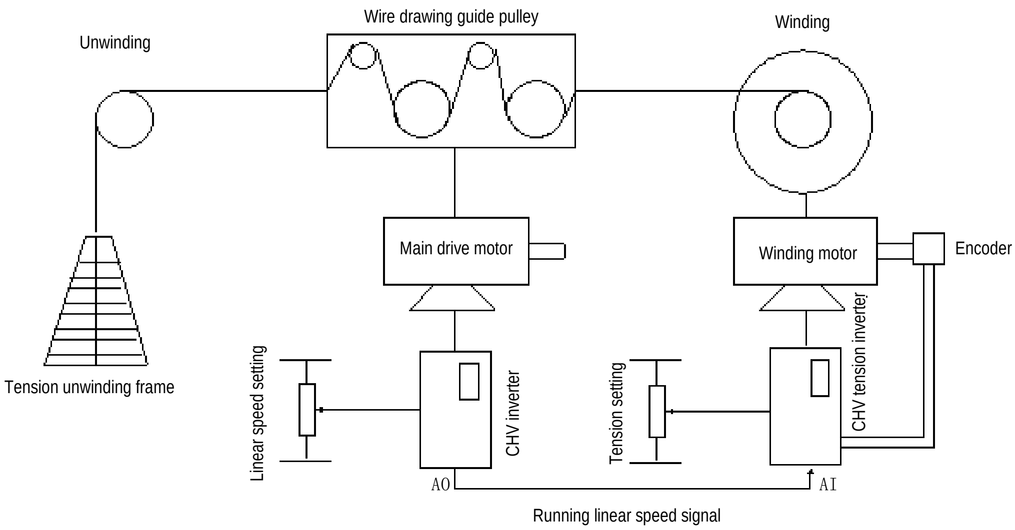
Application of CHV Inverter to Tension Control

A copper wire factory in Shenzhen, Guangdong Province uses a dual-inverter-controlled intermediate wire drawing machine. The main drive motor adopts a 37-KW inverter and the winding motor adopts a 5.5-KW inverter. The intermediate wire drawing machine is equipped with annealing mechanism, but it does not have a tension frame. Therefore, a CHV general inverter equipped with a tension control card is adopted for winding. With the tension setting and winding diameter calculating functional module, the machine can implement wire winding at a constant tension. It does not have tension feedback torque control mode. The schematic diagram of tension control is shown as follows:



Schematic Diagram of CHV Winding Free of Tension Feedback

The system contains two inverters. The traction & drawing inverter controls the operating linear speed of the whole system, which can be adjusted through a potentiometer. The wire drawing speed can be adjusted freely once the wire drawing quality is guaranteed. At the same time, the operating frequency of the main drive is outputted to the winding inverter (AI) through the analog quantity (AO), serving as the linear speed signal for calculating winding diameter. The tension of the system can be set through the potentiometer. The winding inverter adopts torque control, and thus an encoder must be installed on the shaft of the winding motor. The encoder is connected to the built-in PG card of the CHV inverters to collect the rotation speed value of the motor.

The winding motor has a built-in brake. Both inverters are set to free stop mode in the case of shutdown. When the wire drawing system starts, two inverters start at the same time. The system will then gradually adjust the set linear speed and accelerate the system until it reaches the desirable production line speed.

Moment of inertia compensation has been added to the special purpose CHV tension control module, which effectively eliminates the problem of tension instability of the system during system acceleration/deceleration arising from inertia.

Set the functional codes of main drive inverter as follows:

P0.00 0: Vector control without PG
P0.01 1: Terminal command channel
P0.03 1: Analog quantity AI1 setting
P0.06 0: A source
P0.11 Acceleration time (based on actual conditions)
P1.08 1: Free stop
P5.02 1: S1 terminal function selection: Forward operation
P6.07 0: Operating frequency (voltage signal 0-10V outputted from AO1, as the set winding linear speed)

Set the functional codes of winding inverter as follows:

P0.00 1: Vector control without PG
P0.01 1: Terminal command channel
P1.08 1: Free stop
P3.10 PG parameter (encoder lines, based on actual conditions)
P5.02 1: S1 terminal function selection: forward rotation
PF00 1: Without tension feedback torque control
PF.01 0: Winding mode
PF.04 Maximum tension setting (based on actual conditions)
PF.05 1: Analog quantity AI1, as tension setting
PF.11 Mechanical transmission ratio (based on actual conditions)
PF.12 Maximum winding diameter
PF.14 Reel diameter
PF.18 0: Calculating winding diameter based on linear speed
PF.22 Maximum linear speed (based on actual conditions)
PF.23 2: Analog quantity AI2, as linear speed setting source
PF.33 System inertia compensation factor (based on actual conditions)

For other details, refer to *Operation Instruction of CHV Vector Inverter* and *Operation Instruction of CHV Tension Control Function*.