

comparison of heat sources on tank staves

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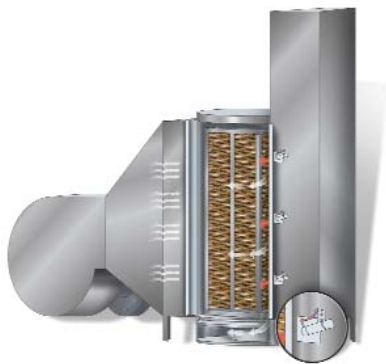


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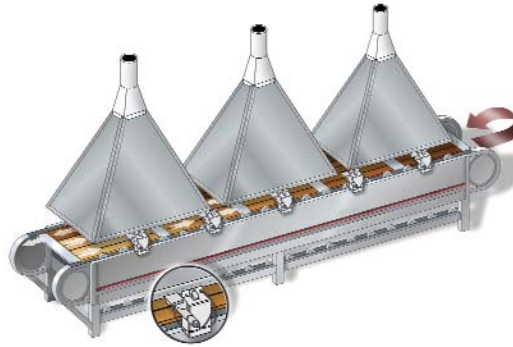


INTRODUCTION

Heat is a form of energy. There are three types of heat: conduction, convection, and radiation. Conduction occurs between solids, for example through house walls. Convection is similar but occurs between gases and liquids and/or solids, for example when a cake is baked in an oven. Radiated heat is very different. The objects transferring energy do not need to come in contact with each other. The heat is transferred in waves rather than in the random motion of molecules.



Convection Toasting



Infrared Toasting

Both radiant and convection heat are found in oak fires used for toasting barrels, but can be difficult to control. Unlike toasting a barrel, tank stave toasting offers an opportunity to select and control the heat source. The company offers both convection toasted tank staves and infrared toasted tank staves.

The aim of this experiment by Beaulieu Vineyard and Rosemount Estates was to compare and contrast tank staves produced by infrared, fixed wavelength heat (i.e. radiant) to convection heat from oven toasting.

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beaulieu vineyard

RESULTS

On 10/06/00, Carneros Chardonnay filled drums 60-77 plus two control-drums (drums 8 and 24) on BB05-1. The same juice was used to fill the toasting technique experiment. Lab analysis at this time:

Date	F/TSO2	pH	TiA	Brix	Malic	RS	Alc
10/06/00	12	3.36	0.71	23.5	265		
11/27/00					171	.064	
12/05/00					165	Dry	
02/01/01	27/52	3.52	0.56		20		14.30

THE WINE

Producer: Beaulieu Vineyard

Year: 2000

Variety: Chardonnay

OAK DATA

Source: French oak

Wood Age: 24 month

TRIAL EXECUTION

Sample Size: Three 55 gallon drums of each variable

Nine tank staves inserted into each drum

THE TRIAL

Infrared, Medium toast

Infrared, Heavy toast

Convection, House toast

Convection, Short time/High temperature (not tasted)

Convection, Extended time/Low temperature (not tasted)

Control (not tasted)

rosemount estates

THE WINE

Variety: Shiraz

OAK DATA

Source: French oak

Wood Age: 24 months

THE TRIAL

Convection

Infrared, Medium toast

Infrared, Heavy toast

RESULTS AND DISCUSSION

Sensory Analysis

At the tasting session in March 2001, the Beaulieu Vineyard wines were tasted. Winemakers were split into two camps. Either they preferred the new infrared toasting method, shown by scoring both samples of wine made with the infrared staves higher than the standard convection toasting method, or they preferred the convection method, indicated by scoring both the infrared samples lower than the convection method. Those that liked the infrared staves said that there was less direct oak flavor, creating a more austere wine. Those that did not like the infrared staves as much did so for much the same reason, describing the wine as not having much toasty oak character.

Chemical Analysis

Chemical analysis showed that in the Beaulieu Vineyard samples the wines made with the conventional convection oven were indeed more “toasty” than the infrared samples. Figure 1 shows the convection house toast produced the most caramelized sugars, while both infrared samples produced the least. The same was true for the vanillin flavored compounds derived from oak lignin. This would give the wine a sweet toasted oak character.

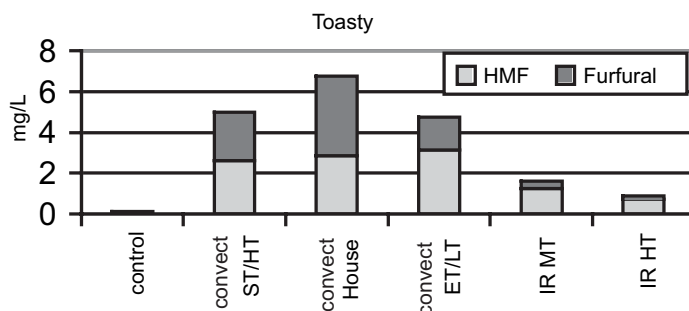


Figure 1: Caramelized sugars in Chardonnay wine

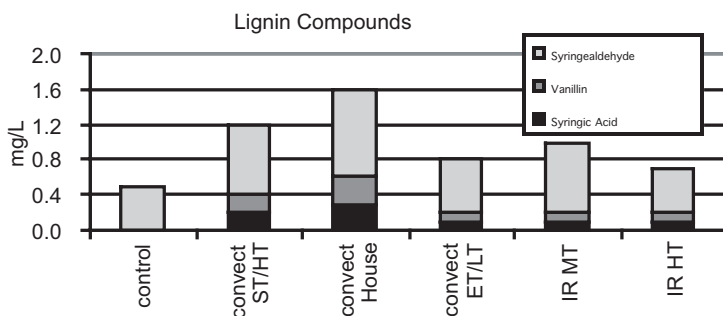
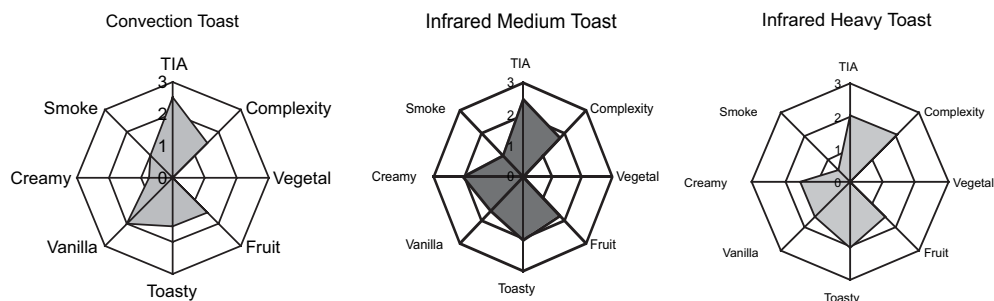


Figure 2: Lignin compounds in Chardonnay wine

Sensory analysis was carried out on the Rosemount wines in our laboratories. Figures 3 through 5 compare the company's standard convection toasting to the infrared medium and heavy toast. The infrared samples scored higher in creaminess and toastiness.



Figures 3-5: Descriptive sensory charts for wines made with convection, infrared medium, and infrared heavy toast staves

The chemical analysis showed the infrared samples did contain more sugar caramelization products than the convection samples. In fact, when compared with other standard toast regimes (low temperature for extended time and high temperature for short time), the infrared samples contained more than they all did (see Figure 6).

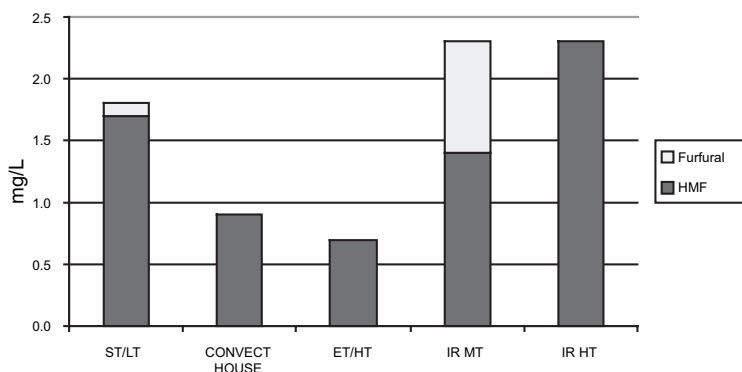


Figure 6: Smoke compounds in Cabernet Sauvignon wine.

The lignin and smoke analysis did not show much difference amongst the samples.

The infrared toasting process is a highly controllable process, so low production of caramelized sugars could be achieved with a different toasting protocol (see Beaulieu Vineyard above). Lactones were not produced in any greater abundance than the conventional process (see Table 1).

Table 1: 3 methyl g octalactone present in wines
Lactone (*cis +trans*)

Rosemount Estates	
Control	0.040
Convection short time, high temp	0.218
Convection house toast	0.324
Convection extended time, low temp	0.551
IR MT	0.511
IR HT	0.317
Beaulieu Vineyard	
Control	0.030
Convection short time, high temp	0.204
Convection house toast	0.122
Convection extended time, low temp	0.251
IR M/T	0.144
IR MT	0.22

CONCLUSION

The company offers convection toasted staves and infrared tank staves. The convection oven toasted staves have been the standard for many years. The new infrared toasting method offers greater temperature control in the wood. In the two presented trials, the toasting protocols were refined to match the winemaker's requirements. In the infrared toasting method, refinement to precise requirements is easier than with previous methods.

TASTING RESULTS FOR BEAULIEU VINEYARD

	Winemaker	Other	Overall
1st Choice			
Infrared, Medium Toast	48%	54%	51%
Infrared, Heavy Toast	37%	19%	27%
Convection, House Toast	15%	28%	21%
2nd Choice			
Infrared, Medium Toast	36%	29%	31%
Infrared, Heavy Toast	27%	57%	41%
Convection, House Toast	38%	14%	27%

TASTING RESULTS FOR ROSEMOUNT ESTATES

	Winemaker	Other	Overall
1st Choice			
Infrared, Medium Toast	22%	25%	26%
Infrared, Heavy Toast	49%	47%	48%
Convection, House Toast	22%	24%	20%
Control	7%	4%	4%
2nd Choice			
Infrared, Medium Toast	48%	29%	37%
Infrared, Heavy Toast	24%	35%	30%
Convection, House Toast	17%	31%	23%
Control	11%	4%	8%