Shop "Tech Talk" April 2007

Q. My motor nameplate shows that it has a 1.15 Service Factor. Does this mean that I can run this motor at a 15% overload continuously?

A. Well, it all depends! The main concern is the heat that is developed within the motor when running at its service factor load. The NEMA definition in Standard MG1-1.43 states "The Service Factor (SF) of an Alternating Current Motor is a Multiplier, which, when applied to the rated horsepower, indicates a permissible horsepower loading which may be carried <u>under the conditions specified for the service factor...</u>" So multiplying nameplate horsepower by the Service Factor (SF) tells how much you can overload the motor but not what effect that overload will have on the motor performance. <u>The overload is only allowable if frequency, voltage and ambient temperature (surrounding air) remain as stamped on the nameplate.</u>

If the conditions mentioned above are adhered to then NEMA has also established a chart (below) showing Standard Temperature Rises in degrees centigrade at the SF Load for various motor insulation systems (these temperature rises are measured by changes in winding resistance methods and are not surface motor temperatures)

Insulation Class	B	F	H
Open or TEFC no SF	80	105	125
All motors SF 1.15,rise @ 115% load	90	115	135

So, for a Motor with a SF of 1.15 and a Class F winding, when operated at <u>the service factor load</u>, the motor will have a temp. rise of 115 degrees C.
(This temp. rise is always based on a NEMA maximum ambient temperature of 40 degrees C)
So the motor temp would be 115+40 = 155°C .

If we now look at the chart below showing the Temperature Classification of Insulation Systems for Electric Motors, we can see that a Class F winding has a **Temperature Classification of 155°C . We can also see that the above motor temperature, in our example, of 155°C is equal to the max. (hot-spot) temperature at which the insulation can be operated for <u>normal expected service life for a Class F winding.</u>

Insulation System	Temperature Classification °C	Temperature Classification °F
Class B	130	266
Class F	155	311
Class H	180	356

****The Insulation Temperature Classification System indicates the maximum (hot-spot) temperature at which the insulation system can be operated for <u>normal expected</u> service life (this hot-spot temperature is reached only deep in the windings, at equilibrium conditions, and is usually about 25°C higher than the temp. measured on the surface of the motor)**

<u>High temperatures reduce motor life</u>. For every 10°C above its Temp. Class. rating, its winding life is reduced by 50% We need to consider this when operating motors at SF load for extended periods, at high ambient temperatures.

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