Industrial Conveyors

Application Overview

Conveyors are used in a broad range of industries and applications to move packaged goods, assemblies, process byproducts, or any material from one place to another. A process designer will typically look for opportunities to use the force of gravity to accomplish product movement. Electric motors are commonly used when gravity cannot be employed or when the speed of a gravitational fall needs to be controlled.

Application Challenges:

- Motor and drive sizing. Conveyors require a good deal of load and speed calculations, combined with actual testing to ensure proper size (power) requirements.
- Smooth product motion. Acceleration/Deceleration times, combined with S-Curve "smoothing" characteristics need fine-tuning to ensure the product is not damaged and/or moved out of position for staging to subsequent processes.
- Rapid deceleration or downhill speed control of conveyors cause load regeneration in drives. Care should be taken to ensure proper sizing of a drive's dynamic braking package or a regenerative converter, to prevent drive overvoltage faults.

Yaskawa Products:

Product	Feature	Benefit
J1000	Simple, compact, reliable, low cost solution for lower horsepower ranges. (Up to 7.5 hp)	Offers flexibility of design in modular conveyor arrangements for small horsepower applications.
V1000 or V1000-4X	V1000-4X provides NEMA 4X enclosure type	"Washdown" environmental rating for direct mounting to food processing conveyors
	Provides DeviceNet communications with SI-N3/V option	(ODVA) communication for control or monitoring of many drive/conveyors
G7	3-Level PWM voltage output	Minimizes peak voltages at motor to extend motor and bearing life in long cable runs.
A1000, G7, V1000	Fully adjustable S-Curve and Accel/Decel rates	Smooth starting and stopping is achieved through the drives Accel/Decel and S-Curve characteristics.
A1000, G7	Torque Control and Speed Droop control in Closed loop Flux Vector Control Mode	Operating two or more conveyor motors in series. The load may shift off between motors. The drive allows for load sharing by using Torque Control or Droop Control.

Subject: Application Overview	Product: A1000, G7, V1000, J1000 Drive	Doc#: AO.AFD.51
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A1000, G7, V1000	Pulse Train I/O for speed control	Control speed of parallel or series conveyors by use of Pulse Train I/O function in the drive. Eliminates the need for complex pulse to analog converter.
A1000, G7	Torque Limit	Torque Limit protects the load and other machinery from excessive torque that may occur when the load fluctuates or seizes.
A1000, G7	Zero-Servo Function	The Zero Servo Function in the Closed Loop Flux Vector Mode makes a mechanical brake unnecessary for tilt-tray and certain incline conveyors that require a mechanical brake to stop.
A1000	Electronic Line Shaft Software	Provides precise synchronization (speed and position) among various conveyor sections
A1000, G7, V1000	Momentary Powerloss Ride-thru Automatic Fault Restart	The Momentary Powerloss Ride-thru and Fault Restart functions allow the drive to continue operation without the need for attended restart.
RC5, DC5	Line regenerative products	Line regenerative units can be a cost effective option to resistors when sizing high duty braking circuits for downhill or fast decel applications.

Application Details:

Airports, mines, cement plants, distribution facilities, assembly and food processing plants are just some of the industries with conveyor applications. Conveyors are typically constant torque loads, meaning the required torque to drive a conveyor is independent of speed. A fixed amount of torque is also required to overcome the frictional, or machine drag, portion of the total load. Conveyors can have substantial amounts of friction and machine inertia for which to compensate.

The heaviest conveyor load needs to be considered when sizing drives and motors for conveyors. Quite often, speed, load and Accel/Decel testing is performed to determine proper drive and motor sizing for conveyors. Speed deviation may also be a consideration when selecting conveyor-driving components. The tolerable speed deviation is a concern if heavy objects are dropped on to the moving conveyor.

If product orientation and/or position are critical to the application, then fine-tuning acceleration rates and s-curve smoothing helps to achieve product movement while keeping transported products stable. This is key when transferring a product from one automated process to another. Electronic Line Shaft software is available to allow precise speed synchronization among conveyor sections.

Downhill or rapidly decel of conveyors may require braking provisions to avoid overvoltage faults on the drive's DC bus. When decelerating large loads, conveyor friction is an advantage that allows for light to medium

braking resistor circuits. When operating a downhill conveyor, however, the motor typically will regenerate power on a continual basis. In these cases, it can be advantageous to use an RC5 or DC5 to allow this power to pass back to the line.