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How to Choose a Brewhouse? Four Vessel Brewhouse vs a Three or Two Vessel Brewhouse

Consistently producing high quality beer must be the first goal of any brewer, and the equipment you purchase has to be able to provide that. Before you attempt to decide which is the correct brewhouse configuration for you, you should attempt to define who you want to be. Is your end goal to distribute packaged beer, or do you want to be the neighborhood brewery? To be competitive in the packaged beer market, investing in equipment that maximizes daily production (brews per day) and decreases labor is well worth increased up front cost. If you only intend to brew twice a week, in small lots, that same level of upfront equipment cost is hard to justify.

A typical four-vessel brewhouse will include a Mash tun, Lauter Tun, Kettle and Whirlpool. Each of these tanks is dedicated to performing a single process, and is designed differently than similar vessel used for performing multiple processes.

The Mash Tun in a four-vessel system is a fairly simple tank, but there a few key features. The size of steam jacket and heating surface area is critical for gaining the ability to do step temperature mashing and heat up the whole mash evenly. The other important consideration is achieving an aspect ratio that allows for effective heating and mixing of the mash during heat cycles.

Dedicated Lauter Tuns should be large enough to allow for high efficiency processing of your most commonly brewed recipe, and small enough to get clear wort with your lowest gravity brew. The large diameter of these vessels will help you to keep grain bed depth at the most efficient level for your product offering. Based on the diameter, the Lauter Tun will have an adequate number of draw off ports to evenly drain the mash bed, and an adequate number of sparge spray nozzles to effectively wash the sugar from the grains. A traveling rake is a mandatory requirement for dedicated Lauter Tuns, and allows the brewer to raise the rakes so they only cut into the top of the grain bed. This improves mechanical rinsing and efficiency during sparge without losing clarity. A Fixed height rake in this application would serve very little purpose, as they are ineffective at mixing the grain and they are too low to the screen to use during sparge.

Having a dedicated Kettle allows for use of an internal calandria and is the most efficient kettle design. The internal calandria not only offers improved heating, but also incredible agitation of the wort which drives off unwanted volatiles. A bottom steam jacket is used in conjunction with a calandria, and functions to start heating wort before the kettle is full enough to use the calandria. A low side jacket can be added for less than full batches. The last small but very important detail in the calandria kettle design is a properly sized stack for creating a natural draw to remove all volatiles.

Whirlpools in a four-vessel brewhouse are designed to be significantly wider than the combination vessel alternative. A 2:1 aspect ratio (Diameter to Fluid Depth) is essential for proper trub separation. Higher aspect ratios only improve the wort/trub separation process, and may be required for breweries with heavy hop loads. The addition of a cooling jacket to the Whirlpool allows you to drop the wort to below the DMS formation temperature very quickly, gives you better separation of solids, and can be tied into the HLT for hot water recovery.

The alternative to a four-vessel production based brewhouse with dedicated process tanks, is two and three vessel systems with tanks that perform multiple processes. These combination tanks can be a more affordable way to start a brewery, they take up less floor space, and depending on your production goals, they might be able to last your business a very long time.

Combination Mash Lauter Tuns are the first combination vessel in these smaller brewhouses line ups. This vessel should be sized to favor the Lauter operation, and have the mechanics for mixing mash and graining out. For that reason, this combination vessel will have the diameter and build of a dedicated Lauter, but will have a mixer design similar to a dedicated Mash Tun. There are several designs that incorporate a fixed height (non-traveling) rake system, but the rakes on these systems do a poor job of mixing the Mash and cannot be used during the sparge process. These limitations render the fixed rake system only useful for graining out.

Next inline is the combination of the Kettle and Whirlpool tanks. This combination vessel is designed and sized for being primarily a kettle, but is equipped with a tangential fitting for whirlpooling. These vessels are heated with bottom and side steam jackets. Internal calandria's are typically not used in this application because they are an obstruction to the whirlpooling process. It should also be noted that since the combination Kettle/Whirlpool tank is not as wide as a dedicated Whirlpool, you do not get the same level of trub and hop separation. Other features like hop dams and inline strainers can help reduce these solids, but do not provide the same level of separation as an appropriately sized dedicated Whirlpool.

A three-vessel brewhouse is hybrid system that incorporates at least one combination vessel and two dedicated process vessels. For example, a medium sized brewery with a focus on heavily hopped beers might choose to go with a combination Mash Lauter Tun, a dedicated Kettle, and a dedicated Whirlpool. Whereas, someone focusing on lagers or feeding a distilling operation might go with a dedicated Mash Tun, dedicated Lauter Tun, and a combination Kettle/Whirlpool. Three-vessel systems don't have the same output and versatility as four-vessel systems, but they will still out perform a two-vessel system and provide increased efficiency.

In conclusion, four-vessel systems offer the highest throughput and the most versatility. With proper vessel sizing, well laid out hard piping, and well-designed controls these brewhouses can be extremely large and only require one person to operate it. The ability to make more beer with less labor input, paired with gains in efficiency and quality control make the four-vessel brewhouse a worth while investment for breweries that intend to produce a lot of beer.

Two & Three vessel systems are typically used in brew pub operations or in small brewery operations. They can be very effective in producing good beer, and are a good choice for a cost sensitive customer. Growing past a certain production volume can be more difficult with these

combination tank systems. They will require more labor to operate to achieve higher production and lack the efficiency a four-vessel system has, making it less profitable to more larger volumes of beer.

Whether you feel a two-vessel or the four-vessel system is right for your business plan, the next step is to correctly size the vessels. To do this accurately, it is important to have a firm Idea of the types of beer you wish to produce, and the batch volumes you wish to produce.

NEXT...Read about “how to size brewhouse vessels”