

# UNIQUELY LEE

The Features That Bring Processing Perfection.



**HEMI**

## **HEMISPHERICAL KETTLE DESIGN**

Intelligent Engineering Improves  
Quality and Consistency in High-Solids  
Food Processing

UNIQUELY LEE:

## Hemispherical Kettle Design

It is a special challenge for food processors to efficiently mix solid ingredients — such as chopped meat, vegetables or fruit — without damaging their freshly cut quality; or to maintain uniform batch consistency when mixing these and other highly viscous products.

In such cases, where products contain solid or particulate ingredients that must remain intact and uniformly distributed throughout the mixing and cooking process, a Lee Industries kettle, with its hemispherical design and specialty agitators can be an optimal solution.

A Lee hemispherical-bottom kettle is engineered to prevent damage to high-value ingredients, assures consistent batch-to-batch quality and eliminates the problems that occur when processing these products in vertical cone-bottom tanks.



The physical design of the vertical tank makes it difficult to prevent damage to solid ingredients, and to assure even consistency in the finished batch.

### Drawbacks to Using Vertical Tanks

Vertical tanks, with standard agitation systems, are commonly used in high-volume processing operations for mixing and processing products having uniform consistencies, such as ketchup, tomato sauce or soup base.

**There are several drawbacks to using vertical tanks when mixing products containing fresh, chunk-like food ingredients** that must remain undamaged and evenly distributed during the mixing and cooking process:

#### **Vertical Tank Drawback #1**

##### **Uneven ingredient distribution:**

Because of the vertical tank's tall, narrow shape, the agitators in these tanks can only be positioned vertically, and rotation is confined to a 90-degree angle relative to the tank wall. This limits options for keeping chunk-like ingredients circulating uniformly during processing. The tall, narrow shape of the vertical tank also causes gravity and pressure to push heavier solid ingredients to the bottom of the tank, making it more difficult to assure even and consistent distribution when the finished batch is transferred from the tank to filling equipment.

#### **Vertical Tank Drawback #2**

##### **Damage to ingredients:**

During mixing operations in vertical tanks, the heavier ingredients in the batch tend to move to the bottom, where the weight of the large mass of water and other ingredients higher in the tank can compress or break down the more delicate, chunk-like food ingredients at the bottom of the tank. Damaging these high-value ingredients in any batch process obviously has a negative impact on overall product quality.

#### **Vertical Tank Drawback #3**

##### **Clumping of ingredients at tank bottom:**

Cone-bottom and other bottom designs of vertical tanks are susceptible to ingredients pooling and clumping at the bottom of the tank into the outlet ferrule or around the agitator shaft. This is another consequence of both the weight of the batch pushing particulate ingredients to the bottom of the tank and limited agitation options. This can cause batch consistency problems when the product is discharged from the bottom of the tank. The first draw of the product batch may contain too many particulate ingredients, and portions higher up in the tank may contain too few of these ingredients.

## Cone-Bottom Vertical Tank Vs. Lee Hemispherical Kettle Design

### Vertical Tank Drawback #4

#### Limited mixing action and incomplete scraper blade coverage:

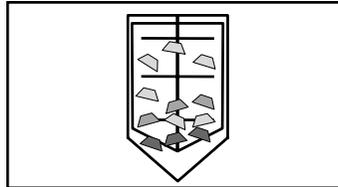
Cone-bottom vertical tanks have "dead zones" around the cone bottom where the agitator and its scraper blades cannot reach. Adjustments to the agitator, such as increasing its speed, may or may not solve this problem, and can cause damage to the particulates.

### Advantages of Hemispherical Kettle Design Combined with Inclined Agitation

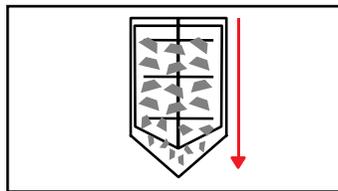
To meet the challenges of mixing products containing freshly cut, chunk-like ingredients — or similar higher-viscosity mixing applications, such as meat or high-particulate soup or salsa products — the hemispherical design of Lee kettles, combined with inclined, single- and double-motion agitation (available in 22.5-, 30- and 45-degree incline options), provides these advantages over vertical tanks:

**(continued on page 6)**

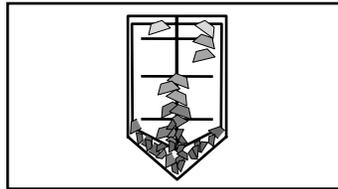
#### Vertical Tank



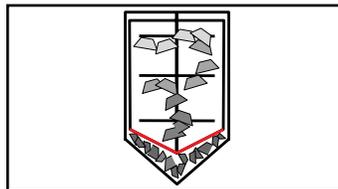
**Uneven Ingredient Distribution** due to vertical tank shape and limited mixing action



**Ingredient Damage** due to gravity and fluid pressure of batch liquids

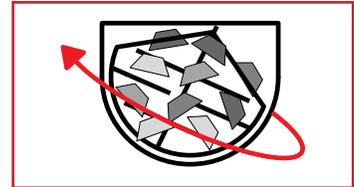


**Pooling and Clumping of Ingredients** at bottom of tank and around agitator shaft due to limited ingredient flow path

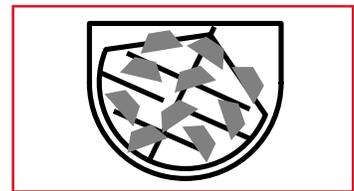


**Inconsistent Mixing and Dead Zones** due to inability of agitator to fully reach cone bottom area

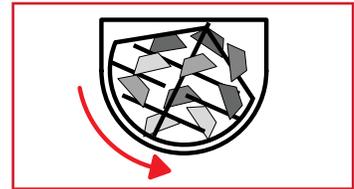
#### Lee Kettle



**Ingredients Evenly Distributed** due to efficient lifting and folding action of inclined, double-motion agitation



**Ingredients Remain Intact** due to shallower kettle shape and gentler inclined mixing action



**Ingredients Thoroughly Mixed** due to sloped kettle sides and natural flow path to bottom discharge outlet



**Total Blending of Ingredients** due to agitator arms and scraper blades closely following the entire interior of kettle surface

## HEMISPHERICAL KETTLE DESIGN

### Lee Kettle Features: Assuring Quality and Consistency in Challenging, High-Solids Mixing Applications

#### Hemispherical Kettle Design

Shallow height prevents pressure damage to high-value, chunk-like ingredients in the batch; large, curved kettle shape provides a natural flow path to the discharge outlet, with no dead zones or clumping of ingredients at the bottom of the kettle.

#### Inclined Agitation

Inclined agitator position (available in 22.5-, 30-, and 45-degree incline options) provides a unique mixing option that blends and folds solid, chunk-like ingredients into the batch, keeping these ingredients intact and assuring uniform consistency.

#### Double-Motion Agitation

Counter-rotating, scrape-surface blade, available in double-motion agitation models, provides a gentle lifting and folding action, to blend and move chunk-like solids or highly viscous materials from the bottom to the top of the kettle, assuring thorough, efficient mixing and uniform consistency.

#### Total Coverage Agitation

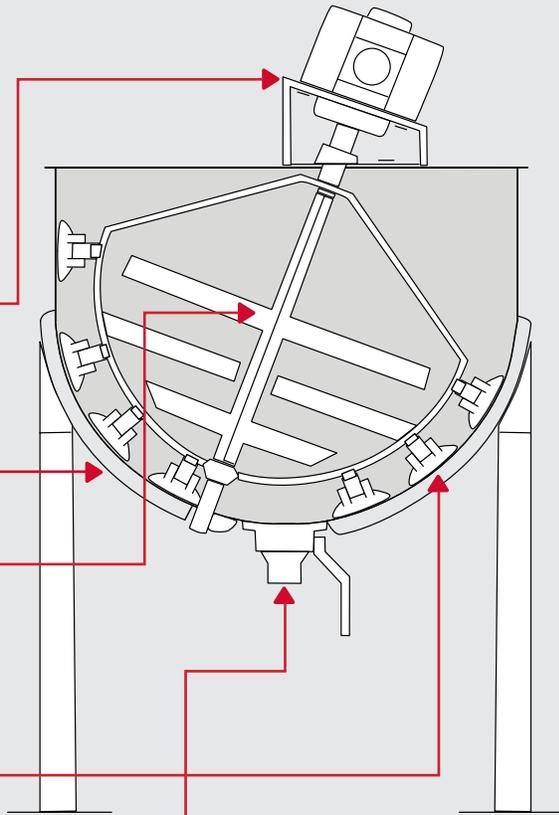
Agitator conforms perfectly to the hemisphere profile of the Lee kettle, and is fitted with multiple scraper blades to fully scrape the surface and move product from the kettle surface during processing, assuring a complete, trouble-free mixing process.

#### Discharge Outlet

Sanitary ball valve is fitted directly to the kettle bottom, with no dead zones where ingredients can collect, and providing for efficient, gravity-assisted discharge for transfer of the finished batch.

#### Tilt-Out Agitator Lift for Vertical Agitators

Tilt-out agitator assembly, mounted on solid, hinged support, can be hydraulically raised above the kettle to provide safe and easy access for cleaning and maintenance.



### **Hemispherical Kettle Advantage #1**

#### **Design that prevents damage to ingredients:**

Compared to taller vertical tanks, there is less downward batch pressure exerted on ingredients in shallower hemispherical kettles. Moreover, an inclined Lee agitator enables gentle action that lifts and turns meat chunks, potatoes, tomatoes, beans, vegetables, fruit slices or other key product ingredients from the bottom of the kettle to the top.

### **Hemispherical Kettle Advantage #2**

#### **Hemisphere profile eliminates dead zones for complete and consistent mixing of ingredients:**

Agitator blades and scrapers in the Lee kettle perfectly match and follow the hemispherical profile of the kettle's curved sidewall, so that ingredients are constantly and uniformly circulated from the kettle's interior surface, with no dead zones. The curved sidewall of the kettle also provides a natural path for the batch to flow to the bottom outlet of the kettle, for more efficient batch unloading and transfer. In addition, Lee's unique on-center scraping system maximizes scraping of the jacketed area and aids in draining the kettle, maximizing product yield.

### **Hemispherical Kettle Advantage #3**

#### **Tilt-out agitator makes cleaning and maintenance easy:**

Unlike vertical tank agitators, which must be lifted straight out from the tank for cleaning and service, requiring substantial extra headroom, many agitators in Lee hemispherical-bottom kettles can be readily tilted up and away from the kettle body, for easy cleaning and maintenance.

## **Vertical Tank Vs. Hemispherical Kettle: Additional Factors to Consider**

While there are clear advantages to Lee hemispherical kettles over conventional vertical tank designs, the final aspect of the decision to choose a kettle depends on these factors:

#### **Product type:**

Vertical tanks can work well when high-quantity output and mass production is needed for lower-viscosity products (such as ketchup or similar sauce products), and where ingredients are combined into a uniform consistency.

## HEMISPHERICAL KETTLE DESIGN

### **Ingredient requirements:**

For products where care must be taken to prevent damage to freshly cut, chunk-like solid ingredients during batch processing, kettles have clear advantages over vertical tanks. Lee hemispherical kettles combined with inclined agitation — which is **not** available on vertical tanks — provide a significant benefit in preserving these ingredients during cooking and mixing.

### **Production style:**

Because kettle-based processing preserves freshly cut ingredients better than other production vessels, it is the ideal choice for mixing and cooking premium artisan or clean-label food products, where extraordinary care is given to preparing, mixing and cooking each batch.

### **Production capacity:**

When the advantages of kettle-based processing are desired but high quantity output is still required, multiple kettles can be installed to match the higher production capacity of vertical tanks.

## Checklist: Are Hemispherical Kettles a Good Fit for Your Product and Your Process?

**The following are key indicators for using hemispherical kettles, often combined with inclined agitation, in your process:**

- Is there a need to preserve the solid, chunky consistency of key ingredients, such as meat, tomatoes, vegetables, etc.?
- Does the complexity of your product require that it be made in smaller batches, to assure high quality and consistency?
- Are you producing a high-end food product with “homemade” “garden fresh,” or artisan qualities?
- Does your process require special care in mixing, such as a folding or lifting action?
- Is batch consistency an issue? Must ingredients be mixed uniformly throughout the batch prior to discharge or transfer?
- Are you processing certain high-viscosity products, such as meat or flour mixes, where product balling, clumping or incomplete mixing is an issue?
- Are you processing thick ingredients, where the scraper blades of the agitator must make full contact with the entire sidewall of the vessel?



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