Shop Tech Talk March 2010

Notes on Grease and Oil on Motor Windings

Windings, like those used in some submersible pump motors and motorized conveyer rollers are designed to run in an oil bath. This oil is useful for the lubrication of bearings and provides cooling of the windings themselves.

We are all probably familiar with the use of oil to cool the coils of large transformers, in the vernacular 'transformer oil.'This oil is intended for use also in circuit breakers, oil-filled switches and in X-ray equipment. This type of oil is a very refined "mineral oil", that is stable at high temperatures even after chronic use. It has high electrical resistance, ie is a good insulator, suppresses corona and arcing and has a high dielectric strength of the order of 30kV, as per the standard ASTM D-877 test. The dielectric strength of a transformer oil is defined as the maximum voltage that can be applied across the fluid without electrical breakdown.

Mineral oil is a by-product of making petroleum (gasoline). It comes in different "grades" , heavier grades are suitable as transformer oil and as general lubricants for machine and other metal working parts.

Transformer oil can also be supplied with fire resistant properties and be biodegradable.

As good as transformer oil is it is easily compromised by minute concentrations of contaminants, like moisture, particulates, fibers and surfactants.

Therefore, it is imperative that electrical insulating oils be kept clean and dry. Storage containers should be dedicated for electrical oil service and include air-tight seals. It is further recommended that electrical insulating oils be stored indoors in climate controlled environments.

Grease is a combination of mineral oil and a suitable thickener. The thickener acts as a carrier for the oil. The % of thickener in grease may range from approx. 3% to 30% or more.

A problem arises when you mix greases which have different thickeners. The most common thickener, or base, used in today's electric motor bearings has a polyurea base. The most common grease used by maintenance departments has a lithium base. Polyurea and lithium don't like each other. If you mix the highest quality polyurea based grease with the highest quality lithium based grease, the result can be a severe reduction in the effectiveness of the base. The result is that your grease can become pure oil and flow into the motor, leaving you with no bearing lubrication. This explains why we sometimes see motors which are full of oil, the bearings have failed, and the customer says there is no oil anywhere near that motor.

Oil,grease and dirt have a detrimental effect on insulated stator and rotor windings.

Oil tends to dissolve insulation systems and makes them more susceptible to the deteriorating effects of moisture.

Oil attracts dirt which reduces heat transfer from the winding surface and plugs ventilating passages causing overheating.

Dirt in lubrication systems will lead to eventual bearing failure.

As a practical matter I am not so much concerned about grease and oil on electric motor windings as I am on why the grease and oil got there. Herein may lie a problem that may end up as a bearing failure which could lead to a winding failure which is the worst production outcome.

Holland Industrial, 518 West Montgomery Street, Henderson, NC., 27536
Tel: 1-800-232-7541,Fax 1-252-492-2444, E-Mail: sales @ hollandindustrial.com