



## Agricultural machinery provides excellent reliability for preparing vegetables

Continuous automation and reliable system protection avoids shutdowns of a vegetable preparation machine

**Location:**

Dannstadt-Schauernheim,  
Germany

**Challenge:**

To avoid costly troubleshooting, rapidly resolve shutdown causes, reduce wiring, easier speed up regulation of machine drives.

**Solution:**

SmartWire-DT with speed starter DE11, soft starter DS7, PKZ motor protection circuit, command and signalling devices RMQ Titan IP69K, Easy 800, MFD-Titan as well as circuit protection via circuit-breaker and additional personal protection by type A F1 circuit breaker.

**Results:**

Thanks to the direct transmission of motor data to the controller and by the clear description of fault type and fault location on the multi-function panel, the plant operator can clearly resolve shutdowns more rapidly. The use of the Eaton motor control, in combination with intelligent connection technology, increases reliability and ensures the simple delivery of required information.

*"With SmartWire-DT and the motor controls by Eaton, the customer immediately sees where and why certain components have been affected in the case of a fault and so can resolve shutdowns more rapidly."*

*Christian Stritzinger, Industrial foreman electric technology at König Sondermaschinen*

Vegetable freshness is essential to customers. To achieve the freshest product possible, vegetable preparation machines need to stay up and running at all times. König, a vegetable preparation machine builder, achieves this through machine reliability. They choose an automated solution and system protection from a single source, with FI residual current circuit breakers, SmartWire-DT, as well as motor, soft - and speed starters from Eaton.

**Background**

Within one hour of harvest, vegetables such as carrots, spring onions, radishes, turnips or celery are washed and packed at Renner's Pfälzer vegetable production plant in Fußgönheim, Germany. To clean the vegetables, Renner operates six vegetable preparation machines that rinse and wash the soil off the vegetables as well as cut the roots and excess leaves. Renner must ensure that any shutdowns or power outages are minimized to guarantee the freshness of the vegetables. Any delays could lead to reduced food quality, lost product and profit.

**Challenge**

König Sondermaschinen GmbH (König) in Dannstadt-Schauernheim, Germany, manufactures harvesting and vegetable preparation machines individually tailored to meet the requirements of its agricultural customers like Renner. Most of König's customers face challenges including reliability uptime and safely preparing and packing vegetables. To meet these needs, König came to its own reliable source, Eaton. They were looking for support from specialists that would provide them with high quality machines with excellent performance. König turned to Eaton who recommended implementing an integrated automation solution with the SmartWire-DT intelligent connection and communication system, combined with motor contactors, soft - and variable speed starters, as well as FI circuit breakers into its machines. Together these control components make König's machines smarter.

"We wanted to design a system where the knives and brushes could be turned on separately, and the speed of the brushes be adjusted," explained Christian Stritzinger, industrial foreman in the electrical engineering team at König. "Furthermore, we required the conveyor belt which transports the vegetables through the system to be speed-controlled."



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## Solution

König's machine for its customer Renner, is equipped with four rotating brushes and three blade systems to cut the roots and leaves to various lengths. In addition, four pumps regulate the water pressure, which can be easily adjusted depending on the type of vegetable being washed and the degree of soiling.

"We use numerous components for switching on and off and many variable speed drives in the machine," said Stritzinger. "To minimize the amount of wiring on the machine, we decided to use Eaton's SmartWire-DT." With intelligent connection technology, the individual switching devices and drives are connected via an eight-pole cable harness through simple electrical connectors, rather than through point-by-point wiring with the control. Using this system, the SmartWire-DT line powers connected devices with electricity and communicates the data simultaneously. "As a result of implementing SmartWire-DT we are using approximately 40% less wiring compared with traditional machines," said Stritzinger.

Another advantage of Eaton's solution is the data transparency that it offers. Information from the connected components can be easily and directly retrieved via SmartWire-DT. Stritzinger has programmed the machine so that in case of failure - for example tripped motor protection - the exact designation of the error location is displayed. The error message appears to the operator on a multi-function panel, the MFD-Titan by Eaton. The cause of the failure is also transmitted and communicated via SmartWire-DT, for example, if a short circuit or overload is present. "Thanks to the display, time-consuming troubleshooting on the panel is eliminated. The customer sees immediately where and why certain components are affected and can resolve

shutdowns more rapidly," commented Stritzinger.

To enable continuous communication, König controls the variable speed-regulated motors with Eaton components and has installed the five-speed Starter PowerXL DE11 in the Renner machine, which are embedded in the SmartWire-DT strand. They control the motor for the four brushes, as well as the motor for the conveyor belt. The speed starter is a new device class between the frequency inverter and motor starter. Frequency inverters are functionally oversized in many cases and too complex to operate, whereas motor starters are limited in functionality. The speed starter fills this gap and combines the advantages of both devices. It enables a variable speed control for applications up to 7.5 kW and is similar to a contactor or motor starter with the option of 'out-of-the-box' operation without needing to set parameters.

"The parameterization is so much simpler than with traditional frequency converters," said Stritzinger. "We have only needed to adjust the minimum and maximum frequencies and the run-up and run-down times – otherwise, the parameters were preset. In addition, the speed starter is 10-15% cheaper."

And the DE11 has another advantage: "It is possible to manually control the speed starter," Stritzinger explained. "If the control should fail, the customer can turn on every single machine manually. This is also important to avoid shutdowns."

In addition to the new speed starters, König has installed Eaton's motor protection switches on the drives for the knives and the conveyor belts. The reliable operation of the pump system also relies on Eaton. "Through using soft starters we optimize the turning on and off of the pump. Thus, we avoid pressure shocks and consequently increase durability," commented Stritzinger.

A total of 56 components in the system are controlled from two Easy 800 control relays. "They are considerably easier to program than a PLC with CoDeSys for example," said Stritzinger.

## Results

Conventional type A FI-circuit breakers are installed in the current machine for the protection of the operators as well as the machine. However, König is already thinking about new ideas to optimize its future machines. "Today we connect up to three frequency inverters on a standard FI protection circuit breaker," according to Stritzinger. "Anything in addition, may lead to false alarms."

In this case Eaton offers Type G/BFQ FI circuit breakers as an alternative for the use of frequency inverters. They are considerably less sensitive to the system-induced current leakages in the range of 50 to 60 Hz, to deliver increased system stability.

König uses numerous methods to further reduce shutdowns of vegetable preparation machines. The Eaton solutions help them with this. "Everything from Eaton just fits together easily – the interplay of the components simplifies the development as well as the integration and operation of our machines immensely," said Stritzinger.

Consequently the reliability of the system is increased, ensuring that the vegetables are delivered fresh and crisp to the customer.



The system for the Pfälzer Renner vegetable production plant is capable of cleaning and cutting different vegetables, depending on the degree of soiling



For Christian Stritzinger at König reliability and flexibility have priority, so therefore, he relies on a consistent SmartWire-DT-solution for Renner



Thanks to the SmartWire-DT intelligent connection and communication system the wiring is reduced by approximately 40%

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