Hazard Assessment:
New Tools for Busy Brewers

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Member BA Safety Subcommittee

Power Hour
January 17, 2019
How can we make time for safety?

By understanding the importance of what it gives us.
Safety is the absence of harm –

“harmful” moments are called hazards

Controlling / eliminating / reducing hazards is how we get to a safe place

The place without harm is called love
How do we control or eliminate hazards?

First, we name the hazards
We ask “what could go wrong?”

We answer by thinking objectively about all the bad possibilities, however (un)likely.
Once we’ve identified the potential hazards...

We propose ways to control, reduce, or eliminate.
Understanding job hazards lets you...

- Reduce/eliminate safety hazards
- Avoid accident and injury
- Maintain healthy wellbeing
- Improve processes and quality
- Achieve the required core compliance underlying OSHA’s health and safety requirements
Hazard Assessment

KEY TERMS AND THE H.A. PROCESS
Hazard Assessment Process

1. Outline steps in a task
2. Identify hazards
3. Specify hazard controls
4. Revise procedure to include controls

Prevention

Avoiding or eliminating hazards by
❖ changing how you behave
❖ process controls

Protection

Reducing hazards with
❖ personal protective equipment (PPE)
❖ some engineering controls
❖ administrative controls
Hazard Assessment in 4 Logical Steps

1. Make a list of Steps involved in Task
2. Identify potential Hazards for each Step
3. Specify Hazard Controls
4. Write/Revise a Procedure (SOP) with both Task Instruction and Hazard Controls
1.0 – Outline the Steps of the Task

1.1 – Drill Down to Instructional Level
(opt., but you have do it later for your SOP)

2.0 – Identify Hazards for each Step

2.1 – Assign Rankings for each Hazard
(opt., details in new Hazard Assessment BMP)
3.0 – Specify Hazard Controls for Each Potential Hazard

- Engineering controls
- Administrative controls
- Personal protective equipment
- Safe work practices
- Substitution or elimination
3.1 – Engineering Controls

Specialized, sometimes expensive

- Control Kinetic & Potential Energy
- Control & Move Gases, Liquids, and Solids
- Monitoring of Hazards
Controlling Energy

- Electrical
- Mechanical
- Hydraulic/Pneumatic
- Thermal
- Chemical
- Gravity
Controlling Pressure

❖ Fermentation
❖ Cleaning
❖ Packaging
❖ Cylinder security
Monitoring Hazards and Calibrating Engineering Controls

- CO₂ / O₂
- Dust
- Noise
- Heat stress, temp. and humidity
- PRVs/VRVs, regulators, gauges
- Wastewater parameters
3.2 – Administrative Controls

Written, audible, visual information

- Written compliance programs
- Company policies
- Injury Recordkeeping
- Training
- Standard Operating Procedures (SOPs)
- Signage, labels, warnings, SDSs
- Alarms
3.3 – PPE

Colorful, inexpensive, imperfect

- PPE includes “work clothes” and specialty protective gear
- Useful in reducing exposure to poorly controlled hazards
- When PPE fails it usually results in direct exposure to the hazard
- Assure correct selection, use, cleaning, inspection, replacement with periodic training
Eye Protection

- Standard safety glasses
- Indirectly-vented goggles
- Face shields
- Machine Guarding (Eng. Ctrl.)
Foot Protection

- Sturdy leather or synthetic work shoes/boots with toe protection and slip-resistance
- Knee-high rubber (PVC) with toe and shank protection and slip-resistance
- Low-rise rubber (PVC) with toe and shank protection and slip-resistance or rubber pullover over sturdy work boot
Other Protection

- Hearing protection, disposable or reusable
- Splash protection apron
- Fall protection harness, lanyard, and anchoring
Respiratory Protection

- Particulate protection: grain dust, filter aids
- Specialized: solvents, coatings, welding
3.4 – Safe Work Practices

The Zen of Safety

❖ Common sense
❖ No special equipment required
❖ Often the most preventative
❖ Importantly…

Safe Work Practices are realized by the individual in the moment

The resistance to the unpleasant situation is the root of suffering.

Ram Dass
3.5 – Substitution or Elimination

Alternate Processes

❖ Substituting less toxic / less reactive chemicals

❖ Avoiding hazards through technology, engineering, e.g.
  ❖ CIP ≠ Confined Space entry
  ❖ Wet milling ≠ Dust hazard
  ❖ Automation / Robotics ≠ RM injury

❖ Replacing portable equipment with fixed purpose equipment, e.g.
  ❖ Catwalks for ladders
4.0 – Create or Revise an SOP

1. SOP is task-based and specific

2. Includes step-by-step task instruction

3. Specifies hazard control procedures and equipment

4. Vital written tool for safety, quality, and training... and regulatory compliance
Hazard Assessment

Example 1 – Caustic Cleaning of a FV or BBT
Caustic Cleaning of a Beer Tank

1. Set up CIP Machine
2. Dispense Caustic
3. Run Caustic in Tank
Basic Outline of Steps in the Task

1. Connect CIP to FV
2. Fill CIP Tanks
3. Load Caustic
4. Circulate Caustic
5. Drain Caustic
6. Load Rinse
7. Circulate Rinse
8. Drain Rinse & Air Dry
1.0 - Outline the Steps

Basic Outline of Steps in the Task

1. Connect CIP to FV
2. Fill CIP Tanks
3. Load Caustic
4. Circulate Caustic
5. Drain Caustic
6. Load Rinse
7. Circulate Rinse
8. Drain Rinse & Air Dry

(opt.) Drill Down to Instruction Level

a. Add cool water to left tank up to overfill tube
b. Add hot water to right tank up to 1” below overfill tube
c. Dispense 4,000 ml caustic into plastic beaker
d. Add caustic to right (hot) tank
e. Rinse beaker and put back on caustic drum
<table>
<thead>
<tr>
<th>NO.</th>
<th>STEP</th>
<th>HAZARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CIP to FV</td>
<td>Slips &amp; Trips, Electrical</td>
</tr>
<tr>
<td>2</td>
<td>Fill CIP Tanks</td>
<td>Slips &amp; Trips, Temperature, Concentrated Caustic</td>
</tr>
<tr>
<td>3</td>
<td>Load Caustic</td>
<td>Slips &amp; Trips, Temperature, Dilute Caustic</td>
</tr>
<tr>
<td>4</td>
<td>Circulate Caustic</td>
<td>Slips &amp; Trips, Temperature, Dilute Caustic</td>
</tr>
<tr>
<td>5</td>
<td>Drain Caustic</td>
<td>Slips &amp; Trips, Temperature, Dilute Caustic</td>
</tr>
<tr>
<td>6</td>
<td>Load Rinse</td>
<td>Slips &amp; Trips</td>
</tr>
<tr>
<td>7</td>
<td>Circulate Rinse</td>
<td>Slips &amp; Trips</td>
</tr>
<tr>
<td>8</td>
<td>Drain Rinse</td>
<td>Slips &amp; Trips</td>
</tr>
</tbody>
</table>
2.0 - Identify Hazards

<table>
<thead>
<tr>
<th>NO.</th>
<th>STEP</th>
<th>HAZARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CIP to FV</td>
<td>Slips &amp; Trips, Electrical</td>
</tr>
<tr>
<td>2</td>
<td>Fill CIP Tanks</td>
<td>Slips &amp; Trips, Temperature, Concentrated Caustic</td>
</tr>
<tr>
<td>3</td>
<td>Load Caustic</td>
<td>Slips &amp; Trips, Temperature, Dilute Caustic</td>
</tr>
<tr>
<td>4</td>
<td>Circulate Caustic</td>
<td>Slips &amp; Trips, Temperature, Dilute Caustic</td>
</tr>
</tbody>
</table>
### 3.0 – Specify Hazard Controls

**Identified Hazards for Step 2, Filling the CIP Tanks**

<table>
<thead>
<tr>
<th>NO.</th>
<th>STEP</th>
<th>HAZARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Fill CIP Tanks</td>
<td>Slips &amp; Trips, Temperature, Conc. Caustic</td>
</tr>
</tbody>
</table>

**Slips and Trips Hazard Controls**

<table>
<thead>
<tr>
<th>PREVENTION (SWP &amp; AC)</th>
<th>PROTECTION (EC &amp; PPE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoid walking in puddles</td>
<td>Textured surfaces</td>
</tr>
<tr>
<td>Keep eyes on the floor</td>
<td>Slotted drain covers (not open)</td>
</tr>
<tr>
<td>Walk like a duck (lower ctr. of grav.)</td>
<td>Waterproof, slip resistant boots</td>
</tr>
<tr>
<td>Organize or stow hoses and cords</td>
<td></td>
</tr>
</tbody>
</table>
## Hot Temperature Hazard Controls

<table>
<thead>
<tr>
<th>PREVENTION (SWP &amp; AC)</th>
<th>PROTECTION (EC &amp; PPE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stand back when filling, recirculating</td>
<td>Thermostatic temp. control</td>
</tr>
<tr>
<td>Disconnect tri-clamps carefully with valves closed</td>
<td>Long pants, long sleeved shirt</td>
</tr>
<tr>
<td></td>
<td>Rubber boots, rubber gloves, safety glasses</td>
</tr>
</tbody>
</table>

## Concentrated Caustic Hazard Controls

<table>
<thead>
<tr>
<th>PREVENTION (SWP &amp; AC)</th>
<th>PROTECTION (EC &amp; PPE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read, understand SDS; Observe labels &amp; placards</td>
<td>Appropriate pumps, non-reactive</td>
</tr>
<tr>
<td>Trained in chemical handling</td>
<td>Long pants, long sleeved shirt</td>
</tr>
<tr>
<td>Good housekeeping</td>
<td>Rubber boots, gloves, apron</td>
</tr>
<tr>
<td>Rinse affected surfaces</td>
<td>Goggles &amp; splash shield</td>
</tr>
<tr>
<td>Dispense where/when others will not be affected</td>
<td></td>
</tr>
</tbody>
</table>
## Dilute Caustic Hazard Controls

<table>
<thead>
<tr>
<th>PREVENTION (SWP &amp; AC)</th>
<th>PROTECTION (EC &amp; PPE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read, understand SDS</td>
<td>Appropriate pumps, non-reactive</td>
</tr>
<tr>
<td>Label working solutions if transferring to next shift</td>
<td>Long pants, long sleeved shirt</td>
</tr>
<tr>
<td>Trained in chemical handling</td>
<td>Rubber boots, gloves, apron</td>
</tr>
<tr>
<td>Good housekeeping; safety signage</td>
<td>Goggles or safety glasses with side shields</td>
</tr>
<tr>
<td>Dispense where/when others will not be affected</td>
<td></td>
</tr>
</tbody>
</table>

## Electrical Hazard Controls

<table>
<thead>
<tr>
<th>PREVENTION (SWP &amp; AC)</th>
<th>PROTECTION (EC &amp; PPE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch off equipment before plugging in</td>
<td>Grounded circuits</td>
</tr>
<tr>
<td></td>
<td>Waterproof housings, fixtures</td>
</tr>
<tr>
<td></td>
<td>Equipment in good repair</td>
</tr>
</tbody>
</table>
4.0 – Write/Revise Your SOP

Original Outline of Steps, plus Procedural Instructions and Hazard Controls

1. Connect CIP to FV
2. Fill CIP Tanks
3. Load Caustic
4. Circulate Caustic
5. Drain Caustic
6. Load Rinse
7. Circulate Rinse
8. Drain Rinse & Air Dry

... in the SOP, include Hazard Controls...

c. Don safety glasses, face shield, apron, heavy nitrile gloves.
d. Dispense 4,000 ml caustic into plastic beaker. Use care to avoid spilling caustic.
e. Carefully add caustic to right (hot) tank.
f. Rinse beaker...
Kick Your SOPs Up a Notch with HA

4.1 – Refine your process with Hazard Assessment findings

4.2 – Numerical Prioritization

❖ Based on Failure Mode Effects Analysis (FMEA)
❖ Rank potential hazards by likelihood, severity, and detectability
❖ Prioritize safety improvement efforts
❖ Identify and re-work high hazard tasks
Hazard Assessment

Example 2
Dry Hopping from a Ladder
<table>
<thead>
<tr>
<th>NO.</th>
<th>STEP</th>
<th>HAZARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>De-gas FV</td>
<td>Pressure, CO\textsubscript{2} exposure</td>
</tr>
<tr>
<td>2</td>
<td>Get hops</td>
<td>STFs, ergonomic, sharps</td>
</tr>
<tr>
<td>3</td>
<td>Set ladder, climb</td>
<td>STFs, elevation</td>
</tr>
<tr>
<td>4</td>
<td>Remove TC fitting, sanitize</td>
<td>Elevation, CO\textsubscript{2} exposure</td>
</tr>
<tr>
<td>5</td>
<td>Add hops</td>
<td>Elevation, CO\textsubscript{2} exposure, potential energy (volcano)</td>
</tr>
<tr>
<td>6</td>
<td>Sanitize, replace TC fitting</td>
<td>Elevation</td>
</tr>
<tr>
<td>7</td>
<td>Put away ladder</td>
<td>STFs, elevation</td>
</tr>
</tbody>
</table>

1.0 – List Steps

2.0 – Identify Hazards
<table>
<thead>
<tr>
<th>NO.</th>
<th>HAZARDS</th>
<th>CONTROLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pressure</td>
<td>Bleed from CIP arm to 0 psi</td>
</tr>
<tr>
<td>2</td>
<td>CO₂ exposure</td>
<td>Keep face away from valves and TC opening</td>
</tr>
<tr>
<td>3</td>
<td>Slips, trips, falls</td>
<td>Walk with care, slip resistant boots, good housekeeping</td>
</tr>
<tr>
<td>4</td>
<td>Ergonomic</td>
<td>Lift correctly</td>
</tr>
<tr>
<td>5</td>
<td>Sharps</td>
<td>Cut away from body, wear work clothes, put knife away</td>
</tr>
<tr>
<td>6</td>
<td>Elevation, ladder</td>
<td>See detail</td>
</tr>
<tr>
<td>7</td>
<td>Elevation, working at height</td>
<td>Tied off, railings, fall protection system, buddy</td>
</tr>
<tr>
<td>8</td>
<td>Potential energy</td>
<td>Add gradually, don’t exceed batch size, hop cannon</td>
</tr>
</tbody>
</table>

### 3.0 – Hazard Controls

- **Step Ladder**
  - Do not stand on top two steps
  - Do not lean against FV; spread and lock legs
  - Adhere to weight limits

- **Straight or Extension Ladder**
  - Use 1:4 pitch
  - Extends 3 ft beyond top edge of FV
  - Use buddy or tie-off to secure

- **Platform Ladder (Step Ladder with Top Platform)**
  - Tall enough that fittings can be reached from platform

- **Ladder Alternatives**
  - Scissor lift
  - Forklift with safety cage (“liftable work platform”)
  - Scaffold
  - Catwalk
  - Hop cannon
Hazard Assessment

Example 3
Packaging Automation Malfunction
### 1.0 – List Steps
### 2.0 – Identify Hazards

<table>
<thead>
<tr>
<th>NO.</th>
<th>STEP</th>
<th>HAZARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hit E-stop switch</td>
<td>Flying objects, noise, hot glue</td>
</tr>
<tr>
<td>2</td>
<td>Control upstream flow</td>
<td>Electrical, mechanical, motion, sharps, etc.</td>
</tr>
<tr>
<td>3</td>
<td>Control energy at problem location</td>
<td>Electrical, mechanical, motion, sharps, etc.</td>
</tr>
<tr>
<td>4</td>
<td>Remove jam, repair, adjust settings, etc.</td>
<td>Electrical, mechanical, motion, sharps, etc.</td>
</tr>
<tr>
<td>5</td>
<td>Restore local energy, test functions</td>
<td>Electrical, mechanical, motion, sharps, etc.</td>
</tr>
<tr>
<td>6</td>
<td>Repeat adjust-test cycle as needed</td>
<td>Electrical, mechanical, motion, sharps, etc.</td>
</tr>
<tr>
<td>7</td>
<td>Restore upstream systems flow</td>
<td>Flying objects, noise</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 3.0 – Hazard Controls

#### 3.1 Engineering Controls

#### 3.2 Administrative Controls

#### 3.3 Personal Protective Equipment

#### 3.4 Safe Work Practices

#### 4.0 – SOP

SOPs for variable task or one-time activities have to be more general, and deal with uncharacterized hazards.
Hazard Assessment BMP

brewersassociation.org…
Click “Best Practices”

- Frequently Asked Questions
- Detailed Examples
- Numerical Prioritizing
- Sample and Template Forms
  - Brewery Hazard Placard
  - Hazard Assessment Worksheet
  - Numerical Prioritizing
  - Standard Operating Procedure (SOP) Template
Hazard Assessment BMP

Hazard Assessment Form

<table>
<thead>
<tr>
<th>TASK:</th>
<th>HA DATE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPT:</td>
<td>INITIALS:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
<th>HAZARDS</th>
<th>CONTROLS</th>
<th>PPE</th>
<th>FMEA NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

SOP FORM

<table>
<thead>
<tr>
<th>TASK: _________________________</th>
<th>SOP NO: ____</th>
<th>REVISION DATE:____</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPT: _________________________</td>
<td>INITIALS: _____</td>
<td></td>
</tr>
</tbody>
</table>

1) Purpose
   
   This SOP describes Brewery ____________________________’s procedure for safe and effective ________.

2) Scope
   
   This SOP is limited to _________________________________.

Subtitle

Click to Edit
Disclaimer

The author, BA Safety Subcommittee and the Brewers Association believe the recommendations in this presentation are appropriate and essential for protecting the health and safety of the craft beer industry’s hardworking, dedicated employees. However, no list of hazards or recommendations will be necessarily be complete for every possible working situation. This presentation does not contain an exhaustive list of all possible workplace hazards or controls. Working in a craft brewery presents many inherent dangers and should not be taken lightly. Proper identification and management of hazards in the brewery can prevent serious injury or death.

Any appearance of a commercial product in this presentation is coincidental and does not constitute an endorsement by the author, the BA Safety Subcommittee or the Brewers Association.

Contact Info

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Thank you for your attendance!