

OAK SOLUTIONS GROUP  
INNOVATION ZONE

*Welcome!*



We are thrilled to have the opportunity to give you a behind-the-scenes tour of Oak Solutions Group as we take you on a journey through the Ozark forest, our stave mill and our cooperage.

# OAK FOREST FACTS

## American Forest



- Presently, one-third of Missouri is comprised of forest – approx. **14 million acres**. This is a gain of over one million forested acres in the last 20 years.
- **White oak accounts for approximately 27% of the oak-hickory forest in Missouri.** The most common method of harvesting white oak is selection cutting, which removes only the mature, merchantable trees.
- Our log procurement team works with over **4,000 active log suppliers** to locate the best material available.

## French Forest

- The size of the **French oak forest is 1.5 million hectares**, 55% of which is covered by oak trees while the rest is made up of beech, ash, fir, spruce and other species.
- **75% of the forest is owned by the French Government** and is managed by the ONF (Office National des Forêts).
- There are **four main forest management methods** in France, including Futaie Reguliere, which is the ideal method for growing tall, straight oak trees for cooperage.
- **French forest management started in the era of Louis XIV.** He tasked Prime Minister Colbert with growing tall, straight oak trees to build ships to compete with the British Naval fleet.



# FOREST SUSTAINABILITY

## Harvesting Trees Improves Forest Health

Research tells us harvesting mature trees helps renew the forest and therefore is essential to keeping forests healthy. The key is to harvest trees in a sustainable manner. Here are several benefits of harvesting:

- Removing trees **creates more room for the remaining trees**, releasing them to grow with more sunlight and moisture available. This is especially important for oaks, as they require lots of sunlight to grow well.
- Thinning a forest can **improve the availability of food for wildlife**. Remaining trees tend to be more vigorous and thus usually produce more seeds and nuts.
- Trees in a healthy, growing forest store carbon, which helps **reduce the impact of the greenhouse effect**.



## We Have a Continuing Commitment to Sustainability

By **utilizing nearly 100% of each oak log** for staves (to make oak barrels) as well as oak chips and mulch, Independent Stave Company operates one of the most sustainable, environmentally conscious cooperages in the world.



# SALEM MILL

Our company-owned stave mill **purchases and receives white oak logs daily.** Our skilled log procurement team inspects each log prior to purchase and only selects cooperage quality logs that meet our high standards. Once scaled for purchase, logs are each tagged with a barcode that contains information on the size, grain characteristics, and overall quality of that specific log.

For oak alternatives, **we source the same high-quality white oak for our products.** However, as our products do not need to be cut to prevent leaking, they are milled with various suppliers in the region. They are flat sawn and sent to our production team for seasoning.

## Stave-Making Process

When ready for processing, logs are debarked and begin the process of becoming rough staves. Below are the steps you will see during the tour of Salem Mill.

- Debarker / Optimizer
- Log Cut-up
- Splitter
- Quarter Bolt Line
- Resaw
- Grading Area
- Cutoff Saw
- White Wood Edger
- Heart Edger
- Stacking Line
- Quality Control Center
- Shipping Dock



# MISSOURI COOPERAGE

## Seasoning

- We maintain a large inventory of seasoned wood to meet customer demand. At any time, we have enough inventory to craft **more than 250,000 wine barrels**. It's a significant investment we make every year to build for the future.
- Our French, American and European oak season naturally in optimal climates in Missouri or at our stave mill in Monthureux-sur-Saone. Natural elements facilitate changes to oak chemistry and result in added **elegance and a softer oak profile**.

## Barrel-Making Process

After seasoning, the oak staves go through many processes on the way to becoming barrels. Below are the steps you will see during the tour of Missouri Cooperage.

- Heading
- Equalizer, planer, jointer
- Motion picture
- Barrel raising
- Bending
- Toasting
- Barrel Profiling
- Crozing
- Hoops & Rivets
- Quality Control

## Toasting

Each barrel is toasted within rigorous specifications to ensure consistent flavors. During toasting, oak compounds break down, releasing desirable aromas, flavors and color. We offer two toasting methods, **traditional fire toasting and infrared toasting**.





## OAK SOLUTIONS GROUP

Oak Solutions Group is an innovative company crafting premium oak alternatives for the world's winemakers and distillers. We produce a wide range of French and American oak alternatives.

These ēvOAK products are now utilized by **winemakers and distillers in more than 40 countries around the world.**



# OAK SOLUTIONS GROUP

## Oak Alternative Process

Once the wood has been naturally seasoned, we begin production of tank staves at the saw line. The wood is cut into stave-length pieces and any defects are removed. Each piece is then planed to ensure a smooth wood surface, resulting in a finished untoasted tank stave.

**Oak alternatives are toasted using a wide range of technology not employed by traditional cooperage.** These products can be toasted for a longer period, and on all sides. This makes the overall impact of toasting more significant, and results in an ever-increasing range of flavors.

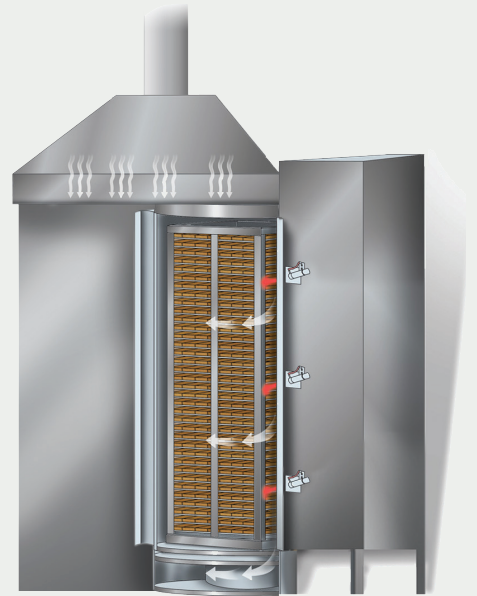
## Three Types of Tank Stave Toasting Techniques

### 1. Convection

This toasting process is similar to the oven you would find in your home or a commercial bakery.

Oak products are placed in a closed chamber, and hot air is continually circulated to heat them, transferring heat to the core. **The end result is a uniform, consistent toast;** the exterior and interior of the wood will be toasted identically. Once tank staves are loaded into the oven, an operator selects the desired toast.

The toasting process is controlled by a computer system following the “recipe” of toasting temperature and duration. Everything is pre-programmed so each batch has the same flavor profile day to day.



# OAK SOLUTIONS GROUP

## Three Types of Tank Stave Toasting Techniques

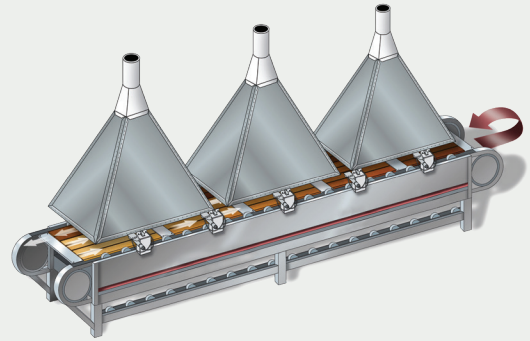
### 2. Infrared

The infrared toasting process has the same effect as grilling a steak.

A heat source radiates heat directly onto the surface of the oak. Consequently, this method does not penetrate as deeply as convection toasting. **Instead, there is a gradient of**

**toast, conveying different nuances from the surface to the center of the alternative.** The combination of these properties creates a unique, complex end result.

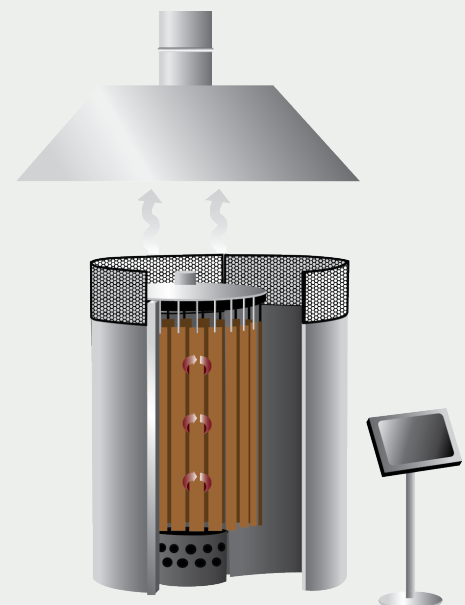
To execute the toast, an operator lays a tank stave on the conveyor, which passes under the infrared heating element. The operator selects recipes for our Latitude series, or sets the time and temperature needed for other classic recipes.



### 3. Fire

Fire is a unique cooking method, as modern as it is ancient. Despite its long history, using fire to consistently achieve a desired target isn't always easy to accomplish.

For this reason, **our team developed a proprietary fire toast system that is customized for tank staves to achieve extreme precision.** This system features state-of-the-art technology that closely controls the thermodynamics, ensuring a consistent and accurate toast across the length of each stave and for every batch toasted.





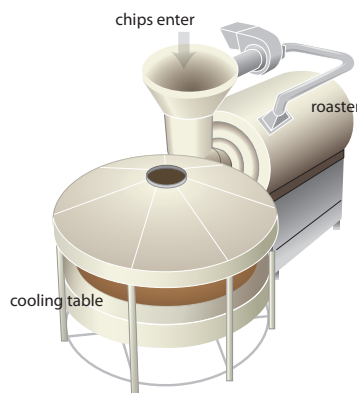
# OAK SOLUTIONS GROUP

## Chips Toasting Techniques

### Batch Roasters

Our roasters are used for toasting cubes, chips and many custom products. **This convection-based process offers precise control during production to change temperatures throughout the toasting process.** Only a limited volume, i.e. smaller total mass, can be toasted at one time, allowing for instant changes in temperature. The batch process enables us to create a wide range of recipes, significantly expanding a winemaker's list of options. While resulting products may cost more per unit due to the limited number of batches that can be produced each day, this does not necessarily mean they are more expensive. These products offer a high overall flavor impact, and often less total volume is required to achieve the desired result.

This technology is used to produce our classic oak chips. Using a continuous toasting process, we can create the oak character sought after by winemakers to create a foundation in wine. While perhaps less intense due to limited residence time (length of toasting) and the inability to change temperature quickly, the resulting flavors are very consistent and reproducible.



### Packaging

All ēvOAK oak alternatives are carefully packaged to ensure freshness. Packaging materials are free from contaminants of any type, maintaining the food-grade quality of our products.

### Traceability

- Each product is clearly labeled to indicate the product name, wood type and selected toast.
- Products also have a batch tag to allow us to trace the product back through the entire process (i.e. wood origin, date produced, which OSG technicians facilitated its production)

### Quality Control

Oak Solutions Group has quality control personnel devoted solely to monitoring production of our oak alternatives. A technician will pull random samples to look for any irregularities and ultimately ensure we are creating a consistent product from the raw product to final packaging.



# OAK 101

## Oak: The Wood of Choice

- The physical structure of oak makes it an excellent choice for crafting **liquid-tight containers**.
- Oak's chemical complexity offers a multitude of options for creating different flavors while also benefiting a wine's color, mouthfeel and tannin structure.
- Three oak sources for wine barrels:
  - French (Quercus petraea or Quercus sessiliflora)
  - European (Quercus robur)
  - American (Quercus alba)

## Physiology of Oak

Oak structure is unique, possessing an **unusually large cell structure that sets it apart** from most hardwoods and plays an important role in wine maturation.

## Growth Rings

- There are **two distinct bands of growth every year** – the earlywood and the latewood. The earlywood is more porous, therefore the oak extractives are more accessible.

## Radial Rays

- Radial rays run from the center of the tree to the exterior and **act as a semi-permeable barrier to liquid**. They are packed with tannins which benefit wine flavor and mouthfeel. They are also a source of vanillin-rich lignin.

## Tyloses

- These balloon-like cells develop during the transformation of sapwood to heartwood. **Tyloses clog the wood pores**, thereby helping to create liquid-tight barrels.
- Also, tyloses are an **easily accessible source of oak extractives**. Their lignin is particularly vanillin-rich, and they contain tannins that migrate from radial rays when the growth rings in the oak convert from sapwood to heartwood.



# OAK IOI

## Oak Chemistry

There are four key components of oak called “oak constituents” and they influence wine and spirits in the following ways:

### Cellulose

- Minimal direct flavor effect
- Transports extractives

### Oak Tannins

- Removal of off-notes
- Subtraction (e.g. vegetal)
- Production of astringency
- Promotion of oxidation products
- Color

### Lignin

- Color
- Increase in blended complexity
- Production of vanilla
- Removal of off-notes
- Subtraction (e.g. vegetal)

### Hemicellulose

- Wood sugars (“body”)
- Toasty characters
- Carmelization Products
- Color

