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This newsletter is designed to inform you about the many aspects of electric motor system maintenance. If there is a subject you would like me to address please contact me and I will research it and record my findings directly to you or in the newsletter

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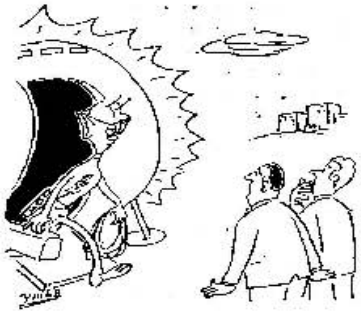
OUR STRENGTH IS OUR PEOPLE

Harrison Stapleton

Harry has been a valued member of the Lloyd Electric staff for over 25 years. Many of our customers know Harry because he his usually the stand-by driver who delivers that emergency motor. Harry's dedicated service is just another reason why Lloyd Electric is still servicing our many valued customers since 1920.



"Offhand, I'd say he was a on-site electric motor technician"

Lloyd Electric's Newsletter for the industrial Community

MAINTENANCE "MATTERS"

Root Cause Analysis #2 Summary of Motor Stresses

The majority of all motor failures are caused by a combination of various stresses acting upon the bearings, stator, rotor and shaft if these stresses are kept within the design capabilities of the system, premature failure should not occur. However, if any combinations of the stresses exceeds the the design capacity, then the life of the system may be drastically reduced and catastrophic failure could occur. These stresses can be broken down into the following groups or classifications :

Stress Type	Actual Stress or Damage
Bearings:	
Thermal	Friction, Lubrication, Ambient
Dynamic & Static Load	Radial, Axial, Misapplication
Environmental	Condensation, foreign materials excessive ambient, Poor ventilation
Mechanical	Shaft and housing fits, Loss of clearances Misalignment
Electrical	Rotor dissymmetry, Static charges, variable frequency drives.
Stator : Thermal	Thermal aging, Ambient, Voltage unbalance, Thermal overload, Load cycling, Poor ventilation, Starting and stalling
Electrical	Dielectric aging, Transient voltages, partial discharge (corona) tracking
Mechanical	Damaged motor leads Abrasion, Improper rotor-to stator geometry, Winding movement, Defective rotor Flying objects
Environmental	Moisture, Chemical, Poor ventilation, Excessive ambient, Abrasion

This covers only two of the four main components of an electric motor that we outlined earlier. In the next issue we will examine the stress type and the actual stress and damage to the Rotor and Shaft. All of these component stresses must be carefully analyses to determine if they contribute to the Root cause of the failure

Winding Materials used in electric motor windings

Whether it is a new motor or a motor rewind it is important that the correct insulation materials are used. This is a factor to be considered when deciding to buy new or rewind the failed motor. An insulation that performs well in a clean environment may give very poor performance when saturated with oil, for example lead wire such as Hypolon, is commonly used in many applications with good success. The same Hypolon if saturated with oil (as in an oil mist motor or machine tool application) becomes spongy or literally falls apart. Hence the need to know the application of the motor in order to determine the cause of failure

We in the rewind business have a definite advantage over the purchase of a new motor. We do not always know what is in the new motor but we know the environment and the application and can determine the correct materials in the rewind.

Properties of insulation materials : Insulation materials have to be flexible enough to prevent cracking, rigid enough to prevent extrusion under compression and mechanically strong enough to resist tearing while being easily formed and cut to size. Some sheet insulation tears easily in one direction only, with the grain, while others are cross-laminated for additional strength.

At the same time, insulation must be temperature resistant without being indestructible, because eventually the motor may need to be rewound, and the insulation must be cremated at a temperature well below that of the lamination insulation. It must also be absorbent enough to to soak up resin, yet not absorb moisture once the is placed in service.

Mylar has great mechanical strength, but melts at a low temperature. Nomex is highly temperature-resistant, but tears easily with the grain. Cross-ply insulations increase **mechanical** strength and complimentary materials can be laminated together to benefit from the strengths of each

Treatment Methods : The intended treatment method will also affect the selection of materials. Windings designed for vacuum pressure impregnation (VPI) will be insulated using dry absorbent tapes, while a winding designed to be dipped (or a field rewind that may only be sprayed to topcoat) should be insulated with pre-saturated tapes. The goal of winding treatment is not only to seal the winding, but also to add to the rigidity. While VPI methods improve the chance of penetration, the stiffness of the resin is also important.

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