Grapes to wine

The right direction using advanced decanter technology

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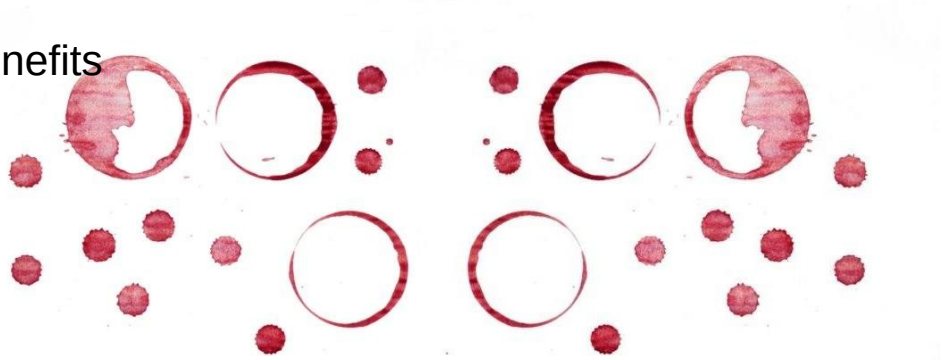


Pneumatic press - Overview

Most common technology for «high quality» white juice extraction is based on ***pneumatic press***:

- Batch process: «semi continuous» if several presses used in parallel
- Draining & pressing in the same equipment
- Need for further juice clarification before fermentation
- Relevant hold-up volume & time
- Juice clarification bottoms to be treated

. 70-80% Free run juice
. 20-30% Pressing juice

. Static settling
. Continuous flotation
. Batch flotation
. Centrifugation
. Filtration

. Juice recovery from tank bottom (10-35% of juice)

Decanter - Overview

Since about 20 years it has been introduced on the mkt a technology for juice extraction based on ***decanter*** centrifuge:

- Continuous process
- extraction & clarification in the same equipment
- Need for further juice clarification before fermentation
- Minimum hold-up volume & time
- Juice clarification bottoms to be treated

. 100% juice at low ssv

. Static settling
. Continuous flotation
. Batch flotation
. Centrifugation
. Filtration

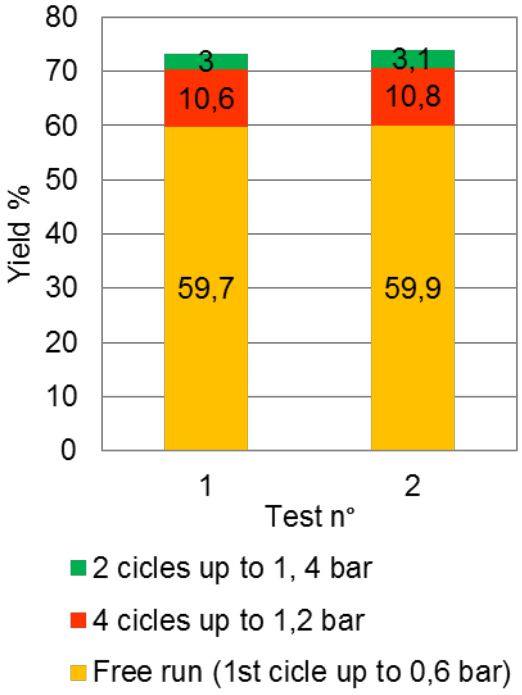
. Juice recovery from tank bottom (5-25% of juice)

Process parameter comparison

- Yield & Solids dryness
- Juice clarity: suspended solids & NTU
- Phenolic contents: conductivity & poliphenols

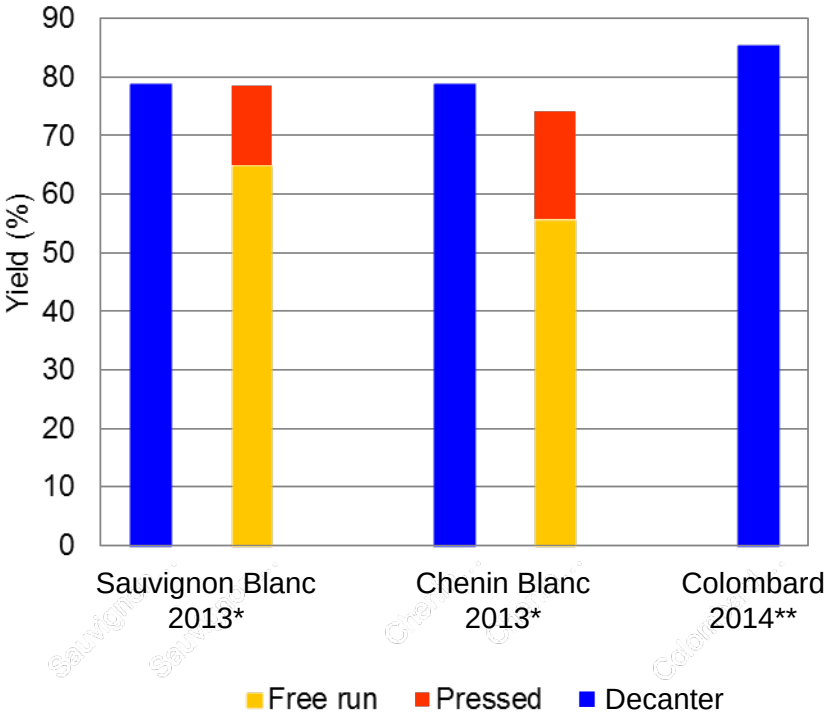
Yield

Press technology – Falanghina 2013 (IT)



Ferrarini, unpublished

Decanter vs Press technology – (ZA)



* Alfa Laval

** Ferrarini, unpublished

- Decanter has higher yield or in line with Pneumatic Press technology , considering Drain and Press juice from Presses;
- Decanter produces single fraction of homogeneous juice.

Characterization of solids

Grape solids discharged by extraction technologies are characterized by different skins conditions

Pneumatic Press

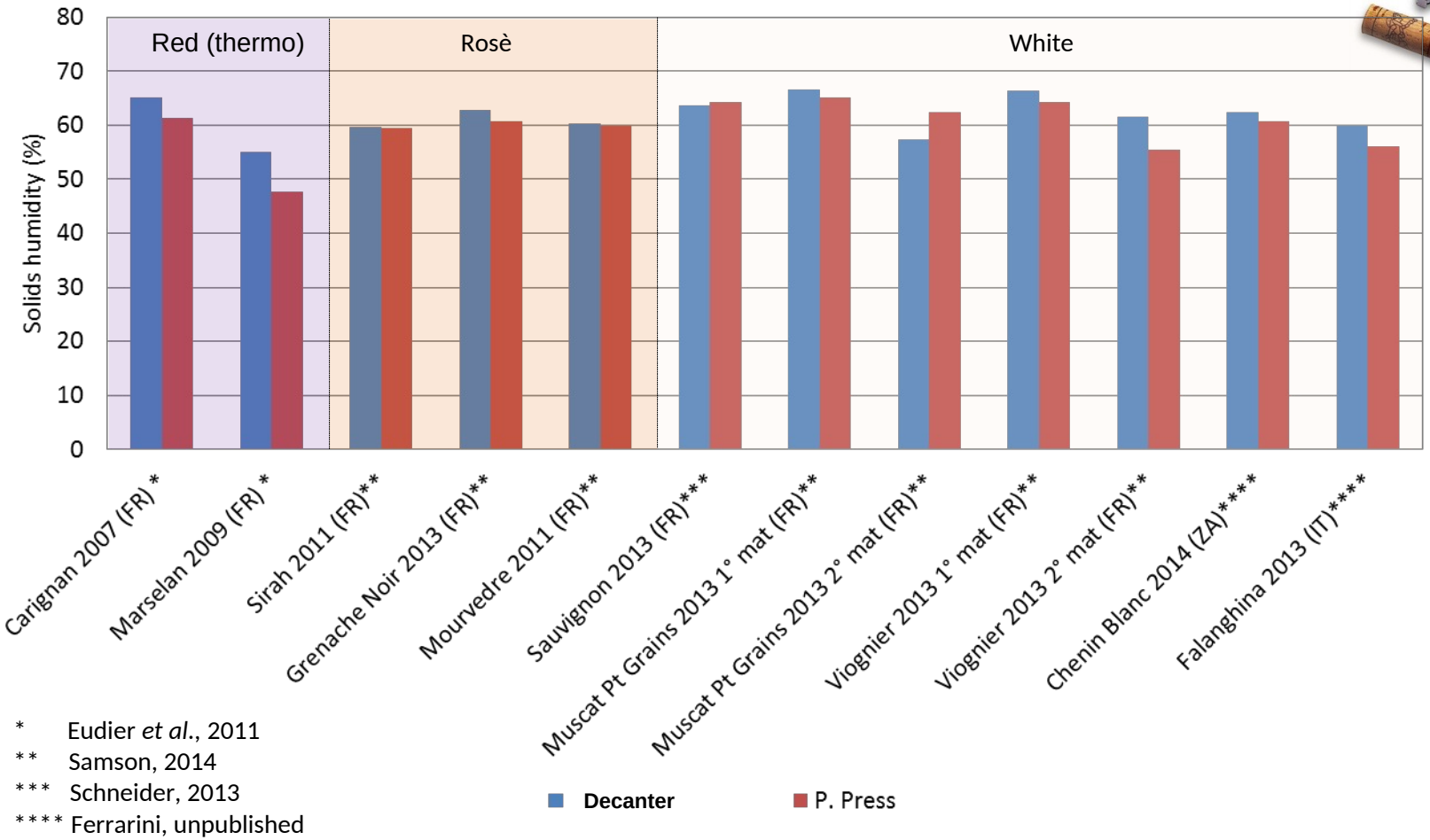
- Flattened berry
- Almost intact skin
- Restrained juice
- Seeds not broken

Decanter

- Open berry
- Torn skin
- Free Juice
- Seeds not broken

These differences make distorted the empirical measure of solids humidity (solids squeezing by hand).
By using a thermo balance the measure is not affected by distorting factors.

Solids dryness

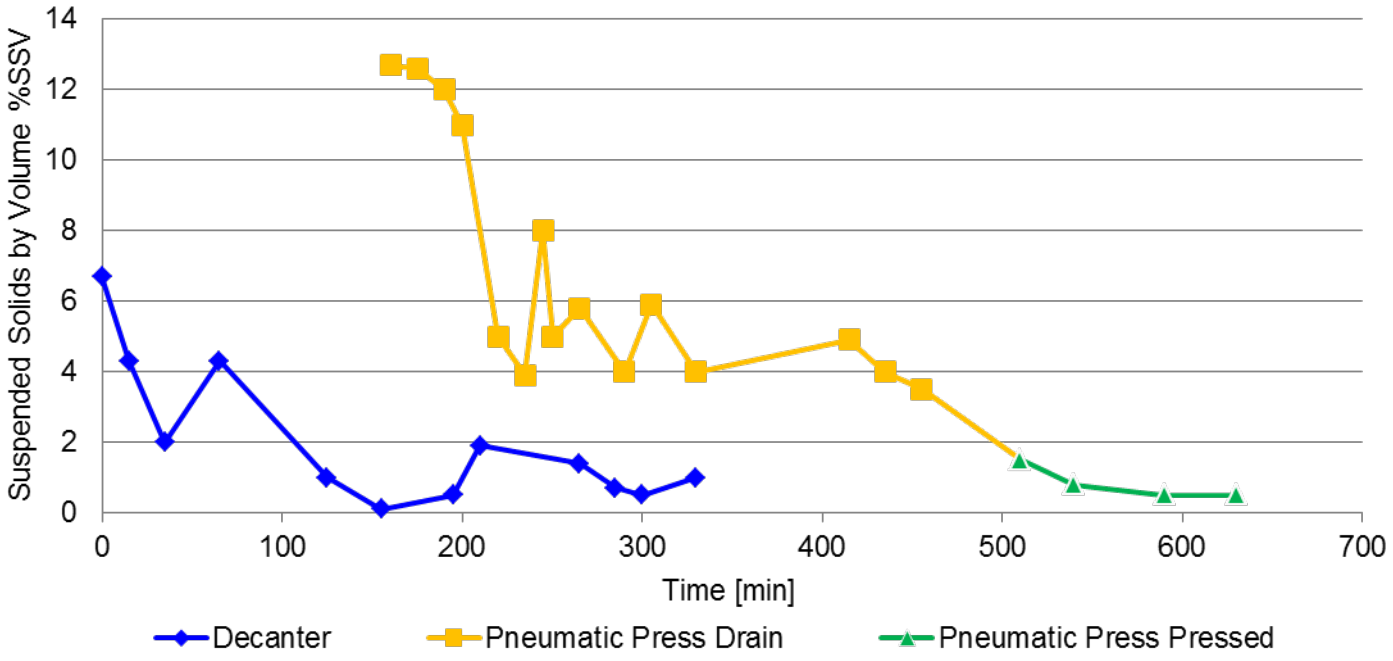


* Eudier *et al.*, 2011
** Samson, 2014
*** Schneider, 2013
**** Ferrarini, unpublished

- No significant differences between technologies

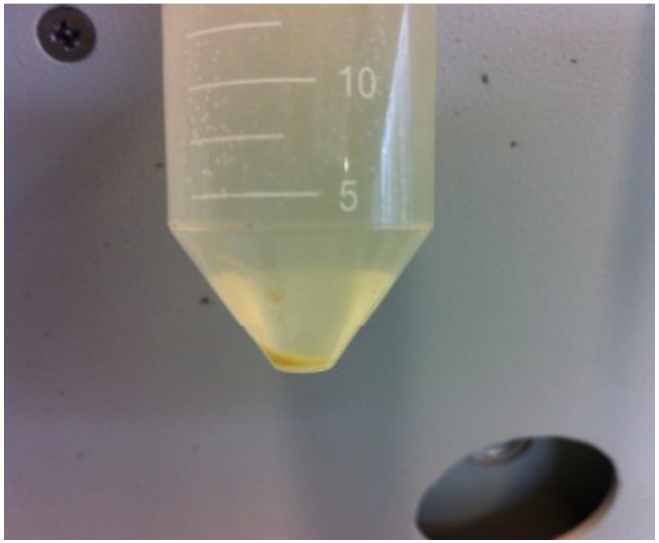
Juice clarity (SSV)

Prosecco 2010 (IT)



Source: Alfa Laval

- Drastic reduction of solids content in the juice of Decanter with respect to Press;
- A single juice fraction with Decanter at constant SSV all over the time.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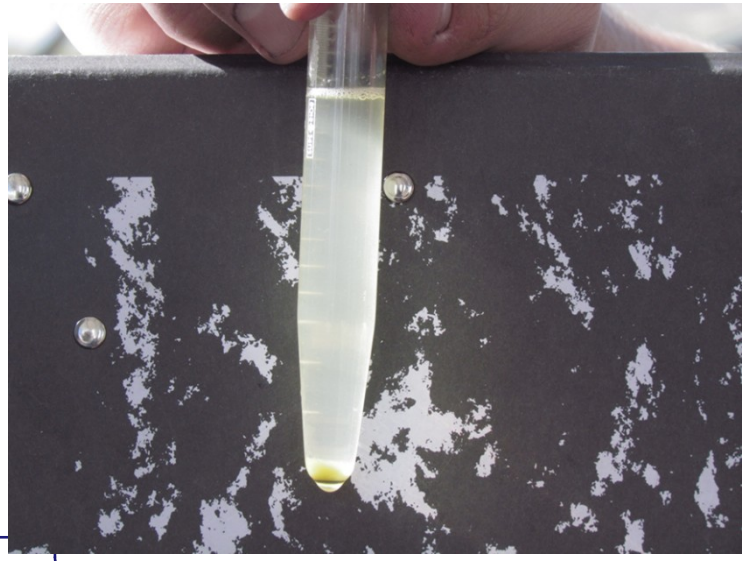

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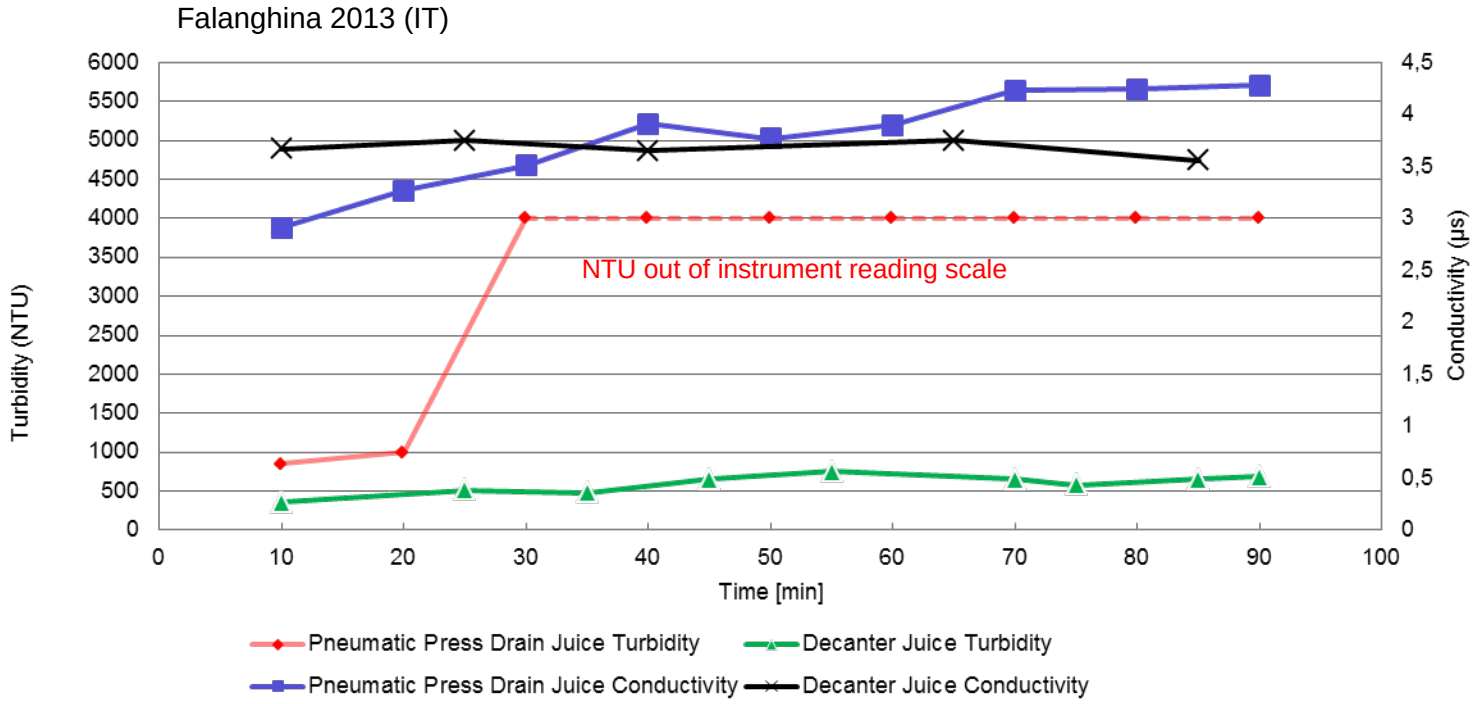
Juice turbidity (NTU) and Conductivity

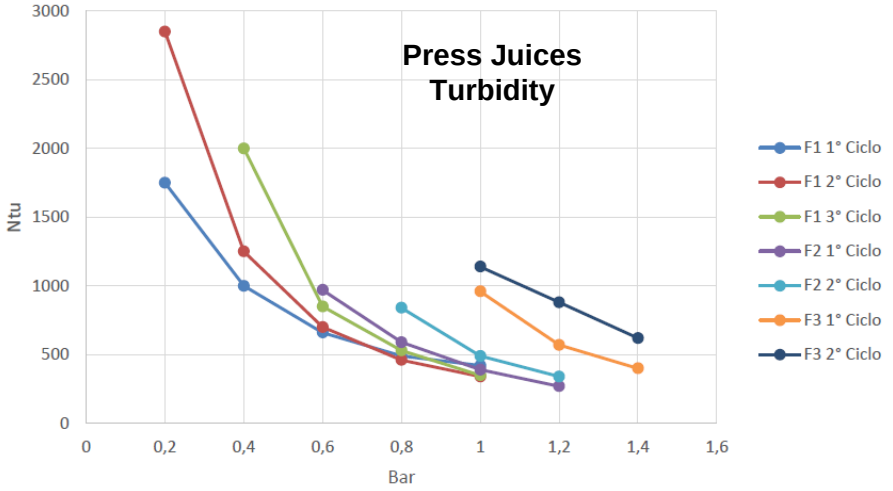


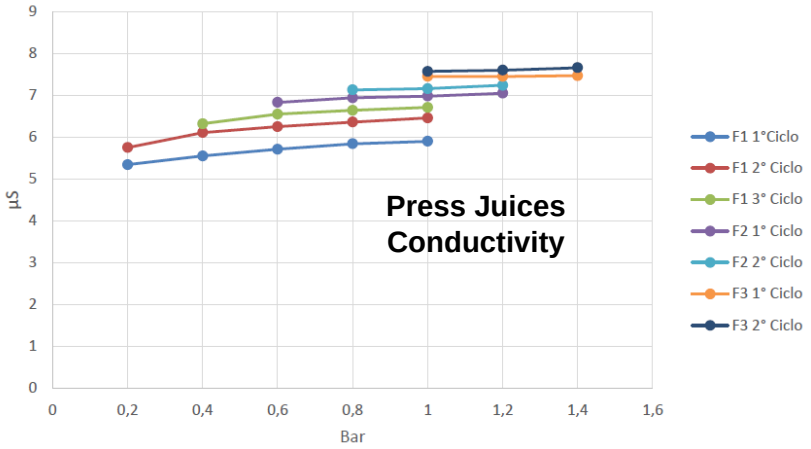
Source: Ferrarini, unpublished

- Conductivity comparable but with notable consistency of value over the time with decanter compared with only drain juice from press;
- Significant reduction of turbidity with notable consistency of value over the time with decanter compared with only drain juice from press.

Juice clarity (NTU) and Conductivity

Falanghina 2013 (IT)

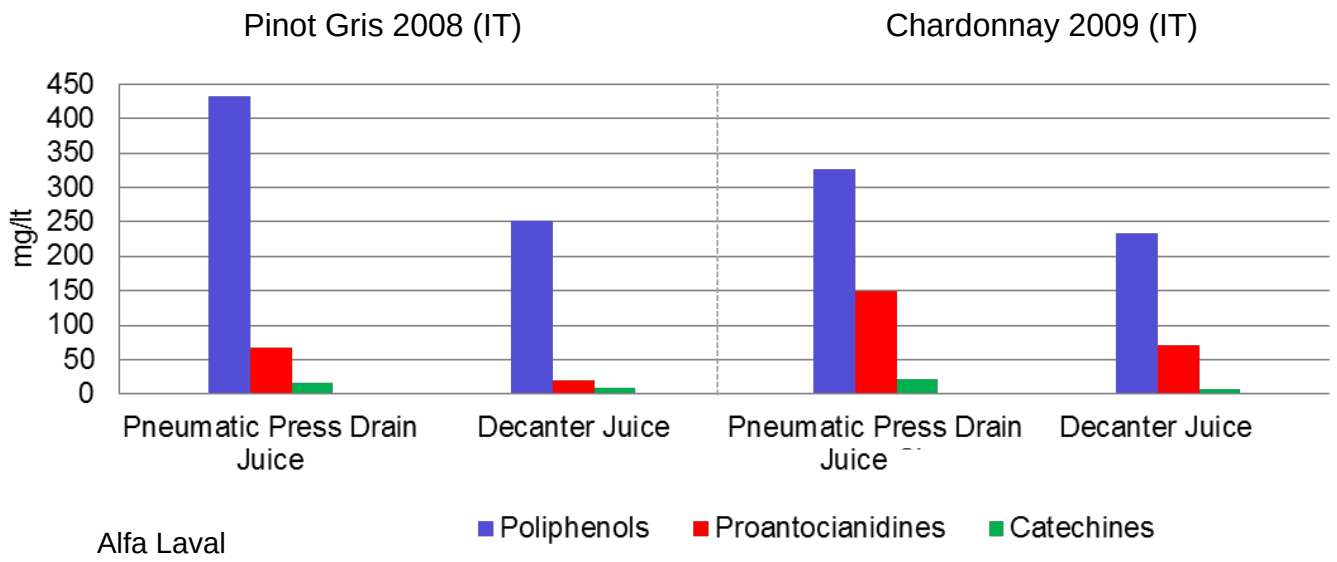




Only Press juice from Pneumatic Press has been considered, from the sequential pressing program: F1 max 1 bar; F2 max 1,2 bar; F3 max 1,4 bar; by 0,2 bar step. Ferrarini, unpublished.

- Considering pressing cycles we get huge variation of juice characteristics in terms of turbidity and conductivity.

Phenolic extraction



Alfa Laval

- Reduction on poliphenols, protoantocianidines and catechines with Decanter with respect to pneumatic press drain juice;
- Different «mechanical impact» between technologies are supposed to be the reason of value reduction with Decanter.

Decanter in the cellar until today. It is enough?

Decanter vs pneumatic presses:

- Same yield;
- Same solid dryness;
- Comparable conductivity;
- Reduction of phenols on white grape;
- Reduction of suspended solids of about 80%;
- Turbidity reduction of about 80% with strong variation depending on grapes characteristics out of process control capability;
- Still necessary juice clarification before fermentation;
- Still necessary juice recovery from bottoms;

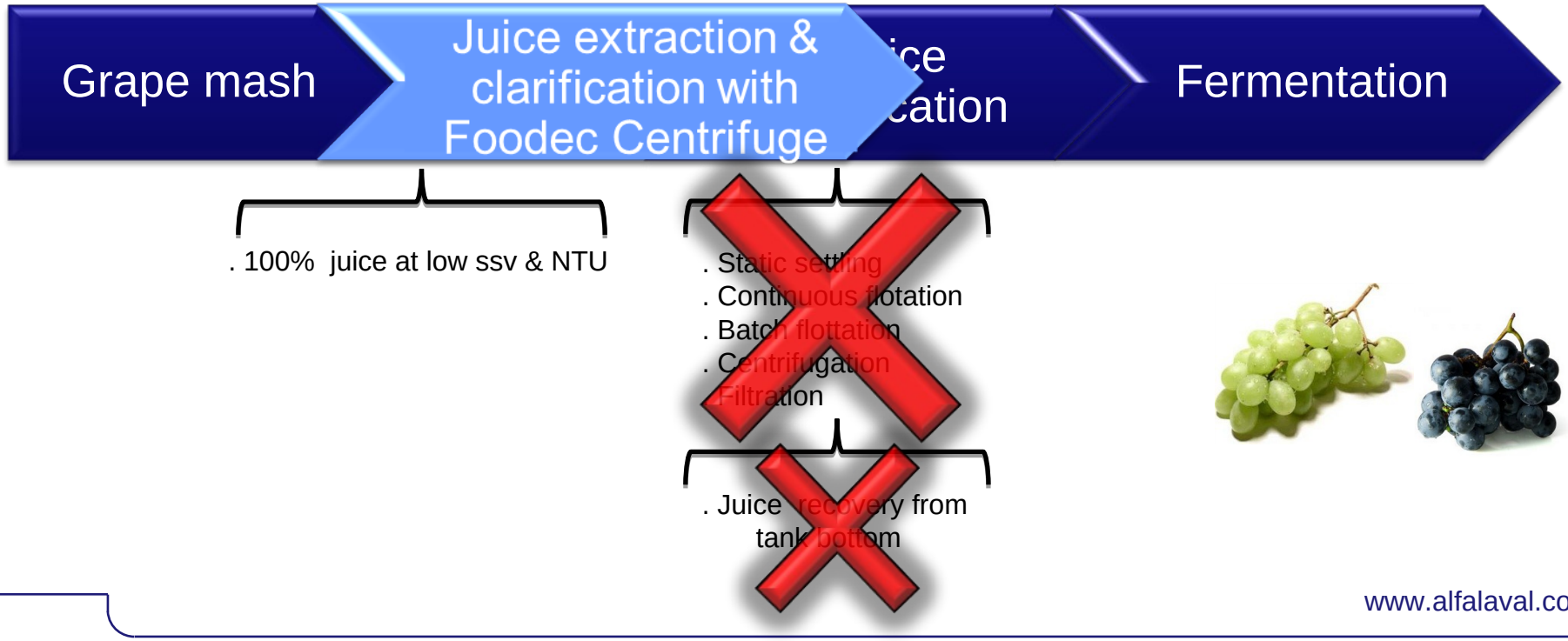
Until today Decanter for juice extraction in the cellar had a partial market acceptance because of not general appreciation of cost/benefit with respect to pneumatic press technology.

New Foodec Centrifuge process system by Alfa Laval (Patented)

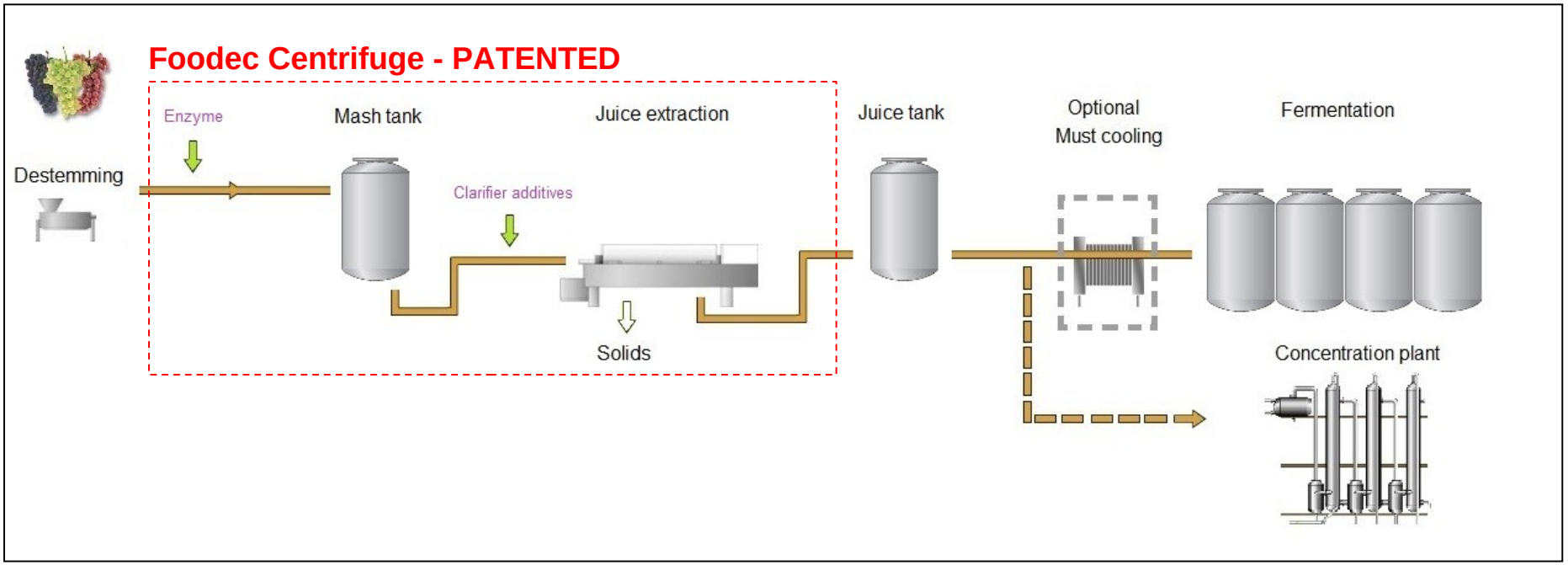
Innovative Foodec Centrifuge - Overview

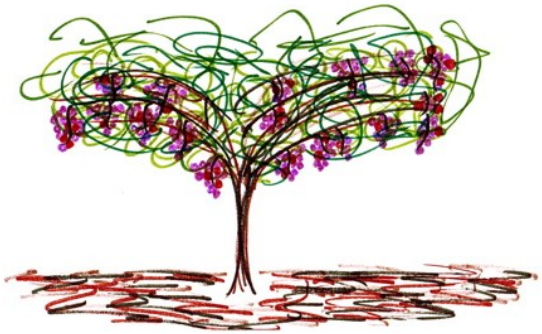
Alfa Laval has developed and already introduced a ***new patented process*** for juice extraction based on a <u>combined process line including the Foodec Centrifuge (FC) & additives</u>:

- Continuous process
- Applicability on fresh grape (for white & rose wine) & thermo treated grape mash (for red wine)
- extraction & clarification in the same equipment
- No more need for further juice clarification before fermentation
- Minimum hold-up volume & time
- No more juice clarification bottoms to be treated

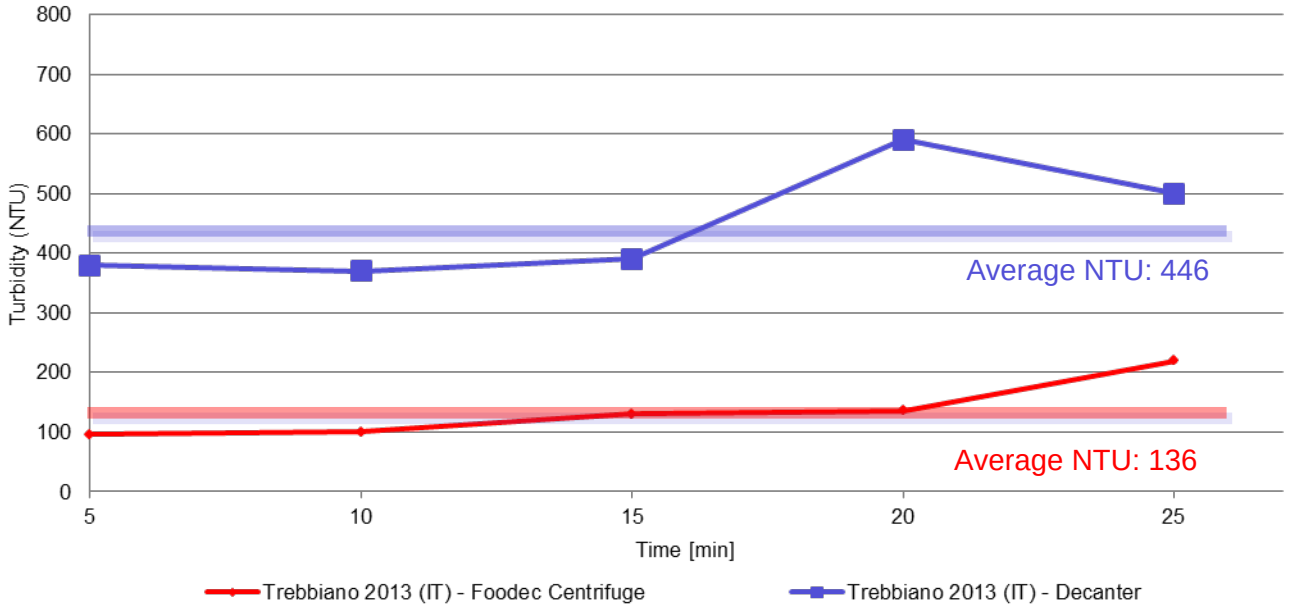


Combined process line with Foodec Centrifuge





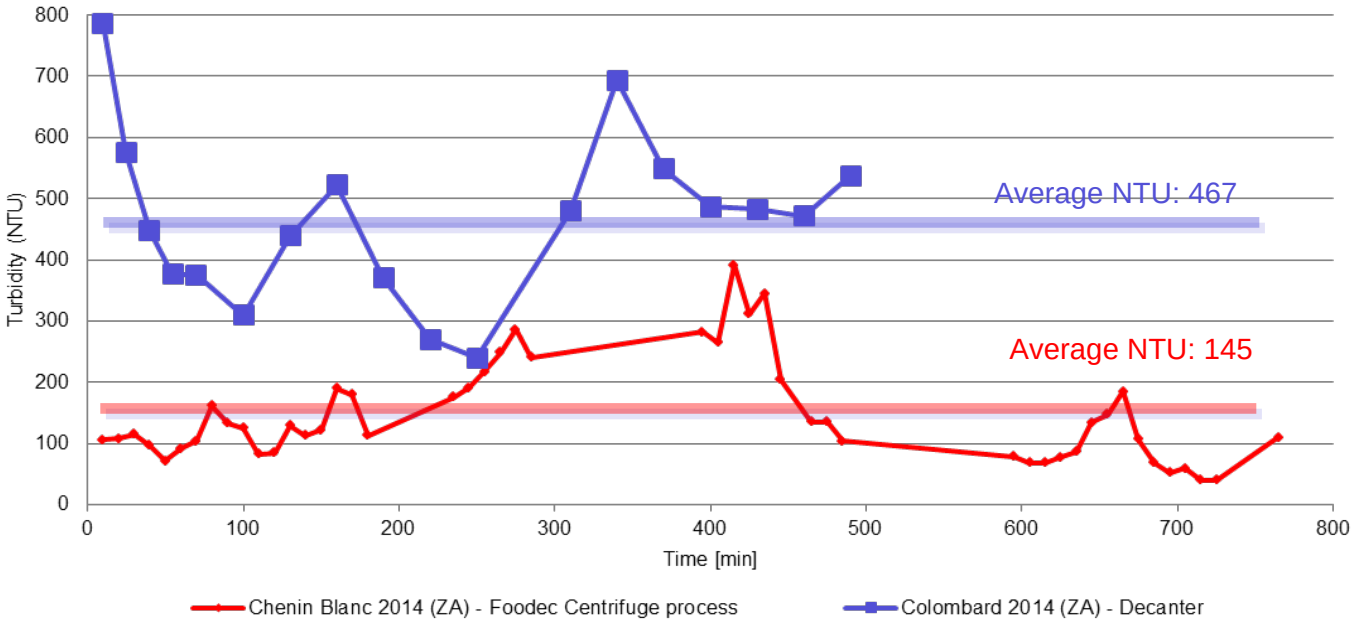
Foodec Centrifuge on juice clarity



Ferrarini, unpublished

- Further to drastic reduction of solids content in the juice, Foodec Centrifuge returns juice with turbidity level also lowered by 50% compared to Decanter;
- Further juice clarification is not needed.

Foodec Centrifuge on juice clarity



Ferrarini, unpublished

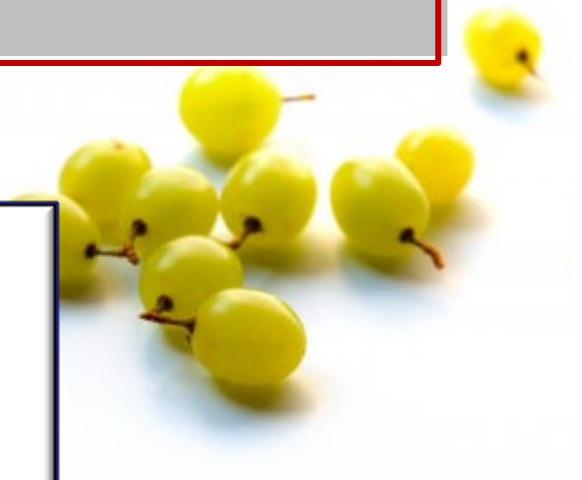
- Further to drastic reduction of solids content in the juice, Foodec Centrifuge returns juice with turbidity level also lowered by 50% compared to Decanter;
- Further juice clarification is not needed.

Alfa Laval Foodec Centrifuge process system

Foodec Centrifuge vs pneumatic presses:

- Same yield;
- Same solid dryness;
- Comparable conductivity;
- Reduction of phenols on white grape;
- Reduction of suspended solids of about 80%;
- **Drastic turbidity reduction with very limited variation depending on grapes characteristics but with possibility of process control capability;**
- **No more necessary juice clarification before fermentation;**
- **No more necessary juice recovery from bottoms;**

Time has come for conversion technology in grape juice extraction.
Cost/benefits results.



Further benefits: time to fermentation

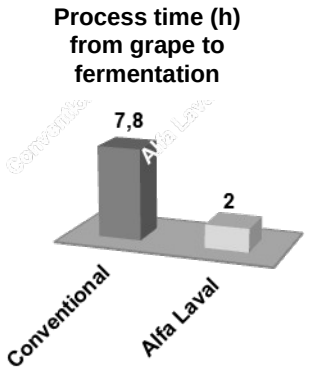
Foodec Centrifuge process system

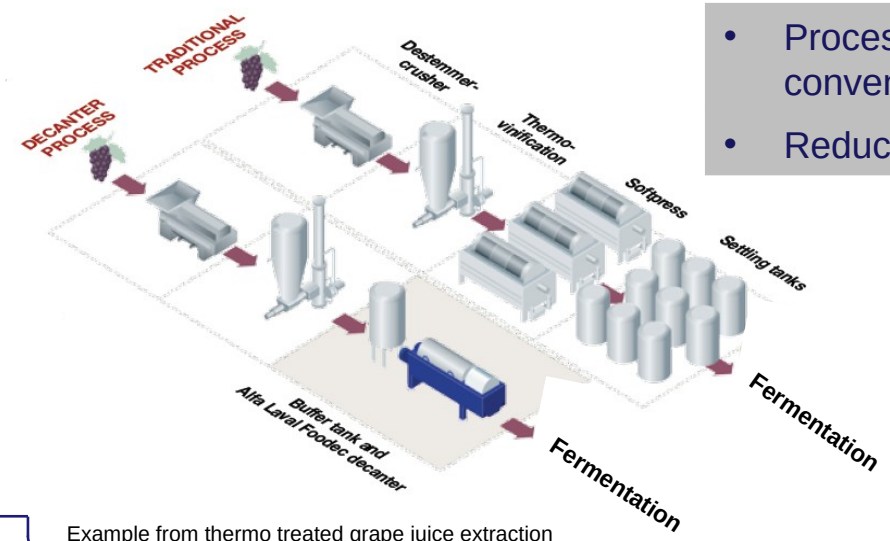
Grapes	Destemmer	Buffer tank and Foodec Centr.	Juice buffer tank	Fermentation
Process time (min)	0' +	0' +	120' =	120' (2h)

Pneumatic press process

Grapes	Destemmer	Presses	Juice clarification*	Fermentation
Process time (min)	0' +	120' +	350' =	470' (7,8h)

Example from white grape juice extraction, * Continuous flotation





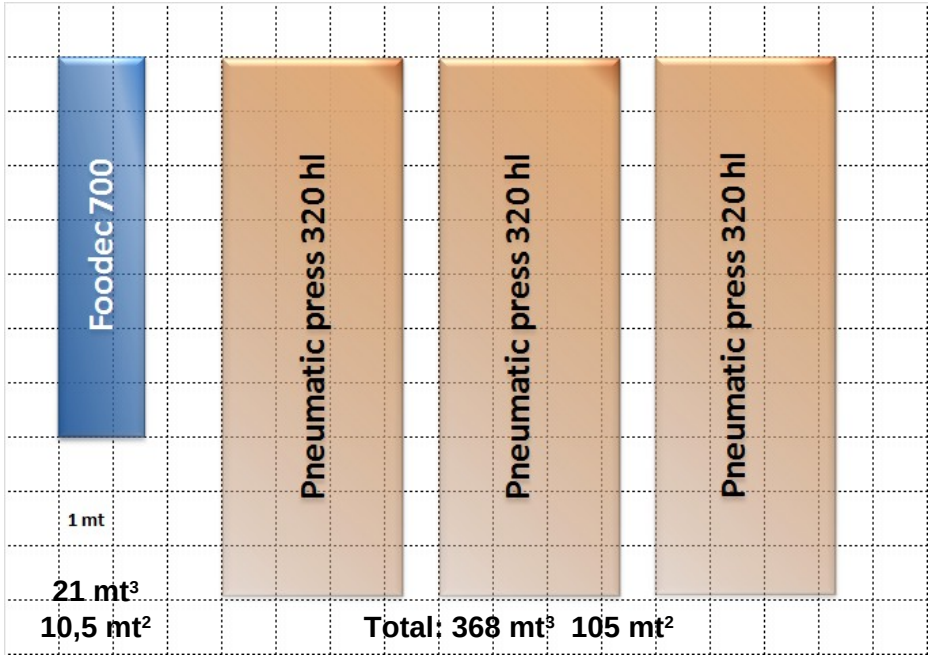
Example from thermo treated grape juice extraction

- Process time reduction of 75% with respect to conventional process with presses ;
- Reduction of labour cost.

Further benefits: footprint

Equipment	Model	Unit nr	Capacity [ton/h]	Dimensions each [mt]
Foodec	F700	1	20	7w x 1,5d x 2h
Pn. press	320 hl	3	19*	10w x 3,5d x 3,5h

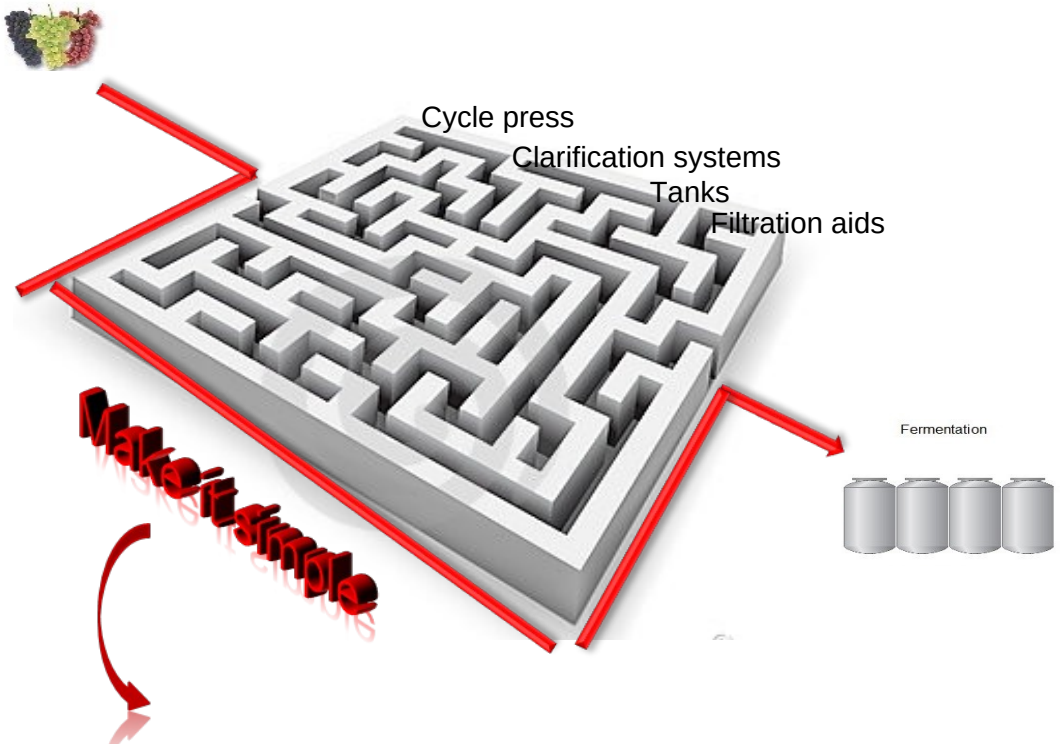
* nr 3 press of 320 hl each and pressing cycles of 5 h, including draining, pressing and emptying



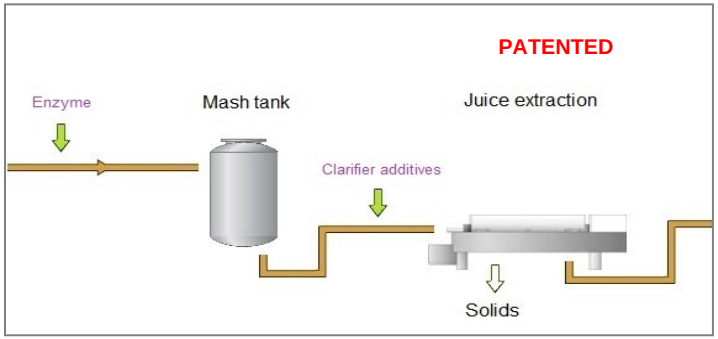
Foodec 700 and press xxxxxxx (IT)

- Footprint reduction (only related to juice extraction equipment) up to 90%

Further benefits: process simplification



FOODEC CENTRIFUGE PROCESS SYSTEM



Foodec Centrifuge process system. Conclusions

- High yield of high value juice
- Extremely low solids content in the juice
- No more need for setting the correct division of juice fraction between «free run» and «pressings»
- Continuous throughput at relevant capacity (flexible to turndown capacity)
- Hold-up volume & time minimized; no dead time for unproductive operations (ie crumbling)
- Screw press can be used to max the total juice yield
- Very small footprint vs traditional method
- No more juice bottom and flitration aids

Example of a plant in operation

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