Keep Your Guard Up – How Safe Are Your Machines?

Sundyne’s Journey on Machine Guarding
Headquarters – Arvada, Colorado

Founded in 1970 as Sundstrand Fluid Handling

1998 Sundyne formed
Employees: 350
Factory: 129,000 Sq. Ft.
Office: 62,000 Sq. Ft.
Total Plant: 191,000 Sq. Ft

Commitment, pride and ownership.

As Sundyne employees we are committed to setting the ACE Gold standard as we strive for an enhanced competitive advantage. We take pride in our American made products. We act like business owners in our everyday challenges because we want our customers to continue to come back to Sundyne. We take pride in being good role models for new employees and passing along our knowledge and expertise. When we pool our global strengths, we are stronger, and we are proud.
Sundyne Family of Products

Highly Reliable Engineered Products
- American Petroleum Institute (API)
- International Standards Association (ISO)
- American National Standards Institute (ANSI)
- NEW PRODUCT LINE: PPI

Centrifugal Integrally Geared Pumps
ISO 13709 API 610

Single and Multi-Stage Centrifugal Pumps
ISO 13709 API 610

Sealless Magnetic Drive Pumps
ANSI API 685

Centrifugal Integrally Geared Compressors
API 617-614

Centrifugal Integrally Geared Pumps

Centrifugal Integrally Geared Pumps
ISO 13709 API 610
Pump Products

Applications Include:

- Feed, Overhead, Reflux, for Refining Process
- Desulfurization
- Loading Feedstock
- Chemical Production
- Feedstock for Polypropylene Manufacturing
- Washwater, Condensate, Waxy Oil for Refining
- Feedstock for Fertilizer Production

Centrifugal Integrally Geared, Multi & Single Stage Pumps

- API 610
- ISO 13709
- Zirconium
- PPI
Compressor Products

Applications Include:

- Hydrogen Feed for Refining
- Waste Gas Recycle
- Regeneration
- Natural Gas Production
- Hydrogen Recycle
- Lift Gas
- Polysilicon Production
Magnetic Drive Pumps

Centrifugal Seal-less Non-metallic & Metallic Magnetic Drive Pumps

- Caustic Chemical Production
- Sour Water
- Hydrofluoric Acid
- Benzene
- Unrefined Gasoline
- Sulfuric Acid in Refining Process
- Municipal Water Delivery
IMPORTANCE OF MACHINE SAFEGUARDING

Most of us have heard the old adage about how machinery doesn’t discriminate between product and people – it will do the same to both. Many people discover this through unfortunate means: an injured machine operator.
The Path to Change – Redundant Machine Guarding

- Continuous Improvement
- Implementation of Redundant Machine Guarding
- Develop Recommended Actions Based on Risk
- Training
- Communication
- Change Management & New Machine Guarding Assessments
- Review Machines Requiring Guards
- Machine Guarding Survey on all “Manual” machines without interlocks
- Categorize Risk of Exposure

Continuous Improvement
Steve Fuller
BACKGROUND ON SUNDYNE MACHINE GUARDING

- Sundyne was tasked with addressing and producing a policy specifically addressing redundancy in machine guarding.
Implementation of Redundant Machine Guarding

EMPLOYEE PARTICIPATION

Job Hazard Analysis

Machine Guarding Assessment

Recommended Actions

Installation

TRUST & USE OF GUARD
MACHINES REQUIRING GUARDS

High Hazard Machines
- Presses

Automatic (CNC) Machines
- Machining Center
- Milling Machine
- Lathe
- Grinder
- Broach
- Hobbs

Manual Machines
- Lathes
- Mills
- Drills
- Grinding
- Boring
- Hones
- Lapping
EH&S to conduct a survey of all “Manual” machines to determine the quantity of these machines at Sundyne without interlocked guards.

Remove potential for employees to be at the point of operation.

The point of operation is where work is performed on the material, such as cutting, shaping, boring, or forming of stock.

Provide improved and interlocked guards on powered machines that are classified as “manual machines.”

This is not a replacement to lock out tag out for maintenance!
Manual Machines are those that are not Computer/Numeric Control machines that only move with the direct control of the operator.

Examples include: jig bore, jig grinder, surface grinders, milling machines, drill presses, pedestal grinders, lathes, hobbers, hones, tool grinders, band saws, cut-off saws, table saws, radial arm saws, sanders, etc.
“Manually operated, powered machines”

Only move with the direct control of the operator
Not Computer/Numeric Control (CNC) machines

Interlocking certain classes of manual machines based on hazard as well as use at the Point of Operation (preventing both advertent and inadvertent contact)

Contact with objects and equipment (caught in, on, or under equipment or machinery only)
• More than 700 fatalities per year
• More than 200,000 lost workday injuries per year
Total Machines
103

<table>
<thead>
<tr>
<th></th>
<th>Not Interlocked</th>
<th>Interlocked</th>
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</thead>
<tbody>
<tr>
<td>Non Production</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td>54</td>
<td>47</td>
</tr>
</tbody>
</table>

Category 1
Potential for Serious Irreversible Injury

- Production: 16 Machines
- Non Production: 2 Machines

Category 2
Potential for Recordable/Lost Time Injury

- Production: 38 Machines
- Non Production: 0 Machines
Goal was to eliminate movable guards, such as doors, panels, gates or other physical barriers that can be opened without using tools.
# RECOMMENDED ACTION

## Category 1: Potential for Serious Irreversible Injury
- **Production**
  - 16 Machines
    - 2012: 3 ($15K)
    - 2013: 1 ($5K)
- **Non Production**
  - 2 Machines
    - 2013: 1 ($5K)

## Category 2: Potential for Recordable/Lost Time Injury
- **Production**
  - 38 Machines
    - 2014: 10 ($50K)
    - 2015: 3 ($15K)
- **Non Production**
  - 0 Machines
    - 2014: 21 ($105K)
    - 2015: 3 ($15K)

### Actual Costs
- **2012 & 2013**
  - Actual cost = ~$200,000
- **2014 & 2015**
  - Actual cost = ~$250,000
Harold Sanchez
SAFEGUARDING REQUIREMENTS

ANSI B11
B11.1 Mechanical Power Presses
B11.5 Lathes
B11.8 Drilling, Milling, and Boring Machines
B11.9 Grinding Machines
B11.10 Metal Sawing Machines
B11.15 Pipe, Tube, and Shape Bending Machines
R15.06 Robotic Safeguarding

29CFR1910 Subpart O
.212 – Machinery and Machine Guarding
.215 – Abrasive Wheel Machinery
.217 Mechanical Power Presses
.219 Mechanical Power-Transmission Apparatus

NFPA 79
Electrical Standard for Industrial Machinery

Sundyne SP
4.1 Machine Guarding Assessment
4.2 Safeguards and Controls
4.3 Machine Guard Bypass or Modification Approvals

SUN SP-008
Dan Bisbee
TYPES OF SAFEGUARDS CHANGED

- Guards
  - Fixed
  - Interlocked

- Devices
  - Photoelectrical

- Feeding Methods
  - Robotic

- Miscellaneous Aids

- Point of Operation

- Distance/Location

Operator

EMPLOYEE PARTICIPATION

Categorize Risk

Recommended Actions

Machine Guarding Survey

Review Machines Requiring Guards

Implementation of Redundant Machine guarding
GUARDS – ADJUSTABLE TO INTERLOCKED

BEFORE

AFTER
DEVICES – ADJUSTABLE TO PHOTOELECTRICAL

BEFORE

AFTER
DISTANCE/LOCATION
FEEDING METHODS – MANUAL TO AUTOMATION

BEFORE

AFTER
MISC. AIDS – HOLDING FIXTURES

BEFORE

AFTER

Confidential and Proprietary
Laura Ward
TRAINING AND COMMUNICATION

Training
- Photo Book
- On the Job Training

Communication
- PPE Requirement
- Safeguarding Photos

- Implementation of Redundant Machine Guarding
- Review Machines Requiring Guards
- Machine Guarding Survey
- Recommended Actions
- Training
- Categorize Risk

EMPLOYEE PARTICIPATION

Accudyne Industries
Click here to begin.
Engine Lathe

Known Hazards

- Rotating Machine Parts
- Flying Chips

Point of Operation
OSHA 1910.212
ANSI B11.6
SUN SP-008

Click to see full-text versions of the standards. Use your browser’s BACK BUTTON to return to this screen.

NFPA 79
Machine driveshafts don’t require specific guarding, but the individual machine hazard analysis must address the danger of rotating shafts, wheels and parts.
• Install Sliding Gate Travel Guard At Point of Operation

Click to see example.
Engine Lathe

• Sliding Gate Travel Guard Installed At Point of Operation
• Install Emergency Stop Switch

Safeguarding Solutions
SUN SP-008
• Use Magnetic Motor Starter Protection

Return to Main Menu.
Pedestal Grinders

Grinder Menu

Click here to begin.

Known Hazards

Standards & Regulations

SUN SP-008 Safeguarding Solutions

Main Menu
Pedestal Grinders

Known Hazards

- Rotating Machine Wheels
- Flying Particles

Points of Operation
Pedestal Grinders

Standards & Regulations

OSHA 1910.215
ANSI B11.9
SUN SP-008

Click to see full-text versions of the standards. Use your browser's BACK BUTTON to return to this screen.

NFPA 79
ANSI B11.9
SUN SP-008
OSHA 1910.215

Machine Menu
Next Page
Pedestal Grinders

When possible, use fixtures to hold parts/tools while grinding.

- Ensure Eye Protection Shields Are In Place
• Ensure Tongue Guards and Tool Rests are installed and properly adjusted.
• Install Start and Emergency Stop Switches
Pedestal Grinders

- Use Magnetic Motor Starter Protection

SUN SP-008 Safeguarding Solutions

Return to Machine Menu.
Machine Guarding Communication

Clausing Gang Drills
Serial No. N.A.
Model No. N.A.

Two Guarding Devices

1 – Guard Door Interlocks
2 – Emergency Stops
MACHINE GUARDING COMMUNICATION

Clausing Manual Lathe 17” (FFM 2550)
Serial No. N.A.
Model No. N.A.

Three Guarding Devices

1 – Chip Guard Door
2 – Chuck Guard
3 – Emergency Stop
EQUIPMENT REPLACEMENT – ID GRINDER

BEFORE

AFTER
EQUIPMENT REPLACEMENT - Bullard

BEFORE

AFTER
## JHA Identifies Need for Machine Guard Assessment

<table>
<thead>
<tr>
<th>Machine Operations</th>
<th>Hand Amputation or Injury</th>
<th>Hand/Arm</th>
<th>4- Daily But Not Continuous</th>
<th>4-Medium High</th>
<th>Action Items Identified on MGA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Conveyor Belt</td>
<td></td>
<td></td>
<td></td>
<td>• Install e-stop on the chip conveyer</td>
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<td></td>
<td>- Tool Changing Cabinet</td>
<td></td>
<td></td>
<td></td>
<td>• Equip tool changer door with an interlock, or</td>
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<tr>
<td></td>
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<td></td>
<td>• Equip tool changer with a longer light curtain</td>
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<td></td>
<td></td>
<td>• Evaluate set-up mode to ensure operator is protected from point-of-operation</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>• Ergonomic Evaluation</td>
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</tbody>
</table>

### Machine Guarding Assessment

- Implement Redundant Machine Guarding
- Review Machines Requiring Guards
- Machine Guarding Survey
- Recommended Actions
- Training
- Communication
- Review Machines Requiring Guards

- Conduct Machine Guard Assessment

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NEW EQUIPMENT JHA/DPR

54
Kristy Belair
CARDINAL RULES

Confined Space

Fall Protection

Hazardous Energy

Electrical Safety

Machine Guarding
MACHINE GUARD BYPASS OR MODIFICATION APPROVALS

- Machine Guarding Exception Approval
- Machine Guard Modification Approval
- Interlock By-Pass Approval
Questions For Sundyne Team

Contact Us With Any Questions

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