machine automatically when the guard is open or does not lock properly, so it is very effective to eliminate hazard.



Interlock guard, Fig. 3

**Adjustable Guard:** Such type of guard is used in point of operation of band saw like machine. This guard can be adjusted manually.



Adjustable guard, Fig. 4

**Self-adjusting guard:** such type of guard is used in Saws machine. It pushed away when materials is fed into the machine during operation.



**Self-adjusting guards, Fig.5**

**Machinery Safety Devices:** Machinery Safety device such as Trip Devices, Two Hand control Device, over run device also use with machinery to control machine related accident. A Safety Device is a protective appliance other than guard that eliminate or reduces to severity of hazardous event before access to a danger point or area.

### **3. Principle to Prevent Machine related Accident:**

Machinery related incidents can be prevented by following way:

**Engineering Control:** Engineering control is best option to control Machine related accident. Ensure guard of rotating machines or parts of Machinery that have potential of injury. Safety devices such as Trip devices, Two Hand control Device, over run device also used to protect to people from exposure of mechanical hazard.

Ensure adequate illumination and suitable work platform. Work environment should be ergonomically fit for operator. Carry out regular inspection and maintenance of mechanical safety devices and guard. Never remove machine guards. Use Log out Tag out & try out system during maintenance work.

**Administrative Control:** Unsafe behaviour is dangerous and this can be lead to cause of Accident. To create positive behaviour safety culture, plan and conduct training, safety awareness/ motivational program and reward to workmen to increase safety awareness and prevent unsafe practices. Effective implementation of Safety Management system, Rules & Procedures will help to prevent human failure and positive safety culture at work place. Ensure trained operator or workman to operate machine. Impart refresher and need based training time to time. Unauthorised person will be restricted to enter hazardous machine area. Display Safety Signage, notice and instruction nearby machinery and Ensure Shut down permit before starting maintenance operation on machinery. Avoid to wear loose belts, Jewellery, Long & loose hair, loose and Long pants, Scarves, Ties around moving machinery or



equipment's. Use suitable personnel protective equipment's (PPE's) and always ensure **good health** of machine operator to prevent human error. Avoid to use alcohol or other drug that effect to central nervous system (CNS). Carry our regular and close supervision by competent person. It will help to prevent unsafe practices i.e human error.

**4. Conclusion:** Human and mechanical failure are main cause of machine related accident and machine related accident can be prevented through engineering control or administrative control method. Engineering control such as to provide guard on danger parts of machinery or to use of safety devices is most effective method to prevent machine related accident. Ensure suitable illumination at workplace and all parameter related to ergonomics must be ensured. Ensure good health of operator and impart training time to time. Effective implementations of Safety rules and procedure help to control machine related accident. Carry out regular supervision to motivate to operator to prevent human error. Hazard identification & Risk Assessment (HIRA) must be carried out for machine operation.

## References

- Springfield B, Thorson J, Lee BC. Sweden's thirty-year experience with tractor rollovers. J Agric Safety and Health. 1998;4(3):173–180.
- Safety Management system in construction industries, Shahnawaz Rampuri, IJSEI, International Journal of Institution of Safety Engineers (India) Volume 1, Issue 1, Jan-Mar 2018
- Challenges to Control workplace Risk in Construction Industries, Mr. Sunil Bhalerao IJSEI, International Journal of Institution of Safety Engineers (India), Volume 1, Issue 4, Oct-Dec 2018
- Bureau of Labor Statistics [BLS] BLS handbook of methods, chapter 9. Occupational safety and health statistics. Washington, DC: U.S. Department of Labor; 2012a.
- Study & analysis of occupational health safety management system (OHSMS) in organisation: a review nair. J sindhu,2shahnawaz rampuri, International Journal of Exploring Emerging Trends in Engineering (IJEETE) vol. 04, issue 01, jan- feb, 2017 pg. 34 – 39 [www.ijeete.com](http://www.ijeete.com) , ISSN – 2394-0573
- OSHA—Occupational Safety and Health Administration, "Occupational Safety and Health Guidelines," 2009, OSHA & BLS statistics
- National Crime Records Bureau (NCRB), India & Factories Act 1948, India
- EUROSTAT, ILO statistics & Bureau of Labor Statistics (BLS), U.S
- .Farm injury/ Fatality Statistics of Canada, Year 1990-2005