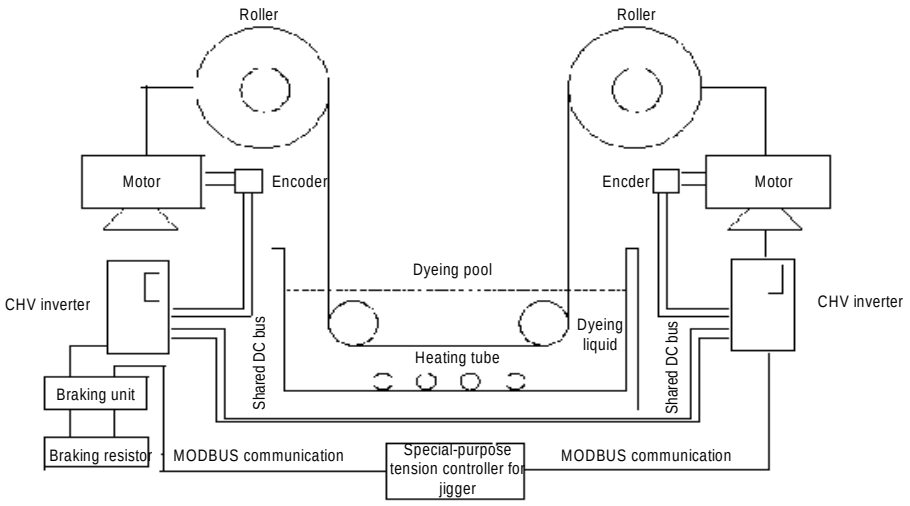
Application of CHV Inverter to Jigger

Overview: Application of special-purpose tension controller and dual inverters to the jigger control features simple configuration, good control performance, and reduced system cost. This article gives a detailed description of the application of the new generation CHV high-performance vector inverter independently developed by Shenzhen INVT Electric Co., Ltd. to the SW1500 jigger of Liangchang Dyeing Factory in Wuxi City, Jiangsu Province.

In the present textile processing market, cloth dyeing is an important procedure. A jigger is mainly to bleach, dye, and refinish the gray cloth. The control of jigger shall provide such functions as automatic counter (cloth feeding times), automatic turning-around (repeated bleaching and dyeing), and automatic stop (sharp but stable stop, without loose or drooping cloth). The tensile force and constant linear speed of the cloth must be maintained during the processing. Therefore, the requirement for the automatic control level of the whole mechanical transmission system is strict. This article illustrates with an engineering example how the CHV high-performance vector inverter precisely meets the process control requirements of the jigger. In addition, it describes the solution of adopting asynchronous motor control for a jigger from another point of view.

The schematic diagram of jigger control is as follows:



Schematic Diagram of Dual-Inverter Control in Jigger

In actual application, two 18.5KW inverters are employed.



The jigger acts as a central axis winding control system when it operates. First of all, finished gray cloth is wound around a roller at a constant speed through a cloth feeding motor. On the transmission shaft of the roller a proximity switch used for counting is installed (The proximity switch generates a pulse at each circle the roller rotates). At the same time, the special-purpose tension controller of the jigger records the number of circles of the complete piece of gray cloth. Upon completion of winding, lead one end of the cloth through the dyeing pool, coupled axis, and wind it tightly around another roller. Turn on the jigger to begin the dyeing. Then, two rollers rotate at the same direction. It is required that the tensile force on the gray cloth must be constant, and the time when the gray cloth passes through the dyeing liquid must be consistent. It is a driving control system without linear speed feedback or tension feedback. Therefore, the control system has to adjust the output frequency of the unwinding inverter to meet this specific requirement.

The jigger has a special-purpose tension controller as its main controller, and a touch screen as the man-machine interface. It is mainly to implement the functions of tension and linear speed setting, counting of circles of the cloth, setting of corresponding matching frequency and motor output torque, and control of related logic actions. The inverters communicate with the controller via 485 (Modbus protocol). As shown in the schematic diagram of control, two identical inverters (18.5 KW) work in the PG vector control mode. During cloth feeding, the special-purpose controller of the jigger records the number of circles of cloth wound around the roller. Then, an operator will measure the diameter of the cloth and enter the value in the controller. The controller will calculates the thickness of a single layer of cloth based on the diameter and total number of circles. In this way, the control system can obtain the rotating radius in real time, with slight error. Based on actual rotating radius, user-defined tension and linear speed, the controller can calculates the corresponding torque (winding motor) and matching frequency (unwinding motor). Through serial 485 communication, the controller transfers such data to the CHV inverters as basic parameters for controlling winding and unwinding motors. The control of constant tension is implemented through the torque control function of the CHV vector inverter.

We can know from the working principle of a jigger that the motor on the unwinding side is constantly in the power generation state. Usually, a braking

unit and a braking resistor are adopted to consume the electricity returned by the load to the inverter by converting the electric energy into heat. However, it is a great waste of electric power for such a device which works in power generation state for a long time as a jigger. Meanwhile, the installation of resistor cabinet will occupy the space of the electric control cabinet. In view of this, the CHV high-performance vector inverter supports a common DC bus, that is, DC buses of two inverters are directly connected in parallel. In this way, when a jigger works normally, the power generated from unwinding braking is transferred to the winding motor through the parallel bus, which greatly enhances the utilization of electric power. However, because two motors are in the power generating state in the case of quick stop, a braking resistor is connected in parallel in an inverter. This braking resistor works temporarily and consumes little energy. It is mainly to prevent inverter overload in the case of system shutdown.

Summary: Application of CHV vector inverter to a jigger optimizes the cost performance of the jigger and offers an ideal solution for product upgrade in winding and dyeing industry.