

Monthly Informative Application Guidelines, with respect to *Motors & Drives* to keep you better INFORMED.

APPLICATION GUIDELINE #35

(Motor Design Quality, Long Term Cost of Ownership)

Brought to you by your Motor & Drive Specialists.....

The proper application and selection of low voltage motors can be a demanding task. Reliability and reduced long term cost of ownership (cost to purchase, operate and maintain) should be at the forefront of every purchasing decision made. Factors affecting reliable operation can include, motor design (quality), application, installation, protection, preventative and predictive maintenance.

This guideline will focus on the 'motor design' (quality) aspect of reliable operation. Most end users try to narrow their options for motor purchases by creating an approved supplier list. The list is often created by selecting suppliers who:

- 1) have local representation,
- 2) who carry some degree of inventory nearby and
- 3) who most importantly meet some kind of mill standard or specification.

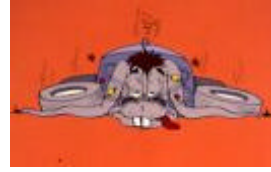
Often when the above conditions are met, the purchase order is usually given to the lowest cost supplier. The specification often is a summary of key points obtained from the NEMA MG1 standard. The National Electrical Manufacturers Association (NEMA) is a nonprofit U.S. organization consisting of members from the manufacturing sector. One of the stated purposes of NEMA is *"to promote the standardization of electrical apparatus and supplies"*. It is the authors opinion that it is fair to say that all manufacturers meet the requirements of this standard, therefore product differentiation by referring to this standard cannot be accomplished if there's a genuine interest to specify a 'high quality' motor design.

In addition to NEMA and since its inception, there have been many other bodies which have realized specific motor requirements and therefore assembled to create guidelines which further meet their specific industry needs. A recently widely accepted standard is that of 'The Institute of Electrical and Electronics Engineers' (IEEE) - Petroleum and Chemical Industry. They have created their own standard for "Severe Duty Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors (SCIM) – Up to and including 500Hp". The stated purpose of this standard is *"to define a specification that deals with mechanical and electrical performance, electrical insulation systems, corrosion protection, and electrical and mechanical testing for severe duty TEFC motors. Many of the specified materials and components in this standard stem from experience with severely corrosive atmospheres and the necessity for safe, quiet, reliable, high-efficiency motors."* The most improved areas in this standard over NEMA is their lower vibration requirements and IP55 frame ratings (320 and above) to improve bearing protection from foreign contaminants (requires the use of a taconite or labyrinth seal to meet). Again, in this case, it is the author's opinion that it is fair to say that all manufacturers have created a line of motors which meet the requirements of this standard, therefore product differentiation by referring to this standard cannot be accomplished if there's a genuine interest to specify a 'high quality' motor design.

Despite the above efforts to improve motor quality by referring to an industry specification, true "Quality Differentiation" is something which can only be observed by close examination of:

- 1) the materials used in the construction of the motor, and
- 2) in the care in manufacturing detail

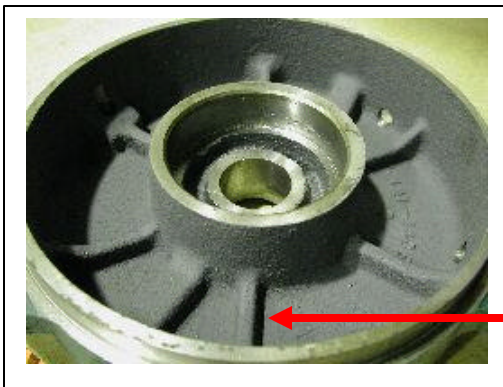
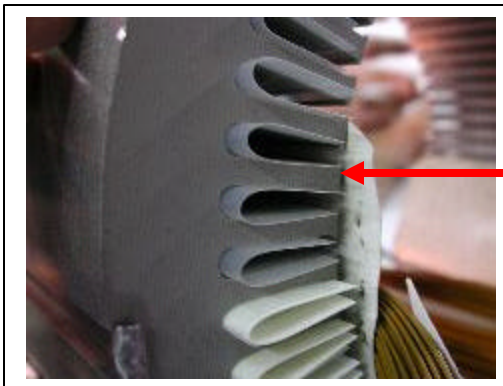
With close examination of these items there is no doubt that a mills downtime can be reduced because of the improvement in consistent reliability. The user will experience a reduction in overall costs ultimately resulting in a 'reduced long term cost of ownership'.



Expected Life of Motor built with limited attention to quality

Often 30-70% shorter life span

Expected Life of a Motor built with close attention to material quality and care in manufacturing



EXTRA LIFE EXPECTANCY IS A RESULT OF:

- Large thermal margins
- Process by process quality inspections with employee performance grading/monitoring
- **High Grade Silicon Steel Laminations with full circle punchings for superior heat transfer**
- High Grade (25) 'low porosity' Cast Iron
- Incoming Bearing Inspections (strict in house on-going supplier inspections)
- Radiused shaft corners
- Ensuring proper clearing of machining burrs
- Thick castings which ensure proper fits and long term stability
- 'Keyed' and 'snap ring' secured fan assembly (very dependable and reliable)
- Graded, and corrosion resistant hardware
- Brass grease pipes, plugs and drain & breathers
- Solid bracing of windings (using heat shrink materials)
- Class H rated insulation materials
- Multiple and consistent dip and bake process'
- Two pass rotor surface machining
- **Mylar inserts for extra winding support from sharp edges of stator core laminations**
- 100% rotor balance with weight limits
- Aluminum die cast process weight check
- Water quenching of rotor assembly after shaft insertion
- Swing test on 440 frames and larger to ensure reliable die cast process (third and final check to ensure rotor die cast quality)
- Bearing Signature test on 440 frames and larger
- 100% routine tests (ensures a properly running motor on ALL start-ups)
- Pre heating of stator prior to varnishing to assist with proper varnish penetration
- Internally painted machine surfaces to minimize corrosion
- High quality rubber gasket on XS motor to seal T-box to frame and individually seal each lead. Prevents water from entering motor frame.
- **Extra support bracing on endbell for ensuring concentricity during chucking processes**
- (2) drain and breather plugs on each end of motor to allow condensation to exit

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