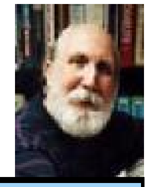

Shop "Tech Talk" November 2007

Q.	**A factory technician was in my plant recently and told me that one of my machines was not geared -in right. Would you explain what he meant by this?**
A.	**This is a common problem and if you address it you could save yourself trouble down the road.**

When a machine is installed it is typically set up speed-wise for the expected maximum speed of the line at that time. Subsequently down the road it may turn out that the maximum speed expected was never achieved or desired. This may leave the machine not geared right for the existing conditions.

Let me show how this could be, using an example of a 50HP dc motor, with a 500v armature and a nameplate full load amps of 86 amps. It was determined originally that with the motor running wide open at 1750 rpm that the customer would get a max line speed of 200 fpm. Now 2 years later we find that the plant never needs any more than 120 fpm, because of a change of material, so the motor is running at 1050 rpm with an armature voltage of 300v and the motor is pulling 76 amps, close to full load amps for the motor.

Because the motor was expected to run much faster than this originally it was not fitted with a blower. Now, however the motor is running much hotter because of this reduced speed and much less cooling capacity of the fan on the armature shaft. This increase in temperature is negative all the way around and could be much worse if the environment the motor is operating in is a hot one. This could lead to tripping of the dc motor thermostat and thus the drive, causing a shut down of the line.

To rectify the problem we have only to get the motor speed up as much as possible and to add a ratio change to a drive component so that the line speed is unaltered from what is needed. This effectively will reduce the motor amps by increasing the motor armature volts. We will still consume the same kw of power because we are still only doing the same amount of work as before.

The original kw in the armature was 300v x 76 amps / 1000 = 22.8 kw and the new kw if we increase the motor speed to 500v will still be 22.8 and the new amps will be 22.8 x 1000 / 500 = 46 amps. The speed ratio adjustment needs to be in the ratio of new motor speed / old motor speed ie 500/300, or 1.67 to 1 , here we make the assumption that speed is directly proportional to armature voltage.

As a further example if we had a sheave on the motor shaft we would need to make it smaller by dividing its diameter by 1.67, so if it was 10.5" originally then it needs to be reduced to 10.5 / 1.67 ie to 6" diameter. If we do not have a sheave drive but have a gearbox with a sprocket on its output the same logic would work so that we reduce the sprocket diameter on the gearbox output or increase the diameter of the sprocket that the gearbox sprocket is connected to.

In this example then we have reduced the armature current from 76 amps to 46 amps and since the armature heating effect is proportional to I^2R ,where I is armature current and R is armature resistance we have greatly reduced the heat in the armature circuit. If we had reduced the current to half of what it was, we would have reduced the heating effect by a factor of 4. Obviously this would have been a major improvement.

Sometimes relatively simple changes can help a problem a whole lot !

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