# Technical Paper: Ontario Paper Products Sector Root Cause Analysis Workshop Results

A focused approach to improving workplace health and safety

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#### **Technical Paper: Root Cause Analysis Report**

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## **Executive Summary**

A volunteer group of labour and management subject matter experts met to conduct a risk assessment of the hazards in Ontario's Paper Products industry, and later, a root cause analysis of its top health and safety risk.

The group of representatives from management, labour, Ministry, and Workplace Safety North, was facilitated by Jerry Traer, Health and Safety Specialist at Workplace Safety North (WSN).

In advance of the workshop, each industry expert submitted their top health and safety concerns, and during the risk assessment workshop, many identified risks were reviewed and discussed by the group.

Both management and labour agreed the top risk was **Interactions with Stationary equipment** involved in production, conveyance, packing, wrapping and other processes that result in worker injury.

The root cause analysis workshop, facilitated by Konor Poulin, Health and Safety Specialist, determined the top 10 causal factors, as well as specific controls for each. The top 10 causal factors were:

- Lack of on-the-job, competency-based training on safe work procedures
- Prioritizing productivity over safety
- Insufficient/inadequate machine guarding on stationary equipment
- Congested work area
- Ineffective health and safety program elements
- Ineffective/inadequate lockout/tagout program
- Lack of adherence to/absence of hazard identification program/process
- Inadequate/insufficient training programs
- Misuse/abuse of equipment
- Inadequate implementation of process changes (management of change)

Next steps include an immediate focus on the most common systemic weaknesses regarding interactions with stationary equipment involved in production, conveyance, packing, wrapping and other processes.

#### 1. Risk Assessment Project: The Subject of Inquiry



Pictured above: The "swiss cheese" model of simultaneous failure, or absence of risk controls, that could cause a "catastrophic event." In this model, when there are latent failures in design, gaps in regulation, outdated training material, shortage of skillsets, and an unsafe act, all the "holes" in the system line-up to potentially cause a critical injury or fatality.

## 2. Background: Revisiting the 2024 Risk Assessment Workshop Results

In spring 2024, a volunteer group of subject matter experts met for a Paper Products sector workplace risk assessment at Workplace Safety North (WSN) headquarters in North Bay, Ontario. The workshop with representatives from management, labour, Ministry and Workplace Safety North was facilitated by Jerry Traer, Health and Safety Specialist at Workplace Safety North (WSN).

In advance of the workshop, each industry expert submitted their top health and safety concerns, and during the one-day workshop, all identified risks were reviewed and discussed by the group.

When it came time for the final vote on the top risks, only actual workers and managers from the industry were allowed to vote. In order to ensure an open and fair voting process, handheld electronic devices recorded votes anonymously. Both labour and management agreed: the top risk in Ontario Paper Products operations is **Interactions with Stationary equipment involved in production, conveyance, packing, wrapping and other processes that result in worker injury.** 

They identified specific conditions and situations that could result in injury or illness. Both workers and managers agreed: the number one risk in Ontario Paper Products operations is interactions with stationary equipment involved in production, conveyance, packing, wrapping and other processes."

## Top 10 health and safety risks in Ontario Paper Products Operations

1. Mobile equipment - Lack of training and monitoring of workers operating mobile equipment

2. Tools and equipment - Conveying equipment causing worker injury

- 3. Psychosocial Substance use resulting in workplace injury
- 4. Training Inadequate training resulting in worker injury
- 5. Culture Workplace culture results in worker injury
- 6. Occupational illness Noise exposure
- 7. Tools and equipment Machine interaction causing worker injury
- 8. Occupational illness Chemical exposure resulting in worker injury
- 9. Falls from heights Worker falls from heights
- **10. Struck by equipment -** Struck by moving equipment/machinery dangers/hazards associated with lift trucks

The risk assessment workshop provided direct feedback from industry experts about their perception of the workplace. By using leading rather than lagging indicators, WSN can be more proactive in helping industry in addressing these workplace risks.

### Health and safety in the workplace

When the group of industry experts reviewed the risk assessment results, they found that the risks were related to interactions with Stationary equipment involved in production, conveyance, packing, wrapping and other processes.

A related resource supporting workplaces gaining a better understanding about the importance of taking a holistic approach to health and safety and having a supportive workplace culture encourages both self-care and concern for coworkers, research also supports an increased focus on overall well-being.

The results of the workshop were reviewed by the WSN Forestry, Paper, Printing and Converting Advisory Committee, which includes experts from the Paper Products sector. The committee, in conjunction with WSN, confirmed their support of the next step: a detailed analysis of the root causes of interactions with stationary equipment involved in production, conveyance, packing, wrapping and other processes, and the creation of an effective prevention plan.

Following review and discussion, both industry labour and management committee members voted and confirmed that the top risk to the Paper Products sector was interactions with stationary equipment involved in production, conveyance, packing, wrapping and other processes.

In June of 2024, the group of industry experts met for two days to determine the root causes of interactions with stationary equipment involved in production, conveyance, packing, wrapping and other processes

#### 3. Root Cause Analysis: Risk Statement

Based on the results of the Paper Products sector risk assessment, the following risk statement was selected by workshop committee members for a root cause analysis utilizing using the "Fishbone" approach:

## "Interactions with stationary equipment involved in production, conveyance, packing, wrapping and other processes results in worker injury."

#### 4. Root Cause Analysis Workshop: A Bipartite and Collective Process

- Workshop participants were peer-recognized industry and system experts.
- Workshop process was open, transparent, and collaborative.
- Ranking and prioritization of causal factors for substance use was voted on by industry management and labour only; MLITSD and WSN attendees did not vote.

Validation of the results involved having the results presented and discussed to root cause analysis workshop attendees, and later, to the Forestry, Paper, Printing and Converting Advisory Committee.

#### 5. Root Cause Analysis Workshop Participants

Industry delegates and Prevention System partners from the following organizations attended:

Name	Organization
David Nevill	Jones Health Care Group
Loren Heymann	
Kiarah Shaule	
Jenanne Graham	
Marty Hrncir	Graphic Packaging
Joseph Nisbet	
Tori Towns	
Stewart Taylor	
Konor Poulin	Workplace Safety North
Brandi Cramer	
Tricia Valentim	
Tiana Larocque	
Shelly Speir	Ministry of Labour, Immigration, Training and Skills Development

6. Fishbone Diagram: The Ishikawa Model to Identify Root Causes



#### Fishbone Diagram: Overview



CLOSE-UP of fishbone diagram: Primary causal factors of Interactions with stationary equipment involved in production, conveyance, packing, wrapping and other processes that result in worker injury.

Focused on six key workplace factors including:

- Tools and equipment
- Culture
- Process
- Environment
- People
- Measures

## Ranked Primary Causal Factors Identified by Hazard Category

#	Category	Primary Root Cause
1	People	Lack of training
2	Culture	Productivity over safety
3	Tools and machines	Lack of guarding
4	Environment	Crowded work area
5	Measures	Ineffective health and safety program (e.g.: first aid, emergency response)
6	Tools and machines	Lockout/tagout (LOTO) issues
7	Process	Lack of hazard identification
8	Measures	Inadequate training
9	Tools and machines	Misuse of equipment
10	Process	Issues with implementation of process
11	Tools and machines	Modified equipment creating hazard
12	Environment	Powered industrial vehicle (PIV) travel
13	Culture	Personal perceptions of safety
14	Tools and machines	Lack of maintenance
15	Process	Inadequate standards
16	People	Behavioural factors
17	Environment	Heat
18	Process	Inadequate documentation
19	People	Lack of supervision
20	Measures	Lack of accountability
21	People	Mental health
22	Culture	Collective morale
23	Tools and machines	Lack of defined responsibilities (e.g.: maintenance, senior operator)
24	Environment	Noise
25	People	Language barriers
26	Environment	Air quality
27	People	Physical abilities
28	Environment	UV exposure
29	Culture	Previous employer/workplace culture

## 7. Top 10 Primary Causal Factors in Ontario Paper Products Operations

Attendees identified the following top 10 primary causal factors:

- 1. People Lack of on-the-job, competency-based training on safe work procedures.
- 2. Culture Prioritizing productivity over safety.
- 3. Tools and machines Insufficient/inadequate machine guarding on stationary equipment.
- 4. Environment Congested work area.
- 5. Measures Ineffective health and safety program elements.
- 6. Tools and machines Ineffective/inadequate lockout/tagout (LOTO) program.
- 7. Process Lack of adherence to/absence of hazard identification program/process.
- 8. Measures Inadequate/insufficient training programs.
- 9. Tools and machines Misuse/abuse of equipment.

10. Process – Inadequate implementation of process changes (management of change).

Next, the industry group of subject matter experts collaborated toward the development of a list of hazard controls that could be put in place to address the top 10 primary causal factors.

## 8. Critical controls to address primary causal factors

Note: Control lists are not in any order of priority.

### 1. People: Lack of on-the-job, competency-based training on safe work procedures.

- a. Job specific training.
- b. Developing procedures for machine operation (job safety analysis for each job) and reviewed on an annual basis.
- c. Training validation process.
- d. Validating task proficiency: "Can you do it?"
  - i. Skill listing to be signed off by trainer and supervisor.
- e. Record keeping (certification, training records of completion, training matrix).
- f. Refresher training frequency.
- g. Mentoring/TTT program and reviewed on an ongoing basis.
- h. Standardize operating procedures.
- i. Review process for procedures.
- j. Safety talks
  - i. Making themes
  - ii. Easy resources to help lead discussions
  - iii. Coaching as needed
- k. New employee onboarding.
- 1. Incorporation of classroom environments and hands-on training in preparing workers.
- m. Incorporating video instructions/segments/technology (Slido, SurveyMonkey etc.) for interactive training components
- n. Ongoing training needs analysis accessible to all the leaders.

Note: Control lists are not in any order of priority.

### 2. Culture: Prioritizing productivity over safety.

- a. Establishing a committed schedule with leadership commitment (e.g.: downtime, preventative maintenance).
- b. Competent supervisor training and coaching opportunities.
- c. Commitment from all parties (from senior leadership to the JHSC).
- d. Institute daily meetings on the shop floor to discuss safety topics including safety, quality, operations, and

maintenance with functional leaders from those areas.

- a. Establishing strong communication
  - i. Handover meetings
  - ii. Monthly safety talks
  - iii. Tier 1 meetings (department toolbox talks for QA, production, and safety; whatever happens on shift)
- b. Culture survey to understand where it is for company, what are the gaps, benchmarking for future.
- c. Walk the Talk Enforcement of organizational values
  - i. Visibility of management on the floor
  - ii. Talking with workers on the floor
  - iii. Leadership commitment and lead by example (serve the servers).
- d. See something say something.
  - i. Not allowing unsafe practices to continue
  - ii. Communicate expectations (verbally, policy, safety alerts, emails) clearly and concise.
  - iii. Consistency of enforcement
  - iv. Positive reinforcement
    - 1. Rewards and recognition program
- e. Internal Responsibility System
  - i. Making implicit (in writing, verbally, standard organizational communication) each person's roles and responsibilities

Note: Control lists are not in any order of priority.

## 3. Tools and machines: Insufficient/Inadequate machine guarding on stationary equipment.

- a. Developing a guarding inventory to be used for auditing.
- b. Auditing of guarding on a weekly basis (e.g.: circle checks, spot checks, annual inspections).
- c. Documentation of auditing completion.
- d. Operator/JHSC/Supervisors included in audits.
- e. Risk assessment completions on new equipment.
- f. Engineers enter site and sign off on new equipment
  - i. Assurance that PSHSRs are conducted
- g. Communicate inherent risks (intermittent safety measures) with workers include signoffs until
  - measures can be considered closed and the machine can be operated regularly.
- a. Incorporation of new technology/guarding styles.
  - i. Light curtains, area scanners, interlocks
  - ii. Cameras that document near misses
  - iii. Wearable technology (identification of unsafe conditions)
  - iv. Robotic applications (potential to retrofit machines; teleoperation of equipment)

#### 4. Environment: Congested work area.

- a. Scheduling of workload.
- b. 5S to maintain an orderly work environment.
- c. Red tag events to help reduce the congestion (disposition of equipment).
- d. Minimum and maximum levels to flag congested work areas.
- e. Cleaning schedules including routine scheduling and sign-off
- f. Reviewing and ensuring floor plan indicates position of equipment, etc.
- g. Daily inspections for congested areas (documented on end-shift report)
- h. First-in and first-out policy with infrastructure design that ensures conformance.
- i. Floor plan auditing for new/used equipment to establish a clear uncongested area.
- j. Process Engineer to recommend efficiencies in the process
- k. Working with sales and customers to reduce congestion (poor forecasting, over ordering issues)

and have more control over inventory.

- i. Utilizing scheduling tool such as Print Flow
- a. Communication/planning between shifts (handovers).
  - i. Leadership standard work

Note: Control lists are not in any order of priority.

#### 5. Measures: Ineffective health and safety program elements.

- a. Active JHSC.
- b. Health and safety board.
- c. Crew meetings
  - i. Logging them
  - ii. Themes
- d. Monthly auditing of departments for health and safety concerns.
- e. Companywide safety alerts to ensure everyone is aware.
- f. Monthly safety talks.
- g. Monthly safety metrics.
- h. Hazard mitigation monthly requirements.
- i. Safety contact with supervisors one-on-one with feedback opportunities to help raise awareness.
- j. Observational opportunities for awareness for safety (behavioural based safety audit)
- k. Meeting legislated requirements for health and safety programs (JHSC, inspections etc.).
  - i. Centralized location for the information

#### 6. Tools and machines: Ineffective/Inadequate lockout/tagout (LOTO) program.

- a. Audit equipment and LOTO boards.
- b. Ensuring each station has accessible LOTO board with tags/filling tags out.
- c. Procedures validation/review.
- d. Graduated training process (knowledge, skill validation, performance).
- e. Supervisor daily audits on the board to ensure LOTO is followed.
- f. Training and follow-up at various periods of time to identify if all energy sources and have they

all been locked out fully.

- a. Authorized and affected personnel can lock out the machines, with continued training.
  - i. Lockout committee
- b. Machine specific placards
- c. Refresher training on the proper procedures of LOTO.
- d. Establishing a mandatory legislated program standard for LOTO that includes energy control and verification steps.
  - i. Lockout tagout tryout
- a. Documentation for steps for energy control involved in LOTO policies/procedures/training.
- b. Perform a hazard and risk assessment for the sources of hazardous energy.
- c. CSA Z460-13

Note: Control lists are not in any order of priority.

## 7. Process: Lack of adherence to/absence of hazard identification program/process.

- a. Training on hazard identification
- b. Complete a site-wide risk assessment.
- c. Discipline process
- d. Supervisors providing mentoring opportunities
- e. Hazard reporting program for newly identified hazards.
- f. Hazard mitigation program.
- g. Ensuring Pre-Startup Health Safety Review are completed and documented.
- h. JHSC monthly audits/inspections for departments
- i. Documentation that ensures follow up for all aspects on hazard identification processes.
- j. An engaged JHSC
- k. Diverse JHSC with cross representation of departments
- 1. Review of machine specific hazards upon initial training.
  - i. Job specific analysis on full machine
- m. Risk inventory available at each area/piece of equipment
  - i. Reference material available on hazards

## 8. Measures: Inadequate/insufficient training programs.

- a. New employee onboarding program.
- b. Performance reviews.
- c. Third-party auditing.
- d. Behaviour based safety training audits
- e. Training matrix
- f. Documentation for all training programs
- g. Train-the-trainer programs
- h. Review of the training process for the training programs.
- i. Skill validation

Note: Control lists are not in any order of priority.

### 9. Tools and machines: Misuse/abuse of equipment.

- a. Training record on how to use the equipment properly.
- b. Disciplinary process
- c. Tool audit for replacement and upgrades.
- d. Tool use training.
  - i. List of tools utilized
  - ii. Tool boards
  - iii. Document information
  - iv. Mechanical aptitude training
- e. Preventative maintenance.
- f. Ensuring access to budget for equipment needs.
- g. Adequate supervision and mentoring.
- h. Employee feedback opportunities.

#### 10. Process: Inadequate implementation of process changes (management of change).

- a. MOC process in place
- b. Communication of changes in the workplace
- c. Follow up procedures
- d. Team meetings, safety talks, toolbox talks
- e. Ensuring a plan, do, check, act system
- f. Employee feedback on the process itself (Open door policies for those with concerns on changes).
- g. SOP's and job safety/hazard analysis.
- h. Standardization for clear expectations of management of change process.

### 9. References

For more information, consult the following resources:

- 1. Top 10 Health and Safety Risks in Paper Products Operations <u>https://www.workplacesafetynorth.ca/sites/default/files/2024-04/Forest-Products-Paper-products-top-10-risks-poster-WSN-2024-04-26.pdf</u>
- 2. Root Cause Analysis Results <u>https://www.workplacesafetynorth.ca/sites/default/files/2024-07/Forest-Products-Paper-products-top-10-Root Causes-WSN-2024-07-22.pdf</u>

#### **10. Workshop Contact**

#### For additional information or questions, please contact:

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TOP 10 PRIMARY FACTOR		
Primary causal factor		
Secondary causal factor		
Third-level causal factor		
Fourth-level causal factor		











TOP 10 PRIMARY FACTOR		
Primary causal factor		
Secondary causal factor		
Third-level causal factor		
Fourth-level causal factor		

#### 12. Appendix A: Risk Assessment Methods/Standards

- Bayesian analysis
- Bow tie analysis
- Brainstorming (e.g., what-if)
- Business impact analysis
- Cause and effect analysis
- Checklists
- Computer hazard and operability studies (CHAZOP)
- Consequence analysis (also called cause-consequence analysis)
- Likelihood/consequence matrix
- Construction hazard assessment and implication review (CHAIR)
- Decision tree
- Delphi technique
- Energy barrier analysis (or energy trace barrier analysis)
- Environmental risk assessment
- Event tree analysis
- Failure mode and effect analysis (FMEA)
- Failure mode, effect and criticality analysis
- Fault tree analysis
- Fishbone (Ishikawa) analysis
- Hazard analysis and critical control points
- Hazard and operability studies (HAZOP)
- Human error analysis (HEA)
- Human reliability analysis
- Job safety analysis (JSA)
- Level of protection analysis (LOPA)
- Marlov analysis
- Monte Carlo analysis
- Preliminary hazard analysis (PHA)
- Reliability centered maintenance
- Scenario analysis
- Sneak circuit analysis
- Structured/semi-structured interviews
- SWIFT (i.e., structured what-if)
- Systemic cause analysis technique (SCAT)
- Workplace risk assessment and control (WRAC)

#### **Risk management standards:**

- 1. Risk management principles and guidelines (ISO 31000:2009)
- 2. Risk assessment techniques (ISO/IEC 31010:2009)
- 3. OH&S hazard identification and elimination and risk assessment and control (CSA Z1002)
- 4. Process safety management (CSA Z767-17)
- 5. Enterprise risk management (COSO 2004)
- 6. Global minerals industry risk management (GMIRM)
- 7. International Council on Mining and Metals (ICMM)

\* Not an exhaustive list

#### 14. Appendix B: Poster: Top 10 health and safety risks in Ontario paper products sector



Root Cause Analysis Report of Interactions with Stationary equipment involved in production, conveyance, packing, wrapping and other processes results in worker injury

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#### 15. Appendix C: Poster: Top 10 root causes of injuries from equipment in paper products sector



Root Cause Analysis Report of Interactions with Stationary equipment involved in production, conveyance, packing, wrapping and other processes results in worker injury