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Go Green! ***By Paul Berberian***

Go Green – Energy Cost Savings Using Precision Laser Alignment

There is a lot of information available about laser shaft alignment, why it's important and what the benefits are. Bearing, seal and coupling life being the primary reasons. Less downtime for industry and better product quality due to the decrease in vibration.

Another great benefit that doesn't get as much attention, but should in these days of rising costs, is energy savings.

When a machine set (motor/pump, motor/fan, motor/gearbox) is out of alignment there are external forces that come into play in the machine. External forces on the shaft and/or rotor can cause bending and flexing that reduce the efficiency of the machine. In effect, the motor is constantly trying to re-align itself. These external forces require energy and reduce the efficiency of the motor.

According to studies by the US Department of Energy nearly 25% of industrial electricity demand comes from industrial motor systems. As shown in the following table, a single percentage point of improved efficiency is worth significant dollar savings—even for motors as small as 25 horsepower (hp).

What is an extra point of motor efficiency improvement worth?

Horsepower	Full-load Motor Efficiency		Annual Savings	
	Original Efficiency	Final Efficiency	Annual Energy Savings, kWh	Dollar Savings per Year
10	89.5	90.5	605	\$30.00
25	92.4	93.4	1420	\$71.00
50	93.0	94.0	2803	\$140.00
100	94.5	95.5	5431	\$272.00
200	95.0	96.0	10746	\$537.00

Note: Based on purchase of a 1,800 rpm totally enclosed fan-cooled motor with 8,760 hours per year of operation, 75% load, and an electrical rate of \$0.05/kWh.

http://www1.eere.energy.gov/industry/bestpractices/pdfs/estimate_motor_efficiency_motor_systems2.pdf



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Depending upon the severity of misalignment, increases in power costs between 2% and 9% may be seen. In some cases it has been reported the power consumption may increase as much as 17%.

Let's look at some real case studies.

Our first example is from a large steel mill. They were able to use the Easy-Laser dual beam laser system to align a long cooling tower jack shaft. They measured each coupling at each end of the jack shaft, then used both sets of alignment results to calculate the necessary correction in order to align the machine units.



These shafts are 4.3 m (14 ft) in length, which is not a problem for the laser system, as it can measure shaft alignment over a distance of 18 m (60 ft). In the past, a contractor had done this work using a single-beam system that could not span the necessary distance of 4.6 m (15 ft) in order to measure directly from the motor shaft to the gearbox shaft.

The motor had an amperage reading taken on the machine unit before the realignment work was done and it showed a draw of 174 amps. After the work was completed, another reading was taken, showing 155 amps. That's a 19-amp drop!

Although this mill is running almost 24/7, it was estimated that the cooling tower ran half the year. That's 4,380 hours, so that 19-amp drop works out to a little over a 10% reduction, which means 78,735 kWh is saved. Using an average of 0.07 cents per kW, that's a saving of \$5,511 per year. If you look at this another way, they have reduced the plant's overall carbon footprint by taking 54 metric tons of CO₂ out of the environment (that's like removing 8.2 cars off the road).

You can read more about this online at:

http://www.mromagazine.com/issues/ISarticle.asp?id=193712&story_id=63393154519&issue=12012007&PC

Our second example concerns a steel and aluminum plant in the United Kingdom. This study was done in 2001 and was conducted with Easy-Laser. This plant had just moved from using a straight edge alignment method to using Easy-Laser laser alignment tools. They had targeted 39 machines and



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the first benefit they realized was an increase in MTBF for these machines from 6 months to 20 months. An increase of just 1 month on the MTBF to 7 months was estimated to give yearly repair costs savings of \$5,126.

One motor found to be misaligned by 25 mils was measured as drawing 12.2 amps. After completing a precision laser alignment to within 2.5 mils, the motor was measured at 11.8 amps, a 3.3% reduction in power. Doesn't seem like much? Let's look at the numbers for a 1% power reduction for the plant!

Energy Cost Savings

**24 mils aligned motor was measured a 12.2 amps
After precision laser alignment to 2.5 mils measurement dropped to 11.8
amps**

3.28% power reduction

We will assume only a 1% reduction in the example below

Plant Size	1108kW
Cost of Power	\$0.06
Machine operating Time	24x365 = 8760 hours/year
Total cost of power in 1 year	1189 x .06 x8760 = \$595,063
Power Savings	11.8kW

What did the customer have to say about these improvements? "This report will go on to show that improving alignment methods will lead to savings in the maintenance budget and the power consumption of the plant."

We may not have needed another good reason to use precision alignment tools on our machines, but in this day of rising energy costs this may end up being one of the best!

For more information on affordable laser alignment systems and how you can start saving maintenance and energy dollars, contact Alignment Supplies, Inc at (800) 997-4467 or online at www.alignmentsupplies.com.

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Since 1985, Alignment Supplies, Inc. has served the rotating machinery industry with a complete line of alignment-related products for shaft and machinery alignment. As the US Master Distributor for Easy-Laser®, Alignment Supplies, Inc. has the experience, resources, and equipment to address any alignment need. Contact us at 419.887.5890 or at www.alignmentsupplies.com.