



Grégoire

Autonomous line guidance
for grape harvesters



Automatic grape harvesting with ifm

Autonomous line guidance without GPS for mobile agricultural machines

With EasyPilot, the manufacturer of multi-equipment carriers and harvesters, Grégoire, has created a sensor-assisted automatic line guidance system that boasts a precision of 3 cm without needing a GPS position signal.

No other beverage holds so many secrets and divides so many opinions as wine. Wine: The Italians claim it as their national beverage, and the cup of the everlasting covenant of the Christian faith is filled with it – for in wine is truth: “in vino veritas”. One truth about wine is that it is necessary to harvest grapes to produce it. And in our days, which are marked by technological progress, the most important question is: man or machine? The romanticised image of the grape harvest, which we often see in movies and which will surely have inspired one or the other Hollywood star to buy their own vineyard, actually looks quite different in reality. Considering that in Germany alone the average citizen drinks about 20 litres of wine per year, it becomes quite obvious how much work has to be done in a

short space of time by about 80,000 German winemakers who cultivate and harvest wine on an area of about 102,000 hectares.

Given these figures, how is it possible to be successful?

Success through technology: Many winemakers use state-of-the-art harvesting machines like grape harvesters instead of manual labourers.

Grape harvesters offer various advantages. One hectare, for example, can be harvested in 3 to 5 hours. Achieving the same result with manual labour requires 40 to 60 workers.


How does an automatic grape harvester function?

The French company Grégoire is a manufacturer of grape harvesters. Their grape harvesters can additionally be equipped with an automatic line guidance system: the “EasyPilot”. This system boasts a precision of 3 cm without depending on satellite signals.

Grape harvester with the EasyPilot automatic line guidance system.

The 3D camera precisely detects the grape row in front of the vehicle.





The automatic line guidance system steers the vehicle precisely along the grape row.

The grape row is detected by a 3D camera sensor (type O3M) from ifm which measures the distance to the nearest surface for each pixel using time-of-flight technology, thus detecting the general properties of the vines. Inaccuracies caused by vine branches from the side or high grass can be excluded.

While the grape harvester moves over the vines, it creates a tunnel beneath the driver's cab. In this tunnel, shaking rods made of food-grade plastic fix and shake the trellises. These vibrations shake the vines, so that the grapes fall off. They tumble on a conveyor belt that transports them to stainless steel containers. Suckers remove unwanted elements such as leaves and twigs.

Another 3D sensor is mounted on top of the grape harvester's driver cab. This sensor is aimed at the ground and determines the height and thickness of the trellis. Once the sensor signal has been processed, a virtual guiding track is generated that visualises the grape row as a model. This model is used as a basis to calculate the ideal route for the harvester to take.



The driver only controls the operating speed, EasyPilot does the steering.

When the machine is in the grape row, the driver starts the EasyPilot via the screen in the cab. Once the system has been started, all the driver needs to do is have an eye on the operating speed and the tools – everything else is taken care of automatically by the system. At the end of the grape row, a visual and acoustic signal informs the driver that the harvester needs to be turned around to move along the next grape row. There were times when the time for the grape harvest was ordained by the government. Today, winemakers can decide for themselves, and with the grape harvesters from Grégoire, grapes can be harvested at any time – even at night. It remains to be said that innovation pays off: Grégoire have won the innovation award for their new automatic line guidance system EasyPilot, which is based on the O3M sensor from ifm.

Numerous advantages

Besides the absence of a GPS connection, Grégoire's system offers many other advantages: precise line guidance even in lots with uneven ground, increased quality of the grape harvest (improved ingress resistance, reduced loss, preservation of the vines), increased steadiness of processes beyond the grape harvest (crop spraying, pruning...), protection of the mechanics, convenience and productivity, application possibilities at day and night, operating speeds of up to 12 km/h.

EasyPilot is available as an option for the current GM7, GL7, GL8, GX8 and GX9 models. Most predecessor models equipped with a direction sensor can be retrofitted with the system.

Use of inclination sensors

The inclination sensors installed on the harvester play an indispensable role in ensuring that the machine is constantly aligned vertically, no matter how steep the slope. Only the perfect levelling of the grape harvester, regardless of the terrain, makes it possible to achieve maximum throughput and ensure the safety of the user. Besides, the machine can drive faster, saving valuable working time. The 1-axis inclination sensors (type EC2045) used have a CANopen interface which ensures easy integration into the machine controller.

Conclusion

Grégoire shows that traditional viticulture and modern harvesting machines complement each other perfectly. The EasyPilot, with its 3D camera, guarantees optimum, smooth line guidance. This ensures that no grape is lost during wine production.