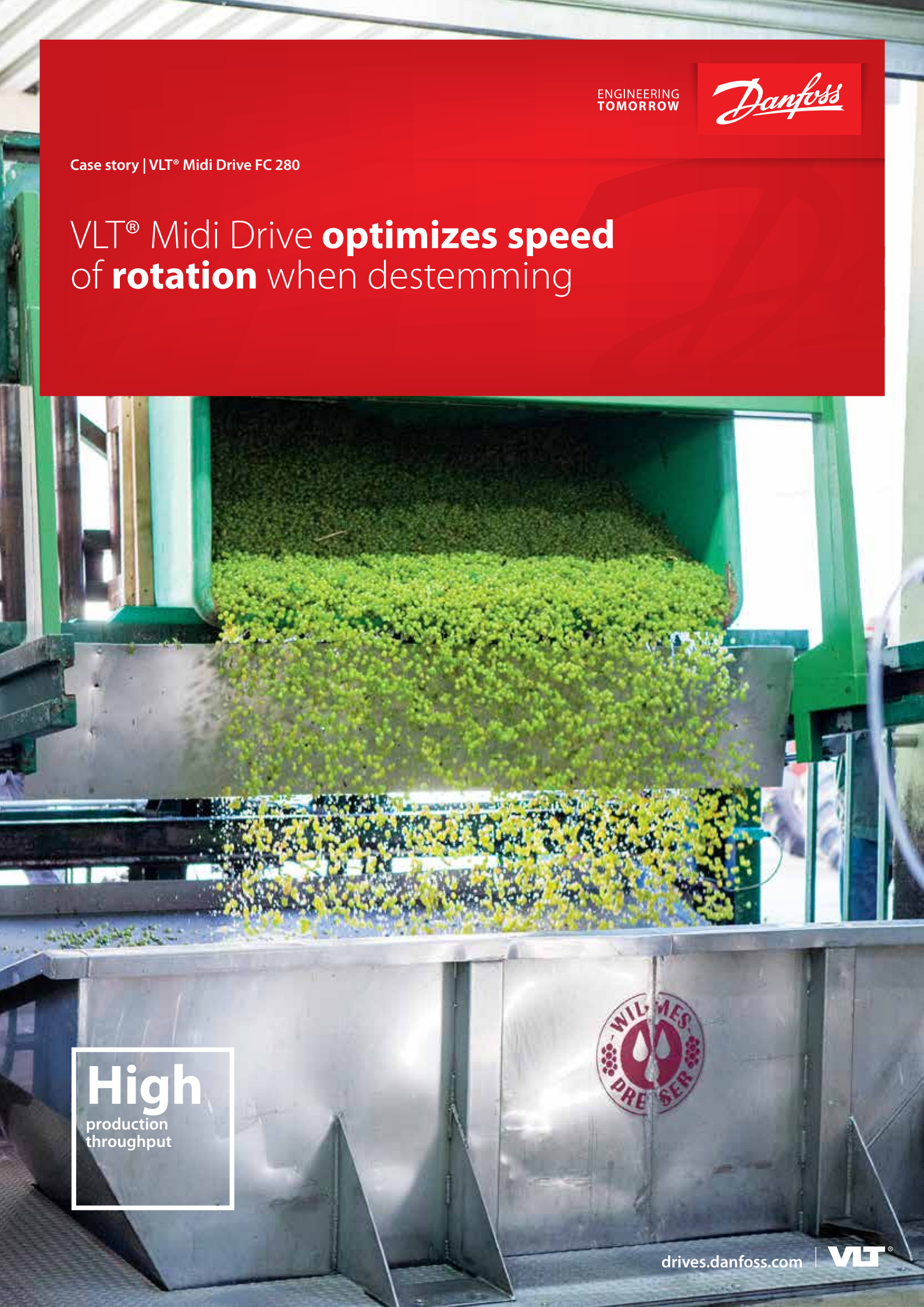
ENGINEERING
TOMORROW

Case story | VLT® Midi Drive FC 280

VLT® Midi Drive **optimizes speed** of **rotation** when destemming



High
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Sweet grapes make good wine

Wine – one of mankind's oldest cultural assets – plays a major role in society and mythology. It is therefore hardly surprising that winegrowers, such as the Winzergemeinschaft Franken eG's Reicholzheim processing plant, are constantly seeking new, improved and optimized production methods, from harvest, via destemming, to pressing and fermentation. Destemming is key to a wine's flavor and quality, as the stalks and stems are detrimental to its taste. This is where the Danfoss VLT® Midi Drive FC 280 comes to the rescue by optimizing management and control of the destemming machine's speed of rotation.

For many people, drinking a good wine is a pleasurable experience, synonymous with being in cheerful, pleasant company and contributing to our wellbeing. For millennia, wine has also been integral to mythical ceremonies or religious services. Mankind has therefore been developing the art of wine production and the culture of wine consumption down through the ages to the present day.

Wine growing and production are both a skill and an art. Vintners' cooperatives – an association of wine growers in a village or area who press the grapes from their vineyards at a central location and produce and market the resulting wine under a common name – ensure that the quality of local wines remains consistently high through expert vinification in a communal winery. The Reicholzheim production plant, which is owned by the Winzergemeinschaft Franken (GWF) in Kitzingen, has a long tradition of wine production and has outstanding Franconian wines in its range. The winery is located in the center of the picturesque village of Reicholzheim, just a few kilometers up the Tauber valley from Wertheim. This is where the wine growers produce their wines – classic white wines such as Mueller-Thurgau, or international-style red wines such as Regent and Acolon. Connoisseurs will find a wine for every occasion here – quaffable wines by the glass, fine wines to accompany dinner, or wines for very special occasions.

In total, at every harvest, the Reicholzheim winegrowers process around 2,500 tonnes of grapes and vinify the varieties into the high-quality, multi-award-winning wines from the Tauber valley. In addition to knowledge of wine making, this also requires considerable skill in equipment automation. GWF therefore called in a specialist to carry out the necessary modernization of its equipment – Tresch Automation GmbH from Bad Dürkheim. The automation specialist has been planning, modernizing and constructing plants for many industrial and water engineering sectors since 1985. It focuses on contemporary solutions specifically tailored to customers' individual requirements. In Reicholzheim, a PLC and system visualization make the equipment quick and easy to operate. The entire system can be controlled, optimized and set up remotely, with the possibility of even accessing the drive system remotely.

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Tresch Automation chose the Danfoss VLT® Midi Drive FC 280 to control the speed of rotation which is defined by the system. The winemaker can then adjust the speed up or down by a few percent using a keypad.

Modern engineering for the best results

Making wine is a multi-stage process. After the harvest, the winegrowers bring the grapes to the reception point in the center of Reicholzheim, where production commences. After the 600–1200 kg boxes of grapes are emptied, they first go into the destemming machine, which removes the berries from the stalks. This is necessary to ensure the highest possible quality wine, because the stalks contain a great many strong tannins, which would affect the wine during vinification and subsequent fermentation. This is why destemming is standard in modern wine production. The only exceptions to this are high-quality red wines, where part of the grapes are fully pressed. The fermentation process extracts certain tannins and colorants from the stalks and skins, to give the wine a richer flavor and deeper color.

Once the grapes have been removed from the stems, they go to the scales and then into two eccentric screw pumps, which transport them to the presses, which squeeze the juice from the grapes. The juice then goes into tanks for fermentation.

Destemming – speed of rotation adjustment increases throughput and protects grapes

In the past, grapes were seldom destemmed because this job, which at that time was still carried out manually, was far too laborious and therefore time and cost intensive. This stage is now a standard part of wine production.

Destemming is carried out mechanically in modern wine production. The grape harvester is responsible for this task. On steep slopes, as are common in the Tauber valley, the grapes still have to be hand picked. Destemming then takes place when the grapes are delivered to the winery, immediately before pressing. The destemming stage crushes the grapes slightly. Subsequent processing of the grape mash is required immediately so that it does not oxidize.

Two destemming machines perform this role at the Reicholzheim processing station. A spike cylinder runs counter to a sieve basket in the units. In this construction, the rotating spike cylinder gently separates the grapes from the stems. The grapes fall through the holes in the sieve basket and are then crushed by two rollers. Tresch Automation chose the Danfoss VLT® Midi Drive FC 280 to control the speed of rotation. It provides the required speed of rotation which is defined by the system, which the winemaker can then adjust up or down a few percent using a keypad. This depends on whether the grapes have already been destemmed or if they have to be fully destemmed, as is the case if they have been harvested by hand. The special thing about this system is that the Midi Drive actuates the motor at 60 Hz, that is above the mains frequency in Germany, which corresponds to 120% of the mains supply frequency. Overall, the system offers more settings for different grapes and faster throughput at the same time.

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Four VLT® Compact Starter MCD 202 are used to limit the starting current when running two screw pumps and two screw conveyors

The VLT® Midi Drives used are compact AC drives for electronic regulation of rotational speed. They are particularly suited to use in the food and beverage industries, in transport systems and in the processing industry. This system uses the version with an integrated Profinet interface. Alternatively, there are versions available which use Powerlink, Profibus DP V1, CANopen, Modbus RTU or Ethernet/IP. In the processing station, the start and stop signals and the speed of rotation are controlled using the Profinet from the superordinate PLC. Another advantage of the Profinet interface is that the FC 280 allows direct access to the AC-drive data for remote maintenance and parameter setting by external engineers.

Parameterization of the AC drive can also be performed on site using the intuitive display. Pluggable power and control terminals, integrated DC choke, EMC filter and a dual-channel STO (safe torque off) function ensure the AC drive is easy to use and make additional, external components unnecessary. An emergency stop button directly connected to the FC 280's STO terminals provides the necessary safety feature in both destemming machines.

Soft starter for eccentric screw pumps and screw conveyors

After weighing, the grape mash passes into a trough, from where it is transported to the presses by two eccentric screw pumps. Both 11 kW pumps run without rotational speed regulation, but are started using two VLT® Compact Starter MCD 202. Tresch Automation recommended their use to limit the starting current for the motors and to avoid torque impact, in the case of a star-delta switch, for example, which leads to reduced pump wear.

The stems, stalks and berries which have fallen through the grid into the destemmer are removed to a separate container by by two screw conveyors. They are also operated by VLT® Compact Starters MCD 202 for the same reasons as explained before. The residue from pressing, known as the marc, can be distilled in small quantities into a flavorful drink, marc or grappa, or can be used as high-quality compost.

Compact AC drive ensures high throughput

The extremely compact Danfoss FC 280 used in the winery at the Reicholzheim processing station increases the destemming machines' throughput, and makes the wine-producing process more convenient and reliable. Furthermore it provides an efficient but also cost-effective solution because of the fieldbus interface, integrated EMC and network filter, and its intuitive operation. And not least, the winegrowers are now even more able to concentrate on the job of producing delicious wine.