B&B Benchmark

B&B ELECTRIC MOTOR CO. Wichita, Ks

YOUR ONE STOP SERVICE CENTER

WHAT'S NEW AT B&B

SERVO LAB

In our continuing effort to provide our customers with the newest technology available, we have updated our shop with equipment specifically designed to test and repair servo motors.

Basically, a servo system is any system that has one or more "closed loops". The closed loop consists of
(1) a command
(2) a feed back signal to indicate command compliance
(3) an error output for non-compliance and
(4) a device or control that will respond in such a way as to correct for the error and reduce it to zero. The command can be for rate, position, direction, acceleration, etc. with feedback loops for each of

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WHO'S WHO AT B&B

Each issue we will be spot lighting one of our staff members.

Our repair staff consists of highly technically trained, long term employees having over 220 years of combined experience in the electric motor repair industry.

WHAT CAN WE DO FOR YOU?

B & B Electric Motor Co. is a full service motor shop providing sales and service of electric motors and pumps from fractional to 2000 H.P. We are U.L. certified to repair and rebuild hazardous location motors.

Our staff provides high quality rewinding of stators and armatures, along with complete **machine shop** facilities which include: vibration analysis, dynamic balancing, laser alignment of shafts, special project machining and welding.

We perform on site electro mechanical trouble shooting and our new Servo Lab (see article at left) is equipped with the newest technology available.

ELECTRICAL APPARATUS SERVICE ASSOCIATION
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Reliable Solutions Today!

TECHNICIAN'S CORNER

THE EFFECTS OF HIGH OR LOW VOLTAGE ON THE PERFORMANCE OF A MOTOR

NEMA MG-1-12.45 states that motors shall operate successfully under running conditions at rated load with a variation in the voltage or the frequency up to the following:

a: Plus or minus 5% of rated frequency, with rated frequency

b: Plus or minus 5% of rated frequency, with rated voltage

c: A combined variation in voltage and frequency of 10% (sum of total values) of the rated values, provided the frequency variation does not exceed plus or minus 5% of rated frequency

There is usually no problem with frequency variation, unless we get into operating at 50Hz, but that would be an article all by itself, so the focus here will be on voltage variation only. Even though NEMA states that motors are designed to operate within 10% of rated voltage, that doesn't give an accurate picture of what will happen when a motor is operated with high or low voltage. Any change from the rated voltage and frequency will affect the performance of the motor, sometimes dramatically.

Today's standard T-frame motors are designed with high flux densities and therefore are more susceptible to improper voltage conditions that will affect performance.

Older motors and high efficiency motors are designed with lower flux densities, so any variations

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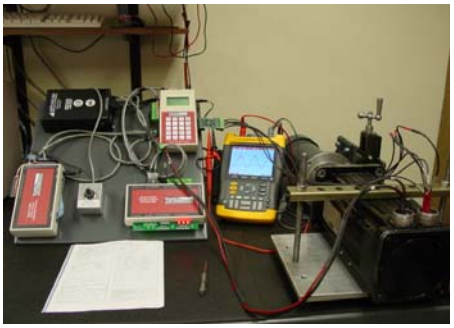
SERVO LAB…..continued

these. A servo system may consist of a single control loop or it can contain multiple loops. These could be for such things as X, Y, Z-axis, speeds rate, etc. The distinguishing characteristic of the servo motor is the fact that it is equipped with a device that will complete a feed back loop to the control and is part of a control system that will respond in such a manner to obtain the desired controlled results.

Servo motors have a wide variety of applications from positioning, to indexing, packaging, flying shear or absolute length, X Y and Z axis. Motors that may be used in a servo system are: AC induction 3 phase motors, DC brush type motors, brushless servo motors (AC and DC), stepper motors, switched reluctance motors and linear motors.

Operation of the feedback devices used to test servo systems requires special training. Our "new kid on the block" , Tom Pilens, has attended an extensive school for specific "hands on" training.

Tom comes to us with a 20 year background in the electrical repair industry and is experienced in the repair of a wide variety of electric motors. Tom is married with 2 grown children. His interests include drag boating, water skiing, and woodworking. Our most recent hire, Tom has been with us one year and is a valuable addition to our staff.



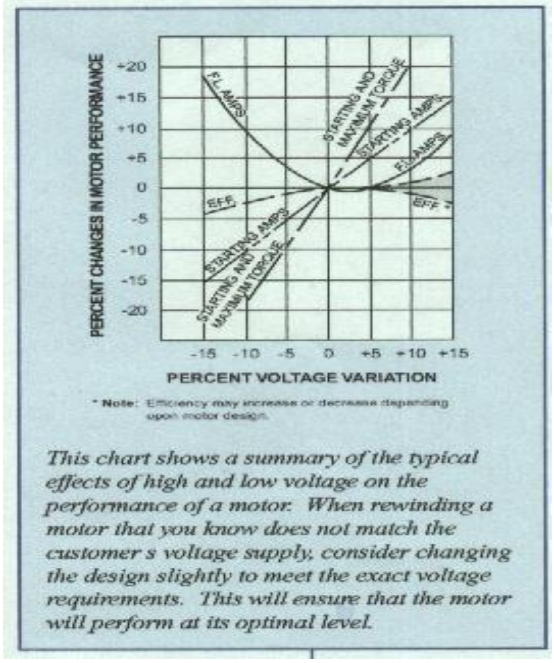
EFFECTS OF VOLTAGE…continued

from the rated voltage will not affect the performance as much (but it may still have negative effects!).

Higher voltage equals higher flux, so in some situations, high voltage can actually improve the performance, but at some point the core will begin to saturate and heat up quickly.

Having a low voltage supply is more dangerous than high voltage, because as less voltage is applied, there is less flux in the iron. Less flux means the core iron is not being used to its optimal level, so efficiency and torque start to fall.

More often than not, your customer will have high voltage supply, but there are cases where it may be low. For example, you could have a motor designed for 440v, but the power supply is actually 485v or 490v, which is right on the edge of 10% over voltage. Or you could have a motor designed for 230v, and the power supply is only 208v, right on the edge of 10% under voltage.



This chart shows a summary of the typical effects of high and low voltage on the performance of a motor. When rewinding a motor that you know does not match the customer s voltage supply, consider changing the design slightly to meet the exact voltage requirements. This will ensure that the motor will perform at its optimal level.

The following is a summary of the effects of over and under voltage for typical induction motors:

TORQUE

The torque of an induction motor varies as the square of the voltage, so any small variation in voltage will significantly affect the starting and maximum torque. At 110% voltage, torque will increase by 21%, but at 90%voltage, the torque will decrease by 19%. This could be a problem if the motor needs to start a high inertia load.

SPEED

The speed of a motor is going to change slightly with high or low voltage. At 110% voltage, the speed will increase about 1%, and at 90% voltage it will decrease about 1.5%. But when you look at the speed change in percent slip, the numbers are more dramatic. At 110% voltage, the percent slip will decrease by 17%, but at 90% voltage, the slip will increase by 23%.

EFFICIENCY

At 110% voltage, the efficiency of a motor may actually increase up to 1%. However, at 90% voltage, the efficiency is going to decrease about 2%. This will especially be a factor to consider for larger motors because of the cost of a lower efficiency.

CURRENT

The starting and full load current will also be affected by changes in voltage. At 110% voltage, the starting current will go up 10-12%, but the full load current will go down 7%. This would be a problem if the power supply cannot handle the higher starting current. At 90% voltage, the starting current will decrease 10-12%, while the full load current will increase 11%.

TEMPERATURE RISE

The temperature rise at full load will be somewhat affected by variations in voltage. At 110% voltage, the temperature rise will decrease 3-7 degrees C, unless the core has become saturated (the temp would increase). At 90% voltage, the temperature rise is going to increase 6-7 degrees C.

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EFFECTS OF VOLTAGE….CONTINUED

A general rule is that for every 10 degrees increase in total temp rise, the insulation life will be cut in half.

Even a slight under-voltage is going to increase the temperature, so that can make a difference in the insulation life of the motor.

OVERLOAD CAPACITY

At 110% voltage, the motor will actually have a 21% higher overload capacity, but at 90%, the capacity will decrease by 19%. More often than not, a motor is going to be overloaded for some period of time, so if the motor is operating with under-voltage, the possibility of failure increases.

Article provided by CYNDI NYBERG

(EASA Technical support specialist)

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