

Dom
Pérignon
(1638 – 1715)



Sorting in
Champagne
c. 1930s

Innovations & options for grape sorting

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Manual sorting (modern configurations)



- Before and/or after destemming
- Belt and/or vibrating conveyors (with juice drainage)
- High labour, slow throughput
- Still often used in conjunction with automated sorting equipment



2-stage vibrating/belt sorter (c. 1990s)



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- 2 stages:
 - 1. Vibrating screen - smalls and juice fall through
 - 2. Vibrating screen/holed belt - grapes fall through
- e.g. Enoveneta TSA, CMA Tommy
- Throughputs: < 7-15 & 3-6 t/hr*

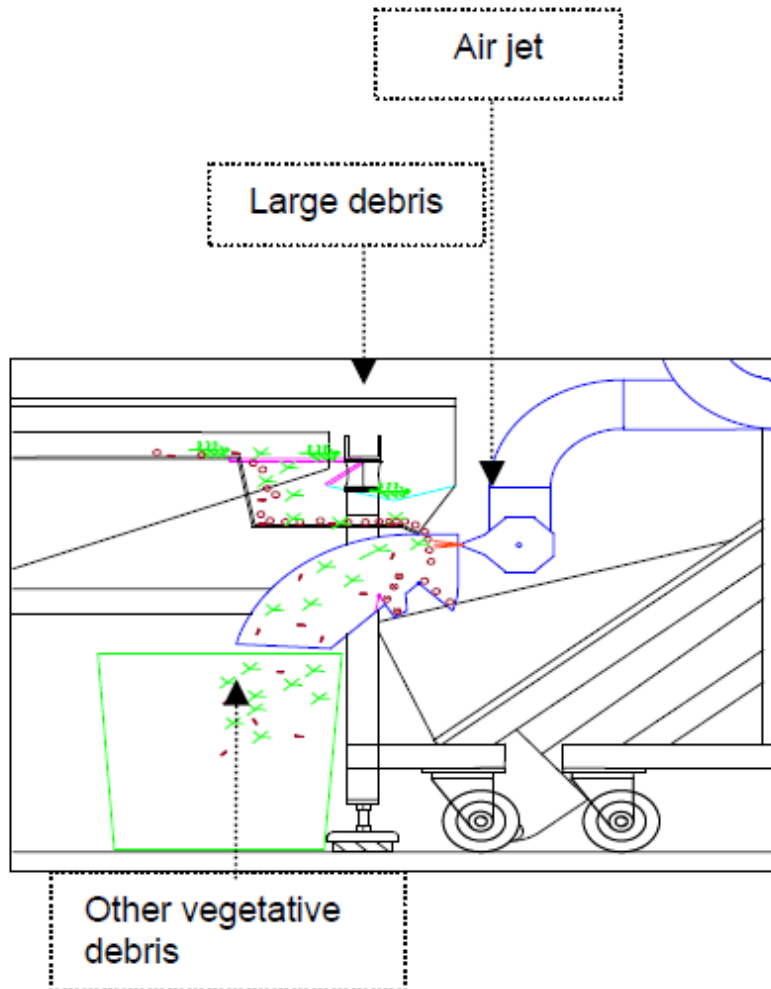


*Nominal capacity, i.e. may overstate real capacity

Air-jet – gravity fed (Vaucher-Beguët Mistral, c. 2004)



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- 2-stage vibrating + air-jet
- Air-jet blows away light materials as they fall off an edge - petioles, leaves, larger raisins and smashed grape skins (Fraser 2012)
- Throughputs: 2-3, 5-7, 6-9 t/hr*



Vaucher-Beguet Mistral - Video



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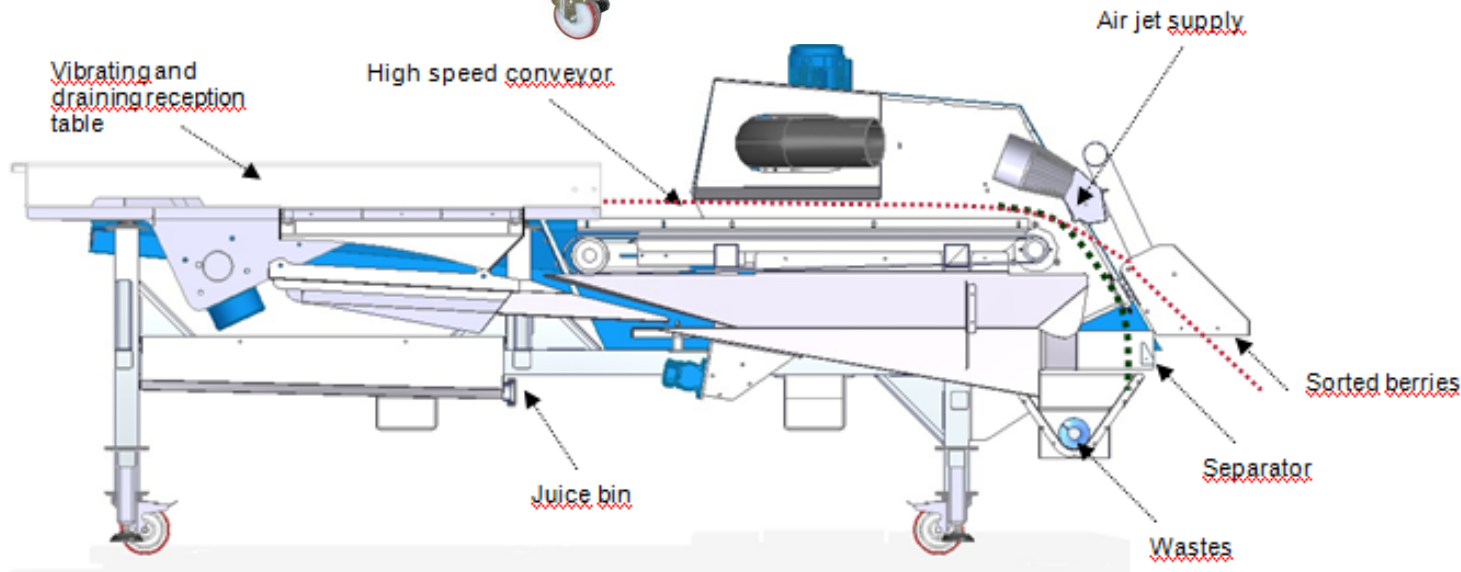
Air-jet – fast belt (Bucher-Vaslin Rflow, c. 2013)



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- Material accelerated by belt to spread them out, allowing higher throughput per width
- Throughput: <math>< 15 \text{ t/hr}^*</math>



*Nominal capacity, i.e. may overstate real capacity

Bucher-Vaslin Rflow - Video



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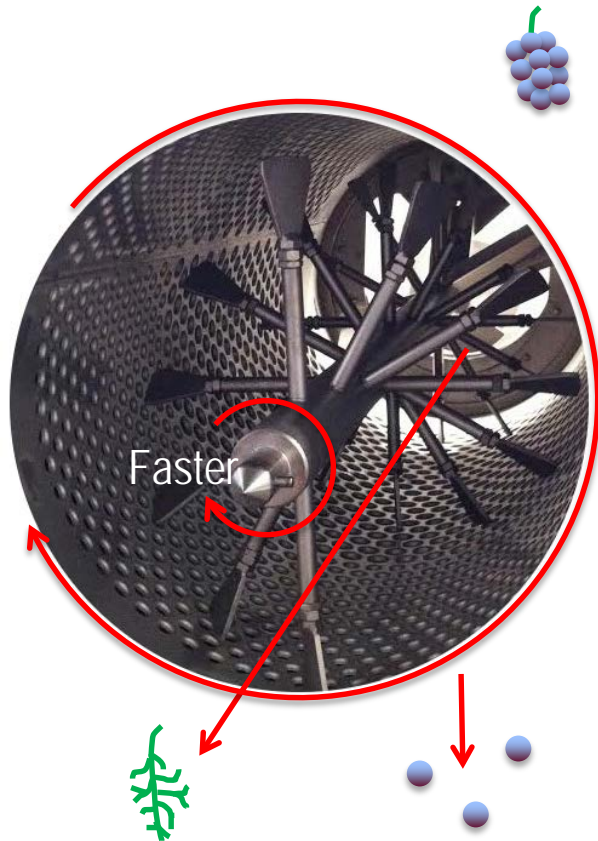


SOCMA linear winery destemmer – c. 1999



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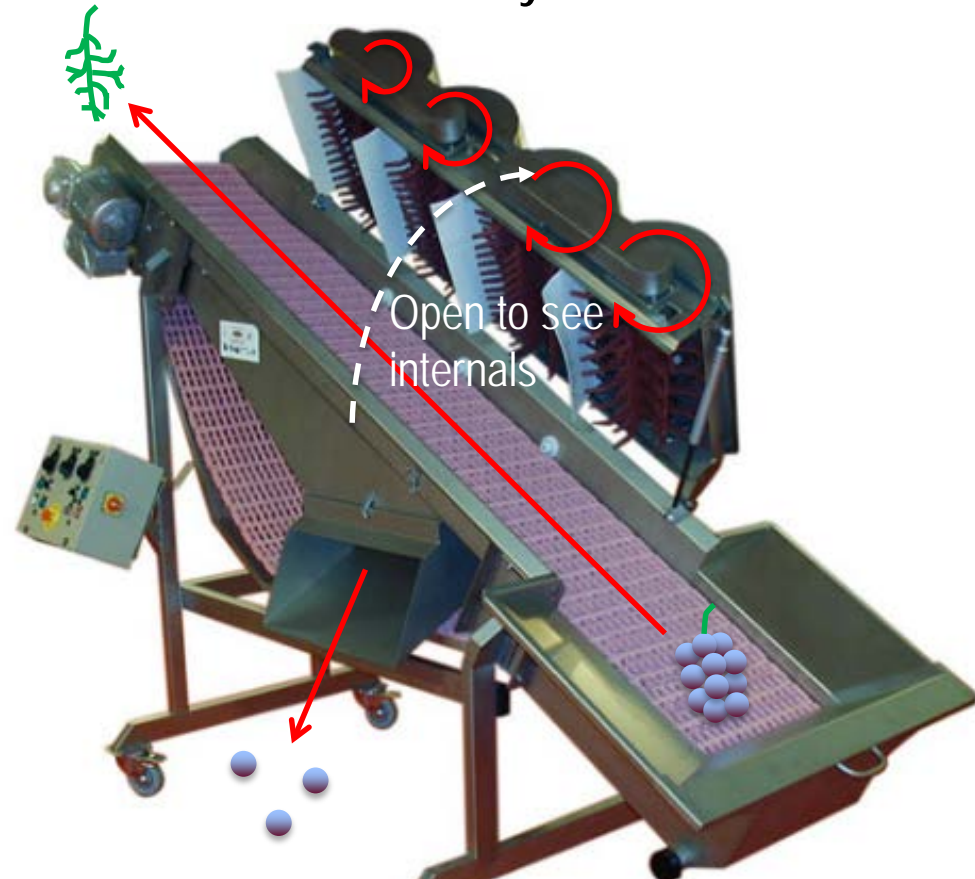
Rotary winery destemmer (traditional)



23% juice

1.5% vegetal matter

SOCMA linear winery destemmer



12% juice

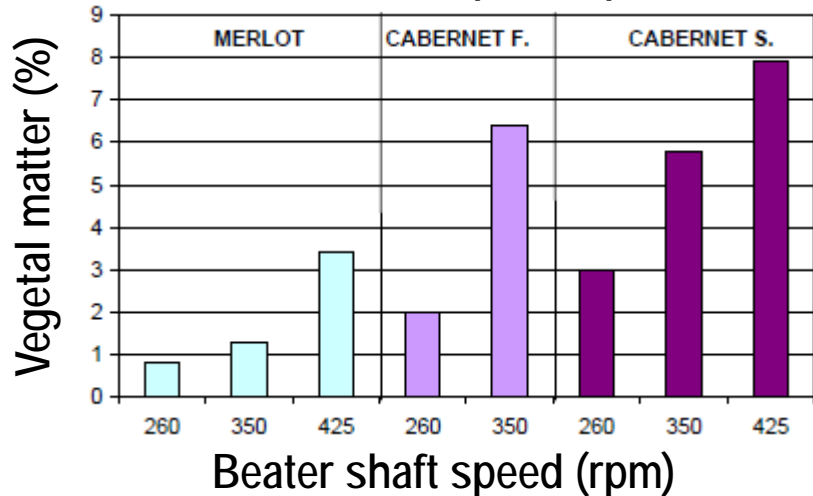
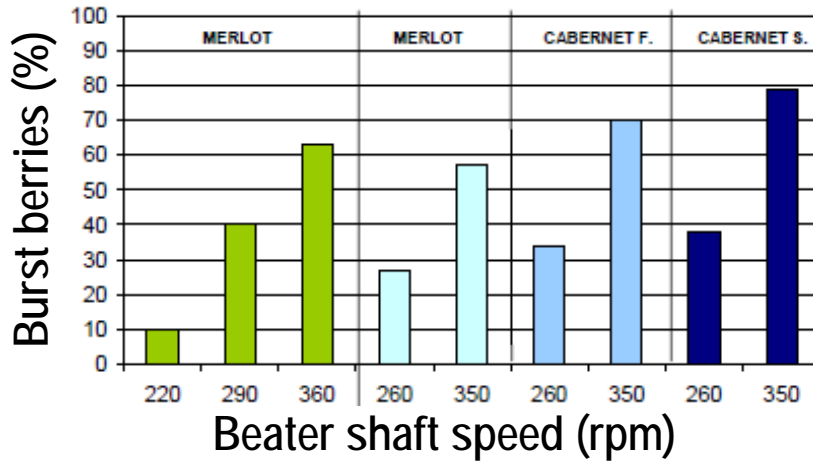
0.9% vegetal matter

Armbruster Rotovib destemmer (c. 2006)



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- Influence of beater shaft speed (Vinsonneau and Vergnes 2000):



- Similar to traditional rotary destemmer but shaft vibrates
- Some grape detachment by vibration
- Lower shaft rotation speed required
- Throughputs: < 10, 20 & 30 t/hr*



*Nominal capacity, i.e. may overstate real capacity

Armbruster Rotovib - Video



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Pellenc Selectiv' destemmer-sorter (c. 2008)



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- Bunches conveyed by sectioned grid conveyor and overhead shark-fins
- Grape detachment by vibrating rods
- Two-stage roller sorting
 - 1. Smalls and juice fall through
 - 2. Grapes fall through
- Throughputs: < 4, 3-10 & 7-20 t/hr*



*Nominal capacity, i.e. may overstate real capacity

Pellenc Selectiv' - Video



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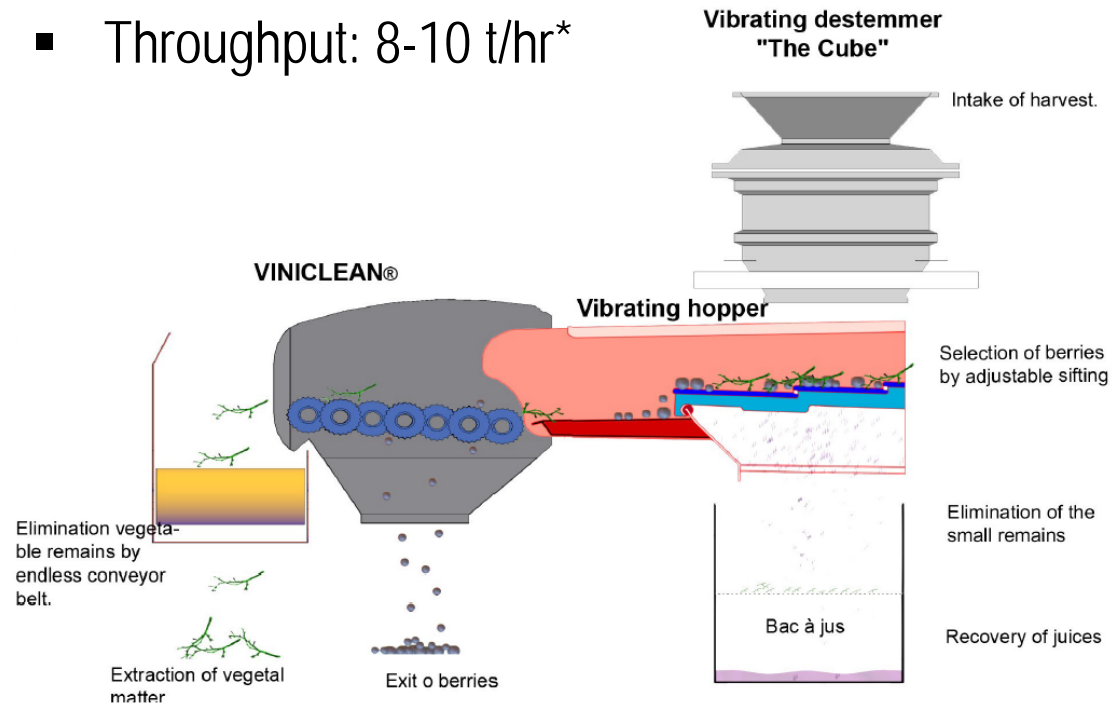
SOCMA Cube destemmer-sorter (c. 2010)



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- Bunches conveyed by gravity & star wheels
- Grape detachment by vibrating rods
- Two-stage sorting
 - 1. Vibrating – smalls and juice fall through
 - 2. Rollers – grapes fall through
- Throughput: 8-10 t/hr*



*Nominal capacity, i.e. may overstate real capacity

SOCMA Cube - Video



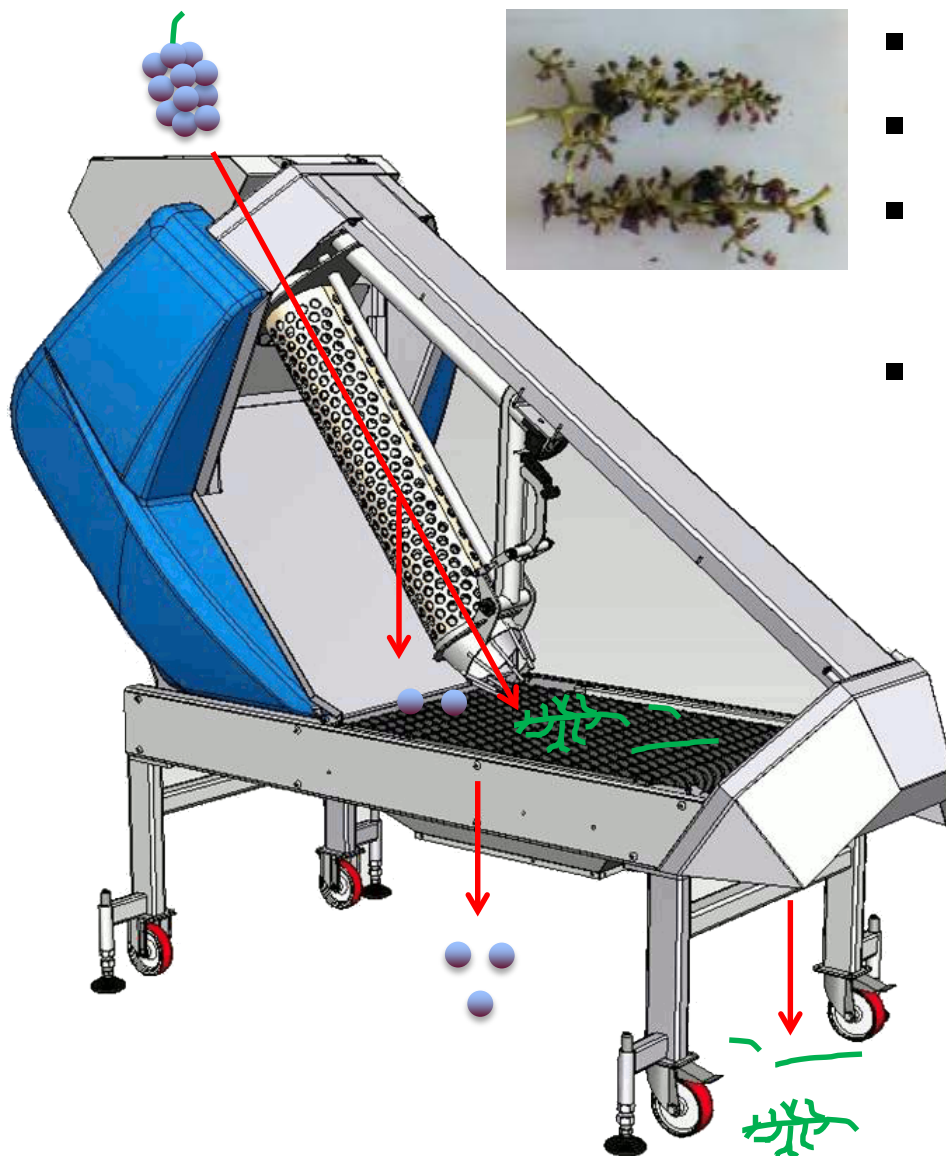
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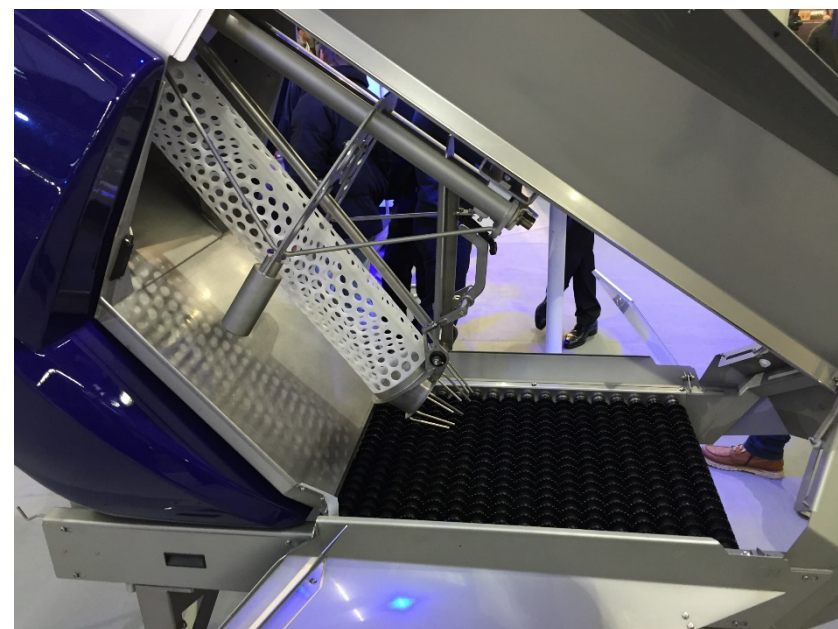
Bucher-Vaslin Oscillys destemmer-sorter (c. 2011)



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- Bunches conveyed by gravity
- Grape detachment in shaking cage(s)
- Single-stage roller sorting
 - Grapes, juice, smalls fall through
- Throughputs: 3-8 & < 20 t/hr* (1-2 cages)



*Nominal capacity, i.e. may overstate real capacity

Bucher-Vaslin Oscillys - Video



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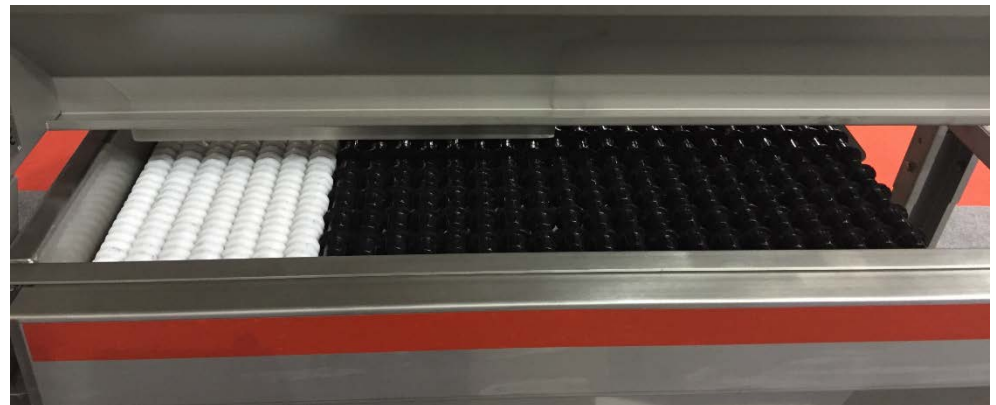
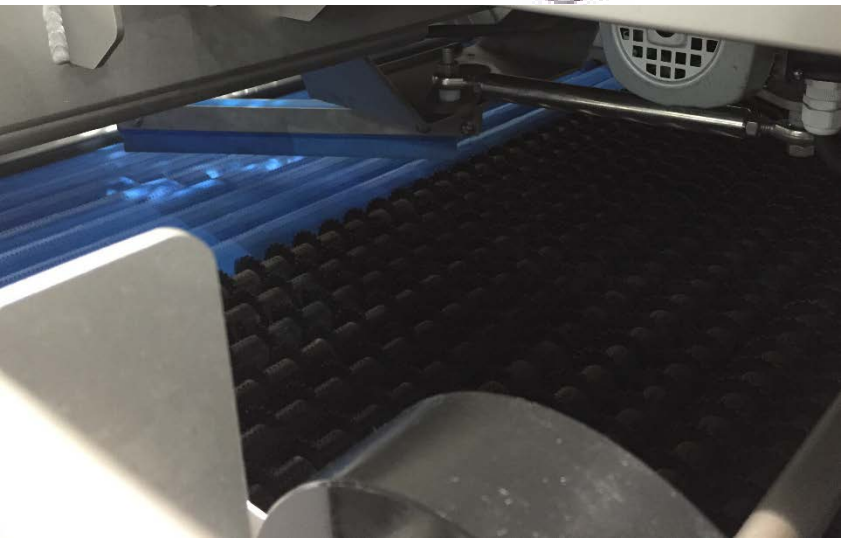
Roller sorting (standalone units)



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- Single or 2-stage rollers (Pellenc-style)
- Spreading systems on larger devices – vibrating, sweeping arms
- Throughput: as high as 25 t/hr*



*Nominal capacity, i.e. may overstate real capacity

Bucher Vaslin Trio - Video



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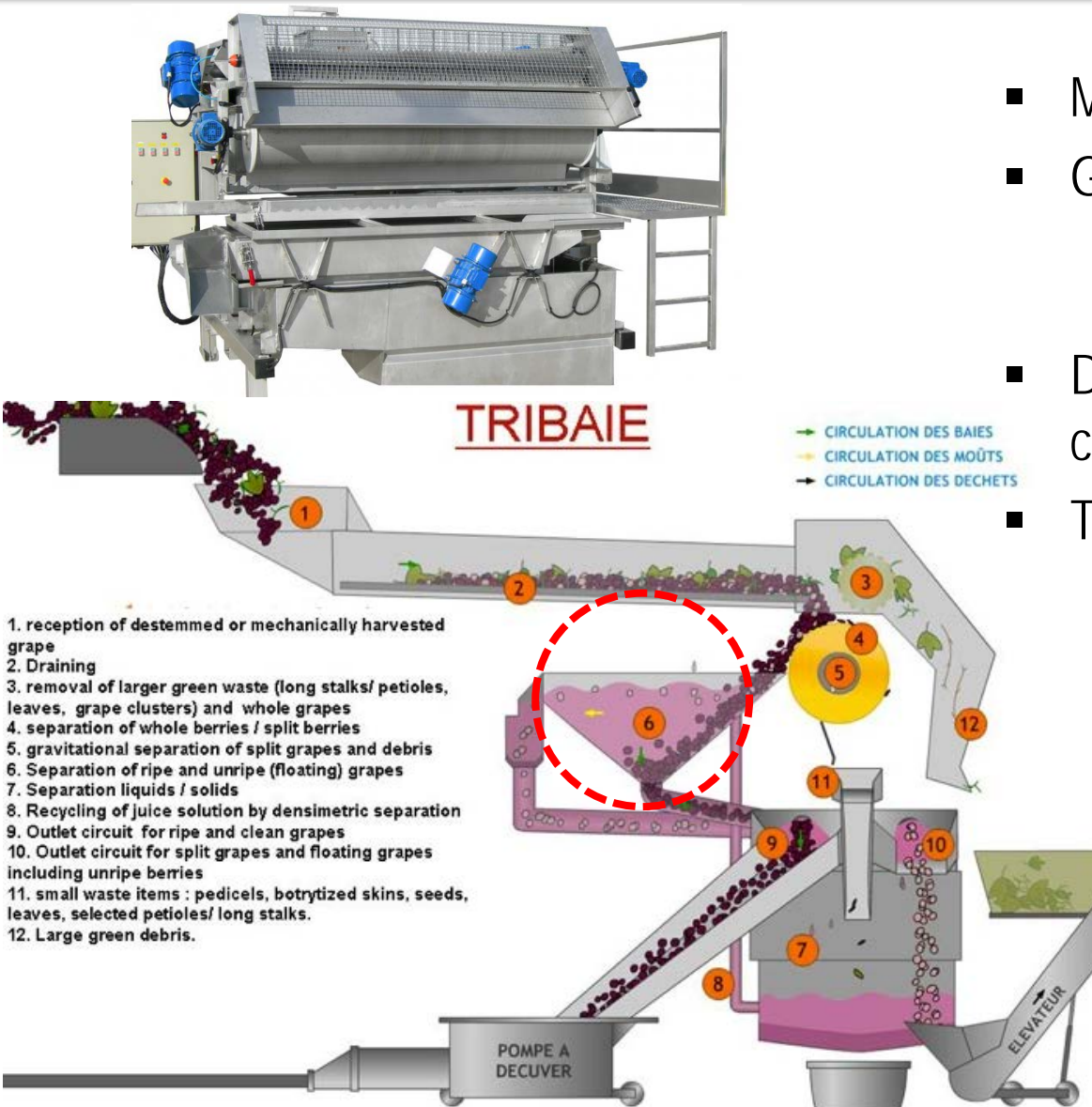


Density sorting (AMOS Industrie Tribaie, c. 2005)



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- Multi-stage system
- Grapes also sorted on density
 - Ripe grapes sink and unripe grapes float in sugar/juice solution of set Brix
- Density bath can also be used for cooling
- Throughputs: < 5, 10, 20 t/hr*



*Nominal capacity, i.e. may overstate real capacity

AMOS Tribaie - Video



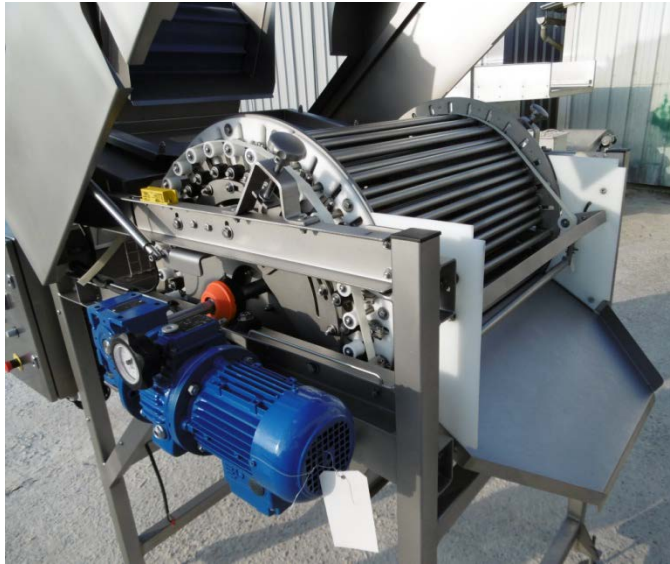
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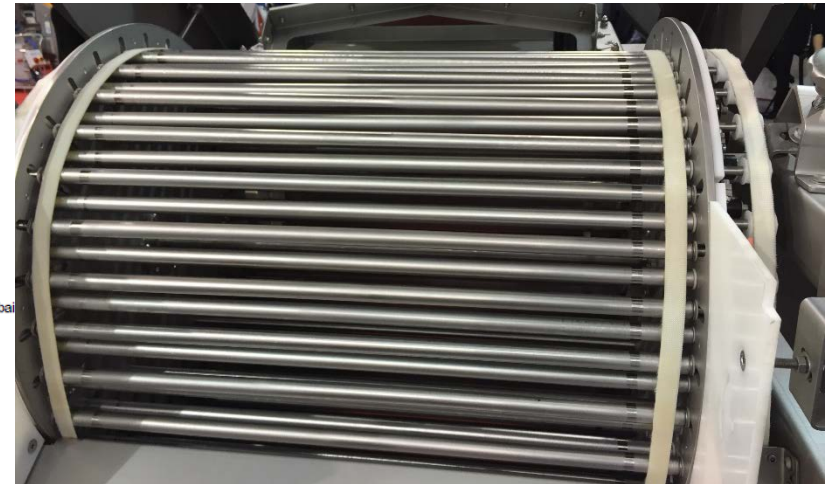
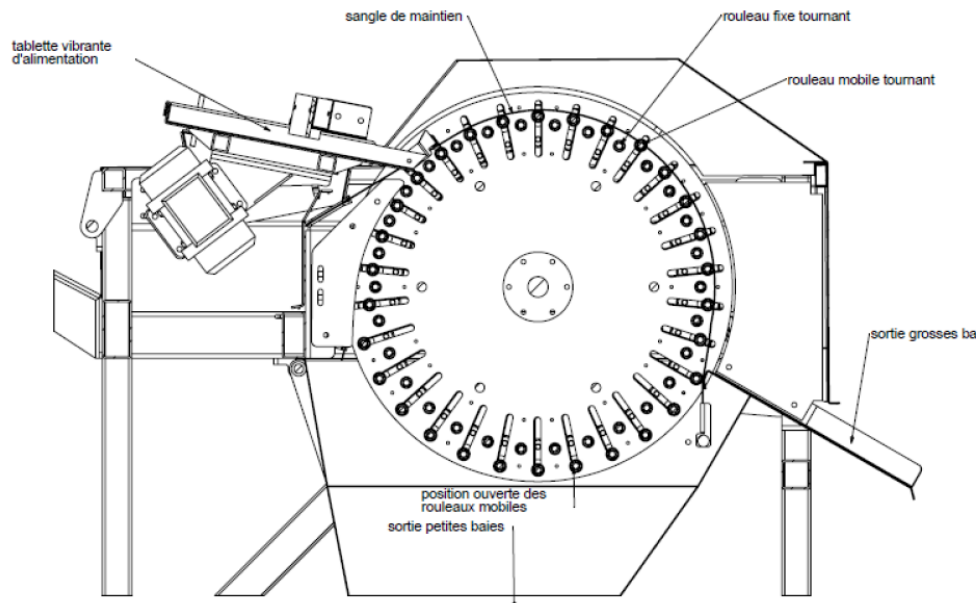
Grape size sorting (AMOS Industrie Calibaie, c. 2014)



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- Sorts grapes according to diameter
 - Grapes larger than set roller gap travel across the top of roller drum
 - Grapes smaller than set roller gap fall into roller drum at the top and fall out at bottom (strap releases spring-loaded rollers at bottom of rotation)
 - Designed to be used after sorting by Tribaie
- Throughput: 4-8 t/hr*



*Nominal capacity, i.e. may overstate real capacity

AMOS Calibaie - Video



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Optical sorting (c. 2008, earlier in other industries)



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- Devices sort according to size/shape, colour
 - (and sometimes other spectral regions – e.g. red light fluoresces chlorophyll in vegetal matter & detected in the NIR)
 - More flexibility than mech. sorting – software not hardware
 - Ability to detect mouldy red grapes? slight ripeness differences?

■ Process:

- Pre-draining by vibrating screen
- Material spread and imaged (while gravity falling for some low throughput, or on a fast belt for high throughput machines)
- Defects ejected by air nozzles

Manufacturers with off-the-shelf products:

- Bucher-Vaslin Vistalys: 3-5 & <10 t/hr*
- Pellenc Selectiv' Process Vision: <12 t/hr*
- Protec X-Tri: 1.5-3.5, 3-10 & 6-12 t/hr*
- Key/Enoveneta VitiSort: <5 t/hr*
- WECO/Scharfenbeberger WineGrapeTEK: <5.4 t/hr*
- Armbruster (new unit < 5 t/hr*), Siprem unit coming soon

*Nominal capacity, i.e. may overstate real capacity



Optical sorters - different feed systems - Videos



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From the destemmer, the grapes can be fed directly to the VitiSort infeed shaker. The infeed shaker removes MOG and raisins and collects free run juice

Key Vitisort
Gravity feed
Lower throughput



Bucher-Vaslin Vistalys
Belt feed
Higher throughput

Automatic winery sorters – costs and adoption* (as of Nov 2014)



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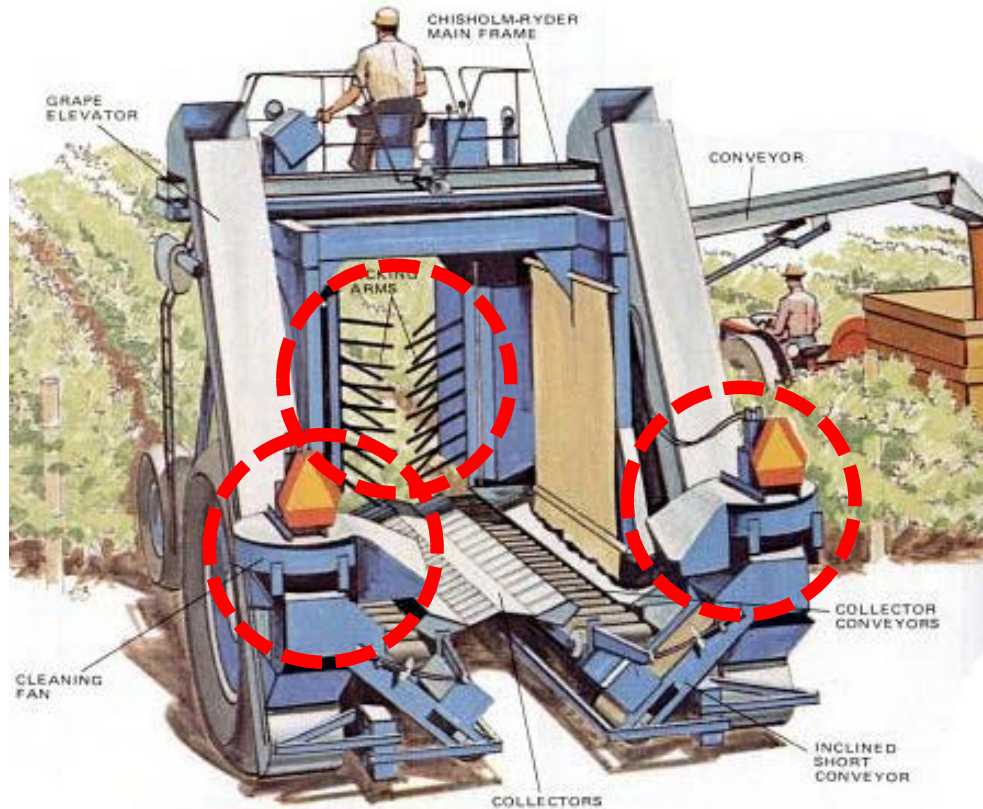
Notable mechanism	Example brands and/or models	Throughput (t/hr)	Cost	# Australia	# World
Rollers	Bucher-Vaslin Delta Trio	<15	\$25,000	~8	~150
	Integrated with vibrating destemmer – Pellenc/SOCMA/Bucher-Vaslin			~20	~1,000
2-stage vibrating	Enoveneta TSA	7-15	\$30,000	~3	~150
Grape size	Amos Industrie Calibaie	4-8	\$45,000	0	~10
Air-jet (gravity-fed)	Vaucher-Beguet Mistral	6-9	\$60,000	~2	~350
Air-jet (fast-belt)	Bucher-Vaslin Rflow	<15	\$55,000	0	~100
Density bath	Amos Industrie Tribaie	< 5	\$120,000	0	~85
		< 20	\$200,000		
Optical	Bucher-Vaslin, Pellenc, Protec, Key, WECO...	< 5	\$90,000	~2	~250
		<10	\$240,000		

*Order of magnitude values – for general technology comparison purposes only, other capacities available

Machine harvesters - c. 1970s

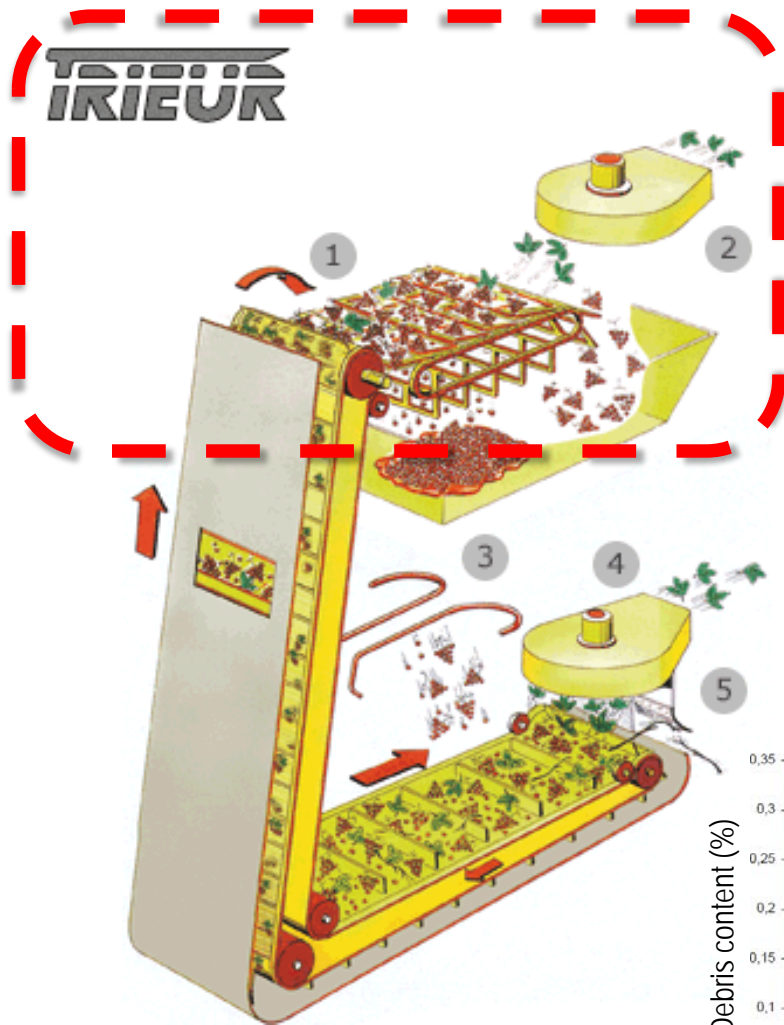


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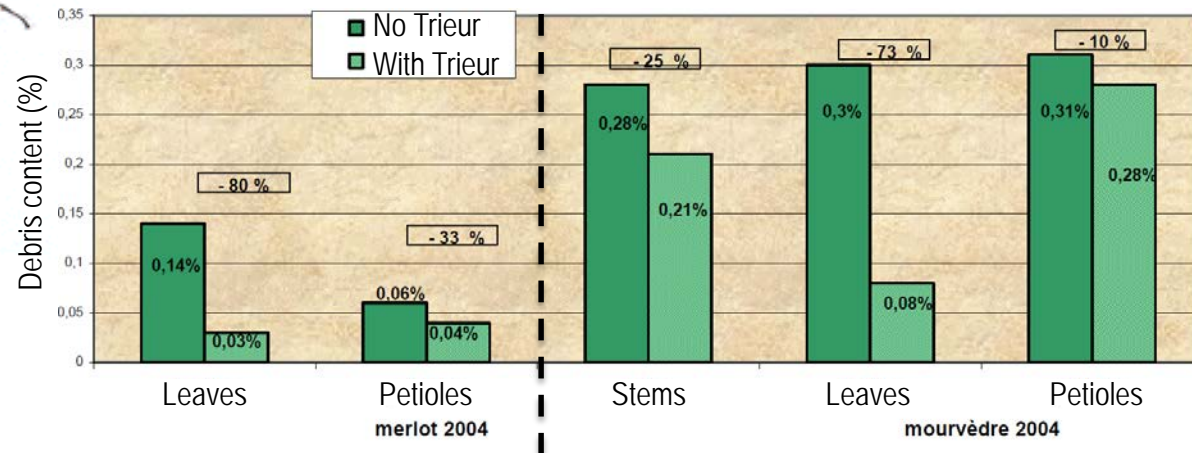
- Partial destemming
 - Many stems left on the vine
- Some sorting
 - Cleaning fans - leaves
- Vegetal matter in harvest
 - Hand-picked: ~7%
 - Machine-harvested: ~1-2%

Pellenc Trieur grid-belt sorter - c. 1999



- Free grapes and juice fall through grid-belt so top fan can clean more effectively / operate at higher suction without losing juice
 - Still mainly just removes leaves
 - Petioles pass / not sucked away

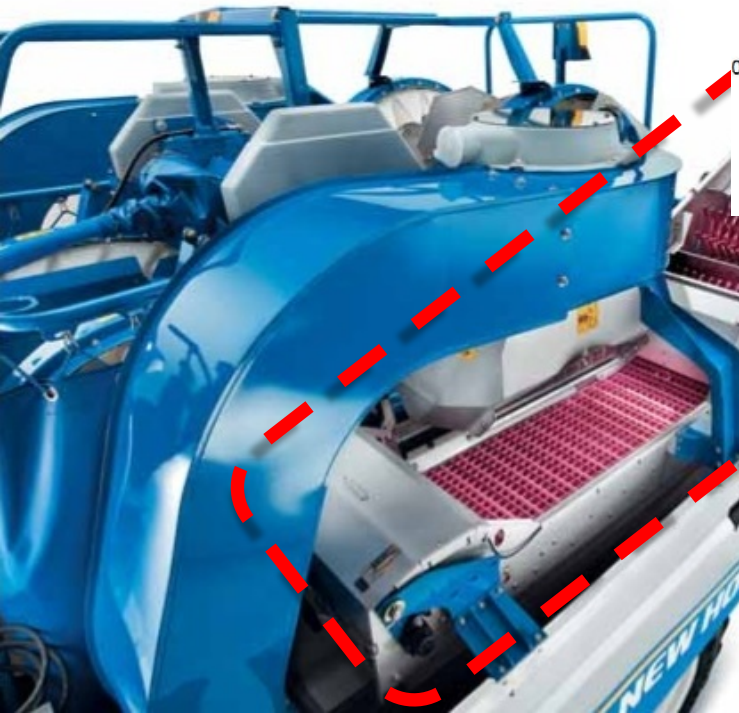
Debris content with and without Trieur top-fan turned on
(Plot translated from Vinsonneau et al. 2005)



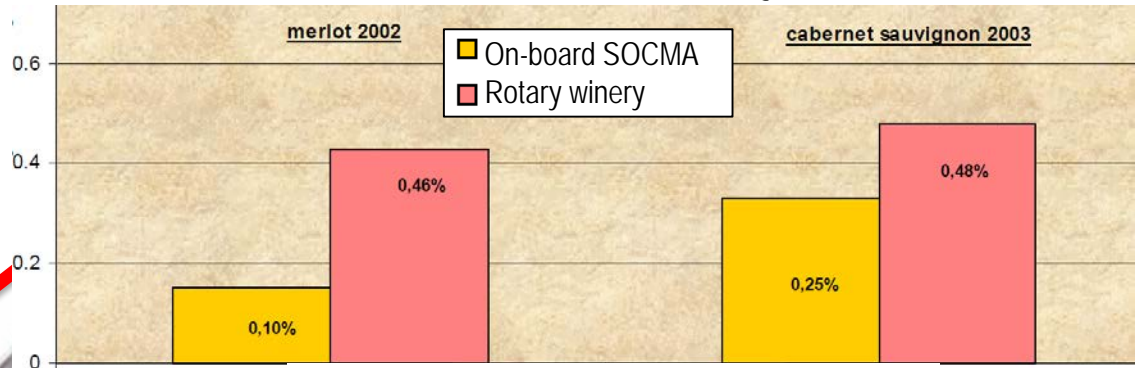
SOCMA destemmer on New Holland Braud harvester – c. 2002



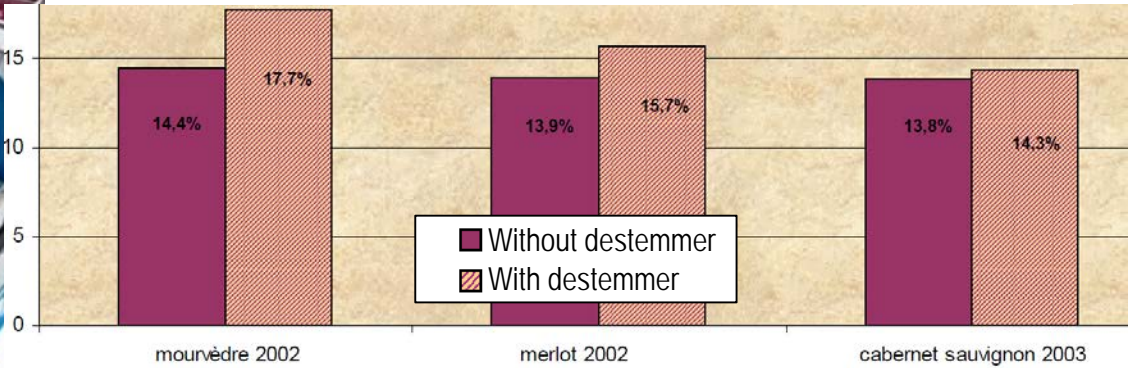
- Above bins on each side – still current destemmer for New Holland Braud harvesters
- Removed more vegetal matter than rotary winery destemmer
- Slightly more juicing at harvest than without destemmer



Stem content – on-board SOCMA vs. rotary destemmer at winery



Juice content – without or with on-board destemmer



Plots translated from Vinsonneau et al. (2004)

Pellenc - Selectiv' Process 1 & 2 - c. 2007 & 2013



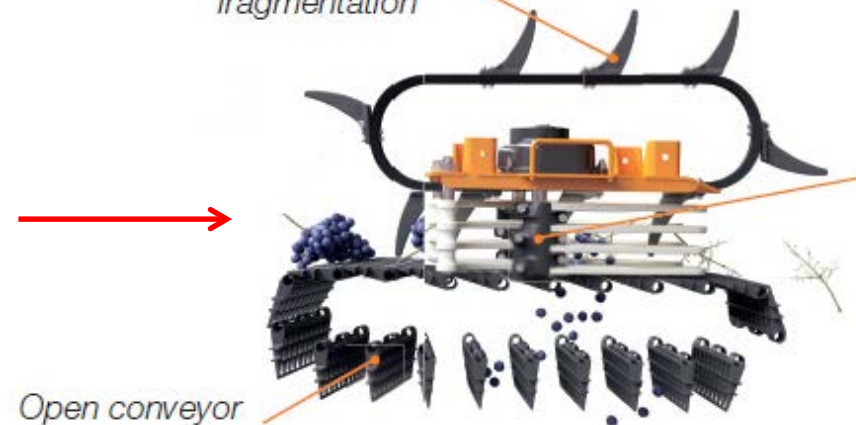
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- Pellenc's new shaking linear destemmer
- Roller sorting table including initial rollers to align petioles
 - Pellenc claim: "95% of petioles eliminated" (bigger than 35 mm long, IFV testing)

*Feeder fingers
steady flow - limits
fragmentation*

*High-frequency
linear destemmer*



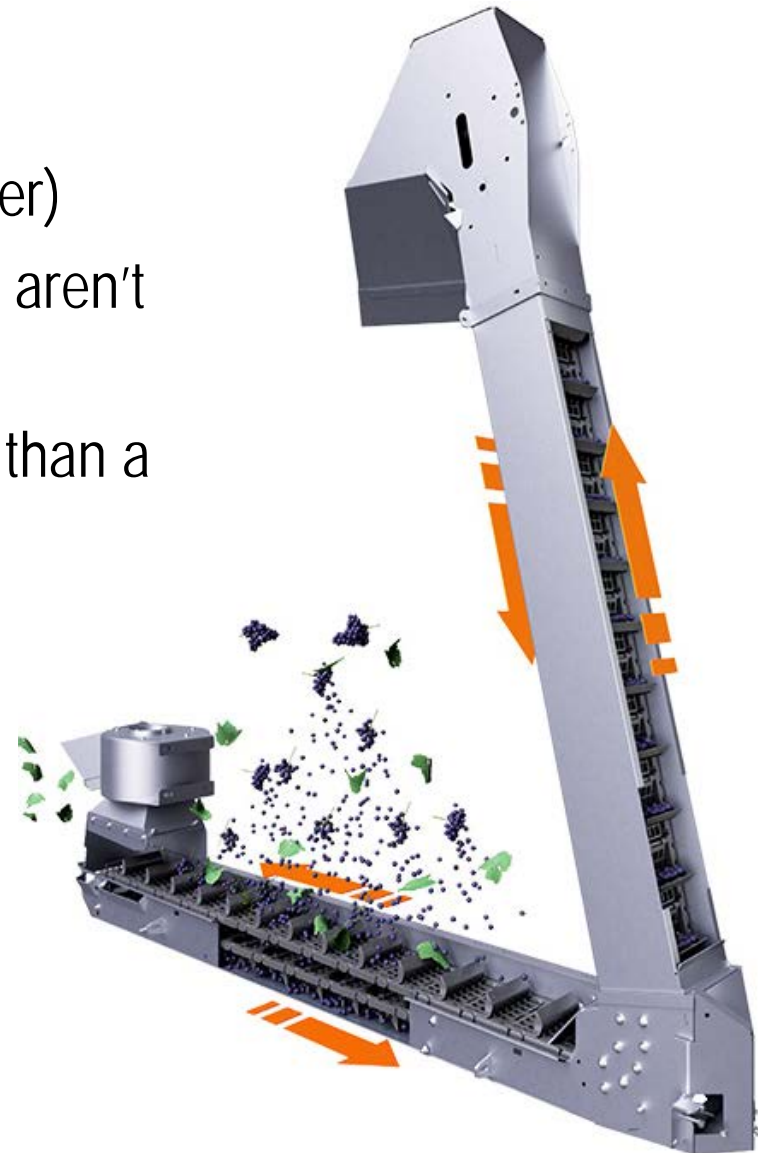
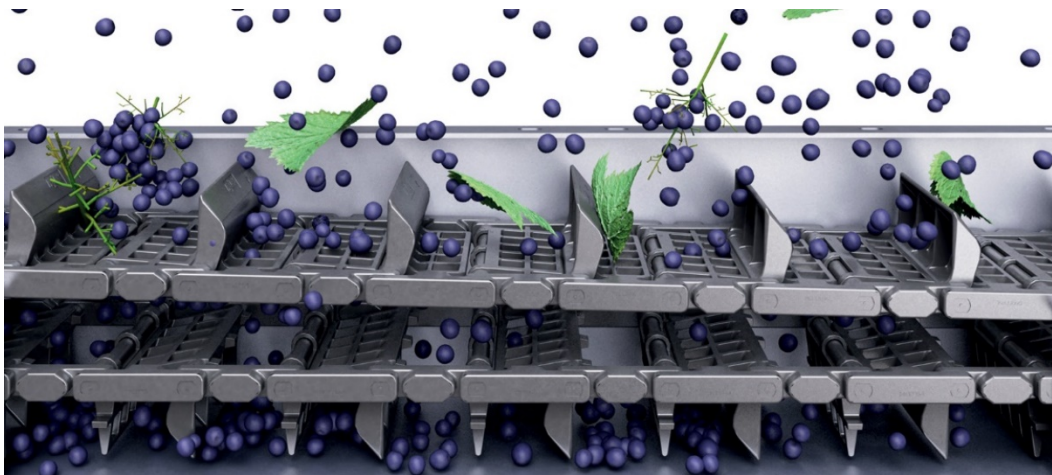
Open conveyor

Pellenc – grid-conveyor sorter



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- Grid for the whole conveyor
(evolution of Pellenc's initial grid fan sorter)
 - Free grapes/juice can fall through and aren't exposed too directly to fans.
 - Pellenc claim "up to 5% more harvest than a competitive machine"



Video - Pellenc Selectiv' Process 2



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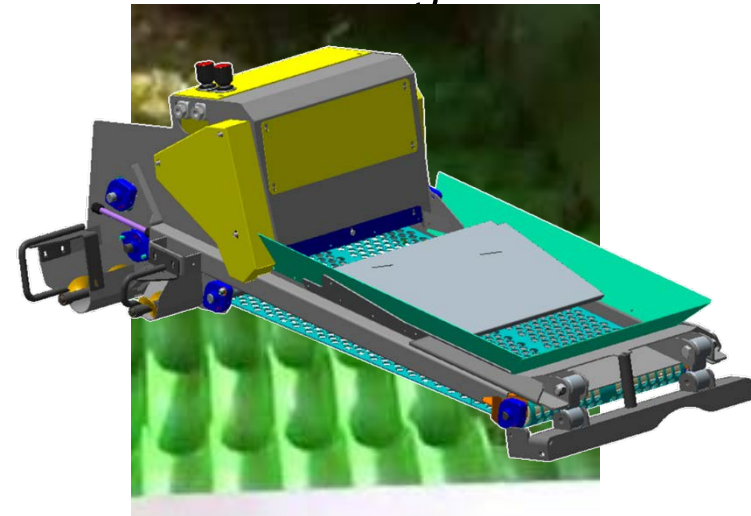
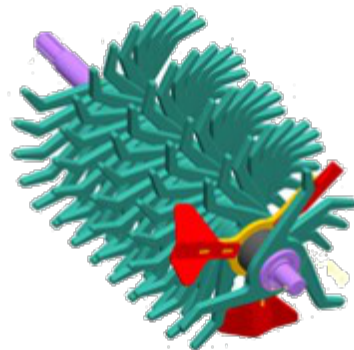
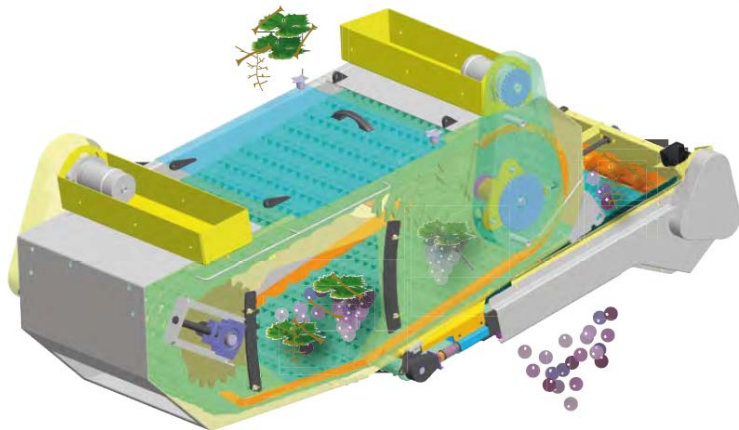
Gregoire Cleantech Vario - c. 2009



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- Gregoire Cleantech destemmer (cross between SOCMA destemmer and traditional rotary destemmer)
- Vario roller sorting table
 - In France they have also offered the ViniSelect holed shaking belt sorter (low throughput, c. 2013) instead of roller sorting



Video – Gregoire Cleantech Vario



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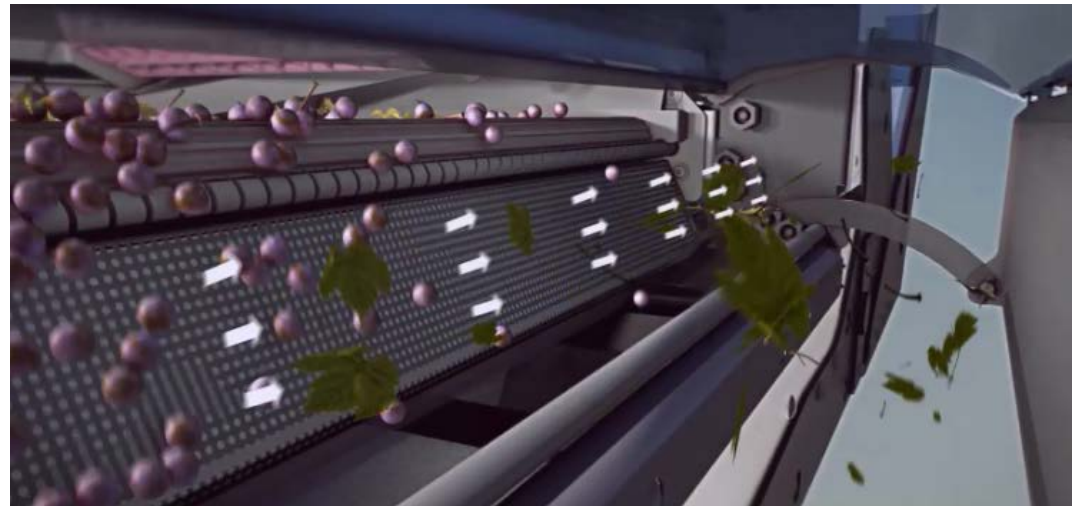


New Holland Braud Opti-Grape - c. 2013



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- Still has SOCMA destemmer
(after a new roller pre-sorting stage)
- Now has an air-cushion sorting stage
 - New Holland claim: “it is also effective at removing dry and mouldy fruit, and also botrytrised fruit”



Video – New Holland Braud Opti-Grape



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ERO Vitiselect - c. 2013



- Traditional rotary destemmer
(ERO claim that they were first with an on-board destemmer in 1998)
- Roller sorting table
- Compatible with side-arm discharge conveyor



Video – ERO Vitiselect



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Oxbo PremiumSort - c. 2015



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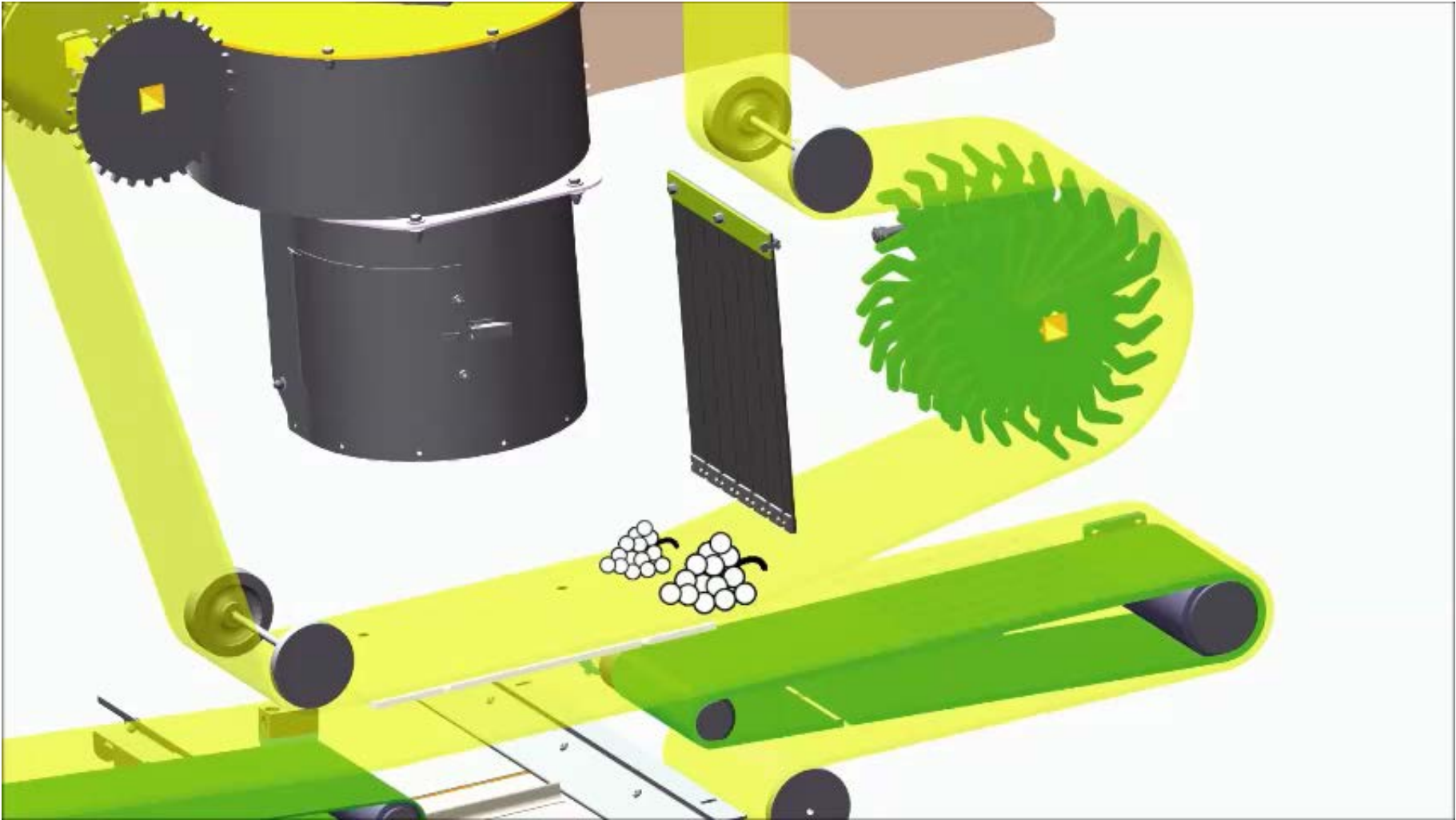
- Destemmer similar to Gregoire but is centrally and rear-mounted
- Ratchet motion sorting belt that grapes fall through
- Compatible with side-arm discharge conveyor



Video – Oxbo PremiumSort



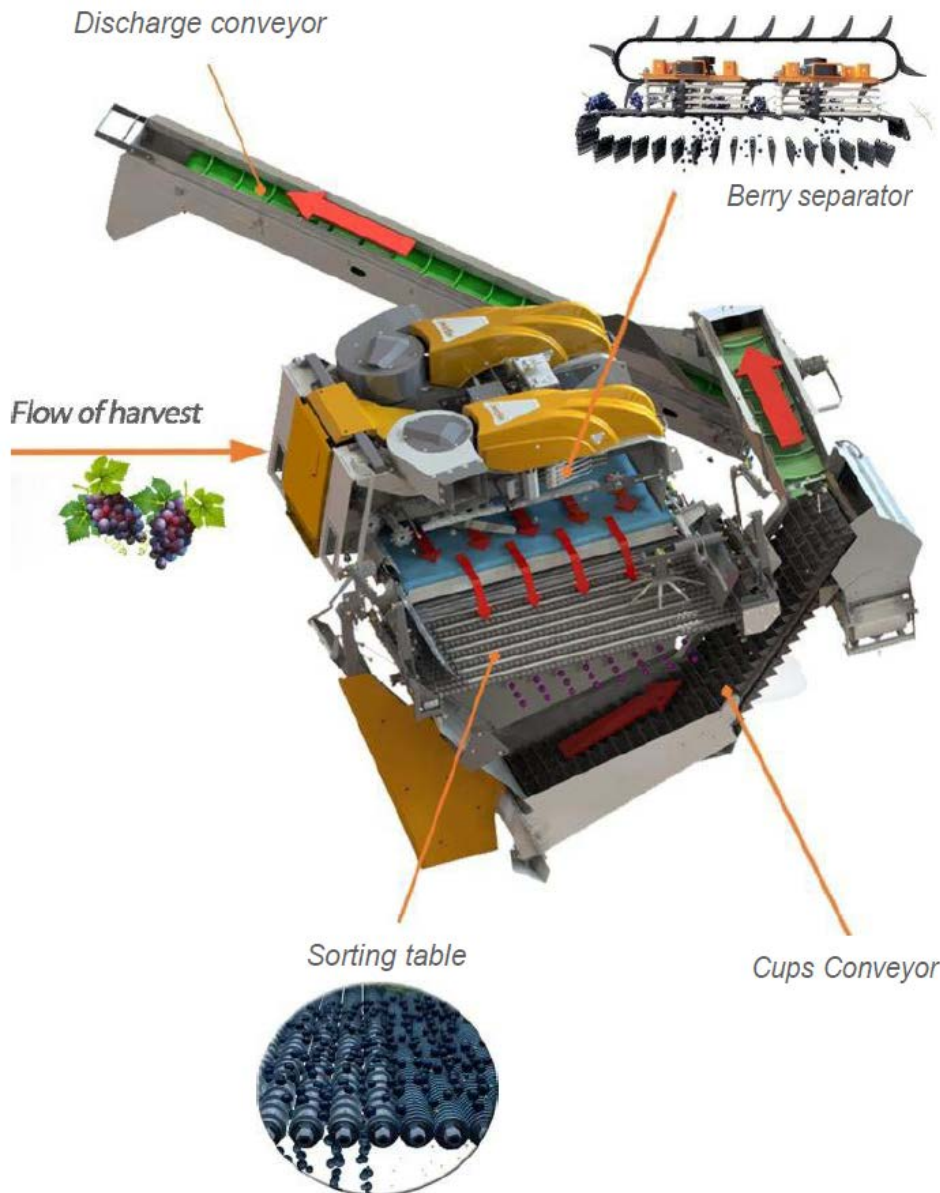
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Pellenc Selectiv' Process 2 (XLE) – conveyor - c. 2015



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- Similar to model with twin on-board bins, but has side-arm discharge conveyor
 - Side-ways moving belt under destemmers transfers grapes to a single larger sorting table
 - Sorted grapes fall into a single buffer bin with a conveyor system in it that feeds the side-arm discharge conveyor
 - Buffer bin allows for storage when changing gondolas, etc.
- Demonstrations in USA and Australia last vintage

Speed and yield

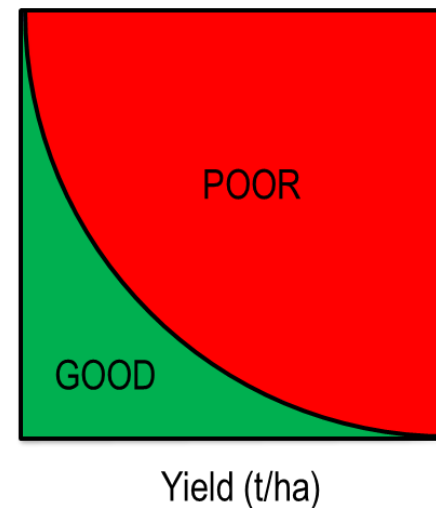


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- Destemming and sorting systems may only process a certain throughput before their performance declines → losses or maceration



Forward
speed (km/h)



- Limitations model/conditions dependent – only have supplier recommendations (not independent – treat with considerable caution)
 - Pellenc: Destemmers “reach speeds up to 50 tonnes/ha at 4.5 km/hr”
 - New Holland Braud: Destemmer only “use in up to 20 tonnes/ha, shorter rows”
Opti-Grape “use in up to 8 tonnes/ha, shorter rows”



- Destemming and sorting systems add complexity and moving parts
- One company I spoke with loved the harvest quality but experienced a few more breakdowns (will be model and conditions dependent)

Does sorting improve wine quality?

(vineyard
or winery)



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- Complex question, factors include:
 - Grape and vine condition
 - Wine style
- With regards to removal of vegetal matter:
 - More important for reds than whites – most important factor is probably the long contact time during fermentation
 - Vinsonneau and Vergnes (2000): 1% additional vegetal matter can negatively impact quality for some red wines (this was added on top of the 0.5-2.1% that was already in the output from the destemmer)
 - Anneraud et al. (2012) trialled many pieces of winery sorting equipment
 - Before sorting vegetal matter was typically 0.4-1.7% and after was 0.1-0.4%
 - Ward et al. (2015): > 5% petiole addition required to produce significant sensory and chemical changes in a Cabernet Sauvignon (petiole addition increased floral characters)



Destemming/sorting in the vineyard or winery?



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- Red grapes/wine



- If mechanically harvesting and want to sort, probably better to sort on harvester as the grapes will be in the most intact condition for sorting
- One benefit of winery sorting is extra technologies (optical, density bath)

- White grapes/wine



- On-board destemming could cause more grape maceration leading to more grape skin derived phenolics in the free-run (level of maceration will be brand/model/conditions dependent)



- Currently low adoption in Australia relative to Europe and New Zealand
 - Low industry profitability
 - Vegetal matter left in the vineyard that currently get paid for by weight at the winery (and some good grapes – typically 0.5% in ITV/IFV studies)
 - Slower forward harvesting speeds in some instances
 - Increased maintenance
 - Side-arm discharge conveyor models only available recently

(the increased operating costs are likely more influential than capital costs – destemming/sorting system only 2-10% extra on \$400K harvester)

Future – what will happen?



- Sorting grapes for red wine production in Australia is likely to become more prevalent as producers seek to premiumise (more sorting is performed overseas).
- Shaking winery destemmers with in-built roller sorting will be adopted more widely for hand-picked grapes. Optical sorters will increase in prevalence as their price reduces and performance increases.
- Machine harvesters with on-board destemming and sorting will also be more widely adopted as a cost-effective means of sorting machine-harvested red grapes while they are in their most intact condition.



- Suppliers who provided information on their winery/vineyard equipment and offered their perspective
- Wine industry personnel who offered their perspective
- People who posted videos of equipment operation on-line that I used/edited snippets from
- MatéVi – includes information on equipment trials performed by the French Institute of Vine and Wine (IFV)



<http://www.matevi-france.com>

Disclaimer



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The information contained in these slides should be considered general in nature, and viewers should undertake their own specific investigations before purchasing equipment or making major process changes.

The dates when different inventions were introduced and the order in which these inventions were made are presented in good faith based on information currently available. Some limited comparisons between different equipment are made and these are again presented in good faith based on available information.

It should be noted that there is fairly limited rigorous independent information available on the relative performance of vineyard/winery equipment, particularly given the importance of equipment performance to all wine producers - both in terms of wine quality and productivity.

None of the information presented in this article should be considered as an endorsement of any product by the AWRI.

Vineyard



How common are?

- Different vine orientations
- Different trellises
- Rootstocks
- Different pruning techniques
- Mechanical shoot thinning
- Mechanical leaf plucking
- Precision viticulture
- Side-arm harvesters
- Harvest bins vs gondolas
- Metal posts

What are the key?

- Pest and disease issues
- Vine nutrition issues

Winery



How common are?

- YAN measurements
- Colour measurements
- Juice flotation
- White skin contact
- Hyperoxidation
- Different yeasts
- Wild ferments
- Cold soaks
- Vinimatics
- CMC for cold stabilisation
- Plant-derived fining proteins
- Different bentonites
- Wine/lees cross-flow filtration
- Screw-caps and corks



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AWRI Vineyard and Winery Practices Survey



*Help build an accurate picture of Australian
grape and wine production practices*

Click to start now



Vineyard Practices Survey

Click to start now



Winery Practices Survey

You could win a trip to Bordeaux, France!



**VINITECH
SIFEL**
THE GLOBAL TRADE SHOW
for horticulture vegetable production

**29 NOV
1st DEC
2016
BORDEAUX**

Project contact: Simon Nordestgaard | The Australian Wine Research Institute
survey@awri.com.au | (08) 8313 6600 | www.awri.com.au | [competition terms & conditions](#)





AWRI Vineyard Practices Survey

Rootstocks

[Intro video](#) | [List of survey topics & FAQ](#)

Business name: simon test

GI region: Eden Valley

12. How many hectares are on rootstocks and how many hectares are on own roots?

On non-vinifera rootstocks

On own/vinifera roots

0 out of 12 Total

Any comments related to Rootstocks

Back

Next

21%





AWRI Winery Practices Survey

Sorting

[Intro video](#) | [List of survey topics & FAQ](#)

Winery site name: Simon's test site

23. Was any sorting performed at the site during the 2016 vintage?

(This includes any manual sorting before or after destemming or automated sorting technologies such as optical sorting, vibrating screens, roller screens, density baths, air-jet sorting, etc. including destemmers with integrated roller sorters like the [Pellenc Selectiv'](#), [Bucher-Vaslin Delta Oscilllys](#), and [SOCMA Cube](#).)

No



Any comments related to Sorting

Back

Next

27%

