

Jess McElvain

SSQ Consultants

jess@ssqconsultants.com

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BREWERY OPERATIONS: INCREASING BREWERY SAFETY IN SMALL SPACES



About Me

Trained Biochemist

- CR&D at a Fortune 500 company
- Developed SOP skills and safety knowledge

Transitioned to Brewing

- UC Davis Master Brewers Program
- IBD Diploma in Brewing

Worked in 3 breweries

- 20,000 bbl/year (50 bbl brew house)
- 5,000 bbl/year (30 bbl brew house)
- 1,000 bbl/year (15 bbl brewhouse)

Graphic Content Ahead





The Injury

- Line of Fire Injury
- Concentrated Caustic
- Very lucky: Skin grafts were not required

What Went Wrong?



Human Error

Placed leg in the line of fire
Did not remove caustic-soaked pants



Systemic Failures

No safety shower
No pump inspection protocol
No quick reference for worker's comp facilities



It could have been worse

Face could have been in the line of fire

The Impact

- Direct Costs
 - Medical Care
- Indirect costs
 - Schedule disruptions
 - Productivity decreases
 - OSHA fines
 - Lawsuits
 - Multiples of the direct costs



Where does Safety Start?

With the Owner

- Provide safe environment
- Attitude is key

With the Brewmaster

- Running day to day operations
- Promotes culture established by owner

With Education

- SOPs
- Safety Manual
- Training records

Safety First!

But How?



- Facility Set-up



- SOPs/Documentation



- Training

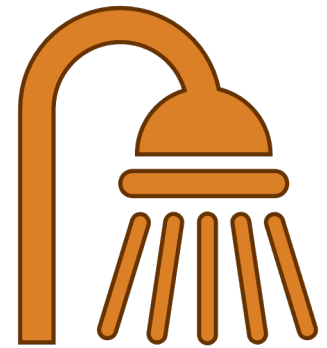
Facility

Where are you in the process

- Planning?
- Construction?
- Operating?

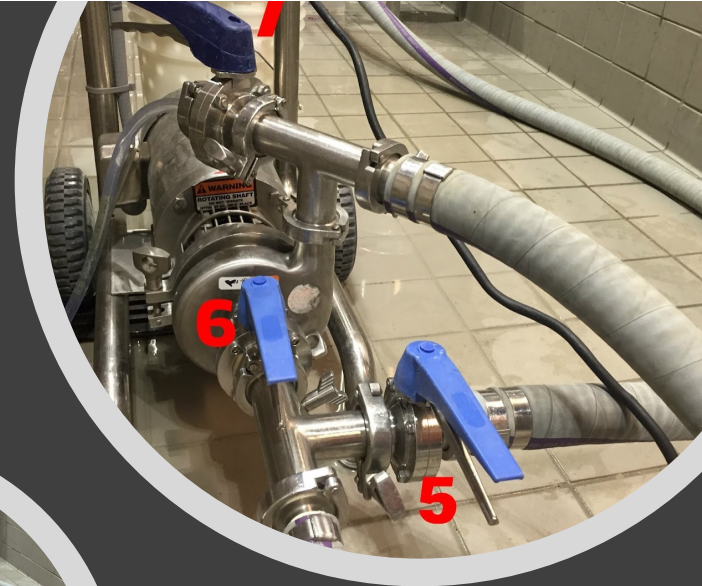
Emergency Shut Off
Switches

Safety Shower



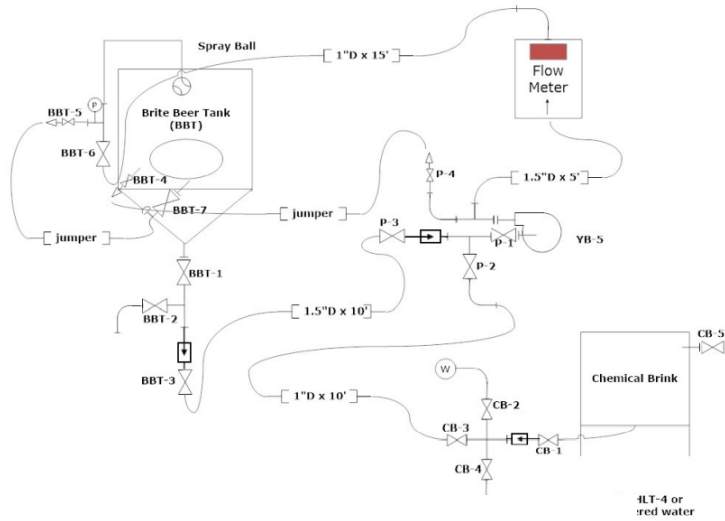
SOPs

- There is NO consistency in chaos!
- Not just for safety
 - Key training documents
 - Protects the brewery
- Verbal SOPs are NOT SOPs
- Pet Peeves
 - No background
 - Vague guidance
 - Paragraphs hiding critical steps



2. BBT CIP, sanitation, and purge should be completed 24 hours ahead of scheduled beer transfer.

Schematic(s)



BBT CIP and Sanitization

Purpose

To describe the process of cleaning the bright beer tank (BBT).

Theory

Proper cleaning is required to remove organic material that can harbor beer spoiling organisms. Removal of this organic material is key for effective sanitation of the BBT.

Frequency

Chemical(s)	Open/Closed CIP	Frequency
None	N/A	Any beer following a filtered lager, any non-lager beer following a filtered ale
Ultra-Niter/X-Puma; Birk-Ox	Closed	After any unfiltered beer within 24 hours of emptying BBT
Ultra-Niter/X-Puma; Cir-Q-Late/Pur-Ox; Birk-Ox	Open	After any beer brewed with diastatic yeast strain or <i>Lactobacillus</i> species or once every 6 months or when infection is indicated

Note(s)

- The closed procedure is done under pressure in a CO₂ atmosphere. Do NOT use Cir-Q-Late or Enforce LP. The chemical reaction of these chemicals (and other caustics) with CO₂ can result in tank implosion.

Strong SOPs

- The Why
- Frequency Guidelines
- Schematic Drawings
- Safety Concerns
- Trouble Shooting

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Closed BBT CIP and Sanitation Procedure

1. Line and BBT rinse

- Set up chemical brink, valves, and lines as detailed in **Figure 10**
- Open valves BBT-2, BBT-3, BBT-4, BBT-5, BBT-7, CB-3, CB-4, P-2, P-3, P-4, and sample port
- Open the filtered water valve
- Flush for approximately **15 seconds**
 - Close valve BBT-3
 - Open valve P-1
- Burst rinse BBT **10 times**
 - Open valve BBT-6 for **10 seconds** and then close
 - Open BBT-1 approximately $\frac{1}{4}$ and drain BBT
 - When gas is primary material coming out of BBT-2, tank is drained
 - Close BBT-1
 - Repeat the previous two steps for a total of **10 cycles**
 - At the end of last burst rinse
 - Close valves BBT-4, P-2, and P-4
 - Drain BBT as described above and close BBT-1

2. Acid/X-Puma Cycle

- Fill chemical brink with ambient water
 - Open valve CB-2 and close valve CB-5
 - Close filtered water valve and transfer **20' x 1" D** hose to HLT-4

Training

- Identify your authorized trainers
 - Attention to detail
 - Patient
 - Honest
- Reward your authorized trainers
 - Training slows down the work process
- Document, document, document
 - Checklists

Keg Line CIP/Sanitation/Purge

Date	Start Time	End Time	Completed By	Verifying Trainer	
Trainer Comments:					

- | | | |
|---|------------------|-----------------|
| <input type="checkbox"/> Set up keg line CIP | Completed By:___ | Verified By:___ |
| <input type="checkbox"/> Open all appropriate valves | Completed By:___ | Verified By:___ |
| <input type="checkbox"/> Turn on air dryer | Completed By:___ | Verified By:___ |
| <input type="checkbox"/> Turn on compressor | Completed By:___ | Verified By:___ |
| <input type="checkbox"/> Open all appropriate keg washer valves | Completed By:___ | Verified By:___ |
| <input type="checkbox"/> Pre-heat lines with HLT water | Completed By:___ | Verified By:___ |
| <input type="checkbox"/> Fill and charge chemical brink | Completed By:___ | Verified By:___ |
| <input type="checkbox"/> Circulate caustic (20') | Completed By:___ | Verified By:___ |
| <input type="checkbox"/> Drain lines of caustic | Completed By:___ | Verified By:___ |
| <input type="checkbox"/> Rinse lines with HLT water | Completed By:___ | Verified By:___ |
| <input type="checkbox"/> Rinse lines with filtered water | Completed By:___ | Verified By:___ |
| <input type="checkbox"/> Fill and charge chemical brink | Completed By:___ | Verified By:___ |
| <input type="checkbox"/> Circulate sanitation chemical (10') | Completed By:___ | Verified By:___ |
| <input type="checkbox"/> Turn off pumps and close valves | Completed By:___ | Verified By:___ |
| <input type="checkbox"/> Set-up lines for SV transfer (if applicable) | Completed By:___ | Verified By:___ |
| <input type="checkbox"/> Break down all unnecessary lines and store | Completed By:___ | Verified By:___ |
| <input type="checkbox"/> Purge lines | Completed By:___ | Verified By:___ |

Appendix D: Training Certification

Trainer	Location(s)	SOPs
	Boulder/Lafayette	Line Cleaning
	Boulder/Lafayette	Brew house, Cellar, Laboratory, Packaging
	Lafayette	Brew house, Cellar, Laboratory, Packaging
	Boulder/Lafayette	Brew house, Cellar, Laboratory, Packaging

Table 2. Certified trainers

The below table lists those who have been trained and approved to independently conduct specific brew house procedures by a certified trainer.

Name	Procedure	Date	Trainee Initials	Trainer Initials



Summary

- Everyone goes home like they came in
- It's all about culture
 - Safety starts with the owner
- Brewery Mock-ups & Process Dry runs
- Documentation!
 - Evacuation Plans
 - Training – including SOPs
 - Chemical Sheets
 - Worker's Comp Info
 - Signature Sheets