Factors to be considered for winding

Coil Winding Information:

For many years, companies have been using Coil Winding Machines with turn of the century technology using gears and cams for motion control. However, with computers now becoming ever more affordable and Motion Control Systems becoming more cost effective, many coil winding manufacturers are automating tasks which used to be done mechanically. Due to the flexibility offered by motion control technology, many secondary operations are being introduced into the winding process. As machinery becomes more computer automated, maintenance cost usually decreases along with direct labor cost.

Quality generally increases as the winding machines become less operator dependent and more computer dependent. The main reason for the increase in quality being the consistent process cycles which are achieved with automation. More consistent process cycles allow many quality standards such as Statistical Process Control (SPC) to become much more beneficial to the production personnel and management. Engineering decisions must be made when automating a coil winding process. If a bobbin is used, it should be designed for automation with as much room as possible for routing wire and wire wrapping terminals. When trying to automate a very labour intensive winding process, consideration must be given to the many variables in the winding process. A decision must be made on how much of the process can be automated. It has been Fisher Baker's experience that when a very labour intensive winding process is automated, it is almost always necessary to redesign the product for automation.

Tension application to the wound fibre, wire, or web is one of the most important elements in the winding process. The correct amount of tension must be maintained and should not be allowed to vary once set correctly.

Perfect Wound Coil:

This type of coil is very difficult to wind in a production environment with any type of winding equipment and/or tension system. When winding perfect wound coils several items must be considered.

1. BOBBIN- The bobbin or coil winding form must be designed to accommodate the coil being wound without interfering with the layering process. Sometimes it may be very helpful to have grooves cut or moulded into the bobbin or winding form to help start the first layer. All dimensions which affect the winding area must be held as tight as possible.

2. WIRE- Wire specifications must be very specific as to wire diameter or width. It is suggested that tolerances should be held so that the total tolerance times the number of turns per layer of wire is always less than half the wire size being wound. If tolerances can be held tighter then there is a better chance of winding a perfect coil.

3. TENSION- Tension must be maintained at the correct levels and should not be allowed to vary once it is set correctly. We recommend electronic or magnetic tension units. Friction tension units tend to change due to wearing parts and even changes in the environment such as temperature and humidity.

4. WINDING MACHINE- The winding machine must have a variable speed spindle and traverse unit. Once the traverse and spindle speed are set they should be maintained. The size and type of winding machine depend on the wire size being wound and the size and number of coils being wound. In most cases where wire smaller than 0.035", 0.912mm, or 19 AWG is used the wire should be guided as close to the surface of the coil as possible. Normally the larger wire sizes tend to be self-layering and therefore the wire guide mechanism can be positioned farther away from the winding surface. Most of the newer winding machines are computer controlled, however how the computer is integrated into the machine and what type of software is being used differ. To get total control over motor movements a closed-loop system must be used. Meaning that the computer tells the motor how much to move and also receives information on the motor's position during a movement. There are several closed loop systems available. The two most common are the DC Servo Systems and the DC Stepper Systems. Stepper Systems are used when movements are slow. Servo Systems are used when movements are faster and precision must be maintained. To get the most precise winds each coil should have its own spindle. A multi-spindle winding machine will allow each coil to have its own spindle.

We have found through experience that a process known as step winding does help in some cases. A step wind is accomplished by moving the traverse approximately one wire width per spindle revolution.

Random Wound Coil:

When there is plenty of room in the winding area for random winding and engineering and quality control will allow a random wind, then random wound coils usually lower cost when compared to perfect or nearly perfect wound coils. Costs are lowered when purchasing raw materials such as wire and bobbins. Costs are lowered in producing the part because the machinery can usually wind a random wind much faster than a perfect wind and tooling is less expensive. Scrap in general is often times lowered due to less stringent quality standards.

TENSION EQUIPMENT -When a random wind is acceptable, tension equipment is still very important to the winding process. Once the tensions are set they should be able to hold a consistent tension on the wire throughout the winding process. When tension is allowed to vary, all types of problems can surface in the winding process. If the tension is too tight, the wire will stretch and often break causing production and quality control problems. If the tension is too low, the coil may become to large or the wire may tangle and break, also causing production and quality control problems.