

General Motor Knowledge
Part 13

Insulation System

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Last month, we began a discussion of our insulation system. We started with the major insulation components, the possis powder, magnet wire and varnish. This month we will continue with the minor components and a brief explanation of why the particular combination of materials is important.

The minor components of our insulation system are such things as the connection boards, sleeving, tape, heat shrink tubing, circuit boards and capacitors. Even the lead wire, or at least that part of the lead wire inside the motor is considered part of the insulation system.

The major components of the system are the ones that separate the current carrying winding from the metal of the motor enclosure. The minor components separate the electrical parts from each other and maintain required electrical spacing.

Why is the specific combination of materials that make up our insulation system so important? Why is it that we must not use a substitute, for even the least of these components? This is the story, as I understand it.

Once upon a time, in the early days of the electric motor, paper was used as the ground insulation. The paper was varnished to protect it from moisture. It was formed around the stator and the coils were wound on top of it. This type of construction is still in use today, although with the appropriate improvements. But, back to the story. There was need for the electric motor to become smaller but with equal or greater output. "You don't get something for nothing" applied in this case. The price for higher output from a smaller motor was an increase in the operating temperature of the motor. It seems, there are several acids used in the manufacture of paper. The higher operating temperatures drove these acids out of the paper and into the motor housing. The acids destroyed the rest of the insulation system and the motor failed prematurely. Surprise! It was a perfectly good system until the temperature increased.

Our insulation system has been carefully tested at our maximum operating temperatures so that we do not have surprises from any of the components. Underwriters Laboratories, Canadian Standards and others periodically check our insulation system the make sure that no one else is surprised either. We must not add any chemical element, even if it is a part of a supposedly "better" product, without first testing the entire system for compatibility at high temperature.