Chemical Safety in Brewing: Do You Really Know What You're Doing?

Presenter: Matt Stinchfield
Brewers Association Safety Ambassador

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Craft Brewers Conference Online

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TODAY’S DISCUSSION

A. PREMISE
- Focus is on Safety
- What You Know
- Coded Information
- Procedures, Equipment

B. HAZARD CONTROL
- Substitution and Elimination
- Safe Work Practices
- Engineering Controls
- Administrative Controls
- Personal Protective Equipment

C. EXAMPLES
- Sanitizers During COVID-19
- Caustics vs. Alkaline pwds.
- Carbon Dioxide

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Thoughts and Actions
- Safe Work Practices (SWPs)
- Product Substitution/Elimination

Engineering Controls (ECs)

Administrative Controls (ACs)

Personal Protective Equipment (PPE)

Prevention & Protection = Hazard Control
SUBSTITUTION, ELIMINATION AND SAFE WORK PRACTICES

THE "THOUGHTS AND ACTIONS" OF SAFETY
**SUBSTITUTION AND ELIMINATION**

**SUBSTITUTION – CHANGE CHEMICALS OR PROCESSES**
- Lower concentration PAA = lesser oxidizer and flammable hazards
- Acid cleaning under CO\(_2\) for FV/BBT
- Lower pH solid oxidizing cleaners instead of liquid caustic
- Adding surfactant to reduce boilover

**ELIMINATION – REMOVE THE HAZARD ENTIRELY**
- Powdered DE filter aid replaced with lenticular filter or centrifuge (but noise??)
- Carbon monoxide eliminated with electric forklift (but hydrogen??)
SAFE WORK PRACTICES – ATTENTIONING THE HAZARDS

HOUSEKEEPING
• Keep Labels Visible
• Put Away Equipment

WALKING, WORKING AND EXITING
• Avoid Spills
• Keep Clear Pathways
• Rehearse Emergency Procedures

HYGIENE
• Wash PPE and Hands After Chemical Use

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ENGINEERING CONTROLS
CONTAINING / ISOLATING / CONTROLLING HAZARDS WITH EQUIPMENT AND SYSTEMS
ENGINEERING CONTROLS

ACTIVE CONTROLS
- Machine Guarding
- Electrical Disconnects
- Ventilation Systems
- Pressure/Vacuum Relief Valves
- Foam Sensor linked to Steam Shutoff
- Hard Transfer Lines

PASSIVE CONTROLS
- Temperature and Pressure Gauges
- CO₂ Monitor
- Forklift Horn
- Secondary Containment for Chemicals
COMMON CLASSES OF ENGINEERING CONTROLS

**PROCESS CONTROLS**
- Brewery Process Automation
- Chemical Metering Pump

**ENCLOSURE AND ISOLATION**
- Machine Guarding
- Enclosed Chemical Transfer Lines

**VENTILATION**
- Grain Dust Exhaust
- CO₂ Exhaust Blower for Cellar Vessels

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ENGINEERING CONTROLS FOR BREWERY CHEMICALS

Secondary Containment
Chemically Compatible Equipment
Ventilation and Monitoring

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ADMINISTRATIVE CONTROLS

TRANSMITTING HAZARD INFORMATION THROUGH SIGNS, LABELS, TRAINING, EMERGENCY ALERTS, POLICIES & RULES
HAZARD COMMUNICATION AND SAFETY DATA SHEETS (SDSs)

Essential Information on Chemical Products, Health Effects, Storage, Spill Mgmt.
HAZCOM BACKGROUND

"HAZCOM"
- Hazard Communication Program, est’d 1983
- Required by OSHA
- No. 1 OSHA citation for manufacturers

"GHS"
- Globally Harmonized Standard, 2012
- Aligned HazCom with other countries
- MSDS → SDS
- Consistent pictograms, signal words, hazard and precautionary statements

HAZCOM PROGRAM
- Written program
- Workplace notice
- Training records
- SDS Binder(s) current and complete
- Labeling
- Chemical inventory
- PPE provided and maintained

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Safety Data Sheet
Spartan Chemical Company, Inc.

Revision Date: 02-Jul-2018

1. PRODUCT AND COMPANY IDENTIFICATION

Product Identifier: CAUSTIC CLEANER FP
Product Name: 3189
Recommended Use: Cleaning agent
Uses Advised Against: For Industrial and Institutional Use Only
Manufacturer/Supplier: Spartan Chemical Company, Inc.
1110 Spartan Drive
Maumee, Ohio 43537 USA
800-537-8990 (Business hours)
www.spartanchemical.com

24 Hour Emergency Phone Numbers:
Medical Emergency/Information: 888-314-6171
Transportation/Spill/Leak: CHEMTREC 800-424-9300

2. HAZARDS IDENTIFICATION

GHS Classification
Skin Corrosion/Irritation: Category 1
Serious Eye Damage/Eye Irritation: Category 1
Corrosive to Metals: Category 1

GHS Label Elements
Signal Word: Danger
Symbols: ☢️

Hazard Statements:
Causes severe skin burns and serious eye damage.
May be corrosive to metals.

Most Comprehensive Resource on Hazards, Properties, Management Recommendations

- 16 Standard Sections
- 1st Four Sections
  - Product/Co. Info.
  - Hazards (summary)
  - Composition (ranges)
  - First Aid
- Other Sections Include
  - Storage & Disposal
  - Emergencies Mgmt.
  - PPE ☢️
  - Chemical Properties

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KEY SDS RECOMMENDATIONS

READ THEM
- Read SDS for All Chemicals You Use
- Request SDS When one is Missing
- Ask for Clarification from Knowledgeable Persons

DOCUMENTATION
- Record SDS Training from Employee Orient. or Task Training
- Refer to SDS in SOPs

KEEP UPDATED
- Binder is Updated & Complete
- Recognized Location
- Available to All

SAFETY DATA SHEETS LOCATED HERE
LABELS

Cliff Notes Version of the Safety Data Sheet
DANGER

Carbon Monoxide

H220: Extremely flammable gas. -
H331: Toxic if inhaled. - H360D: May
damage the unborn child. - H372:
Causes damage to organs through
prolonged or repeated exposure

Keep container tightly closed. Avoid
breathing vapours. If inhaled: Remove
victim to fresh air and keep at rest in a
position comfortable for breathing. Call
a Poison Center or doctor. Store in a
well-ventilated place.

Company ABC
1224 Long Road
New York, New York
555-300-8885

Additional Product Identifiers

3630-08-0 006-001-00-2
211-128-3 ######
Chemical Labels Under the Global Harmonized System (GHS), since 2012

1. Signal Word
   • DANGER
   • WARNING

2. GHS Pictogram

   • Company
   • Address
   • Phone Number

4. Precautionary / First Aid (P codes)
   • General Prevention
   • Response, Storage or Disposal
   • First Aid Recommendations

5. Health & Safety Hazards (H codes)
   • Nature and Degree of Hazards Posed
   • Codes Tie to SDS

6. Product Name / Other Identifiers
   • Product Name, Part No.
   • Major Chemical Ingredient may be Listed

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Other Helpful Label Info

“HMIS”

HAZARD INDEX
• Close to NFPA Placard System
• 0-4 Ratings

PPE RECOMMENDATIONS
• Pictograms Surpass Language Barriers
• Should Agree with SDS
• Workers Still Need Training
Standardized Key Words and Color Schemes for Particular Work Areas
Standardized Key Words and Color Schemes

**CAUTION**
Minor to Moderate Injury Potential

Black on Yellow

**WARNING**
Death or Serious Injury is Possible

Black on Orange

**DANGER**
Death or Serious Injury Likely

Black and Red on White Background

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Standardized Key Words and Color Schemes

**NOTICE**
General Information
- Blue Panel on White
- Image: "NOTICE THIS IS A DRUG-FREE WORKPLACE"

**INSTRUCTION**
General Safety Recommendations
- Green Panel on White
- Image: "SAFETY FIRST BEND KNEES WHEN LIFTING"

**ELECTRICAL & FIRE SAFETY**
No Standard Format
- Often Red on White
- Images: "FIRE EXTINGUISHER DO NOT BLOCK" and "DANGER HIGH VOLTAGE ELECTRICAL SHOCK HAZARD"

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Collective Hazards Posted on Buildings or Transport Vehicles
NFPA Rating Explanation Guide

**HEALTH HAZARD**

4 = Can be lethal
3 = Can cause serious or permanent injury
2 = Can cause temporary incapacitation or residual injury
1 = Can cause significant irritation
0 = No hazard

**FLAMMABILITY HAZARD**

4 = Will vaporize and readily burn at normal temperatures
3 = Can be ignited under almost all ambient temperatures
2 = Must be heated or high ambient temperature to burn
1 = Must be preheated before ignition can occur
0 = Will not burn

**SPECIAL HAZARD**

ALK = Alkaline
ACID = Acidic
COR = Corrosive
OX = Oxidizing
= Radioactive
= Reacts violently or explosively with water
= Reacts violently or explosively with water and oxidizing

**INSTABILITY HAZARD**

4 = May explode at normal temperatures and pressures
3 = May explode at high temperature or shock
2 = Violent chemical change at high temperatures or pressures
1 = Normally stable. High temperatures make unstable
0 = Stable
NFPA PLACARD

WORST CASE:
B. B. L. C.
DOT HAZARD CLASSES AND PLACARDS

SPECIFIC TO D.O.T. REGULATIONS

i.e. FOR CONTAINERS AND TRANSPORT VEHICLES
US DOT Hazmat Class & Division Placards
1. Identification

1.1. Product identifier

Trade name: PERACLEAN® 15

1.2. Recommended use of the chemical and restrictions on use

Relevant applications identified: Bactericide

Function: For industrial use

1.3. Details of the supplier of the safety data sheet

Company: Evonik Corporation USA

Address: 299 Jefferson Road

Parsippany, NJ 07054-0677

USA

Telephone: 973-929-8000

Telex: 973-929-8040

Email address: Product-Regulatory-Services@Evonik.com

1.4. 24 HOUR EMERGENCY TELEPHONE NUMBERS:

CHEMTREC - US & CANADA: 800-537-8990

CHEMTREC MEXICO: 01-800-537-8990

CHEMTREC INTERNATIONAL: +1 703-527-3887

Product Regulatory Services: 973-929-8060

2. Hazards identification

2.1. Classification of the substance or mixture

Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

- Flammable liquids: Category 4
- Organic peroxides: Type F
- Corrosive to metals: Category 1
- Acute toxicity (Oral): Category 4
- Acute toxicity (Inhalation): Category 4
- Acute toxicity (Dermal): Category 4
- Skin corrosion: Category 1A
- Serious eye damage: Category 1
- Specific target organ toxicity - single exposure (Respiratory system): Category 3
- Acute aquatic toxicity: Category 2
- Chronic aquatic toxicity: Category 1

2.2. Label elements
PERSONAL PROTECTIVE EQUIPMENT (PPE)

THE LAST LINE OF DEFENSE
PPE

LIMITATIONS

• NOT Failsafe
• Last Line of Defense
• Poor Understanding
  • Selection
  • Use
  • Cleaning
  • Inspection
  • Replacement

CHEMICAL PPE CAN PROTECT

• Eyes / Face
• Hands
• Feet
• Other Parts
• Lungs
EYE PROTECTION

FROM SPLASHES

• Standard Safety Glasses
• Indirect Vented Goggles
• Face Shield
HAND PROTECTION

FROM DIRECT CONTACT

• Inexpensive disposable nitrile

• Neoprene hybrid over woven or latex base

• Heavy duty reusable nitrile
FOOT PROTECTION

FROM SPILLS, PUDDLES, CONTAINER WEIGHT

- Sturdy leather or synthetic work shoes/boots with reinforced toe and shank
- Knee-high rubber (PVC) with reinforced toe and shank
- Low-rise rubber (PVC) with reinforced toe and shank or rubber pullover over sturdy work boot
OTHER PROTECTION

VARIOUS HAZARDS

• Splash protection apron

• Fall protection harness, lanyard, and anchoring

• Hearing protection, disposable or reusable
RESPIRATORY PROTECTION

FROM DUSTS, MISTS, VAPORS, AEROSOLS

• Chemical Mists/Vapors
  • Brewery Washdown
  • Paints, Coatings, Solvents

• Particulate protection
  • Grain Dust
  • DE Filter Aids
  • Metal, Wood, Plastic Fabrication/Welding

None of These Work in the Absence of Sufficient Oxygen!!
TOTAL MINDSET FOR PREVENTION AND PROTECTION AROUND CHEMICALS

1. SWP
2. EEC
3. AAC
4. PPE

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CHEMICALS IN THE BREWERY

MORE INFORMATION AVAILABLE IN YOUR SDS BINDER
## Chemicals in Breweries/Pubs

<table>
<thead>
<tr>
<th>Category</th>
<th>Substances</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Corrosives</strong></td>
<td>Acid Cleaners, Caustic Cleaners, Alkaline Powders</td>
</tr>
<tr>
<td><strong>Oxidizers</strong></td>
<td>Peracetic Acid, Nitric Acid / Iodine, Hydrogen Peroxide, Ozone, Chlorine Dioxide</td>
</tr>
<tr>
<td><strong>Other Beer Production</strong></td>
<td>Non-Oxidizing Sanitizers (Quats), Glycol Coolant, Lab Reagents, Water Treatment, Filter Aids, Glues</td>
</tr>
</tbody>
</table>

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4 ASPHYXIANTS
- SIMPLE
  - Carbon Dioxide
  - Nitrogen
- CHEMICAL
  - Carbon Monoxide
- OXYGEN
  - Ambient: 20.9%
  - Deficient: <19.5%
  - Enriched: >23%

5 FLAMMABLES
- Alcohols
- Propane
- Natural Gas

6 FACILITIES CHEMICALS
- Lubricants
- Paints
- Janitorial
- Pest Control
- Food Service
  - Surface Cleaners
  - Dishwashing
## EXAMPLE 1 – THREE DIFFERENT SANITIZERS — showing stock/concentrated solutions

<table>
<thead>
<tr>
<th>PERACETIC ACID, 15%</th>
<th>QUATERNARY ALKYL AMMONIUM SOLUTION (QUATs)</th>
<th>60% ETHYL ALCOHOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>DANGER</td>
<td></td>
<td>DANGER</td>
</tr>
<tr>
<td>Corrosive, Organic Peroxide</td>
<td></td>
<td>Flammable Liquid</td>
</tr>
<tr>
<td>EPA reg. bacteriocide</td>
<td></td>
<td>Not EPA reg., check TTB</td>
</tr>
<tr>
<td>pH: ca. -0.6</td>
<td></td>
<td>pH: 6.5-8.5</td>
</tr>
<tr>
<td>Permanent eye, skin, respiratory damage</td>
<td>Wide range of pH: 6-12+</td>
<td>Flashpoint: 63°F</td>
</tr>
<tr>
<td>Incompatible: Cu, Al, Zn, brass, caustics, combustible materials</td>
<td>May have 0-5% ethanol</td>
<td>LEL/UEL: 3.3-19%</td>
</tr>
<tr>
<td>Short-lived working solution</td>
<td>Skin irritant, permanent eye damage, GI irritation</td>
<td>Vapor Density: 1.59</td>
</tr>
<tr>
<td></td>
<td>Incompatible: strong oxidizers, acids</td>
<td>Causes skin drying</td>
</tr>
<tr>
<td></td>
<td>Long-lived working solution</td>
<td>Incompatible: strong oxidizers, ignition sources</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Short-lived working solution</td>
</tr>
</tbody>
</table>
### Example 1 – Three Different Sanitizers

**Peracetic Acid, 15%**

- **SUMMARY**
  - Stock soln. hazardous to skin, eyes, lungs
  - Only use on S/S, plastics
  - Use only in brewery

**Quaternary Alkyl Ammonium Solution (QUATs)**

- **SUMMARY**
  - Stock soln. hazardous to skin, eyes, digestive
  - Good for all surfaces
  - Use on bar surfaces, payment pads, phones

**60% Ethyl Alcohol**

- **SUMMARY**
  - Stock and working solns. flammable; combine with glycerol or aloe gel; don’t aerosolize
  - Safe for skin, not eyes or mouth
  - Use on hands
EXAMPLE 2 – CAUSTIC / ALKALINE CLEANER

STOCK SOLUTION
- DANGER
- pH: 12.8 - >14

WORKING SOLUTION
← EITHER →
- DANGER
- pH: 11 - 13

SUBSTITUTION with ALKALINE SOLID
- DANGER
- pH: 11.0 - 11.5

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### EXAMPLE 3 – CARBON DIOXIDE

<table>
<thead>
<tr>
<th>PURE CO&lt;sub&gt;2&lt;/sub&gt;</th>
<th>PROPERTIES (from the SDS)</th>
<th>CONCENTRATIONS TO CONSIDER</th>
</tr>
</thead>
<tbody>
<tr>
<td>WARNING</td>
<td>COLORLESS</td>
<td>AMBIENT AIR 400 ppm (0.04%)</td>
</tr>
<tr>
<td>DOT HC 2.2</td>
<td>ODORLESS</td>
<td>PEL/TLV TWA 5,000 ppm (0.5%)</td>
</tr>
<tr>
<td></td>
<td>POOR WARNING</td>
<td>FIRST SYMPTOMS 15,000 ppm (1.5%)</td>
</tr>
<tr>
<td></td>
<td>VAPOR DENSITY 1.53 (air=1.00)</td>
<td>IDLH 40,000 ppm (4%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UNCON. / DEATH 80,000 ppm (8%)</td>
</tr>
</tbody>
</table>

- COLORLESS
- ODORLESS
- POOR WARNING
- VAPOR DENSITY 1.53 (air=1.00)

**Properties (from the SDS)**
- COLORLESS
- ODORLESS
- POOR WARNING
- VAPOR DENSITY 1.53 (air=1.00)
High Concentrations Local to Release Source or Cloud Development Scenario

5M is a Maximum Detection Distance and Will be Affected by Topography. Gas Levels Will Drop as Distance to Leak Source Increases Requiring Lower Alarm Set Points

For this CO2 Example use Detectors in the Life Safety Zone to Trigger Ventilation and Evacuation Alarms

Heavier Than Air Gases Can Show a Gradient in Room Levels With Higher Concentrations at Floor Level or Slow Leak Scenario

This Example Illustrating A CO2 Gas Release From A Storage Cylinder. Typical Scenario. Broken or Blown off Hose, Regulator Incorrectly Connected, Ruptured Gauge or Similar.

For this CO2 Example Expect Higher Concentrations at Low Levels. Use for Ventilation Trigger and Pre-Alarms
EXAMPLE 3 – CARBON DIOXIDE – POINTS OF EXPOSURE
SUMMARY
Now, How Well Do You Really Know Your Brewery Chemicals?

**Chemical Safety Information is All Around Us**
- Often is Coded
- May be Absent or Damaged
- May be Wrong

**SDSs, Labels, Signs, Placards**
- Up to Date
- Visible
- Correct for Situation

**Controls and PPE**
- Appropriate
- In Good Repair
- Used Correctly
Matt Stinchfield
Safety Ambassador
Brewers Association
Boulder, Colorado

safetyambassador@brewersassociation.org

@MattStinchfield  @BrewersAssoc  #BrewerySafety

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