

# The power of zero (as in, zero defects) – part II

The costs of repairing and reinstalling failed larger motors were high, and the discussions about the cause of failure were anything but fun.

In part I of this article, we noted that motor and generator manufacturers were making larger and larger low voltage machines with random windings, i.e., round wire which is essentially spooled into coils, totally dependent on the film coating of the wire to insulate between different turns in the coil and adjacent coils.

And we noticed from our own experience that we had occasional early winding failures in random-wound three-phase stators, but never had them on smaller sized units. The costs to the customer to pull and reinstall larger motors were high, and the discussions about cause of failure, were anything but fun.

At Brithinee Electric, there's no shortage of mathematics degrees! And simple mathematics showed that the electrical stress between coils of large motors was much higher than between coils of small motors. Mechanical stresses are greater in large coils also. The film coating on the wire is the primary insulation between adjacent coils and turns.

## The search for a solution

Finally, one of the wire manufacturers suggested we call a small-motor department of a large service center in Florida which was using quad-build wire in an effort to leave out other materials, namely phase insulation. Obviously, our goals were in an entirely different direction; but the idea of a better wire grabbed us. Remember, James Watt's refined steam engine was intended to pump water out of British coal mines; but it transformed the world when it powered our ships and trains.

## Quadruple-coat magnet wire by Essex

We committed to install quadruple-coat wire into our larger motor windings. The manufacturer of the wire insisted on 5'000 pound orders of any given size, which made the experiment high cost and therefore high risk. Victory could be declared only after several years of using this wire. But it worked, and we had added a significant Building Block of Quality to our processes.



Windings of quad-coat Essex magnet wire makes us virtually unique in the USA. The wire has twice the number of coats of resin as the industry-standard “heavy armored” wire, so the resin thickness is twice as great.

Essex’s engineers told us that heavy armored wire has a tolerance of five discontinuities (dry spots) per hundred lineal feet, whereas the quad-coat wire, at the same test voltage, exhibits zero flaws. There’s that pesky number zero again. Of course the extra wall thickness also resists scratching in handling the wire.

This stroke of Brithinee Innovation proved to be hugely successful. Motor manufacturers and our service competitors attempt to add protection through better impregnation, such as VPI and extra dips and bakes in varnish (we do that, too); but a heavier build on the wire has virtually ended early winding failures in our random-wound machines, and has become the Power of Zero.



Trust us to offer new, high efficiency motors when available, and to solve your urgent needs through repair when they are not.

Call us day or night at 909 825 7971.

For additional motor news, visit [www.brithinee.com/news.htm](http://www.brithinee.com/news.htm).

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