

## Variable Speed Drives / Electrical Problems and Solutions

### General

Power electronic variable speed drives provide an enhanced operation and efficient method of controlling the speed of motors. They are used throughout industry for process automation, air

handling conveyor assemblies and much more. The electronic control of the VSD enables fast correction, accurate and repeatable performance. The down side to this is that the VSD's are

no where as tolerable to voltage fluctuations or distortion as their predecessors mechanical approach.

### Problem

The modern power electronic VSDs convert the 3 phase input power to DC then reconstruct a controlled waveform from the DC for the motor. It's the first stage conversion that creates problems. The first stage is

a 6 pulse rectifier reflecting predominate 5<sup>th</sup> and 7<sup>th</sup> current harmonics back to the source. The natural commutation of the rectifiers present a momentary short circuit, thus introducing severe voltage notching on

the input waveform. These notches are more pronounced with long power leads, high source impedance and improperly coordinated transformers.

### Solutions

Go with a proven, field tested system; Controlled Power Company's Power Processor (Series 700A). This power line regulating conditioner is a microprocessor controlled SCR tap changing system with 7 taps. Two taps above nominal and four tap below nominal affording a 1 cycle response to correction and tight  $\pm 3\%$  regulation. The key behind this regulator's assured performance are

three significant approaches within the system. (1) The low output impedance and high level of isolation between the primary and secondary. The natural inductance of the transformer limits severe line notching to acceptable values above zero crossing. (2) Current sensing is done in the primary with a current-zero diode detection circuit and a proprietary noise filtering

network. This assures that the controller maintains flawless synchronization for the firing of the SCRs. (3) The output filter network provides -3dB at 1000Hz with -40dB per decade. Broadband noise and harmonic spurs generated by the VSD rectifier circuit are virtually eliminated at the load side of the power conditioner.

### Summary

Controlled Power Company's Power Processor has over 18 years of field application performance; many of which

are installed on multiple VSD systems within the same facilities. The specialized control sensing and isolation

transformer provide the necessary assurance for long life and trouble free operation.