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MECHANICAL HARVESTING OF WINE GRAPES

5. TYPES OF MECHANICAL HARVESTERS

In the past decade or two, many new innovations and enhancements have been made to existing systems of mechanical harvesters. New harvester brands have emerged and most of the harvesters are equipped with sophisticated electronic equipment.

5.1 Principals of mechanical harvesting

- The grapes are shaken off by the harvester.
- The beaters shake the grapevine to detach the grapes - the grapes are not struck off by the beaters.
- The beaters do not strike towards one another, but work parallel to one another.
- Originally, harvesters used straight beaters with metal points. Nowadays they use bow rods made from hard plastic (Fig. 1).

5.2 Modes of shaking

Three different modes of shacking exist:

1. Horizontal canopy shaking
 - Standard type that is currently available (Fig. 1).
2. Vertical cordon shaking
 - System designed by Intrieri, which uses a Pitman action (rotating force turned into a vertical action) to shake the cordon up and down.
3. Stem shaking
 - Parallel iron beams that shake the stem of the grapevine from side to side.



Figure 1: The harvesting chambers of different mechanical harvesters which use a horizontal shaking mode and bow rods. (Photo: Robert Stolk)

The adjustments made to horizontal canopy shaking harvesters should be very accurate. This ensures that the vibrations from the shaker is optimally transferred to the canopy in order to remove the berries efficiently, without damaging them or the grapevines. Adjustments include the correct combination of the following: beater speed/rate (tempo), ground speed (speed at which the harvester moves forward) and the speed of the fans that remove the material other than

grapes (MOG). If these adjustments are not accurate, one could expect more juice losses as well as defoliation, which will influence the quality of the harvest.

On the other hand, because of the way in which the vertical cordon shaking harvester and the grapevine interact, the transfer of the vibration to the grapevine is more effective and that leads to a cleaner harvest. These harvesters cause less damage to the grapevines and the grapes being harvested compared to the other types of harvesters.

5.3 Conveyor technology

Some harvesters have skids (collection plates) (Fig. 2) that close around the stems of the grapevines and the poles of the vineyard. Other harvesters have rubber collection bowls (Fig. 3) that close around the stems and the poles. Some harvesters have two conveyers (one on each side of the harvesting chamber) (Fig. 3), whereas others have only one conveyor (Fig. 2) on the one side of the harvester.

Harvesters are usually equipped with strong magnets to collect unwanted metal objects from the harvested grapes. These objects can damage expensive equipment when they reach the cellar. Some harvesters also have the ability to dose the harvested grapes with liquid SO₂ before they reach the receptacle.

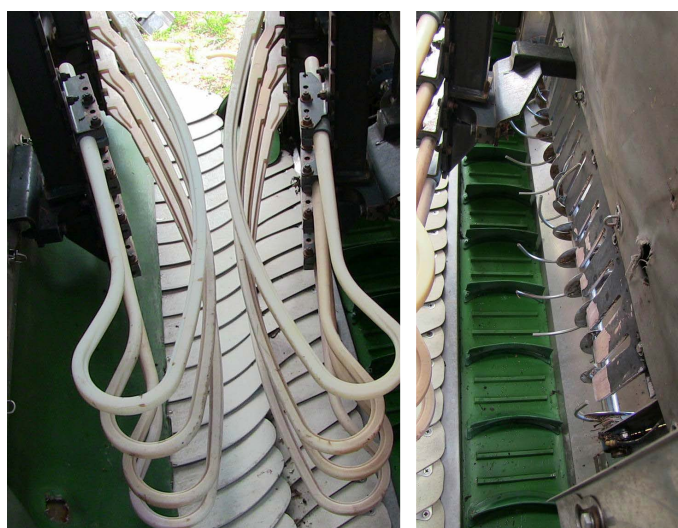


Figure 2: (Left) Mechanical harvester which works with skids – underneath bow rods. This machine uses only one conveyor (right) to carry the grapes to the load bin on the machine. (Photo: Robert Stolk)



Figure 3: Mechanical harvester which works with collection bowls (top). These collection bowls also serve as double conveyers (bottom) that carry the grapes to the load bin on the machine. (Photo: Robert Stolk)

5.4 Receptacle technology

Harvesters that have their own receptacles usually have a limited collection capacity and are more suitable for vineyards with lower yields and shorter rows.

Harvesters with a conveyor arm that drops the harvested grapes into a cart pulled by a tractor in the adjacent row, are more suited to high-yielding vineyards and vineyards with longer rows.

5.5 Fan technology

The position, size and speed of the fan determine the amount of MOG removed from the harvested grapes. This unfortunately also influences the amount of juice blown away with the MOG. With higher fan speeds, more juice losses can be expected and therefore accurate adjustments to the harvester are critical.

5.6 Electronic and automatic control systems

Nowadays, mechanical harvesters contain various technological developments, which include:

- Air-conditioned cabins with electronic screens and control panels (Fig. 4).
- The ability to adjust to the slope of the soil (self-levelling). They are fitted with electronic 'fingers' that sense the height of the machine above the soil surface in order to automatically adjust the tilt.
- Cameras that follow the soil and cordon, which allows the operator to make adjustments (Fig. 4).
- Some possess sorting tables and others de-stemmers, both of which deliver a cleaner product (less MOG) at the cellar (Fig. 5).
- An automatic steering mechanism. However, if something goes wrong with the electronics, it must be able to mechanically override the automatic system.
- GPS technology fitted to monitor the yield while harvesting. This can be used to harvest differentially and selectively apply other cultivation practices.



Figure 4: Electronic control panel (top) and screen of camera view which follows the soil surface (bottom). (Photo: Robert Stolk)

Nowadays, most of the above-mentioned developments are standard on most harvesters or can be added at an additional cost.

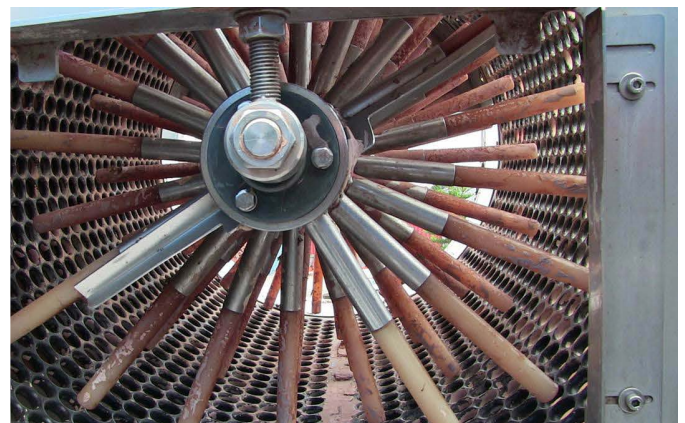
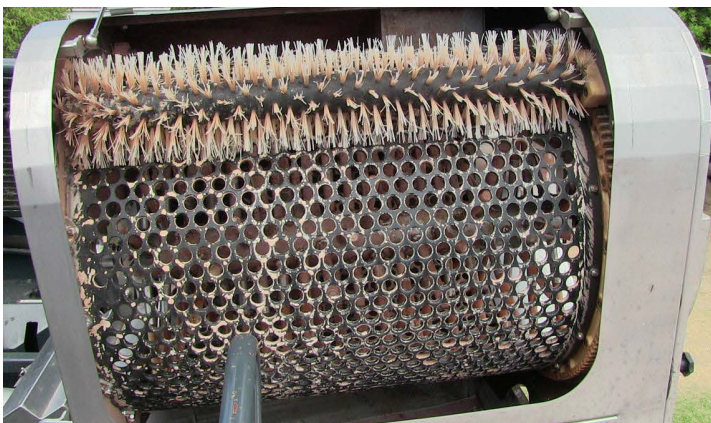


Figure 5: This harvester carries a de-stemmer to ensure delivery of cleaner grapes at the cellar. (Photo: Robert Stolk)

5.7 Multifunctional harvesters

To justify the large capital expense of a mechanical harvester that is only used for a short period every year, manufacturers started to design harvesters that can also be used for other purposes. In such machines, the harvesting chamber can be disconnected relatively easily. The open area can then be fitted with a different piece of equipment depending on the activity, e.g., pruning, topping, disease control etc.

Mechanical harvesters possess strong mechanical and hydraulic propulsion systems that allows them to be used throughout the year for other purposes.

However, it should be kept in mind that the main purpose for purchasing the machine was first and foremost to harvest grapes. Maintenance schedules should be timed properly to ensure that the machine is in perfect condition for harvesting, prior to harvest.

5.8 Towed grape harvesters

- Towed harvesters use the same harvesting principals as self-propelled harvesters, although their harvesting capacity is lower.
- All the towed harvesters currently available in South Africa use a horizontal canopy shaking action.
- Just like self-propelled harvesters, towed harvesters have either one or two conveyers, fans that remove the MOG from grapes as well as receptacles on the machine or alternatively, a conveyer arm that off-loads the grapes into a cart towed behind a tractor in the adjacent row.
- Technological developments such as de-stemmers and sorting tables are also available.

5.9 Manufacturers of harvesters:

- New Holland Braud
- Ero
- Gregoire
- Pellenc
- Nairn
- Oxbo
- TRINOVA – Intrieri