

## Effects of Pulp on Electric Motors

**Light pulp buildup can increase rewind frequency by 75% to 85%.**

A Southeastern USA Paper Mill rewinds a 200 hp, 447T TEFC motor, located below a pulper, 3 to 4 times a year. Rewind costs on this motor are approx. \$3,300.00 per rewind. At 3x a year this one motor takes \$9,900.00 out of the motor maintenance budget. **Can this mill cut this cost? Yes!**

In 1983 Union Camp's Savannah Mill and General Electric Co studied the effects of pulp contamination on premium high efficiency, ac induction, TEFC style electric motors up to a 449T frame. The studied published in the May 1987 TAPPI Journal clearly linked winding failures, bearing failures and high motor temperatures to pulp contamination on motor frames and air intakes.

### Overview of Test

Three motors were dynamometer tested under six specific contamination conditions and under four separate load conditions (0%, 37.5%, 75%, and 115%). The table below summarizes results for loads of 75-100% as this is typical in the pulp and paper industry.

### Effect of temperature on insulation life

Each 10°C rise in temperature reduces insulation life by 50%. The GE/UC test highlighted the importance of maintaining full airflow through the cooling fins and into the air intakes. A pulp coating on the motor will decrease airflow and can increase bearing temperatures by about 28-43°C above ambient temperature for motors operating at 75% to 100% of rated load.

### Areas of mills most susceptible to motor contamination include:

- Paper Mill – Underneath paper machine, paper stock, water

- Pulp Mill – Digester Area, Pulp Tanks, Bleach Plant, Lime Kiln, Black liquor areas
- Wood yard – Sawdust & Woodchips

Motors in these areas are likely to have more than 2/10ths of an inch contamination on the cooling fins and over 50% of the air intake blocked. **Under these conditions a motor will require rewinding 75% to 85% more frequently than a clean motor with free airflow.** Even with a clean air intake, a motor with just 2/10ths of an inch of stock on the cooling fins will require rewinding 50% more often.

### Solutions

A \$500.00 447T form fitting fiberglass motor cover would prevent the pulp buildup and air intake blockage so air could flow freely across the motor to keep temperatures down. The mill mentioned above would save \$9,400.00 in the first year alone. Because the motor is protected it will last longer. Assuming it goes 5-years without a rewind means that \$500.00 cover saved this mill nearly \$50,000.00 in motor repair costs!

**OrangeShield** is designed to defeat pulps destructive nature. **OrangeShield** is a lightweight, chemically resistant form-fitting cover that snaps in place over the motor. **OrangeShield** shields the cooling fins and air intake from falling, splashing debris to permit free airflow through the cooling fins. Actual field installations regularly report temperature drops of between 20°F to 30°F after installing **OrangeShield**. Maintenance workers benefit from cleaner motors by performing routing maintenance tasks such as lubrication or vibration analysis without having to first scrape debris from the motor.

Test	Test Condition		Percent increase in number of rewinds
	Cooling Fins	Air Intake	
A	CLEAN	0% BLOCKAGE	No Effect (100% Life) 18-25 yrs
B	CLEAN	50% BLOCKAGE	40%
C	LIGHT PULP	0% BLOCKAGE	50%
<b>D</b>	<b>LIGHT PULP</b>	<b>50% BLOCKAGE</b>	<b>75% to 85%</b>
E	HEAVY PULP	0% BLOCKAGE	75% to 82%
F	HEAVY PULP	50% BLOCKAGE	87% to 93%

\*\* Light Pulp: about 2/10ths of an inch of pulp    \*\* Heavy Pulp: cooling fins are completely filled