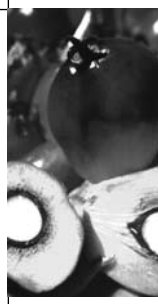
Feature Article



Palm Oil Mills - Caring Your Electrical Motors: Part 1

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I am sure most mill executives will agree that the electrical installations are totally neglected especially in almost all palm oil mills. This could be due to the following reasons: (a) lack of appreciation of electrical equipment, (b) lack of sufficient knowledge of the fundamentals of electrical engineering, (c) leaving the entire responsibility of electrical equipment maintenance management solely to the electrical chargeman, (d) overestimating the knowledge and capabilities of the charge man and (e) indifference in attitude towards electrical equipment.

It is not uncommon to witness failure of even a dozen motors per week in a palm oil mill. Surprisingly, this seems to be acceptable to the mill management. In some factories (non-palm oil mills), motors operate for decades without failure. As mill engineers have you ever asked them how they do it? Many of the failures can be prevented without much effort by following some simple common sense principles. The causes of motor failure can be defined into five categories as something all millers are already well aware and this is repeated here to remind them.

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ELECTRICAL DEFECTS

• Overload. A common problem in palm oil mills when the electrical load is more than what the motor is designed to carry. This will be indicated on the ammeter. So do not forget to look at the ammeter during your rounds. It is usual for the chargeman to set the overload to a higher setting so that the motor does not trip. He does not want to be disturbed. It could also be due to an undersized motor or restriction in rotation by the ingress of foreign objects or other restrictions. This causes the roasting of windings indicated by (i) darkening of the conductor insulation and (ii) insulation become brittle and it easily peel off. This may cause short circuit between turns.

The prevention is (i) reset the thermal overload relay according to its specification, and (ii) defect in the thermal overload relay - can be checked by reducing the setting to the minimum level and replace if found defective.

• Overheat. This is caused mainly by (i) the frequent start and stop (choking of machinery) and (ii) clogging of ventilation ducts. Probably all mills are guilty of this as the dust from the kernel station can easily be sucked into the ventilation ducts. Perhaps a good blower can clear it up if blown every morning, say 1 min per motor? The net

result is the same as that of overload. The prevention is (i) clear blockage by blowing and ensures that the ducts are not clogged, (ii) install thermal switch or thermostat inside the winding to stop the motor when it is overheated.

• Short-circuit. There are three different types of short-circuit normally encountered in palm oil mills (i) inter-turn to turn winding, (ii) phase to phase, and (iii) phase to frame. The possible causes can be any of the following: (i) overload, (ii) overheat, (iii) rubbing of stator and rotor (due to bearing defect), (iv) water/liquid ingression (defective rubber seal or gasket), (v) improper termination of cables into terminal box, and (vi) vibration of motor causing rubbing of the coil windings with the rotor. The prevention is (i) by ensuring a defect free thermal overload relay, (ii) avoidance of frequent start/stop operation, (iii) proper bearing installation and shaft alignment, (iv) proper installation of rubber seals and gaskets, and (v) ensuring ventilation ducts are not clogged that is regular cleaning.

• Poor insulation. This is caused by (i) overload, (ii) overheat, and (iii) ageing. An increase of over 5°C over its maximum operating temperature will shorten its span of life by half. The way to overcome this problem is by (i) cleaning, re-varnishing and baking, and (ii) application of aerosol insulator spray.

• Single phasing/starter defects. The millers may like to call this phenomenon double phase operation but actually there is no such thing as double phasing even though two phases are involved. It is generally caused by (i) defective contacts at the starter isolator or contactor, (ii) one of the fuses short-circuited, (iii) wiring to one-phase open circuited and (iv) loose connection caused by loose nut on bolts. This causes overloading of two sets of windings. The prevention is to i) ensure regular servicing of starters, (ii) use of correct power fuse size, (iii) tightening of all screws and nuts connection, and (iv) installation of electronic phase breaking relay.

MECHANICAL DEFECTS

• Mechanical. They are (i) defects associated with bearing, (ii) defective shaft alignment, (iii) problems with the driven machinery screw press, nut cracker, sludge centrifuge *etc.* and (iv) vibration - a most neglected area. The results are (i) rubbing of stator and rotor leading to short-circuit and (ii) roasting of windings due to overload. The prevention is (i) perform regular inspection of motor and the driven machinery, (ii) ensure thermal overload relay is working, and (iii) proper installation of motor and driven machinery ensures vibration free.

EXTERNAL FACTORS

• The common external factors (i) ingression of liquids, (ii) flooding of motor, (iii) chemical contacts, and (iv) attacked by pests. These will lead to short-circuits or open-circuits of windings. The prevention measures are (i) provide a cover for motors, (ii) install motors at a safe location, and (iii) apply rat baits at infested areas.

DEFECTIVE OPERATION

• Failure by defective operational procedures. The most common defect in operational procedure is frequent start/stop operation due to necessity to remove materials from process flow ducts or machinery, the common one being nut crackers, rotary valves and sludge centrifuge which get choked quite frequently. This invariably causes overheating of windings causing them to fail. Some of the procedures are difficult to control but the workers can be educated to change their habits to be a little more kind to the machines. Improved supervision by the mill supervisor would also help. Installation of a thermal switch at the windings would reduce the incidence of motor failures arising from this defect.