“I am a student of whoever I can learn from. I don’t see myself in position like I’m above anybody else and I can never learn or no one can ever teach me anything ……”

"The only thing that interferes with my learning is my education."

“The illiterates of 21st century will not be those who can’t read, write or express but those who can not learn, unlearn and relearn ……”

R.K.SHARMA
AAIYE SURAKSHA KA SHRIGANESH KAREIN
Three essential ingredients in any Organization.

Man,

Machine

Material

These form three angle of a triangle with Management at center to control them.

It is essential that this triangle is an equilateral triangle, maintaining the essential equilibrium.

R.K.SHARMA
A Machine can be programmed, Material flow can be controlled but Man can not be programmed or controlled in democracy like us.

R.K. SHARMA
HAZARD

“To expose to danger, risk, chance of accidents, loss”
A **hazard** is any source of potential damage, harm or adverse health effects on something or someone under certain conditions at work.

"Condition, event, or circumstance that could lead to or contribute to an unplanned or undesirable event."
<table>
<thead>
<tr>
<th>Workplace Hazard</th>
<th>Example of Hazard</th>
<th>Example of Harm Caused</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Thing</strong></td>
<td>Knife</td>
<td>Cut</td>
</tr>
<tr>
<td><strong>Substance</strong></td>
<td>Benzene</td>
<td>Leukemia</td>
</tr>
<tr>
<td><strong>Material</strong></td>
<td>Asbestos</td>
<td>Mesothelioma</td>
</tr>
<tr>
<td><strong>Source of Energy</strong></td>
<td>Electricity</td>
<td>Shock, electrocution</td>
</tr>
<tr>
<td><strong>Condition</strong></td>
<td>Wet floor</td>
<td>Slips, falls</td>
</tr>
<tr>
<td><strong>Process</strong></td>
<td>Welding</td>
<td>Metal fume fever</td>
</tr>
<tr>
<td><strong>Practice</strong></td>
<td>Hard rock mining</td>
<td>Silicosis</td>
</tr>
</tbody>
</table>
Types of Hazard

- Physical
- Chemical
- Biological
- Ergonomics
Physical Hazards

- Noise
- Vibration
- Radiation
- Temperature
- Pressure, Velocity, Height
- Electricity
- Physical characteristics
Chemical Hazards

- Explosives
- Flammable liquids
- Corrosives
- Oxidizing materials
- Toxic, carcinogenic, substances
- Gases and air particulate
Biological Hazards

- Biological wastes (blood, fluids, etc.)
- Drugs (antibiotics & others)
- Viruses, bacteria
- Parasites, insects
- Poisonous or diseased plants, animals
Ergonomic Hazards

- Physical
- Environmental
- Psycho-Social
Ergonomic Hazards

Physical

- Poor work, task design
- Repetitive motion
- Prolonged sitting
- Poor layout
- Poor posture
- Improper lifting and handling
Ergonomic Hazards

Environmental

- Poor lighting, glare
- Poor ventilation
- Poor temperature control
- Poor humidity control
Ergonomic Hazards

Psycho-social

- Work rest cycles
- Violence, discrimination
- Extraneous stress
- Un even work load
- Lack of personnel space
- Poor inter staff relationships
RISK

“A possibility of danger or harm”
**What is risk?**

**Risk** is the chance or probability that a person will be harmed or experience an adverse health effect if exposed to a hazard. It may also apply to situations with property or equipment loss.
A Simple Risk Assessment

\[ R = (P) \times (S) \]

\( R = \text{Risk} \)

\( P = \text{Probability of occurrence} / \text{Likelihood} \)

\( S = \text{Severity of effect (consequence)} \)
Difference between Risk & Hazard

The term "risk" is often confused with "hazard". A high voltage power supply, a sample of radioactive material, or a toxic chemical may present a hazard, meaning that they present the potential for harm.

Risk indicates probability of hazard causing the harm.
HAZARD
Anything that can cause harm (eg. a chemical, electricity, ladders, etc)

RISK
How great the chance that someone will be harmed by the hazard
It is thus evident that hazards are something we can do little about. The hazards posed by a carcinogen, a concentrated acid or an explosive substance are inherent properties of the material. The risks they pose, however, can be (and should be!) minimized by initially preparing a suitable risk assessment, and then by following the procedures laid down in that assessment.
A quality or condition of being safe from “danger, injury, damage, loss, accidents”
WHAT IS SAFETY?

- IS IT FREEDOM FROM ACCIDENTS ??
- IS IT REDUCTION OF ACCIDENTS ??
- IS IT ALL ABOUT COMPLIANCE OF LEGAL REQUIREMENTS ??
INDUSTRIAL SAFETY MEANS

CONTROL OF HAZARDS BY ABIDANCE TO BEST PRACTICES.

DEGREE OF PROTECTION OF HAZARDS.

CAN IT BE 100% ??

ANSWER TO THIS DEPENDS UPON THE DEFINITION OF THE TERM HAZARD
HAZARD

BASIC & INTRINSIC PROPERTY BY VIRTUE OF WHICH SOME THING OR SITUATION CAN CAUSE LOSS OR HARM.

THIS PROPERTY BEING INTRINSIC, CAN NOT BE CHANGED.

OUR KNOWLEDGE IS LIMITED BY Experience.
HAZARD

As our knowledge increases with experience we try to apply better controls as well.

Due to our limited knowledge we are constrained from using the term 100% safe.

Hence we can say:

- Complete freedom from accidents is not possible.
- Safety does not mean Zero Accident.
HAZARD CONTROL HIERARCHY

- ELIMINATION
- SUBSTITUTION
- ENGINEERING CONTROL
- ADMINISTRATIVE CONTROL
- PPE’S
BEST PRACTICES

- NATIONAL STANDARDS: BIS, OISD, TAC.
- INTERNATIONAL STANDARDS: ILO, API, UL, NFPA, EN, OSHA, NIOSH
- MANAGEMENT SYSTEMS: ISO, OHSAS, DUPONT, BSC 5 STAR
- STATUTES - VARIOUS ACTS & RULES
- BENCHMARKING
WHY SAFETY IS REQUIRED?

<table>
<thead>
<tr>
<th>MORAL ARGUMENTS</th>
<th>LEGAL ARGUMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obligation, Duty Of Care</td>
<td>Labour Laws</td>
</tr>
<tr>
<td>Fatalities/Disabilities</td>
<td>Penalty/Closure</td>
</tr>
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<td></td>
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<tr>
<td>SOCIAL ARGUMENTS</td>
<td>FINANCIAL ARGUMENTS</td>
</tr>
<tr>
<td>Loss to Society</td>
<td>Direct Cost</td>
</tr>
<tr>
<td>Sufferings</td>
<td>Indirect Cost</td>
</tr>
</tbody>
</table>
INCIDENT

An event that could or does result in unintended harm to people and/or damage to property and/or environment.

Incidents are divided into two categories.
INCIDENT

NO LOSS

RESULTING IN LOSS

NEAR-MISS
(No Loss-Type Incident)

ACCIDENT
(Loss-Type Incident)
- Facility or Injury
- Ill health
- Property Damage
- Environmental Damage
- Process Disruption
- Disturbance
- etc.
A near-miss is an unplanned event that did not result in injury, ill health or damage, but had the potential to do so. Only a fortunate break in the chain of events prevented a loss. Near-miss is smaller in size and easier to deal with, and it is a cheaper – in fact, almost zero cost – learning tool than learning from actual loss.
WHAT IS ACCIDENT

AN UNINTENDED, UNPLANNED EVENT WHICH HAS THE POTENTIAL TO CAUSE HARM OR INJURY.

AN INCIDENT WHICH CAUSES HARM OR HAS POTENTIAL TO DO SO.
1. **ACCIDENT** – incidents that do cause harm or damage. These are often called **LOSS-TYPE INCIDENTS**.

2. **NEAR-MISS** or **NEAR-ACCIDENT** – incidents that could have caused harm or damage but did not. These types of incidents are often called **NO-LOSS INCIDENTS**.

Clearly, **an event** is called a near-miss when meeting the elements below:

- It is an event as a result of a contact with a substance or a source of energy.
- The event is **unplanned** or **undesired**.
- The event could have caused harm to people and/or damage to property **but did not**.
HEINRICH THEORY OF ACCIDENT CAUSATION

INJURY IS THE RESULT OF COMPLETION OF 5 DOMINOS

1. Social Environment.
2. Fault of the person
3. Unsafe Action / Unsafe Condition
4. Accident
5. Injury
Domino no-3 i.e. Unsafe Acts & Unsafe conditions are the main contributory factor for accident causation.

Unsafe Acts – 88%

Unsafe Conditions – 10%

Others – 2%

It indicates that 98% of accidents can be prevented.
H.W.Henriech- Analysis of 75000 accidents in 1931

Theories of Accident Causation

- The above figures are averages. Injury can occur the first time also
- Should analyze root cause of problem than attacking the symptoms
Frank Bird analyzed 1.75 million accidents in 1969

Theories of Accident Causation

- **600 Near Miss / Unsafe conditions**
- **30 Property Damages**
- **10 Minor Injuries**
- **1 Fatality**

Reporting and investigation of "No injury accidents", "Near misses" can improve the safety performance of a unit.
How do accidents occur??

- Defects in the system
- Existence of Hazard
- Employees to error
- Associated Risk

Accidents occur
ACCIDENTS CAUSATION

Components

Management

Knowledge & Competence

Behaviour

Working Environment

Control System
1. Accidents do not just happen, they are caused
2. It is not simply due to human or technological failure, but failure of Management Control Systems
3. Accidents are due to uncontrolled events or activities
4. It is a mgt. Function to control all events/activities in its physical, technological and human aspects
CAUSES OF ACCIDENTS

ACCIDENT CAUSES

DIRECT CAUSE
- UNSAFE ACT
- UNSAFE CONDITION

INDIRECT CAUSE
- PHYSIOLOGICAL UNSUITABILITIES
- PSYCHOLOGICAL UNSUITABILITIES
- LACK OF KNOWLEDGE & SKILL
## Causes of Accident

<table>
<thead>
<tr>
<th>Direct</th>
<th>Indirect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unsafe Act</strong></td>
<td><strong>Unsafe Condition</strong></td>
</tr>
<tr>
<td>Operating without authority</td>
<td>Unguarded or inadequately guarded machines / equipments</td>
</tr>
<tr>
<td>Bypassing safety devices</td>
<td>Defective conditions of m/c's, equipments, tools etc.</td>
</tr>
<tr>
<td>Operating at unsafe speed</td>
<td>Unsafe methods of storing, piling etc.</td>
</tr>
<tr>
<td>Using wrong tool / equipment</td>
<td>Inadequate or incorrect illumination</td>
</tr>
<tr>
<td>Unsafe Placing</td>
<td>Inadequate Ventilation</td>
</tr>
<tr>
<td>Unsafe Loading</td>
<td>Improper House Keeping-- things not at their proper places</td>
</tr>
<tr>
<td>Taking unsafe position or posture</td>
<td>Unsafe design or construction of machines and equipment etc.</td>
</tr>
<tr>
<td>Working on dangerous or moving equipment</td>
<td></td>
</tr>
</tbody>
</table>
Causes of Accident

Indirect Causes

Physiological Unsuitability's
- Poor eye sight
- Hard to hearing
- Intoxicated
- Physiological disabled

Psychological Unsuitability's
- Negative attitude towards safety
- Ignorance of safety rules and procedures
- Frustration & Conflict
- Morale
- Individual differences
- Acclimatization
- Motivation & aspiration
- Boredom & monotony

Lack of Knowledge & Skill
COST OF ACCIDENT

DIRECT COST –

- Insurance Claims
- Loss of Production or reduced output
- Product loss or damage
- Damage (plant, materials, premises)
- Sickness cover/ sick pay
- Medical treatment
- Repairs to plant & equipment
- Replacement of equipments
- Compensation
- Business opportunities, Share prices
INDIRECT COST

- Business interruption
- Product liability
- Loss of orders
- Legal fees/fines/penalties
- Delay in production
- Start up cost
- Increased insurance renewal costs
- Training replacement
- Cancellation of orders
- Reduced productivity, overtime/additional wages
- Loss of profit
- Loss of corporate image
- Cost of time spent on –
  - Investigations
  - Supervisors assisting victim
  - Workers stopping to discuss the incident
  - Preparation of reports
  - Attendance on court proceedings
  - Hospital visits & dealing with relatives

R.K.SHARMA
The Cost of Accidents

“Iceberg” analogy of costs

Direct Cost
- Compensation
- Medical Expenses
- Equipment damage

Indirect Cost
- Cost of Lost time
- Production loss
- Over head & administrative expenses etc.

Accidents are just the tip of the iceberg.....

Beware of the hidden threat. Identify and reduce Risk!

....Potential ones are those hidden in the murky lights of the future.
“Unsafe action / Unsafe condition & accidents are only the symptoms of some thing wrong in the safety management systems”.

“Safety should be managed like any other company function.

“The key to effective line safety performance is management procedures that fix ACCOUNTABILITY”.
Reasons for Accident Prevention

1. Humanitarian
2. Economic
3. Social
4. Legal
5. Productivity
How to achieve Safety?

Broadly it is grouped in to 5 Es methods;

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Engineering</td>
<td>Process Control</td>
</tr>
<tr>
<td>2</td>
<td>Enforcement</td>
<td>Rules &amp; Procedures</td>
</tr>
<tr>
<td>3</td>
<td>Education</td>
<td>Training</td>
</tr>
<tr>
<td>4</td>
<td>Enthusiasm</td>
<td>Behavioral Aspect</td>
</tr>
<tr>
<td>5</td>
<td>Evaluation</td>
<td>Audit, Mock Drills</td>
</tr>
</tbody>
</table>
Safety Helmet is required but Positive Thoughts are important.
Safety Goggles are required but Conscious Vision is important.
Safety Hand Gloves are required but Righteous Protective Action is important.
Safety Shoes are required but Quick and Safe Steps are important.

Safety Equipments are required but Trained, Alert & Safe Man is more important in any Disaster Prevention programme.
SAFE OPERATOR

KNOWLEDGE
What to do?

WILINGNESS
Want to Do?

INTELEGENGY
Why to do?

EXPERIENCE
How to do?
A trained workforce alert of hazards, aware of guards & facilities and also aware of the need to work safely is indeed an asset because it is ultimately the safety performance on the shop floor that matters. Hence human touch to all your shop floor policies is an important strategy in any Organisation for a Total Disaster Prevention Program.
Here are some dangerous thoughts
Do you ever think this way?

- I have been doing this job for years and have not faced an accident yet.
- There is no need for safety glasses because I am only going to be grinding for a few seconds.
- I’ll clean it up later.
- I’ll stack this in front of the exit and pick it up later.
- Anyone who is able to drive a car can manage to drive any vehicle!
- Why bother about it.
Dangerous thoughts, continued..

- The next shift can deal with the overheating—why bother with it now. To take care of it, I would have to stay back.
- I’ll leave this on the stairs, so that I remember to take it when I go down.
- Why wear my seatbelt, it’s just a few blocks away.
- That’s safety—it’s not my responsibility.
- Why ask someone how to do this job. I do not want them thinking I am not capable of handling it.
The above thoughts are the kind that could lead to accidents and injuries to ourselves and other people.

Try making safety a habit and apply it at all times. For example, a first aid kit in your vehicle or fire extinguisher in your home adds to safety. At work, make sure you checked all safety aspects before proceeding with a job.
Take hold of safety before an accident takes hold of you

Remember safety starts with you
Don’t try to change the people

Change the environment
i.e. method of working, training, instructions, supervision, inspection & Safety culture
to
have ZERO tolerance for Accident
Thank You........