



LEE INDUSTRIES
Processing Perfection™

Going from Small-Scale to Large-Scale Food Processing

How to Choose the Right Production Kettle to Take
Your Food Company to the Next Level





Custom commercial grade production kettles, available in a variety of configurations for mixing and cooking a wide range of food products, help you successfully scale your food processing business while maintaining the highest levels of safety, quality and production.



Whether your company is moving from small, stovetop batches to your first commercial mixing and cooking vessel, or is a growing specialty food company looking to expand to fill new orders from a large retail chain, there are several important factors to consider as you plan for production. Most critical are the choices you make when specifying and selecting your first production kettle. These choices will have the greatest impact in helping you maintain your product's quality as you increase your output, while also ensuring food safety for your customers and safe operation for your production team.

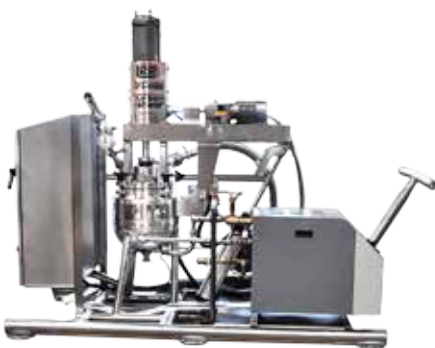
Your First Production Kettle: Carefully Consider Your Options to Successfully Scale Your Process

Since it plays the most important role in maintaining your product's quality, your kettle is the heart of your production operation. A custom commercial grade kettle is a major investment for every food processing operation, and this is especially true for smaller businesses.

A commercial grade kettle is usually custom designed to match your product, your cooking and mixing process and your overall production requirements. Because of this, you must thoroughly consider every characteristic and feature — kettle type, capacity, agitation, heat source and several other options — to select the right kettle for your production and quality goals.

You should know that scaling up your food processing may require you to make important changes to your process. Since cooking and mixing characteristics will be different when making larger batch quantities of your product, your cooking times, temperatures, and mixing speeds and techniques must be carefully determined to maintain product integrity. Address this issue early in your kettle selection process by seeking a kettle manufacturer that can provide you with access to a testing lab. There, you can run sample batches of your product — using kettles and agitators that match the specifications you are considering. This will go a long way to helping you determine the changes that may be necessary to achieve consistent product flavor, character and quality at larger volumes.

Scaling up your food processing may require you to make important changes to your process



Steam or Hot Water Temperature Control Units: A Practical, Cost-Effective Solution for Powering Your First Commercial Grade Production Kettle

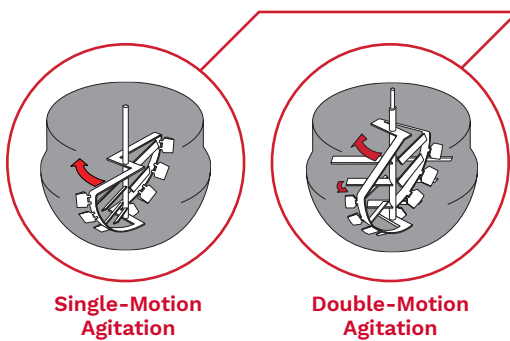
A commercial grade steam/hot water jacketed kettle requires an independent steam or super-heated water supply to heat the kettle for cooking operations. If your facility does not have a boiler system to provide a sufficient supply of steam or hot water, it may be cost prohibitive to install one at this point in your operation. As an alternative, many owners of smaller food processing companies install either an electric (fixed or portable) steam generator or a hot water generator to get the advantages of a steam/hot water jacketed kettle.

A steam or hot water generator can provide enough capability to supply steam or super-heated water to a commercial kettle for a fraction of the cost of a dedicated facility boiler system. Although portable steam generators and hot water units may have output limitations depending on kettle capacity or the number of kettles they can supply, it is sometimes possible for a single steam or hot water generator to supply multiple kettles, enabling you to defer a larger boiler system until the cost can be justified by higher production volumes.

Types of Commercial Grade Kettles

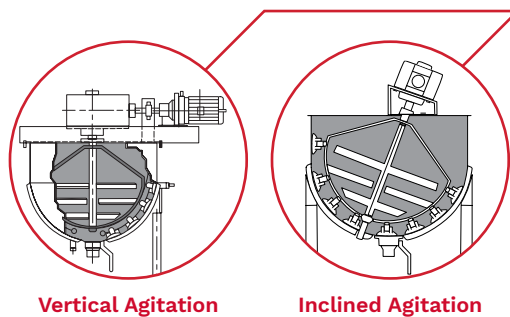
Your first major decision is to choose between the two primary types of production kettles: a steam/hot water-heated jacketed kettle, or a self-contained electric- or natural gas-heated kettle.

1 Steam/hot water jacketed kettles are the standard type of production vessel used across most food processing operations, with capacities ranging from one gallon up to several thousand gallons. They are available in two general mixing configurations:



• **Scraped-surface single or double-motion agitation:**

Kettles having single-motion agitation, using an anchor-style agitator, are used for scraping the jacketed sidewall to prevent burn-on. This style of agitation, combined with an optional auxiliary propeller and/or high-shear mixer, is used for blending liquids and lower-viscosity food products. Double-motion agitation, utilizing both inner and outer agitation arms that turn in opposite directions during operation, is used for mixing higher-viscosity food products, where a thorough top to bottom mix is required.



• **Vertical or inclined agitation:**

Kettles can be specified in either a vertical orientation — with the mixer blades set on a vertical shaft within the kettle — or at an inclined angle. Inclined agitation is recommended whenever a gentle lifting and folding action is needed to process heavy and highly viscous products, such as meat mixes. Kettles with inclined agitation are also preferred for mixing vegetable- or fruit-type products, such as soups, stews and pie fillings because they virtually eliminate the risk of damage to freshly-cut ingredients that must remain intact, and provide thorough gentle mixing for even distribution of particulates.

Steam/hot water jacketed kettles require a dedicated source to provide heating for cooking. If your facility does not have a boiler system for steam, a steam or hot water generator (**see sidebar on page 4**) can be a practical, cost-effective solution for powering your kettle.

2 Self-contained electric/gas kettles use a high voltage, 3-phase electrical connection or a connection to your building's gas line as their heat source for cooking and are available in capacities ranging from 20 to 100 gallons. While some of these types of kettles can be less expensive than steam/hot water kettles, and do not require the additional cost of a boiler system or hot water generator, their features, agitation and process capabilities, capacities and service life are much more limited.

Commercial Grade Steam/Hot Water Jacketed Kettle vs. Self-Contained Electric/Gas Kettle: Which is right for your operation?

While the cost of a steam/hot water jacketed kettle can be higher than a self-contained electric/gas unit, many food processing businesses find it to be a better long-term solution when evaluating the most critical performance factors:

- **Operational performance:**

Steam or super-heated water are excellent economical heat sources for food processing operations, and in some cases are capable of providing faster heating times than electric/gas heated kettles due to highly efficient, scraped-surface agitation that can be included.

- **Configurability to your process:**

Commercial grade steam/hot water jacketed kettles are custom-built to optimize production of your specific food product, whereas electric/gas kettles are only available as standard, “off the shelf” models.

- **Product integrity:**

The mixing units on steam/hot water jacketed kettles are far more robust, customizable and flexible than those found on an electric/gas kettle. Adjustable mixing configurations and higher power and speed have a positive impact on the quality and consistency of your product, especially for challenging mixing processes involving delicate ingredients, meats or high-viscosity ingredients.

- **Production efficiency:**

Greater efficiency through faster heating times may often translate to higher batch production rates. In some cases, the time difference between heating a steam/hot water jacketed kettle and an electric/gas kettle can be enough to produce one or two extra batches per shift, per day — at the same hourly production labor cost. Additionally, since a steam/hot water jacketed kettle can control both heating and cooling in a single production vessel, cold water can be routed to the kettle after the cooking cycle, to further increase production efficiency.

A custom commercial grade steam/hot-water-powered kettle, combined with a hot water generator unit, is often the best choice for many smaller food processing businesses



- **Service life:**

The build quality of a custom commercial grade steam/hot water jacketed kettle is typically far better than that of any self-contained electric/gas unit, with more durable agitator drive units, heavier gauge stainless steel and hand-polished finishes. When properly maintained, these kettles will provide decades of reliable, low-cost service in daily use. Moreover, top-quality steam/hot water jacketed kettles hold their value as a business asset, often selling on the used equipment market for as much or more than their original cost.

Which type of kettle is right for your business? The decision to invest in a self-contained electric/gas kettle or a steam/hot water jacketed kettle (plus a steam or hot water generator if needed), depends on your product type, sales volume and budget, as well as your willingness to invest in the future of your operation. While the decision process is different for each business owner, many opt to leverage the significant production benefits of a commercial grade steam/hot water jacketed kettle to establish the foundation for a successful, long-term, food processing operation.



Determining the Right Kettle Size

The need for additional capacity may be driving your expansion, but your success in scaling operations is dependent on production quality and consistency. Accordingly, it's important to think about how your kettle's capacity can impact product integrity.

The “10X Rule:” One approach commonly used in the food processing industry, called the “10X Rule,” states that, generally, production equipment capacity can be successfully increased by as much as ten times higher than your current equipment's production capacity.

It is important to note that this rule is a general equipment design and configuration guideline for processing higher quantities in a larger kettle, and is no guarantee of consistent results when applied to every type of food product. Since increasing batch size is highly dependent on your product and process, the 10X Rule must always be carefully tested with your own ingredients and recipe to ensure consistent results in larger batch sizes. Since results can be highly variable, you can utilize the Lee testing lab at our facility in Philipsburg, PA at no additional cost to run test batches in a larger kettle to verify the scalability of your process while maintaining consistent high product quality.

Here are typical examples of how the 10X Rule could generally apply to a small food processing operation:

- **From stovetop to first production kettle:**

If you are currently producing your product in a five-gallon kettle on a stovetop, you can generally scale your product's recipe to a 50-gallon production kettle.

- **From first production kettle to larger/multiple kettles:**

If you are already running a ten-gallon kettle, you can often scale up to a 100-gallon kettle and maintain predictable product safety, quality and consistency.

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GOING FROM SMALL-SCALE TO LARGE-SCALE FOOD PROCESSING

- **Increasing batch sizes from larger kettles:**

If you are currently running a 100-gallon kettle, following the 10X Rule means you could theoretically scale your production to a kettle as large as 1,000 gallons. This can be done when producing relatively simple food products such as low-viscosity sauces, but for products that could be crushed or damaged in a larger kettle — like those containing fresh, chunk-like ingredients — a 300- to 600-gallon kettle capacity is usually a better choice for consistent results.

Variations Using Multiple, Smaller Kettles:

Some food processors, especially those producing “home style,” artisanal, clean label and other premium food products, find that using multiple, smaller kettles is the best way to maintain their product’s high quality and consistency, and still increase production rates. For example, if you were expanding production from your current five-gallon stovetop kettle, you could add two 50-gallon kettles, which would enable you to expand your production by 20 times, while safely staying at 10X for each production batch. Again, these production decisions depend on your product and should only be made after careful advance testing of your recipe and process on larger equipment, available at no extra cost at the Lee testing lab.

- To maximize production using this approach, your operator can alternate their work between each kettle. For example, they can load ingredients to start a new batch in a second kettle while a batch is cooking in the first kettle; then unload the cooked, completed batch from the first kettle while the mixing and cooking process starts in the second. This can maximize production while minimizing the extra man-hours required to expand your process. Larger food processing operations can similarly scale up from existing production kettles to multiple additional kettles.



Food processors can use the Lee Industries testing lab to run test batches of product on the equipment they are considering, to assure consistent quality at higher production volumes.

Additional Factors to Consider When Scaling Up Your Production

There are other important aspects to consider when making decisions on how, and how much, to expand the batch processing volume for your product:

- **Production space:**

Is there sufficient floor and floor-to-ceiling space to accommodate your new production kettle? Is the access to your facility, including doorways, large enough to move your kettle into place in your production area?

- **Utilities:**

Is there sufficient electrical capacity available to power the agitator drive unit of your new kettle? Larger kettles with higher-horsepower electric motors may also require three-phase power. Connection to other utilities, such as water lines for kettle cleaning and drainage, steam lines (if the kettle is being connected to your existing boiler system) or other connections (if using a hot water generator) also must be arranged.

- **“Upstream” and “downstream” capacity:**

Installing more or larger capacity kettles also increases the “upstream” capacity required to prepare and load a higher volume of ingredients into each new kettle; and higher capacity may be needed for all “downstream” operations, such as unloading, canning or packaging, and shipping. This may require additional space and equipment to achieve your production goals.

Upgrading to your first commercial grade kettle or adding more kettles to your existing operation is a big step for a small and growing food company. It is critical that you plan for the impact it will have on your entire food processing operation, both in the short-term and over the long haul. A custom commercial kettle manufacturer with experience in the food industry can provide invaluable guidance to help you make the best choices for your business.

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The Support You Need to Make the Right Decisions

Lee Industries offers important services to help your food processing operation scale to the next level:

- **Process consulting and configuration assistance:**
You can tap the extensive experience and know-how of the Lee process engineering team to help you decide on the right kettle, with the right mixing, cooking, safety and production options, to maintain product integrity at higher production volumes.
- **Sample batch processing and testing:**
You can use Lee's on-site testing lab to ensure product quality and consistency before you finalize kettle specifications. Mix, cook and taste-test your own ingredients, using your own recipe, on a production kettle having the same options as the kettle you are currently considering for purchase.

We make these services available to help you eliminate the risks of making expansion decisions. Our goal is to help you reach your new production targets as efficiently as possible, while maintaining the quality of the product that you and your team have worked so hard to achieve.



About Lee Industries

The mission of Lee Industries is to assure our customers are successful by focusing on their custom processing needs and providing them with the highest quality, most durable products and services available.

Lee Industries is committed to the success of your company by providing you with world-class, high-quality stainless alloy process equipment and service. We design and manufacture the most technologically advanced equipment in the industry. Our customer service team, backed by over 80 years of innovation and experience, provides Lee clients with a single source for all their processing system needs.



P.O. Box 688 | Philipsburg, PA 16866
P. (814) 342-0461 | F. (814) 342-5660
www.leeind.com