Motor Qualification and Evaluation for Aftermarket Low-Voltage VSD Application

MOTOR QUALIFICATION FOR AFTERMARKET VSD APPLICATIONS

YORK Engineering along with Service Marketing, and the YORK Parts Center conducted a review of variable-speed drive (VSD) application criteria due to the aging of the existing population of installed chillers. During this review several motor rules were put in place to mitigate/minimize risk exposure of the local branch business with respect to questionable aftermarket VSD applications.

The purpose and goal of the committee and the decisions made by it were to:

1. Address the issues and risks associated with retrofitting an aging population of chillers.
2. Determine the appropriate policy with our customer's best interests in mind.
3. Ensure that policy limited risk exposure to the business while allowing for our local branch teams to properly serve our existing equipment customers and generate revenue growth.

In the 29 years of successful aftermarket application of YORK low-voltage variable-speed drives there has NOT been a significant experience of motor failures directly related to the VSD retrofit. However, it is recognized that there exists an inherent risk associated with retrofitting to aged preexisting chiller equipment of unknown condition. Therefore, it is necessary that the chiller motor is locally evaluated to ensure it is physically and electrically suitable for aftermarket VSD retrofit application, refer to the **MOTOR EVALUATION FOR AFTERMARKET VSD APPLICATIONS** section.

LV MOTORS **QUALIFIED** FOR VSD APPLICATION – subject to local evaluation

024-26513- & 024-26514-	460/380V – 0XX, 1XX, 2XX, 3XX, 4XX, 5XX, 6XX, 7XX 575V – 0XX, 1XX, 2XX, 3XX, 4XX, 5XX, 6XX, 7XX
024-26521-	460/380V – 0XX, 1XX, 6XX, 7XX 575V – 0XX, 1XX, 6XX, 7XX
024-26522-	460/380V – 0XX, 1XX, 2XX, 3XX, 6XX, 7XX 575V – 0XX, 1XX, 2XX, 3XX
024-27800- & 024-34020-	460/380V – 4XX, 5XX 575V – 4XX, 5XX
024-27802 -& 024-34022-	460/380V – 4XX, 5XX, 8XX, 9XX 575V – 4XX, 5XX, 8XX, 9XX

LV MOTORS **DISAPPROVED** FOR VSD APPLICATION

024-27800-	– 0XX, 1XX, 8XX, 9XX
024-34020-	– 0XX, 1XX, 8XX, 9XX
024-21269- (single bearing)	– XXX (all)
024-21271- (single bearing)	– XXX (all)
024-24021- (single bearing)	– XXX (all)

Specific to the issues around single bearing motor applications that affect early, 20+ year old, YT chillers only, the decision was made by the committee to disallow VSD retrofit to this population of chillers. What the team determined is that in the event of a motor failure Johnson Controls has no direct replacement capability. If a motor failure were to occur, with or without a VSD, the customer's only options would be to replace the entire driveline or purchase a new chiller. We have determined that it is in the best interest of the customer and the company to only allow VSD application to single bearing motor chillers in combination with a driveline retrofit. Based on the in-service age of this YT chiller population and that they could only use HCFC refrigerant, that is to be phased out in 2020, it would make greatest investment sense to work with the customer toward replacing these chillers with current design high efficiency YK chillers factory equipped with OptiSpeed VSD and using environmentally friendly HFC 134a refrigerant.

LV MOTORS **NEITHER QUALIFIED NOR DISAPPROVED** FOR VSD APPLICATION – subject to local evaluation

024-26178-	460/380V – 0XX, 1XX, 2XX, 3XX, 6XX, 7XX 575V – 0XX, 1XX, 2XX, 3XX, 6XX, 7XX
024-25569-	460/380V – 0XX, 1XX, 2XX, 3XX, 6XX, 7XX 575V – 0XX, 1XX, 2XX, 3XX, 6XX, 7XX
024-24056-	460/380V – 0XX, 1XX, 2XX, 3XX, 4XX, 5XX, 6XX, 7XX 575V – 0XX, 1XX, 2XX, 3XX, 4XX, 5XX, 6XX, 7XX
024-23992-	460/380V – 0XX, 1XX, 2XX, 3XX, 6XX, 7XX 575V – 0XX, 1XX, 2XX, 3XX, 6XX, 7XX

Due to the in-service age of these motors they must be locally evaluated to ensure they are physically and electrically suitable for aftermarket VSD retrofit application. It is recommended that motors with greater then ten (10) years in service be replaced with current design Qualified new motors to ensure continued reliability and operation throughout the useful life expectancy of the VSD and chiller.

The final determination for aftermarket VSD retrofit application is a local business decision made by the Service Branch.

Regarding motors not listed above, contact Service Marketing for review.

MOTOR EVALUATION FOR AFTERMARKET VSD APPLICATIONS

An aftermarket variable-speed drive (VSD) retrofit may be a consideration for existing YORK chillers that in some cases could be 20+ years old. Should we apply a new VSD to an existing chiller, and that chiller were to experience a major compressor or motor failure a short time later, the customer would be dissatisfied, and may even be inclined to blame the failure on the addition of the VSD. In a proactive effort to mitigate the inherent risk of such pre-existing aged equipment situations, we should make certain that the customer's chiller has been properly maintained, and is in good operating condition, prior to proposing a VSD retrofit.

Regarding motor condition, the following things should be checked at a minimum to assure that the existing motor is in good working condition and should continue to operate without difficulty for years ahead. There is no absolute formula or non-destructive test to determine if a given motor is healthy. However, positive answers to many of the questions raised below will provide better assurance of longevity, compared to having no knowledge of the motor's history, or worse yet - negative answers to these questions.

Maintenance

- Has the motor been under maintenance contract since startup? Who has been responsible for maintenance?
- Have motor bearings been re-lubricated on the prescribed interval (no greater than 1800 hours between lubrications), using the correct type and amount of grease or oil? Is there a log of maintenance history to support claims of re-lubrication?

Motor Condition Monitoring

- Has the motor been meg-ohm tested recently, and at regular intervals (at least once per year)? Is there a maintenance log of meg-ohm test-results? Does the motor presently test higher than 50 meg-ohms (at 500V scale) from windings to ground and between windings?
- Has there been any recent vibration analysis performed on the motor? Is there any change to vibration trending over time since the motor was commissioned? We suggest vibration should be checked at least once per year.

  If vibration analysis has not been performed, you can arrange to have the motor tested by contacting the Johnson Controls Predictive Diagnostic department at 800-524-1330, and selecting options 6, 1, 1, and 5 – to get to the diagnostic team.

http://publish.cg.na.jci.com:9085/publish/controls/us/eng/pd/header/home_page.html

Location

- Is the chiller located within 50 miles of a salt-water coastal area?
  If so, does the motor contain space heaters that are wired and energized when the motor is not running?
- If not near a coastal location, does the equipment room take in 100% outside air for ventilation or have roll-up doors that expose the chiller to outdoor humidity for significant periods? If so, we again suggest that the motor should have internal space heaters to assure moisture does not condense inside the motor when not running.

The final determination for aftermarket VSD retrofit application is a local business decision made by the Service Branch.