



→ A quiet technological revolution is currently taking place at the Wuhu cigarette factory in Jiang Cheng, China. Thanks to advanced control technology and fieldbus components from Beckhoff, the tobacco cutting line is operating at very high rates compared to previous systems.

Wuhu cigarette factory uses  
Beckhoff fieldbus components

## Complete motor control through power terminal

According to Wang Long Ming and Huai Zhe from the Anhui Wuhu cigarette factory, the new production line, including tobacco cutting line, cigarette rolling machine, MES & ERP system, processing line and process management systems, has multiplied productivity. The companies Hauni, Germany and Dickinson-Legg, Great Britain, supplied the key elements of the tobacco cutting line. The China Academy of Launch Vehicles (CALT) was responsible for the control system. The control system includes an automatic control and management information system, as well as the fieldbus network, which was implemented using the Beckhoff I/O system.

With a throughput of 8,000 kg of tobacco per hour, the tobacco cutting line is very demanding in terms of the control system. The engineers responsible at the Wuhu cigarette factory made a conscious decision to use the Beckhoff Bus Terminal system, which is renowned for its reliability, robustness and simple installation and wiring. The system includes BK3120 Profibus Bus Couplers, BC3100 series Bus Terminal Controllers and various Bus Terminals including the KL8001 Power Terminal.

### Stockkeeping of spare parts minimized

One of the key characteristics of this tobacco cutting processing line is that all components such as vibration grooves, rollers and conveyors are driven by motors with less than 5.5 kW output. It is therefore particularly important that status and error messages are available without delay in order to ensure stable operation without interruption. The KL8001 Power Terminal from Beckhoff helps achieve this.

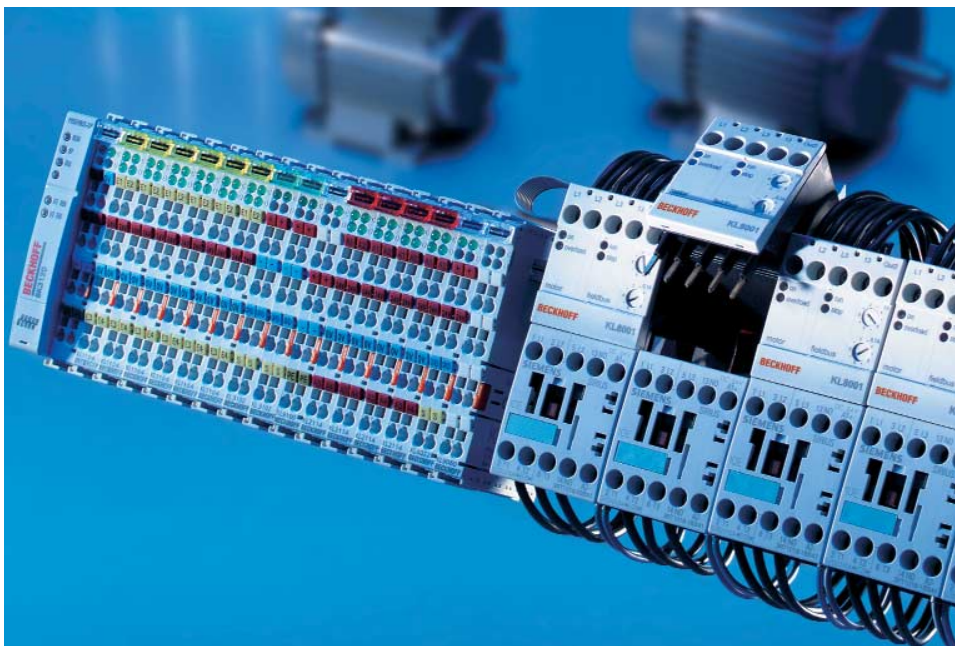
Together with a 3RT 10 series Siemens contactor, the KL8001 forms a three-phase motor starter. A reversing contactor connection can be realized with two contactors. The system has the benefit that each motor can be controlled via the same terminal type (KL8001). In this way, stocking of spare parts can be reduced to a minimum, despite the large number of motors installed in the system. Furthermore, compared with the integrated design that is commonly used in many motor starters, the modular design of this system offers significant benefits during installation, thus reducing maintenance times and costs.

Motors with different outputs can be set up via the nominal current selector at the KL8001 or via software. The motor specifications for maximum overvoltage, undervoltage, overload, underload and current differences for each phase can also be set via software. Accordingly, the motor will detect fault conditions and switch off automatically ensuring optimum protection.

At the same time, detailed information is supplied via the fieldbus in the event of a motor failure. Via the fieldbus the KL8001 not only controls the motors (right, left, stop and return), but also provides more than 30 different performance data such as instantaneous load, voltage, phase-specific output, run and response times. Load change data are reported to the controller; current levels can be set precisely, so that the vibration channel and the three-phase motor can be balanced. During debugging, the motor can be set up accurately, thereby reducing the failure rate.



The Wuhu tobacco cutting line with a throughput of 8,000 kg of tobacco per hour.



The tobacco cutting line uses more than 400 Power Terminals.



## Power terminal system

### More than 400 power terminals are being used

Due to the high functionality of the device, the process image of the KL8001 occupies 8 bytes each for input and output data. In order to reduce the burden on the fieldbus communication, the BC3100 Bus Terminal Controller is used as an intelligent slave that pre-processes the data through the integrated IEC 61131-3 PLC and only transfers those data that are required for the central controller.

The BC3100 Profibus Controller transfers the main motor parameters to the controller. The other motor output and status data determined by the KL8001 are stored in the BC3100. The data may also be uploaded by querying the master controller.

Standardized programming for all 120 BC3100 slaves within a single software set not only significantly reduces susceptibility to faults, but also the work effort involved. Accordingly, program maintenance is relatively simple.

Wang Long Ming and Huai Zhe are very satisfied with their decision: "Bearing in mind the exacting requirements of the production plant in terms of the automatic control system, the need for up-to-date production management data, and our objective of making maintenance fast, convenient and efficient, the Beckhoff control components have fully met our expectations."

The Beckhoff fieldbus components offer an ideal development environment for the control system of the tobacco cutting line. As the system development process progresses, the superiority of this environment is becoming even more apparent. "Points to note are the high reliability, ease of debugging the controller, the high functionality, and excellent price/performance ratio, enabling a wide range of applications," Wang Long Ming and Huai Zhe concluded.

The KL8001 power terminal, together with a power contactor, forms a complete distributed motor starter with "any" fieldbus connection. Apart from all the protective functions of a motor protection relay the power terminal contains comprehensive diagnostics. By means of values such as current, voltage, active-power input and apparent power consumption or load condition the control programmer is able to regulate the drive or a machine component in the best possible way and to protect them from damage and failure. The Bus Terminal block is fitted with a KL9060 adapter terminal instead of a KL9010 end terminal. The KL9060 is connected to a power terminal using a simple ribbon cable. Up to 10 power terminals can be driven by one KL9060.

No other wiring is necessary apart from an ground cable. The power terminal is supplied using the K-bus and the 24 V control voltage and switches the contactor checking a bit in the process image of the controller. A setting range for the nominal motor current of from 0.9 A to 9.9 A covers a wide range of normal motors operating on three-phase 400 V AC mains. That represents a motor rating of from approximately 300 W up to the maximum switching capacity of the contactor being used (typically 4 kW to 5.5 kW).