



Forgeworks Brewhouse User's Manual

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Contact Information for Questions and Service:

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Many support documents and troubleshooting guides are available on our website, forgeworksstainless.com, under "Articles" in the menu, then look for "Brewery Equipment Support Documents". This includes manuals for the Midco Power Burners, Johnson/Penn A421 Controllers, as well guidelines for installation of the burners and venting.

Typical brewing procedures can also be found on our website.

NOTE: A list of IMPROPER USE that may VOID WARRANTY is detailed at the bottom of this manual

Pre-Cleaning and Passivation following the receipt of your equipment

Upon receiving equipment, rinse inside tanks with heavy spray, run your typical CIP with Caustics and Passivate each tank. If your tanks have been stored by us, or by you for any additional length of time other than receiving the equipment a week or two after completion, take extra care of spraying out the tanks, potentially with a power washer.

Best practice in terms of maintaining the integrity and functionality of the equipment is periodic Preventative Maintenance measures, 3-4 times annually. This would include as many days as needed of non-brewing functions so that all the equipment can be inspected, cleaned, etc.

Anytime you have a person getting inside a tank for any reason, have an established "Lock out Tag Out" safety precaution in place, and have a spotter present.

Mash/Lauter Tun

-Grain Bills

Our Mash/Lauter Tuns are designed with a specific inner diameter to accommodate a variety of beers. However for maximum efficiencies, it is optimal to keep your grain bills within the parameters below. These parameters are based on a minimum grain bed depth of 12" and a maximum of 26". For half-batches with lighter beers, keep in mind the minimum grain bed depth. For gigantic beers, plan to scale back the yield to maintain the maximum grain bed depth. The big beers commonly are less popular, thus garner less sales, so yielding less barrels in a brew is strategic (this could be 6-8bbls from a brew), and you won't experience long shelf life. Below is a table of grain bills based on optimal grain bed depths.

Brewhouse Size	<i>Lighter Beers</i> @ 12" Grain Bed Depth	<i>Bigger Beers</i> @ 26" Grain Bed Depth
3.5bbl	158lbs	343lbs
5bbl	230lbs	498lbs
7bbl	315lbs	683lbs
10bbl	460lbs	997lbs

-Manometer Ports

We strongly encourage the use of a grant during vorlauf and transfer to the kettle. You simply gravity feed from the Mash Tun into the grant and pump from the grant. This completely eliminates any risk of pulling a vacuum underneath the false floor. A micro-adjustment valve is best attached to the under-screen outlet of the mash tun to control the gravity flow of wort precisely as to not out flow the pump and overflow the grant. A kitchen sieve can be implemented at the top of the grant to capture any grains that may have found their way under the false-floor. This is particularly useful on transfer to the kettle.

The manometer ports are equipped on the mash tun for instances when you are not using a grant, and hooking up the pump directly to the Mash/Lauter Tun outlet. By keeping eyes on the levels in the tubes that they are staying in one place, verses spreading apart, which indicates a vacuum is taking place. This is NOT recommended practice; a one PSI vacuum under the screen causes an extra 2600 pounds of force on the false floor of a 10bbl mash tun.

Thermowell and Analog or Digital Temperature readout

-The thermowell will provide reasonable accuracy of the temperature of the grain bed initially, but as stratification occurs, the reading will become less accurate. For your dial thermometer that fits in the Thermowell, will require a 1/2" FNPT fitting at the back, with a 6" stem, checkout <https://reotempbrew.com/back-connect-brewing-thermometer-threaded-sanitary/>. It is best practice to also use a hand help temperature wand to probe various areas of the grain bed to read more accurate temperatures. An excellent brand and model of a temperature wand is ReoTemp, item # BTA11-B360A, riotempbrew.com.

-Mash Tun Manway Opening/Closure Latch Mechanism

The closure pressure of the Manway is fine-tuned and set to seal the manway via the large food grade gasket. Although the closure is meant to be simple and an action requiring just one hand (versus the typical gigantic wing nut type manway closures), the latch must first be very deliberately slotted correctly before using the Forged Brass lever arm to seal up the manway. See the pictures below for correct placement of the latch in the slot.





-Cleaning

Every brewhouse has different considerations and brewhouse cleaning methods vary widely. Many brewery equipment manufacturers avoid the question and just say "everybody does it different" which is true. But, here are recommendations and answers to the frequently asked question concerning our Flat Lid Mash Tun being CIP-able.

The following are questions and answers posed to our customer Brett Williams with Little Machine Beer in Denver, Colorado. Brett has the Forgeworks 10bbl Indirect Fire Brewhouse and has been brewing on it since October of 2015. We went to Brett to ask about his thoughts on CIP for a Flat Lid MashTun.

Forgeworks:

-Our Dual Hinged Flat Lid with the center support that you have on your mash tun doesn't feature a dedicated port for CIP. Do you wish it had it?

Brett Williams:

-Personally, no. Since I have no rake & plow and mix in by hand, I like having the extra space to paddle that the flat lid offers. The flat lid is a tiny bit harder to clean than a dome top, just because you have to get up in the crevices and scrub, but worth the savings and the extra paddling space to me. I wouldn't want to paddle through a manway. It also makes it easier to scrub the sides by hand, and I prefer not to CIP the tun for our size brewhouse.

Forgeworks:

Do you CIP your Mash Tun by rigging a spray ball through any other port?

Brett Williams:

-No. I did once and I don't recommend it.

-We clean our mash tun (and screens), every time we use it, with a cleaner designed for scrubbing (Five Star's CMC). We use our grant as a brink to hold the cleaner and scrub the inside/outside of the tun with a long-handled brush from the grant. We also completely remove the screens and scrub them separately every time. We let CMC pool in the drain pipe to soak that while we do this, then rinse everything really well.

-We also fill and soak the mash tun quarterly (or as needed) with an alkaline cleaner to get it back to original condition. After this deep cleaning we re-passivate the stainless with acid.

Forgeworks:

If you did route a spool and spray ball through another port to CIP, does caustic/acid drip down the outside of the mash tun?

Brett Williams:

-Absolutely. I would not recommend this as it will cause streaking/staining of the outside of the tun, unless you give it constant attention and spray off the dripping chemical, which is also pretty dangerous.

-I did the initial passivation of our Forgeworks mash tun by removing the sparge assembly and replacing it with a 1' long extension pipe and the sprayball from our kettle. I didn't want to soak it because of how much acid it would have required. I knew what I was getting into and was prepared to spray the dripping acid off the sides of the tank, while it cycled, so it wouldn't stain. I only did this once and it wasn't worth the mess and the effort. Now I just pool the strong acid solution in the bottom of the tank, scrub it all over the sidewalls, drain, and let air-dry for passivation.

Forgeworks:

Think the Mash Tun should be CIP-able?

Brett Williams:

-This depends on the size of the tun and how often it's used. It would be very hard to scrub a 50 Bbl mash tun by hand, and it wouldn't be economical to fully fill and soak it with chemical. Also, lauter tuns at breweries that run more often, counterintuitively, actually need to be cleaned less.

-I personally prefer not to CIP the mash at our 10bbl scale because there are pretty big gaps between brews; we usually brew twice per week. This means if the tun doesn't get cleaned after each use, it has time to get funky. CIP'ing after each use would be an excessive use of time and chemicals so the scrubbing method is more economical, less time consuming and works great.

-Larger craft breweries typically CIP once per week because the tank is getting turned over so much it doesn't have time to get funky. For larger tuns that are getting turned over day in and day out, the tun just needs to be sprayed out/rinsed between brews. Then, once per week you would deep clean by soaking with chemical just above the screens to deep clean the screens. Then, rinse and remove the screens and scrub them additionally by hand if needed to get fully clean. Then, CIP the tank with alkaline cleaner with the screens removed to make sure all the husk material can drain and doesn't get caught up in them. Then, once you're sure everything's cleaned and rinsed and there's no more husk material anywhere (including the spray-ball), re-assemble and run the acid CIP cycle with the screens in the tank.

-The trickiest situation is if your brewery is oversized. Then, your tank may be too big to scrub, but also isn't getting turned very often so should be cleaned each time. In this scenario you'd want to do some combination of the above methods. Or, just suck it up and CIP more often.

OTHER NOTES ON THIS TOPIC from Forgeworks:

CIP WITH OUR FLAT DUAL HINGED LID MASH TUN: *A typical CIP on our Flat Dual Hinged Lid Mash Tun can still be achieved with some modifications. You can connect a 6-10" spool to the Sparge Port, and utilize a 180° Spray Ball. This will minimize caustic/acids from escaping under the flat lid and running down the outside of the vessel.*

Kettle/Whirlpool

Power Burner Operation

For Indirect Fire (Power Burner via Natural Gas or Propane), during knock out transfer of wort from the Mash Tun to the Kettle, do not turn on the burner until you can physically see at least 8" of wort is inside the kettle, or for reference, note that the wort is above the thermowell. Some newer Kettles now have a sight glass as a standard feature. On the volume scale on the outside of the tank is a "flame" symbol. When your water or wort is halfway up the "Flame" it is OK to fire your burner.

Accidental Dry Fire (pertains to Indirect Fired Kettles)

At the location of the controller (typically a Johnson/Penn A421, (or ControlTec Accu Tank in the case of a modulating burner) it is best practice to install an emergency cut off switch with ease of access or the brewer in the case of a boil over (see more on boil over potential under separate heading). Install these two units in the easiest to get to location near the Kettle. For the cut off switch (also the on switch), we recommend that it be a switch that does not look similar to a light switch. This precaution is so that a person that is not familiar with the equipment does not mistake the switch for a light switch, and inadvertently turn on the burner.



Best Results for Temperature Control

If your controller was purchased through Forgeworks, the controller wire may have already been installed in the thermowell for you. If the parts were not installed, you will notice that a container of Thermo Paste (Heat Conductive Compound), along with a syringe was provided. For the most accurate temperature readout results, apply the Heat Conductive Paste generously into the thermowell (via use of the syringe and latex gloves) before installing the thermocoupler and the thermo-probe that wires to the controller. Regarding the Thermocoupler, if not already installed, study how the parts disassemble as you prepare it for the thermoprobe. This fitting has very small parts, so if you lose track of how it goes together, see Figure 1 below.



Use this paste liberally in the thermowell

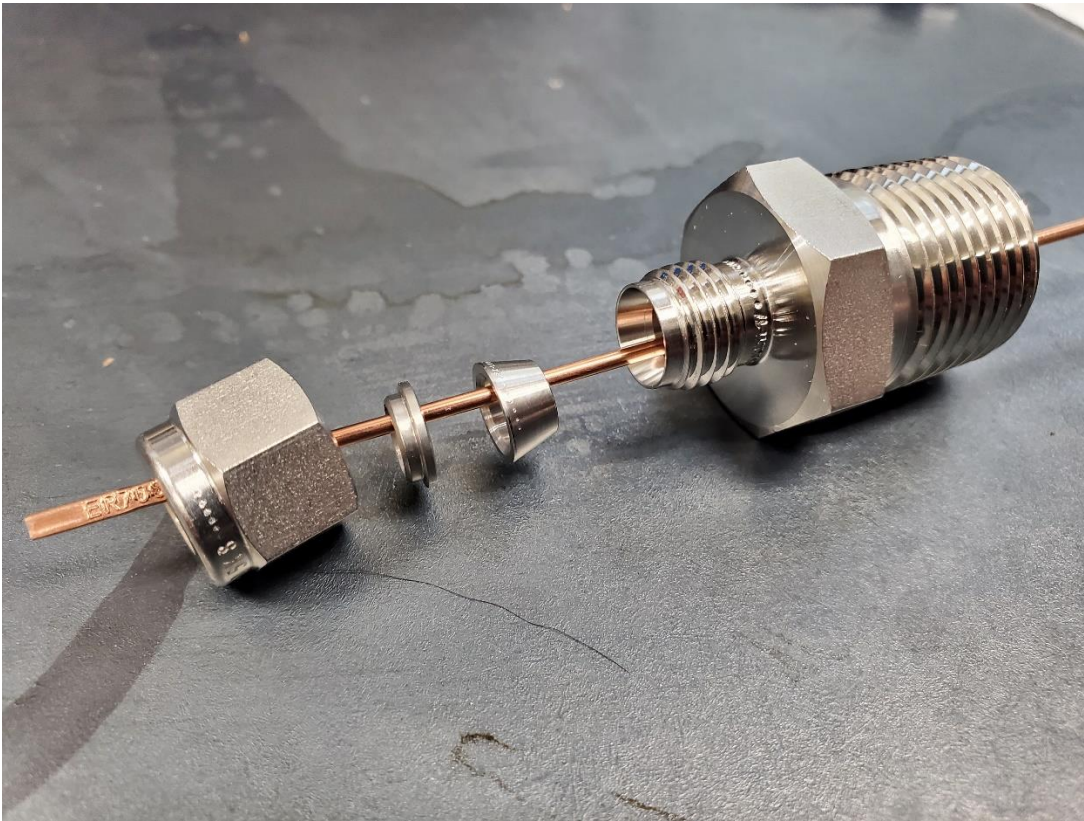


Figure 1: How the thermocouple compression fitting goes together

The Bevel Seat (DIN) Racking Arm mechanism





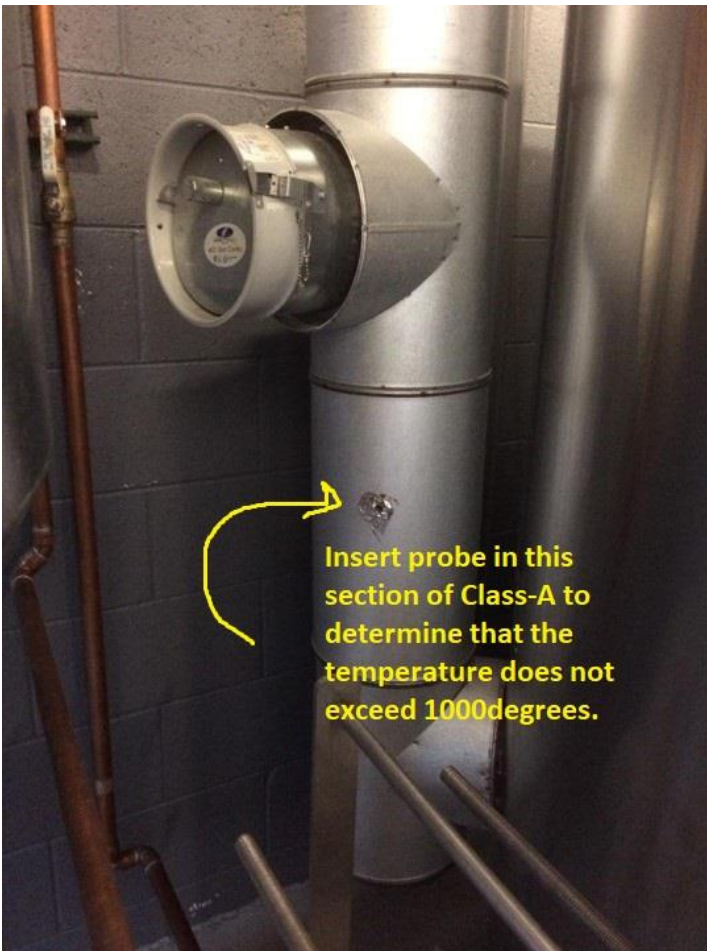
Delicate caution is required when adjusting the Bevel Seat Racking Arm (DIN Fitting) on the kettle for your transfer of hot wort to the Fermenter via the Heat Exchanger. Turning the adjustment lever on this DIN fitting maneuvers the racking arm up or down to draw off clear wort. The use of an inline sight glass incorporated with the transfer is necessary so you can visually see the wort clarity, and know when to adjust the arm up for clearer wort (not drawing debris from the Trub Cone). The DIN fitting is the large nut with lever handles for loosening and tightening. The fitting needs to be loosened enough to get a fairly easy turn on the racking arm lever. If the DIN fitting is not loosened enough, too much pressure will be required to "force a turn in the racking arm that may result in damage to the lever or the fitting over time. NEVER use a "cheater bar" to gain more leverage. If hot wort leaks from the DIN fitting when loosened, it is too loose. Tighten up until there is no leak, and then adjust the racking arm. For a demonstration of proper use, refer to this youtube video.

<https://www.youtube.com/watch?v=kdd-6lwwCgQ>

Kettle Burner Care

See our Burner and Venting Guidelines for proper installation which may have been emailed to you, but it is also available on our website, under "Articles", then "support documents".

NOTE: With the installation of the burner, your HVAC Professional will absolutely need to test the temperature of the exhaust flue with a probe, in the first section of Class A Double-Walled Chimney between the exhaust exit and the Atmospheric Dampener. The flue temp must not exceed 1000 degrees, of which the Class A Chimney is rated for. The burner must be dialed in such that the exhaust temperature is correct, less than 1000degrees. The Atmospheric Dampener is required equipment, incorporated usually after the first section of Class-A Double Walled Chimney. The Dampeners function is to cool the exhaust air, and thus increasing the efficiency of the heating of the kettle by slowing down the exhaust flow. The drawing of cooler air from the room through the Atmospheric Dampener will require sufficient make up air in the room. Make up air that is inadequate will create negative pressure in the room, and can contribute to issues with other appliances in the room, and carbon monoxide poisoning.



Other Burner Items

During normal use, and the clean up process in the brewery, avoid any spray or splash of water or chemicals in the area of the burner. There is a controller unit mounted to the top of the burner that is not designed to survive direct contact with liquids. As a precaution, Forgeworks and Midco International (the manufacturer of the burner) both offer a "weather hood" for the burner. If you did not include one on your order, the Forgeworks version can be installed after the burner is already in service. In the case of the Midco version, a full disconnection of the burner would be required for the install.

In the event of a burner malfunction, the manufacturer of the burner, Midco International will not discuss troubleshooting measures with Forgeworks, nor our end user (customer). Midco requires that the installation of and maintenance of the burner needs to be done by a hired licensed HVAC professional. We do publish a burner troubleshooting guideline, found on our website under "Articles", "Support Documents". Should this guideline not satisfy your needs to get brewing again, please reach out to your licensed HVAC professional.

If by chance the control box mounted to the burner is deemed inoperable, there is a replacement you can purchase. That link and information is on our website under "Articles", "Support Documents".

As you unpack the packaging for the Midco Burner, there is a small kit in a plastic bag that is twist tied to the burner. This bag of parts is the air restrictor kit, manual info on pages 7, 8 & 9. The application of these parts has to do with the firing rate that the burner is set to fire at. The chart/table 3 in the Midco manual, page 7, shows whether or not to install the air restrictor plates based on BTU/H firing rate desired.

The EC200 & EC300 burners are ready to fire on natural gas or LP gas. All EC burners must be set up and adjusted and this is shown in the burner manual (attached) on pages 7 & 8.

The gas valve provided will work with either fuel and no physical changes need to be made to this valve (but set up adjustments need to be made to dial in the needed manifold pressure in order to achieve desired BTU/H firing rate.

Kettle Boil-Over Potential, Boil Over Management and Safety

Each Forgeworks Kettle (since August of 2017) is equipped with a 2" port on the dome lid which is intended to fit up to a Foam Sensor, should the customer exercise the option to install one. Foam Sensors must be purchased directly from a manufacturer or supplier, and will require installation by a licensed professional HVAC company. The unit would be tied into the controller/emergency cutoff, and will shut down the burner in the event of a boil over. If a foam sensor is not being used, a 2" Blind/Cap and Tri-Clamp should be used to close off this port on the Kettle dome. Each Forgeworks Kettle has 40% head space, which is helpful in the prevention of boil overs, but does not in any way ensure an absence of boil over risk. Always keep in mind that the making of certain varieties of beers, and the use of various additions to the boil have their own risk propensity for a boil over. Each brew may be different in terms of risk.

Regardless of whether or not you equip your Kettle with a Foam Sensor, your brewery should implement training and written protocols for Boil Over Safety, which should include boil management techniques such as the use of agents that control foam, like BSG's FermCap Foam Control Anti-Foaming Agent or the equivalent. At all time during a boil, the brewer should have quick access to a water hose/sprayer to knock down any looming boil over. This hose should be secured to the platform in some way, or in the absence of a platform, be assessable in proximity of the kettle, BUT NOT positioned below the Kettle's manway.

A written protocol should include not only the boil over prevention management techniques, but safety precautions such as never standing below the Kettle Manway, always wearing essential PPE, a focus on the kettle during boil (avoiding multi-tasking, phone calls, etc) and quick access to an emergency cut off switch to the burner. Making it known which varieties of Beers have a higher risk propensity is very important. Your staff should also be aware of and versed in first aid for boil over burns, including what not to do. In most cases, emergency room care is best.

Hot Liquor Tank

-Features/Functions

The majority of Brewhouses we build are with the intention of the Hot Liquor Tank (HLT) function to be primarily a holding tank. If your brewhouse is a steam fired system, then your Hot Liquor Tank is also steam fired, so you can disregard the information below, except for the topic of cleaning the HLT. This is also applicable if your HLT happens to be In-Direct Fired. The following is information if your HLT is not steam fired, or In-Direct Fired.

Although the (non-steam fired, or non-Indirect fired) HLT has (3) 2" ports for Electric Immersion Elements, you may never actually have a need to install electric elements on the HLT. These ports can be capped off with a 2" Blind tri-clamp fitting. If you wish to equip the HLT with one or more Electric Immersion Elements, we recommend that among your comparisons of available products, you reach out to Mike McGinnis with Glo-Quartz, mmcginnis@gloquartz.com, 800-423-4078.

We recommend heating your Hot Liquor in your Kettle. As part of a standard Forgeworks brewhouse, the Hot Liquor Tank serves as a storage tank (either insulated or un-insulated), and the Kettle is the workhorse for all the heating. The strategy here is to not have a duplicate piece of equipment....so to speak. A self-heating Hot Liquor Tank (Electric, In-Direct Fire or Steam heated HLT is very close to being a duplicate kettle, thus adds an unnecessary cost at start up for the brewpub business model. In this case, a Forgeworks self-heating and insulated Hot Liquor Tank adds an additional 52-70% (depending on size, 3.5, 5, 7,10) on to the cost of an insulated but non-heated Hot Liquor Tank. Beyond that, there are other costs for numerous electric immersion elements, an additional Natural Gas hook up, or steam hookup

The Flow

Step 1) Our typical brewery customer uses the Kettle for the initial heating of the Hot Liquor, heating the water the afternoon before brew day up to about 180°. The temperature is a bit higher than your strike water target, allowing for temperature loss (overnight).. Before leaving for the night, an included steam stack slide gate on the kettle is closed to retain heat and the kettle is turned off (the slide gate closure does not allow pressure build up....its not an airtight seal). This also helps evaporate off chlorine.

Step 2) First thing in the morning, the kettle is fired back up to gain back any temp loss that is below your target strike temperature, approximately 165°.

Step 3) Then you transfer from the Kettle to the Mash Tun for your strike water on mash in.

Step 4) The Kettle is turned back on to take the temperature up to approximately 185°, then the balance of the Hot Liquor is transferred to an insulated or un-insulated Hot Liquor Tank. The metal of the Hot Liquor Tank is at room temperature, so upon transfer, it will absorb some of the heat. Typically your target temperature for sparge is 178°. Your sparge water is then transferred to the mash tun. We equip our insulated Hot Liquor Tanks with 1-2 Electric Immersion Element ports (2"). You may never need these at all if you heat the Hot Liquor in the Kettle hot enough to put you at or over your target temperature after some heat is absorbed by the metal of the HLT. In a case that for some reason you end up below your target sparge temperature in the HLT, the Electric Immersion Element can be turned on to regain the few degrees that you are lacking.

Step 5) You then transfer your sparge water from the Hot Liquor Tank.

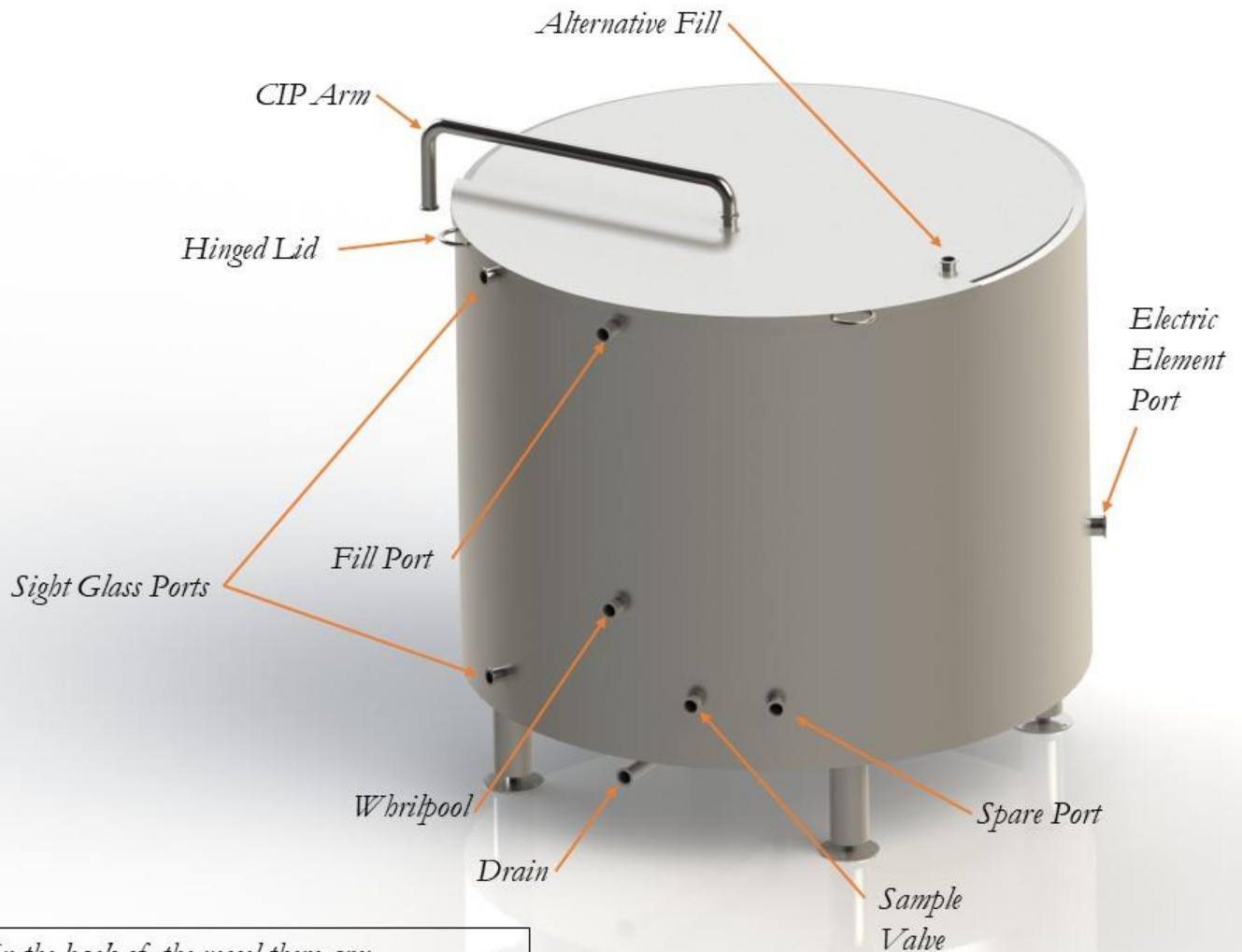
Step 6) On knock out to the fermenter, you can recapture hot water from the Heat Exchanger into the Hot Liquor tank. You now have Hot Liquor for a potential second brew. This can be done with a single sized Hot Liquor Tank. This scenario reduces cost by not having a self heating Hot Liquor tank, which is basically a second kettle minus a few features. When getting into 2x or 3x sized Hot Liquor Tanks, those are typically self-heating (with the exception of a 3.5bbl Brewhouse), and typically those size tanks are heated by Indirect Fire (Natural Gas) or Steam for power consumption efficiency.

Note:

-Forgeworks kettles have 40% head space, so there is extra capacity for more hot liquor than is required for one brew. You can heat extra hot water for cleaning, or a contribution to or all required strike water for a second brew, the balance of which is generated by recapturing hot liquor off of the heat exchanger.

-Down the road with cash flow and an ever-increasing demand on certain beers, you can weigh the practicality of replacing your single sized Hot Liquor Tank with a 2x or 3x sized self heating Hot Liquor Tank. This will better accommodate an increasing number of back-to-back brews (in terms of time savings). As part of your equipment evaluation, considering the supplemental help of a Hot Water on Demand System can be a valid option.

Hot Liquor Tank Features



In the back of the vessel there are:

- *Additional electric element ports*
- *Electric element low-level cutoff switch port*
- *thermowell*

-Cleaning

Let the Brewer Beware, It is common for the Hot Liquor tank to receive far less love than the other tanks in the Brewery. It's just water, right? Many of the typical chemicals used for CIP in the brewery, are not effective on scaling that can take place in the Hot Liquor Tank. As part of your routine preventative maintenance, the hot liquor tank should be thoroughly cleaned and passivated. Every 60 days would be a reasonable routine for this tank. Neglecting to clean the HLT can result in compromises to welds and surface of your stainless steel. For more detailed information concerning the care and cleaning of your HLT, reach out to Dana Johnson with Birko Corporation.

Birko Corporation, Food Safety Solutions, *(Diversey Company)*

Dana Johnson, Technical Director for Craft Brewing

Cell: 720-345-1562

Office: 303-289-1090

E: dana.johnson@diversey.com

<https://www.birkocorp.com/resources/blog/hot-liquor-tank-cleaning-using-birkos-ac-tec-100/#:~:text=Simply%20use%204%2D6%20oz,The%20result%20is%20undeniably%20outstanding>

Pumps

Proper Centrifugal Pump operation includes having your butterfly control valve on the Outlet side of the pump. Having this incorrect, such as the valve being on the inlet side, will cause cavitation. Pumps need to be primed. Best practice to prolong pump life is to have a short inlet hose, and your longer hose sections at the outlet.

Pump Seals will need to be replaced periodically (see below section concerning seals), and the frequency of needed replacement varies. Generally, you can expect seals to last you six months. Carbon seals are appropriate for the Hot Side Operations, (do not use Teflon seals for these functions. Teflon seals are appropriate for Cold Side or Cellar operations. It is a good practice to have both types of seals on hand for reasonably quick replacement should your pump malfunction during a brew day.

You can purchase replacement seals from Dairy Engineering (see contact information below) or from Central States Industrial's Sierra Seals website, SKU #75377, SP41-SK-C.SSI

For specific Centrifugal Pump Questions, Contact Steve Trese at Dairy Engineering, 303-423-2332, stevet@dairyeng.com, the model # is SP41, 1.5 HP.

Many other replacement parts are also available from Sierraseals.com (Central States Industrial)

SP-41 Pump Routine Maintenance

The Stainless Products Model 41 pump is a light to medium duty pump capable of generating 100 gallons per minute flow and 30 PSI when coupled to a high speed motor and 50 gallons per minute and 5 PSI when coupled to a low speed motor. The pump is appropriate for small brewery processes including transferring water and finished beer, pumping wort for mash to kettle as well as finished wort to fermentation through a cooling heat exchanger.

In general, when transferring hot water or wort, the pump should operate at low speed (1750 RPM) while liquid transfer and CIP should operate at high speed (3500 RPM). In order to use the same pump in different operations, the pump can be fitted with a variable frequency drive (VFD) to vary the speed of a high speed motor.

A SP-41 pump configured for small brewery use will typically include the pump head with a 3.75" impeller and a carbon/ceramic shaft seal fitted to a 1 to 2 horsepower white washdown motor attached to a single rail pump cart fabricated by Dairy Engineering. The pump can be controlled with a simple on/off switch, fused soft starter or VFD. All motors and VFDs will be washdown duty and NEMQ 4X rated for use in wet environments. Unless requested otherwise by the customer, VFDs will include an on/off electric disconnect.

Regular cleaning of wetted surfaces of the pump is the most important aspect of regular maintenance. The only user required lubrication is greasing the cart wheels with a general purpose mechanical grease. The motor will not need user lubrication. Special attention should be paid to preventing foreign objects from entering the pump. Though this may seem unlikely, in a busy operation with multiple pump operators, it is not unusual to have nut or bolt or gasket get into a tank that is being cleaned.

The electric components are wet area compatible, but should not be exposed to direct water spray. Best practice is to plug portable pumps into a de-energized switch outlet. If switched outlets are not available, be sure the switch or VFD on the cart are switched off. We recommend VFDs with on/off disconnects as standard equipment. By plugging a VFD into a "hot" power outlet while the VFD is on, damage to the unit can occur.

Some notes on this pump are below.

- The SP-41 shaft seals typically last 6 months to a year depending on frequency of use and care.
- When used on the hot side for pumping wort, the pump needs to be rinsed after pumping wort. The remaining sugars can stick the two halves of the seal together then cause a tear in the elastomers when the pump starts up again. To prevent this, run some hot water through the pump after pumping wort and at end of day, run a chemical cleaning with the pump. You can also rinse the exterior of the seal with a hose just in case some wort has started leaking.
- The other typical problem is running the pump dry. The seals are not flushed with cooling water, so they need to be submerged in liquid (even at 200 degrees) to dissipate friction heat. We don't really see this too often in very small breweries where the owner is the brewer, but once they hire an assistant, they get less life out of the seal as the new guy is overwhelmed and misses a dry running situation.
- Very rarely thermal shock will damage a seal. This happens when going from very hot to very cold quickly. This sometimes happens during CIP.
- Check the pump direction. If the motor is turning backward, the impeller nut can un screw and cause the impeller to rub against the pump cover. This also loosens the tension on the spring. Rotation direction is indicated on the pump. You can change direction of a 3 phases pump by switching 2 hot leads.
- Harsh service "Brewery seal" are offered by SPI.
- Seals currently available are: Teflon/Ceramic (Cold Service) Carbon/Ceramic (Hot Service) and Carbon/Silicon Carbide (harsh service)
- Cavitation occurs when the pressure inside the pump head is lower than the vapor pressure of the liquid being pumped. This occurs locally at parts of the impeller and creates bubbles that form and collapse quickly. The collapsing bubbles damage the metal of the pump interior. Cavitation can be prevented by keeping adequate liquid height on the inlet of the pump to exceed the NPSH published on the pump curve in the included manual. Cavitation can also be prevented by slowing the pump as a tank being emptied is close to empty.
- SPI indicates that the pump can be pumped through by an upstream pump. We don't recommend this as it could lift the seal rotary off the stationary to allow grit in between.

Barley Cracker

The Forgeworks Barley Cracker 1200 will crack your grain at a rate of 1200#'s per hour. Every Forgeworks Barley Cracker is tested, the grain is Assayed, and results of the crush and roller gap recorded before leaving our shop. Our mills are calibrated to specs that according to research, achieve the best efficiencies and flow. This is based on a conveyance of reasonable length, 25' or less. Lengths 25' plus may require additional calibration before shipping to compensate for any additional break down of the grist during conveyance. If your brewery space and specific location of this equipment dictates the conveyance system to make horizontal turns, then you will need to utilize a "chain and disk" type system rather than a "flex auger" system.

The roller position is fixed on the Forgeworks Barley Cracker, and is not meant to be adjustable on the fly. Specific Spacer Plates are installed on your mill to hold the optimal gap for the desired crush. Should you feel your mill needs the calibration changed, contact us at 970-626-2100

For a economical flex auger, we recommend contacting Farmer Boy Ag.

Farmer Boy Ag

<http://www.farmerboyag.com/flex-augers-parts>

Reference Model 350 (3.5" O.D.)

Farmer Boy Contact:

Dan Maulfair, Sales Representative

Email: danm@farmerboyag.com

Direct: 717-866-8248

Safety Precautions

- Follow standard OSHA Lock Out-Tag Out procedure's when an employee is entering a brewery tank for any reason
- Use proper brewing techniques to minimize and control the potential for a Kettle boil over.
- Consider the Installation of a Foam Sensor on your Kettle's Dome Lid. Newer models of the Forgework's Kettle come standard with a Foam Sensor Port, a 2" Tri-Clamp Ferrule fitting. On our website's Articles page, find the "Brewer's Resources" page for (2) Foam Sensor manufacturer's links.
- Have an Emergency Cut-Off Switch for the Kettle Burner (Indirect Fire), Electric Immersion Elements (Electric Kettle), or Steam Control for Steam heated systems.
- Wear appropriate Personal Protection Equipment, including but not limited to safety glasses, long pants over boots (not tucked in), long sleeve shirts and hand protection. See the "Best Management for the Selection of Protective Clothing for Brewery Workers" document on the Brewery Association Website, or see the same information on our Brewer's Resource page on our website, under articles. See boil over safety.

Forgeworks Imported Fermenters, Brights, Lagering Tanks, Bright Serving Tanks

- The Fermenters and Brights we provide are rated at 14.9PSI. Clean and inspect the Pressure Relief Valve after every turn of the vessel (batch of beer), and never pressurize over the rated PSI of 14.9.

IMPROPER USE that may VOID WARRANTY

- Dry Fire on Kettle, or firing below the above described level.
- Excessive moisture or direct spray on Midco Burner Control Box leading to burner malfunction
- Heat Exchanger cleaning and packing to avoid clogging
- In-Frequent cleaning and passivation of HLT, as well as the Kettle and Mash Tun
- Cavitation of the pump and infrequent disassembly for cleaning (pre-mature seal failure)
- The Fermenters and Brights we provide are rated at 14.9PSI. Clean and inspect the Pressure Relief Valve after every turn of the vessel (batch of beer), and never pressurize over the rated PSI.
- If your Mash Lauter Tun is equipped with a Rake and Plow feature, always make sure the False Floor screens are installed correctly with each section fitting-up flat with each other. Inspect before each brew. Any obstruction, such as the screen sections not installed properly will result in potential damage to the rakes, and the screen.
- Using a "cheater bar" or other mechanical device to adjust the attitude of the kettle racking arm can break the lever that adjusts the arm. If the nut that secures the arm is adequately loosened, the arm can be easily adjusted via the lever welded to the outlet tube without any additional leverage.

Thank you for trusting us to build your equipment and provide other ancillary items for your dream job. Serve your patrons well with good tasting beer!

Bennett Forgeworks, Inc

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