Keeping it simple

What monks can teach us about brewing

“Two of the pale malts, two of the sugars, two hop varieties, two yeast strains . . . two of this and two of that . . . we like to keep it simple.”

- Brother Antoine

Jamil Zainasheff's Dark Strong grain bill

Pilnser malt	62.2%
Munich malt	10.8%
Wheat malt	2.7%
Aromatic malt	5.4%
CaraMunich malt	5.4%
Special "B"	5.4%
Melanoidan	2.7%
Cane sugar	5.4%

“You know, if there were a secret, it is to be found in our attitude towards life, in our relation with God and with nature. We believe that everything growing on the field or in nature — and what you brew out of it — is not merchandise but a gift.”

- Brother Pierre

Keep it to one page	
Targets	
Grains	
Sugar	
Mashing schedule	
Hops	
Yeast	
Fermentation	
Lagering	
Packaging	

We’re talking about

Category 18 - Belgian Strong Ale

‘Trappist’ (on the other hand) is not a style

Three hallmarks of these beers

* Attenuation/digestibility
* Sugar
* Refermentation in bottle

Fermentables

- Pilsner malt
- Kilned malts

Percentage of sugar in recipe (estimates)

- Achel 15%
- Orval 16%
- Duvel 17%
- Westmalle 15-20%
- Westvleteren 20%-plus

So simple it fits on one page	
Targets	1.064 OG, 1.008 FG, 7.4% ABV
Grains	80% Castle Pils, 8% Caramunich
Sugar	7% Dark Candi Syrup, 5% table sugar
Mashing schedule	
Hops	
Yeast	
Fermentation	
Lagering	
Packaging	

Mashing schedule

The Trappist breweries and many other Belgian producers of the styles follow a regimen close to that suggested by Jean De Clerck in *A Textbook of Brewing.*

Brewery Ommegang: begins at 113° F (45° C) for 15 minutes
raised to 144° F (62° C) for 35 minutes
raised to 158° F (70° C) for 25 minutes
raised to 172° F (78° C) for 5 minutes

Single step: conversion at 146° F (63° C)
don’t mash off hot (163° F/73° C)

Beer	Gravity	AA	ABV
Achel Blond 8	1.078 (18.9 °P)	84%	8.9%
Chimay Red	1.061 (14.9 °P)	88%	7.1%
Chimay Blue	1.077 (18.7 °P)	89%	9%
Duvel	1.069 (16.9 °P)	93%	8.4%
Orval	1.055 (13.6 °P)	94%	6.8%
Rochefort 8	1.078 (19 °P)	90%	9.2%
Westmalle Dubbel	1.064 (15.6 °P)	87%	7.3%
Westmalle Tripel	1.081 (19.6 °P)	88%	9.6%
Westveleteren 12	1.090 (21.5 °P)	86%	10.2%


SAAZLAAN


Kentlaan

Keep it to one page	
Targets	1.064 OG, 1.008 FG, 7.4% ABV
Grains	80% Castle Pils, 8% Caramunich
Sugar	7% Dark Candi Syrup, 5% table sugar
Mashing schedule	146° F
Hops	Styrian Golding, 22 IBU, all first wort
Yeast	
Fermentation	
Lagering	
Packaging	

Fermentation character

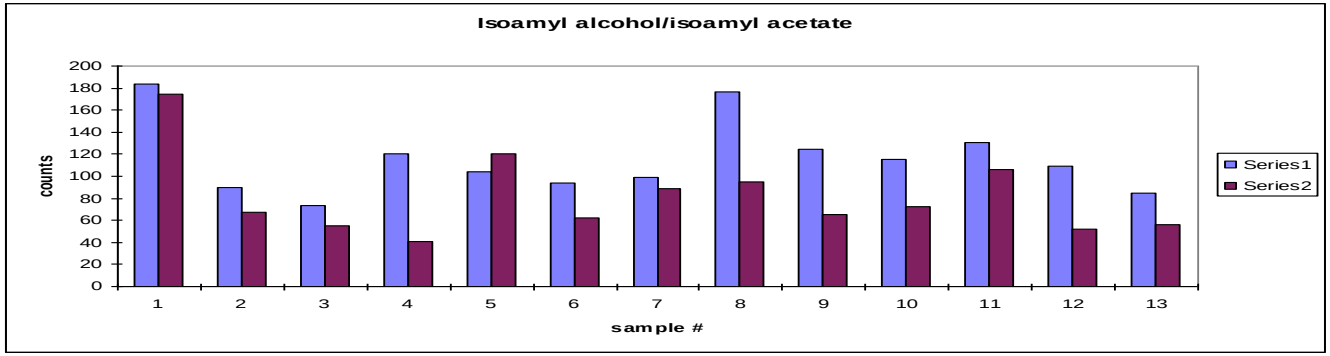
Good: Fruity, spicy, complex aromas and flavors. Pears, bananas, apples, tangerines, oranges, and strawberries; raisins, plums, figs, and prunes in beers that include darker malts and/or sugars. Peppery, perfumy characteristics. A combination esters, phenols, “mature” higher alcohols.

Not good: Some esters, such ethyl acetate (solventy, like nail polish remover), even desirable ones (isoamyl acetate) in excess. Fusel alcohols (solventlike).

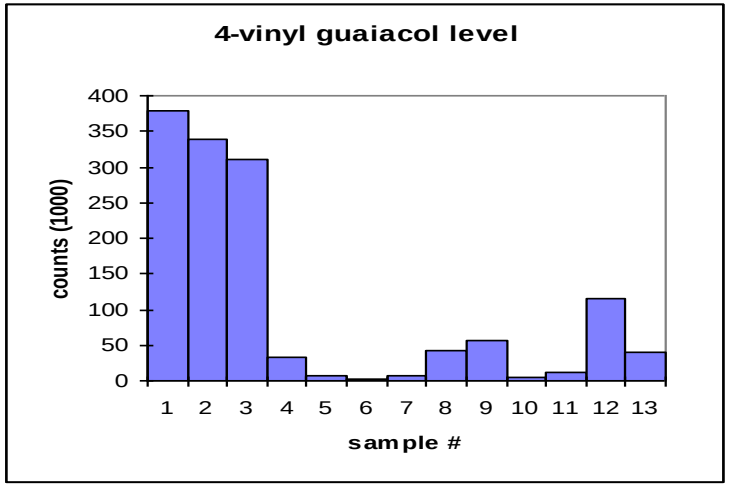
The variables

Higher alcohol production by yeast is directly correlated with the amount of yeast growth during fermentation. Yeast growth promotes higher alcohol production and inhibits ester production. It depends on many factors, including original gravity, fermentation temperature, fermentation tank geomtery, and pitching rate.

Wyeast Strain	Source
1214 Belgian Ale	Chimay
3787 Belgian High Gravity	Westmalle
3522 Belgian Ardennes	Achouffe
3333 German Wheat	Weihenstephan
3068 Weihenstephan	Weihenstephan (68)
1010 American Wheat	Widmer
1762 Belgian Abbey	Rochefort
3463 Forbidden Fruit	Hoegaarden
3942 Belgian Wheat	De Dolle
3944 Belgian Wit	Hoegaarden Wit
3638 Bavarian Wheat	Weihenstephan
3864 Canadian Belgian	Unibroue
3538 Leuven Pale Ale	Corsendonk



#	yeast type	isoamyl acetate normalized	GC-O value	Isoamyl alcohol normalized	GC-O value	flavor panel
1	Belgian Ale Yeast	87.4	1537	184	712	strong banana
2	Trappist High Gravity	33.5	1413	90	682	
3	Belgian Ardennes Yeast	27.3	1102	73	1054	banana
4	German Wheat Yeast	20.4	846	120	1515	banana
5	Weihenstephen Weizen Yeast	60.3	1946	104	1293	strong banana
6	American Wheat	31.1	1584	94	1896	
7	Belgian Abbey Yeast II	44.3	2197	99	1856	
8	Forbidden Fruit Yeast	47.2	694	177	1153	
9	Belgian Wheat Yeast	32.9	527	124	664	banana
10	Belgian Whitbier Yeast	36.2	1062	115	591	
11	Bavarian Wheat Yeast	52.9	1213	131	1563	strong banana
12	Canadian/Belgian Style Yeast	26.2	998	109	1198	
13	Leuven Pale Ale Yeast	27.9	835	85	449	banana



#	yeast type	4-vinyl guaiacol	GC-O value: 4-vinyl guaiacol	4-vinyl phenol	flavor panel: selected aromas from overall beer evaluation
1	Belgian Ale Yeast	380	4780	46.0	clove, spicey
2	Trappist High Gravity	340	2955	75.0	spicy
3	Belgian Ardennes Yeast	310	5216	no value	clove, spicey
4	German Wheat Yeast	34	419	2.9	clove, spicey
5	Weihenstephen Weizen Yeast	7.5	973	<	clove
6	American Wheat	2.7	0	0.2	none
7	Belgian Abbey Yeast II	6.0	0	0.6	none
8	Forbidden Fruit Yeast	42	1016	0.4	clove, spicey
9	Belgian Wheat Yeast	56	838	1.2	spicy
10	Belgian Whitbier Yeast	5.5	0	<	spicy
11	Bavarian Wheat Yeast	12.5	571	0.3	spicy
12	Canadian/Belgian Style Yeast	115	830	2.0	clove, spicey
13	Leuven Pale Ale Yeast	40	1030	3.5	clove, spicey

Original gravity, attenuation, aeration: Higher original gravity produces more esters, as does higher attenuation. More aeration lowers ester production.

Beer	Gravity	AA	ABV
Achel Blond 8	1.078 (18.9 °P)	84%	8.9%
Chimay Red	1.061 (14.9 °P)	88%	7.1%
Orval	1.055 (13.6 °P)	94%	6.8%
Rochefort 8	1.078 (19 °P)	90%	9.2%
Westmalle Dubbel	1.064 (15.6 °P)	87%	7.3%
Westmalle Tripel	1.081 (19.6 °P)	88%	9.6%
Westveleteren 12	1.090 (21.5 °P)	86%	10.2%

Fermentation temperatures: Increased temperature increases ethyl acetate levels, floral and fruity esters, and may be necessary for some of these yeasts to finish attenuating. Lower temperature restrains ester production, promotes perception of phenols. Temperature has a much greater effect on ester production than pitching rate.

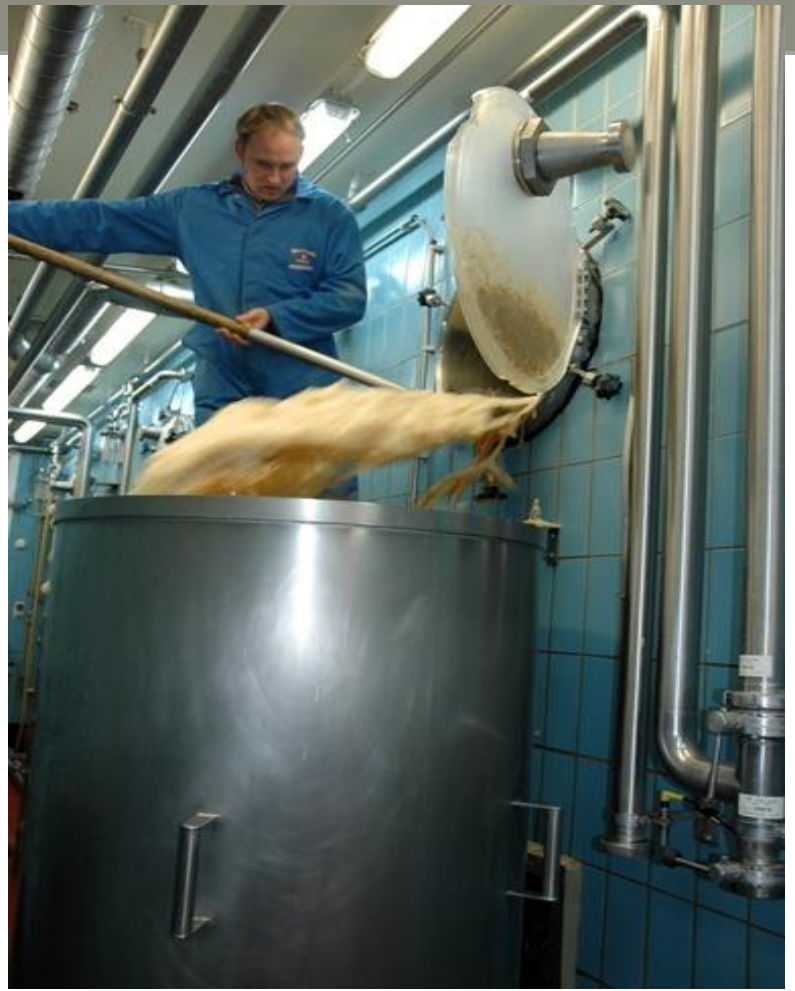
Duvel	Pitched at 16-18°C (61-64° F) rises to 26-29°C (78-84° F)
Orval	Pitched at 14° C (57° F) rises to 23° C (73° F)
Westmalle	Pitched at 18-19° C (64-66° F) rises to 20°C (68° F)
Achel	Pitched at 17-18°C (63-64° F) rises to 22-23°C (72-73° F)
Westvleteren	Pitched at 20°C (68° F) rises to 28-29°C (82-84° F)

Keep it to one page	
Targets	1.064 OG, 1.008 FG, 7.4% ABV
Grains	80% Castle Pils, 8% Caramunich
Sugar	7% Dark Candi Syrup, 5% table sugar
Mashing schedule	146° F
Hops	Styrian Golding, 22 IBU, all first wort
Yeast	Achouffe
Fermentation	64° F environment, pitch at 64° F and let rise
Lagering	
Packaging	

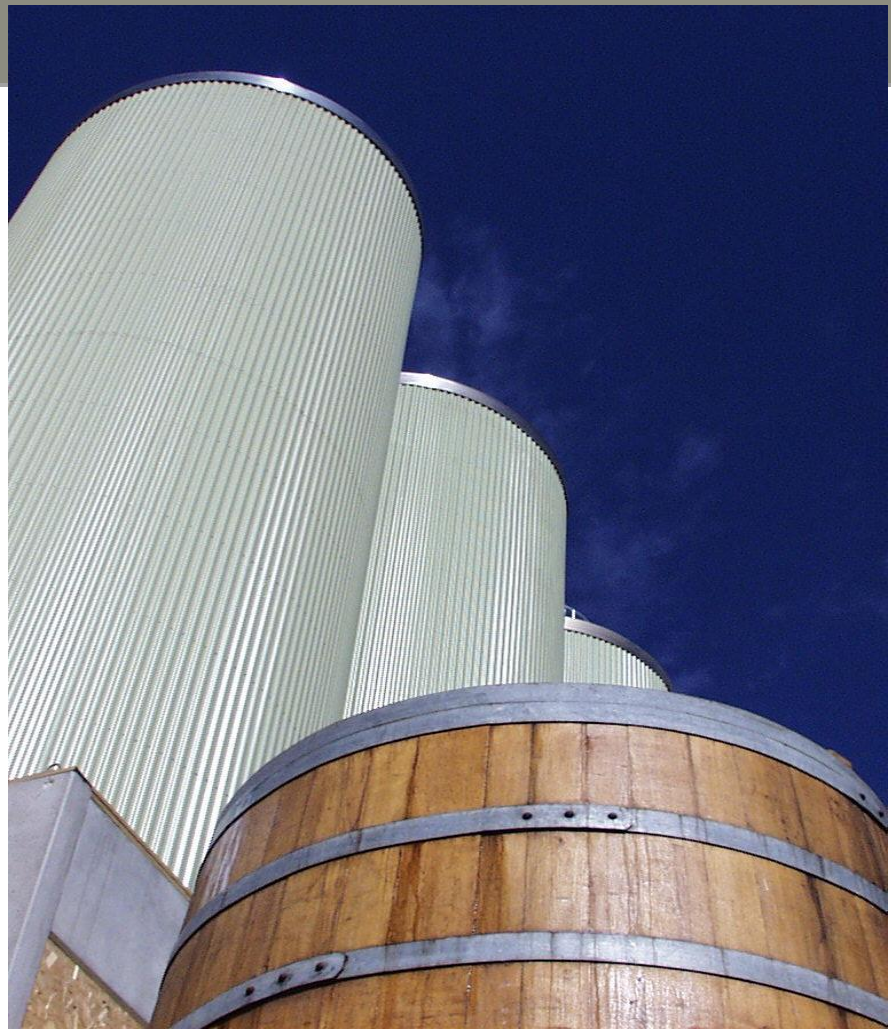
Pitching rates

Higher pitching rates lower ethyl acetate levels. Very high or very low pitching rates increase ester levels.

Duvel (16.9 °P)	7.5 mio/ml
Orval (13.6 °P)	10 mio/ml
Westmalle (19.6 °P)	5-6 mio/ml
Rochefort (19 °P)	19 mio/ml



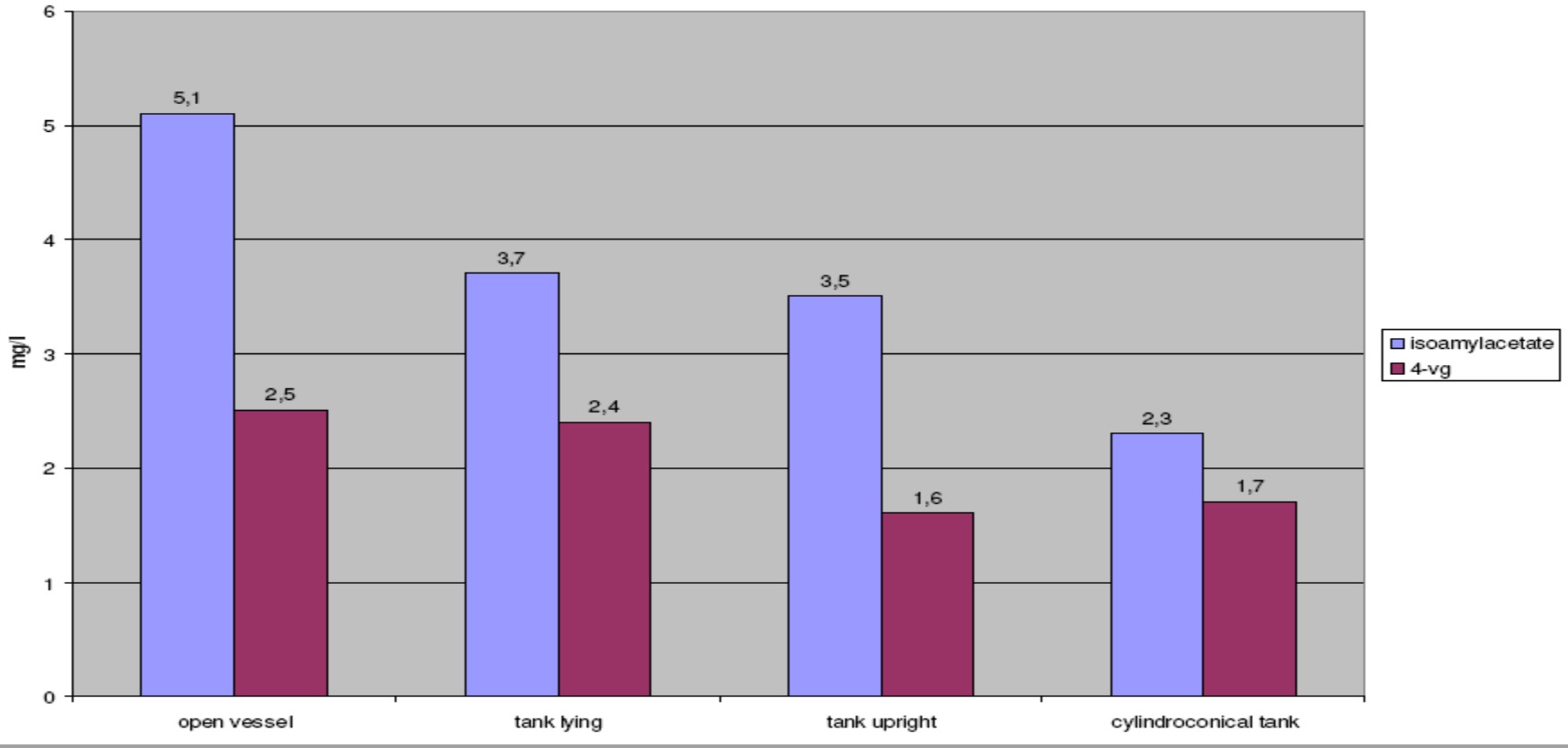
Fermentation tank geometry: Horizontal tanks increase ester production, and cylindro-conicals supress esters. Do open tanks decrease esters because of exposure to oxygen?




10
11

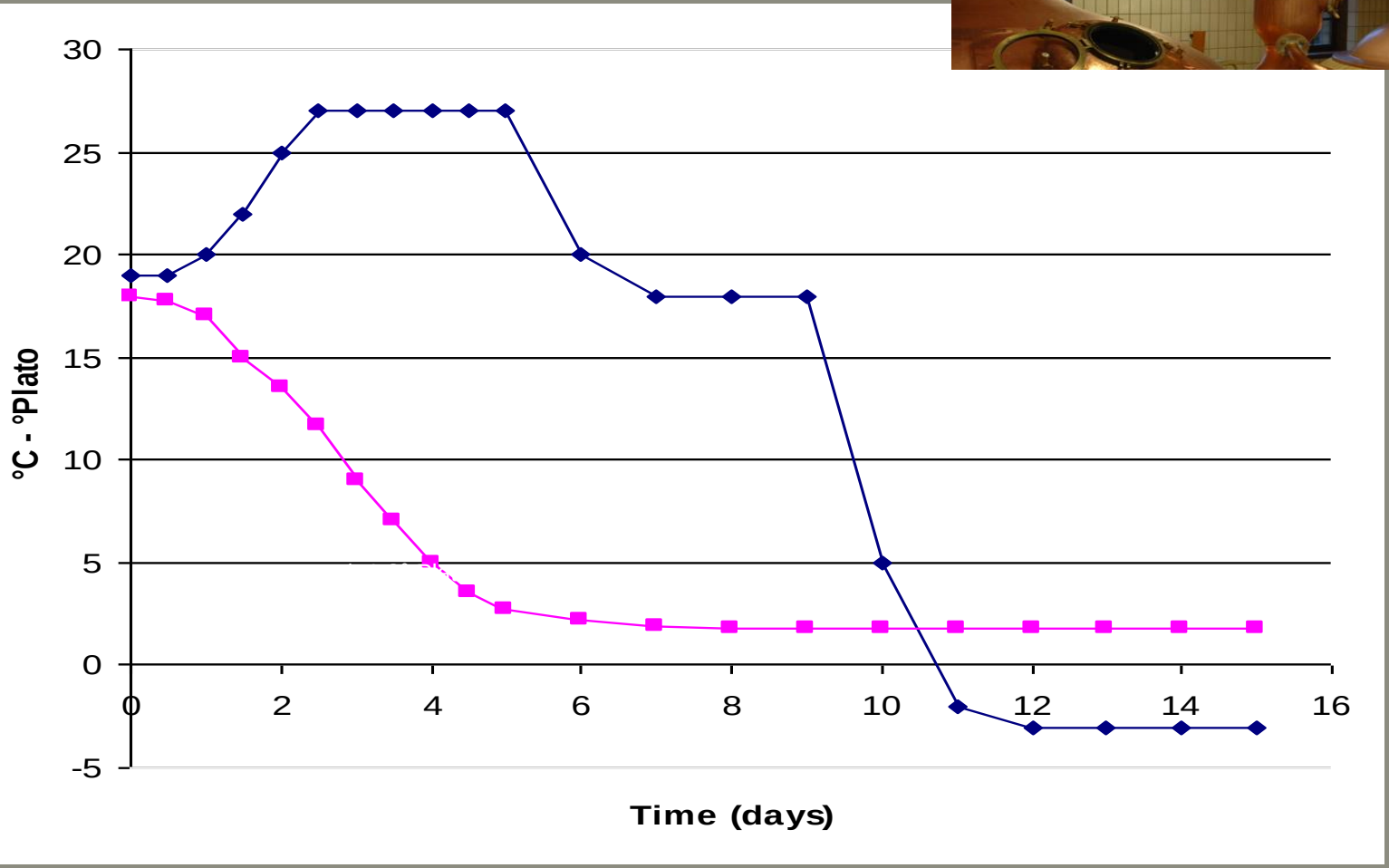

12

	Acetaldehyde	Ethyl Acetate	Isoamyl Alcohol	Ethyl Caproate	Ethly Caprylate	Isoamyl Acetate
Threshold	25	33	70	0.23	0.9	1.6
Open (mean)	7.3	35.17	146.43	0.29	0.38	5.18
CCT (mean)	7.15	39.32	160.69	0.28	0.32	5.03
	Green apple Fruity	Solvent Fruity Sweetish	Alcohol Banana Sweetish	Apple Fruity Aniseed	Apple Fruity Sweetish	Banana Apple Solvent


6
5
4
3
2
1
0
mg/l
5,1
2,5
3,7
2,4
3,5
1,6
2,3
1,7
open vessel
tank lying
tank upright
cylindroconical tank
isoamylacetate
4-vg

Fermentation & rhythm of the brewery

Duvel	Pitched at 18°C (64 °F) rises to 27°C (81 °F), 5 days
Orval	Pitched at 14°C (57°F) rises to 23°C (73°F), 4 days
Westmalle	Pitched at 18-19°C (64-66°F) rises to 20°C (68°F), 5-6 days
Achel	Pitched at 17-18°C (63-64°F) rises to 22-23°C (72-73°F), 7-8 days
Westvleteren	Pitched at 20°C (68°F) rises to 28-29°C (82-84°F), 6 days


30
25
20
15
10
5
0
-5
°C - °Plato
0
2
4
6
8
10
12
14
16
Time (days)

- Fermentation: 120 hours
- Maturation: 400 hours minimum
- Bottle conditioning: 10-12 days
- Cold cellar maturation 6-8 °C: 6 weeks

- Fermentation: 4-6 days
- Maturation: 8-12 weeks
- Bottle conditioning: 10 days
- Beer old sold 11 weeks (or longer) after brewing

Orval – 6 grams per liter (3 volumes) after 3 weeks,10 grams per liter at one year

Rochefort – 7 grams per liter

Westmalle – Dubbel 7.3-7.8 gr/l, Tripel 7.5-8.5 gr/l

Duvel – 8.5 grams per liter

De Koninck Pale – 4.8 grams per liter

Westmalle
2 mio/ml. Dubbel two weeks at 70-73° F (21-23° C); Tripel three weeks

Schneider
First week at 70° F (21° C)
Next two at 50° F (10° C)

Keep it to one page	
Targets	1.064 OG, 1.008 FG, 7.4% ABV
Grains	80% Castle Pils, 8% Caramunich
Sugar	7% Dark Candi Syrup, 5% table sugar
Mashing schedule	146° F
Hops	Styrian Golding, 22 IBU, all first wort
Yeast	Achouffe
Fermentation	64° F environment, pitch at 64° F and let rise
Lagering	At least 4 weeks at 34° F
Packaging	Target 3.5 volumes