

Keep Your Cool And Save Energy With Your Heat Treating Oven

By Craig LaMotte

Saving energy, while keeping your cool, is everyone's goal. But saving energy must be a deliberate action on the part of management and begins with an understanding of how your company uses energy. A good place to start is a survey that shows how you use energy to produce heat, compressed air, hot water, processes and movements. Management must provide realistic and obtainable strategies and goals that employees can follow.

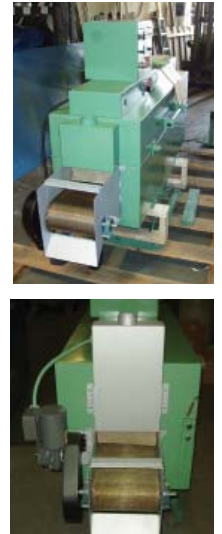
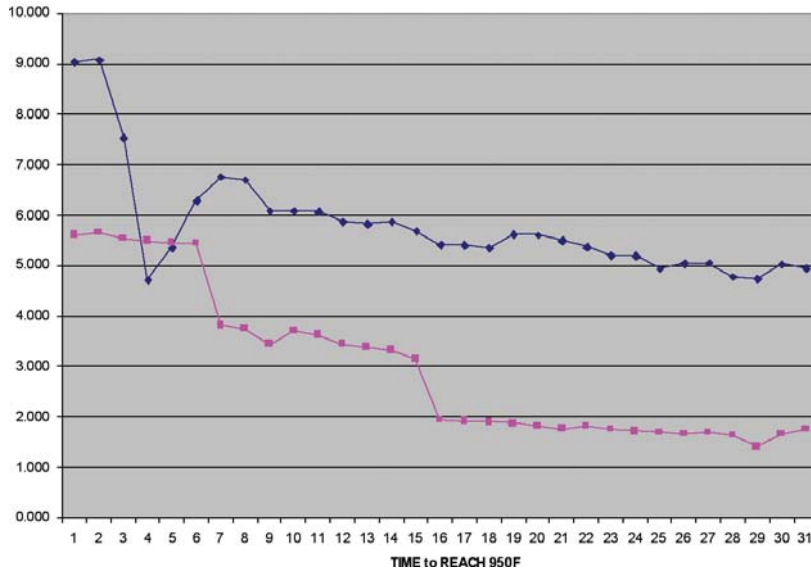
There have been many articles written on lighting, insulation and compressed air; this article will look at the heat treating furnace. It is a good place to start because it uses a significant amount of electricity and can make a big difference in your electric bills and hence the bottom line. I will look at a couple of ways to save money and energy, and whether rebuilding an oven or buying a new one is the best choice. Finally, I will demonstrate how changes in the way you startup your ovens can reduce the impact of skyrocketing energy costs.

Rising Energy Costs

Energy prices are increasing nationally and internationally. A recent *USA Today* article reported that, "Utilities across the USA are raising power prices up to 29 percent ... Even more dramatic rate increases are ahead." Increased demand and tightened environmental controls are driving costs faster than ever, and with no "silver bullet" solution in sight, it appears that this will be the reality for the foreseeable future.

The Energy Information Agency web site (www.eia.doe.gov/oiaf/forecasting.html) provides a number of charts and data including one that shows the annual electricity capacity versus demand from 1996 – 2006. This data demonstrates that the demand has grown slightly faster (2 percent) than our capacity to produce electricity. The effort to reduce pollution and carbon emissions will push the cost to produce electricity even higher. The Energy Information Agency web site also shows the average energy costs for the U.S. have increased an average of 41 percent since 2000 with the industrial sector leading the increase with a 45.6 percent jump in electricity prices in that period (\$0.046/KWh - \$0.067/KWh). The same article predicts this trend

Power Comparison MKP10 to MKP10XI



to continue into 2009 with a forecasted increase for US average across all sectors of 10.4 percent per KWh.

Make Your Own or Reduce Your Usage

Fortunately, you are not totally helpless in this situation. There are steps you can take to lessen the impact these increases will have on your bottom line. One approach is to produce your own electricity with either solar photovoltaic (PV) panels on the roof or a wind generator in the parking lot. But at an installed cost of \$10 per watt for solar PV and about \$5 for wind the payback is 20 plus years. Another approach is to use solar thermal to preheat your process water. Although the initial cost is much less than either solar PV or wind, the actual dollar savings are also much less. The best approach is to find ways to reduce your total energy requirements through better energy conservation practices and purchasing decisions.

Rebuild or Buy New?

The heat treating oven is a great example to illustrate how savings can be realized through purchasing decisions and operating practices. Furnace Fixers constantly looks for ways to improve our ovens to make them more cost effective for customers. For example, four years ago we added the "XI" models to our product line and changed the way we insulated the unit. This resulted in the oven being cooler to be around, improved performance and throughput. Over the last two years we have performed power surveys as part of our quality checks on every oven we make and rebuild. While not a total surprise, these changes resulted in a significant reduction in the amount of electricity needed to operate the "XI" models versus the standard models.

Actual savings realized depends on the oven temperature, but at 900°F the MKP-10XI used approximately half the KW to maintain temperature (with no load) than the comparable standard MKP-10. This resulted in an "XI" using over 2.8KW less electricity. If you look at the annual incremental

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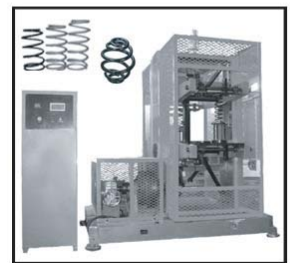


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Savings Comparison MKPI0 to MKPI0XI

| COST PER KW \$0.0845 | | | | | | |
|----------------------|-------------------|--------|--|--------------|--------------------|--------|
| | Rate Increase 10% | | | | Rate Increase 10% | |
| YEAR | 1 shift 40 hrs/wk | | | YEAR | 2 shifts 80 hrs/wk | |
| 1 | \$512.59 | 10.00% | | 1 | \$1,025.18 | 10.00% |
| 2 | \$563.85 | 11.00% | | 2 | \$1,127.70 | 11.00% |
| 3 | \$620.23 | 12.10% | | 3 | \$1,240.47 | 12.10% |
| 4 | \$682.26 | 13.31% | | 4 | \$1,364.51 | 13.31% |
| 5 | \$750.48 | 14.64% | | 5 | \$1,500.97 | 14.64% |
| 6 | \$825.53 | 16.11% | | 6 | \$1,651.06 | 16.11% |
| 7 | \$908.08 | 17.72% | | 7 | \$1,816.17 | 17.72% |
| 8 | \$998.89 | 19.49% | | 8 | \$1,997.79 | 19.49% |
| 9 | \$1,098.78 | 21.44% | | 9 | \$2,197.56 | 21.44% |
| 10 | \$1,208.66 | 23.58% | | 10 | \$2,417.32 | 23.58% |
| Total | \$8,169.36 | | | Total | \$16,338.73 | |

costs over a 10 year period to operate an "XI" versus a standard MKP oven, the savings add up quickly. Using a cost of \$0.0845 per KWh (the average of the 2008 cost per KWh for commercial and industrial sectors) the chart below shows a savings of just over \$8,000 over ten years. Plus, if this oven was used for two shifts the costs would double to over \$16,000.

This chart clearly shows that when you consider whether to rebuild or purchase a new oven, you have to take into account the total cost to operate including any energy costs. If not it could cost more in the long run to rebuild your older oven than it would to purchase a newer, more energy efficient model. The energy efficiency of the oven should be demonstrable, as shown in the above graph that compares the MKP-10 with the new MKP-10XI, and not merely an unsubstantiated claim.

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Stagger Start Times to Save

Another electricity cost aspect is the charge imposed by many electric utilities for the peak energy demand (demand charge) used by your company. This charge can vary from \$5 to over \$15 per KW. Not everyone is assessed this charge. If you are, a simple change in operation can result in significant savings. The demand charge is based on the highest average amount of electricity (in kilowatts) used in any given period (usually 15 to 30 minutes) over the month or whatever period used by the utility. An example may help clarify the concept.

Two companies use the same amount of electricity in a month, but Company 1 turns on all their equipment within a half hour period while Company 2 staggers their startup over a two hour period. As a result, Company 1 has a higher demand charge from the utility. Both companies have ten MKP-10XI ovens each drawing 9.6KW at full load as the ovens heat up to temperature. After the ovens have heated up to 900°F they operate at 2KW plus whatever load is being placed on them, for a total of 20KW. Company 1 turns on all 10 ovens at once which equals a total demand of 96KW, while Company 2 starts their ovens over a two hour period. The ovens are

started in groups of three per period, except the final period when the last oven is started by itself. They allow a half hour for each group of ovens to heat to 900°F. For Company 2, the demand for the first half hour is 28.8KW, the second half hour is 34.8KW, the third half hour is 40.2KW and the last half hour is 27.6KW.

The difference between the two companies demand is 96 KW minus 40.2 KW for a total of 55.8KW (40.2KW is the largest demand). If the demand charge is \$10 per KW, the first company will be charged \$550 more per month that results in an annual total of \$6,600 of additional cost for the privilege of turning all their equipment on at the same time. Newer ovens, like our "Touch Panel" models, have better controls including PLCs and digital timers that make the timing of startup and shutdown easy to control. They can also be easily connected to your data network to ensure they are all set to start at the correct time. The lesson here is to pay attention to your electrical loads when you start up for the day. Start the largest load first, and when it has settled down move on to the next largest load, etc. The results can be very rewarding.

A change in the time when you begin operations can have a big impact on your electric bill. By moving to an off peak rate, you can realize significant savings. Check with your electric service provider, to see if they offer off peak rates and if the savings make sense for your operation.

In Conclusion

The cost of energy has become a significant percentage of a company's operating expenses and can have a major impact on your bottom line. It should be reviewed on a routine basis, because changes in equipment, operations and personnel will effect how efficiently energy is used and can point out ways to realize savings. Finally, the cost of energy must be part of the decision process when you make operational or capital decisions. I hope these energy saving ideas are helpful to your company. Please contact me at (630) 736-0670 with any questions. ♦

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