

#### Raytheon

# VPPPA National Conference Machine Shop Safety



#### **Integrated Defense Systems**

Jim Caulfield

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  - Purchasing equipment/machinery process
  - New equipment installation approval
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#### Introduction



Jim Caulfield is an SGE and Facilities EHS Manager for the Raytheon IDS EHS organization with over 25 years of experience. Jim joined Raytheon in 1990 with a B.S. in Occupation Safety Studies from Keene State College NH. He is currently streamlining IDS's behavior safety program. In his current role, Jim also is responsible for standardizing the facilities EHS program in New England.

- Raytheon Company is a technology and innovation leader specializing in defense, security and civil markets throughout the world for over 92 years.
- 2015 net sales: \$23.2 billion
- 62,000 employees worldwide across 80 nations
- Headquarters:
   Waltham, Massachusetts









#### **Business Headquarters**



A global leader in technology and innovation

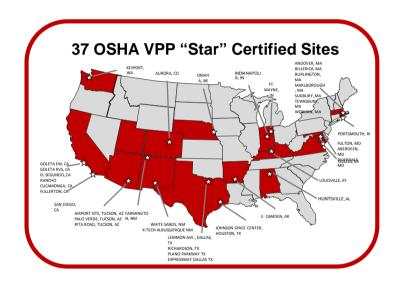


## SERVING CUSTOMERS WORLDWIDE WITH AIR AND MISSILE DEFENSE, RADARS, C41 AND NAVAL SYSTEMS



- Integrated air and missile defense
- Battlefield, land- and sea-based radars
- Command, control, communications, computers and intelligence (C4I) for defense
- Sonar, navigation, integrated bridge and shipboard combat systems
- Systems integration and sustainment

### Raytheon VPP Star Sites



- 37 VPP Star Sites
- 4 New sites in 2016
  - IIS Riverdale MD
  - RMS Albuquerque NM
  - SAS Plano TX
  - SAS Dallas TX
- 1 Additional Planned 2016
  - SAS McKinney TX
- 38,591 Employees at US Star Sites



## **Machine Guarding Safety Project**

#### **Business Case:**

Need to identify residual risks on new and older machines and eliminate them before they lead to an injury.

#### **Problem Statement:**

 Existing equipment that is lacking guarding needs to be identified and corrected before it causes harm to employees.

#### Goal:

 New equipment purchased needs to have adequate guarding that meets the current OSHA and ANSI standards as well as Raytheon EHS standards

## **Project Stakeholders**

- Team EHS, Machinists and Maintenance Employees
- Key Stakeholders All employees
- Resources Required: Audit Team, Checklist and tracking system
- Barriers to Completion:
  - Need by in from stakeholders and top management support
  - Need process that is computer based and easy to implement

<u>Project Scope</u> - Audit team trained to identify and provide viable solutions to new and existing equipment safety risks, in accordance with current regulatory standards.

#### Milestones:

- Have outside consultant review our current state of machine guarding
- Create process/checklist based on Raytheon acceptable risk
- Obtain approval by EHS Director
- Present at VPP Meeting
- Obtain approval by stakeholders
- Train participants
- Implement schedule
- Track results

### **New Equipment Checklist**

- Operations, engineers, etc. are trained in the use of the checklist
- Checklist must be filled out before capital equipment is approved
- Where needed local EHS helps out filling out the form
- Allows for input from EHS, hourly workforce, maintenance personnel etc.
- Red tag system is used before equipment can be placed into production

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Does new equipment have hazards (e.g. in running nip/pinch points, rotating shafts, crushing hazards, amputation hazards, exposed electrical conductors, etc.) that require guarding?	X	Ensure guards/barriers, hazard signs and procedures are in place to eliminate exposure to recognized hazards; Removal or addition of any of the safeguards require site EHS approval.
Does new equipment have hazards that require emergency stop buttons?	x	Emergency stop buttons are required when machines or equipment may need to be stopped rapidly and securely due to failure of existing safety devices, or when normal shutdown of machine or equipment is not sufficient to prevent injury or product damage.  Ensure emergency stops are NFPA 79 compliant in design and operation.

### **Red Tag Installation Approval**

- Industrial Engineers/Project Coordinators are responsible for the process
- Red Tag is placed on equipment once new and/or moved equipment is in place
- Experts in their field are required to initial and date tag
- EHS are the last signatures on the form.
- LOTO procedures and JHA's (if applicable) must be in place before equipment is approved for use





- One or more methods of machine guarding shall be provided to protect employees from hazards such as those created by (29 CFR 1910 Subpart O - Machinery and Machine Guarding):
  - Point of operation
  - Nip points
  - Rotating parts
  - Flying chips
  - Sparks
- Examples of guarding methods
  - Physical barrier guards including distance
  - Light curtains
  - Two-hand tripping devices
  - Interlocks
  - Trip mats



- Guards must be attached to the machine where possible guards can be secured elsewhere if attachment isn't possible.
- Machines which usually require point of operation guarding
  - Shears, power presses, milling machines, power saws, portable power tools
- Fan blades less than seven (7) feet above the floor or working level must be guarded.
- Machines designed for a fixed location must be securely anchored to prevent walking or moving.

- Guards
  - Fixed, interlocked, adjustable, self adjusting
- Devices
  - Presence sensing
    - Photoelectrical, radio-frequency, electromechanical
  - Pullback
  - Restraint
  - Safety controls
    - Pressure sensitive body bar, tripwire
    - Two hand controls, two hand trip
  - Gates

## **Methods of Safeguarding (Cont.)**

- Feeding mechanisms
  - Automatic feed
  - Automatic ejection
  - Robot
- Miscellaneous aids
  - Awareness barriers
  - Protective shields
  - Hand-feeding tools and holding fixtures
- Location/distance



- Rotating shelves are pinch points
- Railing, walls, light curtains and trip mats can control access
- Post a sign warning of risk

- Distance between carousel and rails must be at least 12 inches
- Walls must be at least 28 inches from the carousel



#### **Additional Guards**



**Light Curtain** 



Pressure Sensing Mat





- Rotating storage shelves present a pinch point hazard
- Light curtains are used as interlocks to shut off power to protect the employee
- Remember that interlocks must be tested quarterly

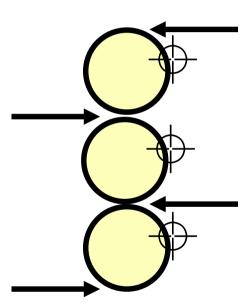




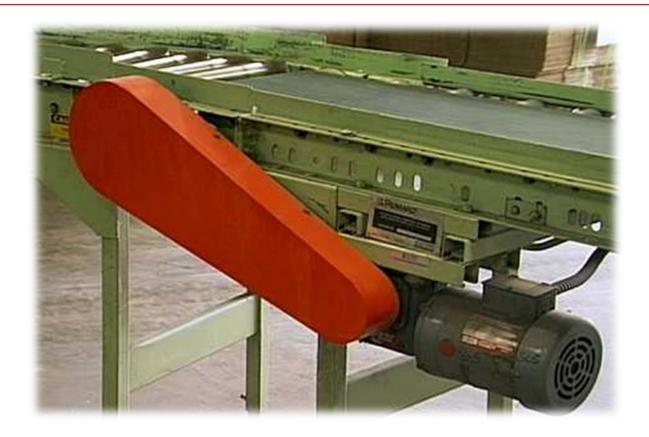
- Top portion of the machine moves
- Mounting a guard to the machine was not possible
- Limited access to the machine

Other Moving Parts: Any part of the machine which moves while the machine is working.

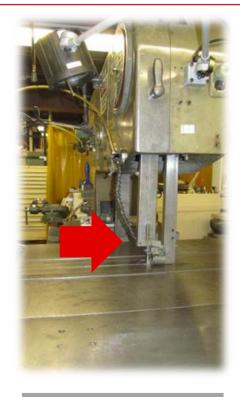
- ✓ Rotating parts
- ✓ Feed mechanisms
- ✓ Reciprocating parts
- ✓ Transverse moving parts
- ✓ Auxiliary parts of the machine



## **Guarding Pinch Points Drive Belt**



#### **Old Band Saw**



Blade guard part of the machine



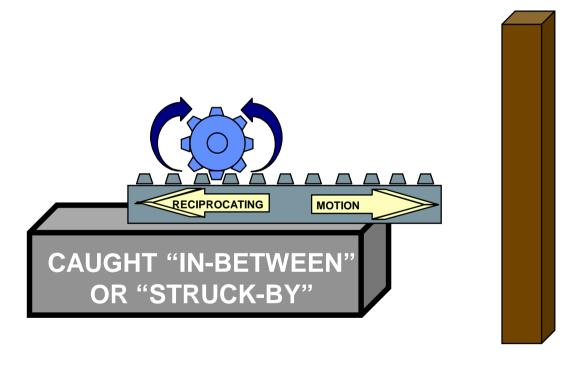
In-house manufactured blade guard under the cutting table

### **Grinder Guard Adjustment Tags**





Reciprocating Motions



### **Bridgeport Mill**



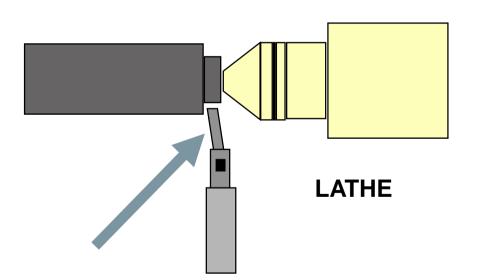


- Adjustable guards work just fine
- Make sure the guard is usable to the machinist
- If operators don't like the guard, they will not use it
- Many guards are only useful for flat materials
- Watch for flying metal or debris in electrical outlets
- Moving table so be cautious of being too close to fixed objects

Machinists should never wear rings, watches, gloves, long sleeves, necklaces or lanyards, long earrings or have long hair that is not pulled back – these are all concerns around rotating equipment

The Point of Operation: Where work is performed on the material, such as:

- ✓ Cutting
- √ Shaping
- ✓ Boring
- √ Forming of stock





- Off the shelf guards available for many lathes including old equipment
- Mount directly on the machine
- Need to be adjusted over the point of operation

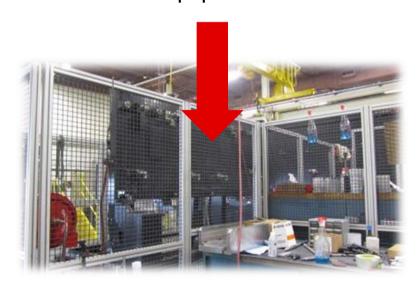
### **Large CNC Machines**





- Equipment does not come with guards
- Include interlocked guarding as part of the capital package – get as many bells and whistles as you need to make it safe
- Think of pinch points but also fall hazards
- Keep in mind of access points for maintenance or oiling

## Large rotating pieces of equipment



#### **Custom Made is A-OK**

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Make sure operators and maintenance are involved with the design

## **Large Vertical**

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Without guarding

With guarding

Large/old equipment purchased prior to guarding requirements-guarding made in house

#### **Full Enclosure Guard With Interlock**



#### **Mechanical Power Press**





## **Shrink Wrap Machine**

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Rotating equipment with pinch points

## **Tooling Guards**

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Cover sharp tooling when not in use



## **Coolant Management**

#### It all started with an odor complaint...

- A site switched coolants in early 2015 due to foaming concerns with existing coolant
- In fall of 2015, started noticing "Monday Morning Odor"
  - Equipment idle over the weekend
- Significant odor issues after returning from Holiday shutdown
- OSHA received employee complaint issued letter
- Consultant contacted to perform assessment for microorganisms
  - Help identify equipment contributing to complaint

- Biocide cycling
- Pre and Post remediation sampling
- Dip slides & coolant monitoring
- 3rd party coolant management review
- Updated procedures
- Benchmarking internal and external

#### **Corrective Actions**

- Develop a comprehensive coolant management system
- Check pH regularly
- Remove tramp oils
- Do not let coolant stay stagnant for too long
- Maintain correct coolant concentration

- Never operate equipment without guards Be prepared to have hard discussions with employees
- Guards don't have to be fancy or expensive they have to work
- Always bring the operators/machinists into the guard planning
- Incorporate guard cost into capital packages
- Use consultants to perform a guarding assessments
- Look at the need for guards based on the risk, not if you can quote a specific law requiring the guard
- Have a system in place for new equipment to ensure proper machine guarding is in place
- Ensure you are properly maintaining machine shop coolants



### **Questions?**