

2

Risk Assessment

Risk Assessment

What is risk?

Risk is a sliding scale measure of how serious a safety concern is. It takes into account a number of factors. The two most important factors affecting risk are:

- *How likely* is it that an accident will occur?
- If an accident does occur, *how serious* would injury be?

The first factor is a measure of probability (how likely?). The second is a measure of severity (how serious?).

The level of risk is based on the combination of these two factors. For example, in one case, the likelihood that a worker will come in contact with dangerous moving parts of a machine is low, but if he does, it is certain that he will lose his arm; the level of risk is *high*. In another case, the probability of harmful contact with moving machine parts is low, and the expected injury is only a mild abrasion; the level of risk is *very low*. If harmful contact is almost certain and the expected injuries are very severe, the risk level is *extremely high*.

Assessing risk

To realistically assess the risks of machinery and related equipment, it is necessary to understand how the moving parts of a machine can injure a worker. Chapter 1 of this manual, which deals with hazard recognition, provides some of this information.

A risk assessment must involve the operator, maintenance personnel, and the supervisor. You should also consult with the manufacturer, suppliers of safeguards, and safety professionals. Each party sees the machine from a different perspective, and will provide a valuable contribution.

Gathering the information necessary for a good risk assessment may require repeated observations, especially when determining what the worker does when normal production flow is interrupted. The length of time that a piece of equipment is in service without causing an injury has no bearing on whether or not it is safe.

Never ask the question, "What is a worker likely to do?" In a given situation, with the pressures of production, you cannot reliably predict what someone is likely to do. The question you need to ask is, "What *can* they do?" In general, if someone can access a hazard, additional safeguards are warranted.

Operators are at greatest risk of injury when hand feeding an unguarded machine activated by a foot control.

Some significant factors that increase the probability of contact with unguarded hazardous machine moving parts include:

- Lack of familiarity with the machine
- Hand feeding a machine activated by a foot control
- Reaching into a machine to clear jams and misfeeds
- Boredom and repetition
- Frequent access to danger areas of the machine for setup and adjustments
- Lack of operator training and experience
- Machine cycle speed

There are a number of machinery risk assessment models in use. Some are highly technical in nature (**quantitative** risk assessments), others are more observation-based (**qualitative** risk assessments). The model shown in Figure 2.1 is a simplified combination of the two approaches. (A blank form is found in Appendix 1 of this manual.)

The main purpose of a risk assessment is to decide which machine should be given priority, and which parts of the machine should be safeguarded first.

Machine Risk Assessment Survey				
Company Name ABC Food Processors Ltd.	Date of Survey March 10, 2005	Survey done by: 1. Raj Nagal (supervisor) 2. Bill Knight (maintenance) 3. Lindsay Hall (operator)		
Machine Name Integrated Wrapping Line	Machine Function Tray Wrapper			
Identify and describe every hazardous machine motion or harmful condition to which the worker's body parts are exposed (e.g., rotating shafts, in-running nip points, shearing parts, reciprocating parts, punching action, impact hazards, flying debris, abrasive surfaces, electrical hazards, hot/toxic fluids, vapours, emissions, radiation). Be as descriptive and detailed as possible.	Describe the worst injury that would reasonably occur due to each hazard. Use the following descriptions as a guide: <ul style="list-style-type: none"> • Fatal • Major (normally irreversible: permanent spinal damage, loss of sight, amputation/crushing, respiratory damage) • Serious (normally reversible: loss of consciousness, burns, fractures) • Minor (bruising, cuts, light abrasions) 	Estimated severity of injury: Minor = 1 Serious = 5 Major = 7 Fatal = 10	Estimated likelihood of injury (see Note 1): Unlikely = 1 Possible = 5 Probable = 7 Certain = 10	Estimated level of risk (see Note 2): Estimated severity × estimated likelihood
1. Initial infeed belt creates pinch point near front roller.	Minor bruising of fingers	1	5	5
2. Crushing hazard between tray wrap film folder arms and machine frame	Amputation injury to fingers or severe crushing of hands	7	7	49
3. Outfeed tray/film heat belt is very hot	Burns to hands	5	5	25
4. Web belt drive unit for outfeed belt has no guard – infrequent access required	Bruising of fingertips	1	5	5

Note: Gathering this information may require repeated observations, especially when determining what the worker does when normal production flow is interrupted.

Recommended safeguarding to eliminate or reduce the risk to an acceptable level (see Note 3)	
1. Realign belt to eliminate pinch point.	3. Lower exhaust ventilation capture hood a few inches to close off access to this hazard. Place warning decal near burn hazard.
2. Design and install interlock gate guard over moving arms; operator can then make minor adjustment without locking out.	4. Extend side flange to enclose access to chair-sprocket drive.
<p>Note 1. The following factors may be useful when estimating the likelihood of injury:</p> <ul style="list-style-type: none"> • Machine cycle speed • Hand feeding with foot control • Operator training and experience • Boredom factor (repetition) • History of jams and misfeeds resulting in frequent access to danger areas of the machine • Previous injuries on this machine or machines of this type <p>Note 2. Use the estimated level of risk to set the priority for implementing safeguarding measures. The higher the estimated level of risk, the more urgent it is to implement safeguarding solutions.</p> <p>Note 3. Always follow the hierarchy of safeguarding controls regardless of the perceived level of risk.</p>	

Figure 2.1. Sample completed machine risk assessment survey form, with hierarchy of safeguarding controls to be used.

Hierarchy of safeguarding controls

When selecting a safeguard or a combination of safeguards, always start at the top of the hierarchy shown below. Choose a less effective safeguard only when the more effective solution is impracticable.

For example, you may be able to eliminate the need to hand-feed a machine by installing an automated feeder. Installing a fixed barrier guard across a feed point may be practicable if the feed stock is a flat sheet metal blank; for larger material, you may have to allow access to the point of operation using two-hand controls or a light curtain (a presence-sensing device) instead.

Hierarchy of Safeguarding Controls		
Most effective	1. Elimination or substitution	<ul style="list-style-type: none"> • Eliminate human interaction in the process • Eliminate pinch points • Automate material handling
□	2. Engineering controls (safeguarding technology)	<ul style="list-style-type: none"> • Mechanical hard stops • Barrier guards • Interlocked guards • Presence-sensing devices • Two-hand controls
□	3. Awareness	<ul style="list-style-type: none"> • Lights, beacons, strobes • Computer warnings (PLC-generated) • Restricted space painted on floor • Beepers • Horns and sirens • Warning signs and labels
□	4. Training and procedures (administrative controls)	<ul style="list-style-type: none"> • Safe work procedures • Safety equipment inspections • Training • Lockout
Least effective	5. Personal protective equipment	<ul style="list-style-type: none"> • Safety eyewear • Face shields • Hearing protection • Gloves • Respirators