Allen-Bradley

1336 IMPACT™ AC Drive

Speed PI Regulator
**Speed PI Regulator**

The drive takes the speed reference that is specified by the Speed Reference Selection Block and compares it to the speed feedback. The speed regulator uses proportional and integral gains to adjust the torque reference that is sent to the motor. This torque reference attempts to operate the motor at the specified torque necessary to maintain speed. This regulator also produces a high bandwidth response to speed command and load changes.

The important part is the Speed PI Regulator output is used to produce a torque reference for the current regulator block. The following section will describe each block of the speed PI regulator.

**Velocity Loop Feed Forward**

The [Command Spd Sts] parameter is the speed command. Remember that the speed reference has been manipulated by the reference selection block and then the process trim regulator prior to this point. The first section of the PI regulator is the feed forward block. Parameter (160) [Kf Speed Loop] allows the speed regulator to be dampened during speed changes. To reduce speed overshoot, reduce the value of [Kf Speed Loop]. During auto tune, the feed forward is left open (no dampening).
**Proportional Gain**
The output of the feed forward block is summed with the unfiltered speed feedback signal, shown as “V” in the chart below. The output is the error signal and is filtered. Parameter (162) [Error Filter BW] sets the responsiveness of the filter. After the filter, the proportional gain block adjusts the signal. The proportional gain determines how much of a speed error occurs during a load transient.
Integral Gain

The [Command Spd Sts] parameter is also sent to the integral gain section of the regulator. This signal is summed with the output of the droop gain control. Refer to the “Droop” section later in this document for more detail on how droop operates.

The result of the summing junction is sent to an integrator hold circuit. This circuit will hold the integrator value if “torque limit” is reached. This reduces the possibility of a “wind-up” on the integrator.

The reference signal is then summed with the speed feedback and the error is adjusted with the integral gain block. The integral value determines the time it takes for the speed error to be corrected.
**Droop**
The droop circuit subtracts from the reference by the percent specified in parameter (46) [Droop Percent] when at full load. The percentage that is specified is of the motor base speed.

Droop is used to share load and is usually used when a soft coupling of two motors is present in an application. This reduces contention between two speed regulators.

**Torque Limit**
The outputs of the proportional and integral gain blocks are added and then checked by a torque limit. The torque limit block sets the upper and lower levels for the torque reference.

If the torque limit block is clamping the signal produced by the proportional and integral gains, a signal is sent to the integrator hold block. The droop gain block uses the output of the torque limit to determine the torque reference.

The torque reference can be disabled by bit 8 of the logic word. This is used to allow the motor to be fluxed but have a zero torque command. Once the regulator is enabled, the reference signal is sent to the torque reference control block.
NOTES