control services incorporated

Intelligent Building Environments

SERVICING A VFD

Standard VFD maintenance includes checking the drive, motor and environment. While it is impossible to predict the failure of an electronic piece of equipment, certain parameters can be observed that can hasten VFD failure. The initial check of each installation is a visual check of the variable frequency drive and its associated load. During this check, sounds and touch are the main tools used. A drive that is not firing correctly will begin to jerk the motor and create a different sound in the windings. This is done before opening the drive or any other checks are made. The surrounding environment is observed for airand area cleanliness as well as any visible signs of moisture on or around the drive. That having been done, the drive is opened while on-line for a temperature scan of all high voltage connections as well as the switching transistor heat sink. If no abnormal conditions are found, the voltage and current of both incoming and outgoing lines are recorded at the base frequency of current operation. These will be analyzed for value and balance. While the input can have exhibit a current imbalance because line current is dependent upon the switching of the rectifiers, the drive output should exhibit very close voltage and currentbalance. Keep in mind that these parameters are interpretive as electrical instrumentation is calibrated for 60 Hertz, sine wave parameters whereas the output of a drive is switched DC. The measured values are compared to the drive operating parameters which are also recorded for comparison. The DC bus is measured for DC and AC values. The DC level is compared to the indicated value in the drive operating parameters. The AC value is recorded as a matter of record as this indicates proper rectifier and capacitor operation.

All of the above are also compared to the motor nameplate data which is recorded both on paper and in the drive itself. Most of the drives have had the complete parameter list saved to disk on start up. All the parameter data has been saved to the LCP in the event a drive replacement is required. This data can be restored as long as the replacement drive is using the same revision of drive software. The drive heat sink and associated cooing fan(s) are cleaned with a brush, soft cloth and high pressure nitrogen depending upon the observed condition of the dirt accumulation on the heat sink.

Depending upon outside air and building environment conditions, the remaining checks may or may not be performed. If the owner can tolerate a 15-20 minute shut down, the drive and associated load are powered down for motor evaluation. In the case of air handling units with multiple fans pulling air from a common plenum, it may require that all the fans be turned off as the motor can only be evaluated from a dead stop condition. When the above conditions can be met without causing any undesired environmental conditions, the motor is checked for AC impedance (resistance to AC current flow), phase theta (degrees between voltage and current) for each winding, and I/F (current to

frequency shift relationship). If the motor can be easily disconnected from the drive (units with bypass) the windings are also checked for insulation resistance to ground at twice the expected line voltage. On installations that do not have an easy disconnect means, this check is not done as disconnecting and reconnecting the load from the drive can result in a hot spot at a later date. This is based upon the general consensus of electrical maintenance not to touch a connection that is not exhibiting signs of over temperature.

The above data is recorded and run through a motor evaluation calculator provided by ABB. Any suspect motors are noted and this information is passed on to the owner/owners representative.

The final part of drive maintenance is to reassemble the drive covers and clean the surface of the drive. This not only keeps the drive appearance acceptable, it also provides feedback as to the environment that the drive is exposed to during the time leading up to the next scheduled maintenance.

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