

MOTOR MANUFACTURING 101 - SHORT COURSE

While the basic process for assembling small motor stators has changed little over the past 30 years, increased international competition has driven manufacturers to seek significant process improvements in their facilities. Although many subtle improvements in assembly processes are ongoing (i.e. Lean Manufacturing), equipment modernization also needs to be implemented in order to achieve maximum product quality and minimize labor costs. In addition, drastic changes in motor control technology, coupled with the reduction in the cost of microprocessors, has given birth to an entire range of variable speed motors which were not available 10 to 15 years ago.

This paper will discuss the steps involved with assembling a stator for a small electric motor. It will also cover some of the recent advancements in technology implemented in many facilities that improved stator quality while minimizing labor, production and material costs.

STATOR CORE ASSEMBLY

Lamination Selection

Lamination stacking is either performed by hand selecting (by weight or height) or by automatic stack selection. Although automatic stack selection minimizes operator intervention with the core build process, most machines still require frequent operator attention. If the lamination process is inconsistent, automatic selection holds little benefit over hand selecting.

Manual stack selection still remains the most popular method, since an operator can easily compensate when selecting laminations with problems like adhering laminations from heavy burrs, oil or annealing oxidation. To assure stack height accuracy with manually selected laminations, motor manufacturers are using electronic gauges mounted to the core securing machine.

Welding

Welding is a popular and widespread method for securing stator cores. New welding machines offer flexibility and reliability since many have eliminated the need for hydraulic operation.

Despite recent advancements in machine design, welding has a number of drawbacks since a welding machine requires manual loading of the laminations and a high level of maintenance. This maintenance activity (including torch tip adjustments, the monitoring of argon and the sharpening of torch rods) usually requires the attention of a skilled operator or technician. This is an additional concern to the electric motor design since stator core loss could occur by welding across the laminations.

Cleating



This process "V" rolls and then flattens a strip of soft steel down a dovetail slot on the O.D. of the stator laminations. The cleating strip steel is low cost and the process is fast. Cleating machines are extremely flexible and require little setup. Unlike welding, cleating still leaves the stator with

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