Serious Injury and Fatality Prevention

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Serious Injury & Fatality (SIF) Prevention

AGENDA

Overview
SIF Background
Mosaic’s SIF Journey
Using the data
Closing
About The Mosaic Company
(NYSE: MOS)

Our Work
We are the world's leading integrated producer and marketer of concentrated phosphate and potash.

Our Mission
We help the world grow the food it needs.
Who We Are

- Fortune 500 company incorporated March 2004, combination of IMC Global Inc. & Cargill fertilizer businesses
- 100 years of phosphate mining history in U.S.
- 50 years of potash mining history in Canada
- Approximately 22.2 million tonnes of operational capacity
- $7.2 billion in sales in calendar 2016
- Customers in approximately 40 countries
- Nearly 9,000 employees in operations and joint ventures (JVs) in:
  - United States
  - Paraguay
  - Australia
  - Canada
  - China
  - Peru (JV)
  - Brazil
  - India
  - Saudi Arabia (JV)
Global Offices & Operations
Distribution and Markets

Daily global distribution:
Approx. 50,000 tonnes
SIF Background
Heinrichs's Loss Pyramid

- Fatality: 1
- Lost Time: 3
- Recordable: 10
- First Aid: 100
- Near Miss: 600
Heinrichs’s Loss Pyramid

- Near Miss: 60
- First Aid: 10
- Recordable: 1
Common trend of injuries versus fatalities

![Graph showing the trend of injuries and fatalities over years](image)
Heinrichs’s Loss Pyramid re-examined

- Not all incidents have an equal probability of resulting in serious injury.
  - i.e. Incidents involving the following generally have a higher probability of a more serious outcome:
    - Confined space
    - Working at heights
    - Mobile equipment
    - Lifting / rigging activities
- A reduction at the bottom does NOT correspond to a reduction at the top
- Different intervention strategies
Mosaic’s SIF Journey
Mosaic’s SIF Journey

2004-2008
Formed in 2004
Utilized DNV Loss Control Theories
Numerous programmatic improvements

2009-2011
Obtained ISO14001 & OSHAS18001 Registrations
Joined Serious Incident & Fatality (SIF) Working Group

2012 – 2015
Develop SIF concept within EHS
Measure “SIF” data
Socialize SIF concept with leaders
Targeted Interventions

2016 and beyond
Branding of Potentially Serious Incidents
Included Environmental potential
Deployed PSI across organization
SIF Initially Defined at Mosaic:

Serious Injury/Illness or Fatality (SIF)
- Fatality
- Life-threatening injury or illness requiring emergent care (EMS)
- Life-altering injury or illness (Permanent)
Developed SIF Decision Tree

SIF POTENTIAL
1) Did the incident involve:
   a) Fatal or life-altering injury?
   b) Confined Space w/o adequate safe-guards?
   c) Critical lifts, suspended loads, unsecured loads, improper rigging or heavy objects falling over 5’ (i.e. needs enough height and/or weight to contain SIF potential)?
   d) Structural failure or corroded structural steel?
   e) Elevated work without proper fall protection (tie off at 4’) or opening with insufficient guarding?
   f) Energized equipment – electrical => 110 V or other potential energy?
   g) High pressure water blasting, abrasive blasting, etc.
   h) Operating mobile equipment/vehicles in hazardous conditions (weather or people)?
   i) Working around water > 5’ deep?
   j) Crane near overhead power lines?
   k) Ground fall?
   l) Working around hazardous materials at high volumes, temperatures, pressures or concentrations?
   m) Human interaction with operational equipment with high potential energy?
   n) Hand-held high-powered tools?
   o) Severe weather (wind, tornado, lightning, etc.)?
   p) Excavation w/o adequate safe-guards?
   q) Hot work?

CARDINAL RULE DETERMINATION
1) Did the SIF involve the Violation of a Cardinal Rule (Life Critical Program)?

NOT SIF POTENTIAL
1) Did the incident involve:
   a) Fall from same level?
   b) Hearing shift?
   c) Insect bite/sting?
   d) Discussion for more than 5 minutes?
SIF by Category

Count

Falling Object  High Energy: Non-Electrical  Fall Protection  Mobile Equipment  Haz Materials  Ground Fall  Blasting/Explosives
Intervention: Prevention of Falling Objects

- Developed Corporate Standard
- Created communication strategy
  - Stop the Drop
- Trained employees on requirements
- Procured tools to enable employee success
- Conducted field checks for coaching & feedback
- Integrated into EHS Management System self assessment program
Refined and Rebranded SIF: Potentially Serious Incidents (PSIs)
Refined SIF Program

• Branded internally as Serious Incidents (SI) and Potentially Serious Incidents (PSIs)
  • Emphasizing Potential
• Updated definition and Updated categories
• Transitioned PSI determination to Operations
• Communicated across company
• Created Quality Assurance Process
• Communicated Initial Notices of PSIs to Mosaic leaders with investigations
• Applied SIF concept to Environment
Communication Points: Serious & Potentially Seriously Serious Incidents

- Serious safety incidents are life altering and impact families, friends, and co-workers.
- Serious environmental incidents can affect our license to operate a facility, part of a facility or obtain permits in the future.
- Serious incidents can also affect our public image.
- Incidents, including near misses or minor incidents, with a potential to have serious consequences are “free lessons” and should be treated with the same importance as a serious incident.
- Recent research has taught the safety industry that reducing or attacking the frequency of incidents does NOT simultaneously achieve a reduction in severity. Therefore, a different strategy is required to reduce high risk incidents than a strategy to reduce all incidents.
Serious and Potentially Serious

Mosaic is defining and using the term **serious** to describe incidents that are or can be:
life altering or
affect our license to operate.

A **Serious Incident (SI)** is an event that:
 Actually resulted in an A or B consequence on the RAM

A **Potentially Serious Incident (PSI)** is an event that:
 Potentially could reasonably result in an A or B consequence on the RAM if only one factor around the event was changed.

A **Factor** could be a control, the weather, time of day, person’s location, etc.
## Mosaic Risk Assessment Matrix

<table>
<thead>
<tr>
<th>Safety Impact</th>
<th>Environmental Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong> Fatality OR release of materials that pose a widespread threat to the health and safety of employees or members of the public.</td>
<td>Release of material that poses a widespread threat to the environment or irreversible damage to ecosystem</td>
</tr>
<tr>
<td><strong>B</strong> Permanent Disabling Injury OR multiple people injured</td>
<td>Any Regulatory Non Compliance with a localized environmental impact that can be remediated over months or years</td>
</tr>
<tr>
<td><strong>C</strong> Injury/Illness with work restrictions</td>
<td>Any Regulatory Non Compliance, including those with quickly reversible^ environmental impact</td>
</tr>
<tr>
<td><strong>D</strong> Injury/Illness with minor severity</td>
<td>Release with minimal impact</td>
</tr>
</tbody>
</table>

\(^{*}\) Environmental impacts with a quick recovery or limited long-term effects.
# PSI Health & Safety Categories

<table>
<thead>
<tr>
<th>Letter</th>
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</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Abrasive &amp; Water Blasting</td>
<td>M</td>
<td>Mobile Equipment</td>
</tr>
<tr>
<td>B</td>
<td>Blasting (explosives)</td>
<td>O</td>
<td>Operating Equipment</td>
</tr>
<tr>
<td>C</td>
<td>Confined Space</td>
<td>P1</td>
<td>Fall Protection</td>
</tr>
<tr>
<td>E1</td>
<td>Electrical contact</td>
<td>P2</td>
<td>Unprotected Openings</td>
</tr>
<tr>
<td>E2</td>
<td>Overhead Power Line</td>
<td>Q</td>
<td>Hot work</td>
</tr>
<tr>
<td>F1</td>
<td>Falling Object - lifting</td>
<td>R</td>
<td>Fire</td>
</tr>
<tr>
<td>F2</td>
<td>Falling Object - unsecured</td>
<td>S</td>
<td>Severe Weather</td>
</tr>
<tr>
<td>F3</td>
<td>Falling Object - structural</td>
<td>T</td>
<td>Hand Held Powered tools</td>
</tr>
<tr>
<td>G1</td>
<td>Ground Conditions - Underground</td>
<td>U</td>
<td>Hazardous Wildlife</td>
</tr>
<tr>
<td>G2</td>
<td>Ground Stability - Surface</td>
<td>V</td>
<td>Vehicle Travel</td>
</tr>
<tr>
<td>H</td>
<td>Hazardous Materials</td>
<td>W</td>
<td>Water</td>
</tr>
<tr>
<td>I1</td>
<td>Energy Isolation</td>
<td>X</td>
<td>Other</td>
</tr>
<tr>
<td>I2</td>
<td>Stored Energy</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PSI Quality Assurance Process - Overview

- **Site**: Reviews and determines if incidents are PSI in real time, Maintains PSI category in Incident information system, Reports and investigates incidents per Investigation & CAPA procedure

- **Business Unit**: Conducts monthly review to determine: Incorrectly determined or categorized PSI *(false positives)*, Review of non-PSIs *(false negatives)*

- **Corporate**: Conducts periodic review to determine: Incorrectly determined or categorized PSI (false positives), Missed PSI (false negatives), Generates reports / metrics on a monthly basis
Using the information to make a safer workplace
Decreasing RIFR vs Flat PSI Recordable Rate

Recordable Injury Rate vs. Potentially Serious Recordable Injury Rate

RIFR

Recordable PSI

Linear (RIFR)

Linear (Recordable PSI)
Monthly metrics

PSI Rate (Year to Date)

PSIR - Health & Safety

Time

Number of Incidents

Health & Safety PSI Types

A) Abrasive/Water Blasting
B) Electrical Contact
F1) Falling Object - lifting
F2) Falling Object - unsecured
F3) Falling Object - structural
H) Hazardous Materials
I1) Energy Isolation
I2) Stored Energy
M) Mobile Equipment
O) Operating Equipment
P1) Fall Protection
P2) Unprotected Opening
W) Water

Example data output
# Improving Controls from SIF/PSI work

<table>
<thead>
<tr>
<th>Pictogram</th>
<th>Life Critical Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lockout/Tagout &amp; Linebreak</td>
</tr>
<tr>
<td></td>
<td>Confined Space Entry</td>
</tr>
<tr>
<td></td>
<td>Work at Height</td>
</tr>
<tr>
<td></td>
<td>Falling Objects</td>
</tr>
<tr>
<td></td>
<td>Lifting Operations</td>
</tr>
<tr>
<td></td>
<td>Electrical Safety</td>
</tr>
<tr>
<td></td>
<td>Mobile Equipment Safety</td>
</tr>
<tr>
<td></td>
<td>Underground Ground Control</td>
</tr>
<tr>
<td></td>
<td>Machinery Safety</td>
</tr>
<tr>
<td></td>
<td>Working Around Water</td>
</tr>
</tbody>
</table>
Closing

- Importance of SIF concept
- Develop your definitions
- Analyze the data
- Take Action
- Refine
### PSI Metrics

<table>
<thead>
<tr>
<th>Health &amp; Safety</th>
<th>Calculation</th>
<th>Purpose</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious Incidents</td>
<td># Actual SI x 200,000 # work hours</td>
<td>Reactive – Reporting</td>
<td>NA</td>
</tr>
<tr>
<td>Serious &amp; Potentially Serious Incidents (Recordables w/ PSI potential)</td>
<td># RI (as PSI) x 200,000 # work hours</td>
<td>Proactive – Trending</td>
<td>NA</td>
</tr>
<tr>
<td>All safety incidents w/ PSI potential (inc. near miss &amp; FAs)</td>
<td># Incidents PSI x 200,000 # work hours</td>
<td>Proactive – Trending</td>
<td>NA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental</th>
<th>Calculation</th>
<th>Purpose</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Serious Incidents</td>
<td># Actual PSI x 200,000 # work hours</td>
<td>Reactive – Reporting</td>
<td>NA</td>
</tr>
<tr>
<td>Reportable w/ PSI potential</td>
<td># RI (as PSI) x 200,000 # work hours</td>
<td>Proactive – Trending</td>
<td>NA</td>
</tr>
<tr>
<td>All incidents w/ Env PSI potential</td>
<td># Incidents PSI x 200,000 # work hours</td>
<td>Proactive – Trending</td>
<td>NA</td>
</tr>
</tbody>
</table>
## PSI Health & Safety Categories – DETAIL

<table>
<thead>
<tr>
<th>Letter</th>
<th>Category &amp; Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td><strong>Abrasive Blasting</strong> - Inadequate safe-guards</td>
</tr>
<tr>
<td>B</td>
<td><strong>Blasting</strong> - Use and Handling of Explosives</td>
</tr>
<tr>
<td>C</td>
<td><strong>Confined Space</strong> - Inadequate safe-guards</td>
</tr>
<tr>
<td>E1</td>
<td><strong>Electrical contact</strong> - Person, tool, or equipment accidental contact with live electrical 110 V or greater (arc flask, cable strike, etc...)</td>
</tr>
<tr>
<td>E2</td>
<td><strong>Overhead Power Line</strong> - Crane/ equipment contact or operating near</td>
</tr>
<tr>
<td>F1</td>
<td><strong>Falling Object</strong> - lifting - Mechanical failure; Lifting, Rigging, Suspended loads falling over 5 feet</td>
</tr>
<tr>
<td>F2</td>
<td><strong>Falling Object</strong> - unsecured - Unsecured loads over 5 feet; dropped or falling object</td>
</tr>
<tr>
<td>F3</td>
<td><strong>Falling Object</strong> - structural - Structural failure or corroded structural steel falling over 5 feet</td>
</tr>
<tr>
<td>G1</td>
<td><strong>Ground Conditions</strong> - Underground - Underground mining ground fall (unexpected)</td>
</tr>
<tr>
<td>G2</td>
<td><strong>Ground Stability</strong> - Surface - Surface ground conditions / Unstable ground / Excavations (sloughs, cracks, washouts; includes mobile equipment on unstable ground)</td>
</tr>
<tr>
<td>H</td>
<td><strong>Hazardous Materials</strong> - Human Exposure to materials that are hazardous by temperatures, pressures, volume and/or concentrations. [Thermal, pressure, and/or chemical energy]</td>
</tr>
<tr>
<td>I1</td>
<td><strong>Energy Isolation</strong> - Improper control of hazardous energy (which should have be isolated) (i.e. Lockout/Tagout; Line Break)</td>
</tr>
<tr>
<td>I2</td>
<td><strong>Stored Energy</strong> - Human Exposure to stationary equipment (i.e. pipe flex, spring release)</td>
</tr>
<tr>
<td>Letter</td>
<td>Category &amp; Explanation</td>
</tr>
<tr>
<td>--------</td>
<td>------------------------</td>
</tr>
</tbody>
</table>
| M      | **Mobile Equipment** - Mobile equipment: Human interaction with mobile equipment or operation in hazardous condition/environment (includes trains, dump trucks, mobile cranes, high reaches...)
| O      | **Operating Equipment** - Human interaction with operational process equipment and rotating assets (pinch points, nip points) [Mechanical Energy]
| P1     | **Fall Protection** - Elevated work over 4 feet with inadequate fall protection
| P2     | **Unprotected Openings** - Unguarded or unprotected opening or edge; greater than 4 feet fall distance
| Q      | **Hot work** - Inadequate safe-guards
| R      | **Fire** - Underground fire or significant fire hazard
| S      | **Severe Weather** - Human exposure to severe weather event
| T      | **Hand Held Powered tools** - Human interaction with hand held power tool
| U      | **Hazardous Wildlife** - Hazardous Wildlife & Plants: snakes, spiders, reptiles, moose, etc.
| V      | **Vehicle Travel** - Vehicle travel: within a site, between sites, or any use on company business (autos, pick up trucks, gators, golf carts, 4x4s, etc...) incidents associated with driving
| W      | **Water** - Working around water: People or equipment > 5’ water with inadequate safeguards
| X      | **Other** - Not otherwise Classified