

MOTOR MANAGEMENT SUCCESS:

Boeing and Puget Sound Energy Team Up to Reduce Energy Costs

Boeing is the world's leading aerospace company and the largest manufacturer of satellites, commercial jetliners and military aircraft.

Puget Sound Energy supplies electricity and natural gas to over 1.2 million customers in Washington State and offers a wide range of innovative energy solutions.

In October 2002, Electric Motor Management's (EMM) WINDINGS publication featured a story detailing improved motor management at the Boeing Company initiated by Ken O'Donnell, the Lead Maintenance/Reliability Engineer at Boeing's Kent plant. O'Donnell acted on recommendations presented at an EMM-sponsored motor management seminar to achieve these results:

- Creation of an extensive active and spare motors database for plants in Kent, Renton and Tukwila, WA
- Establishment of a standard data input for motors database software (initially **EM2**, then **MotorMaster+** software) for use in repair/replace decisions
- Development of an in-house training program for effective motor management practice

EMM met with O'Donnell in early 2004 to update on his progress. We learned about a new project he initiated at Boeing's Renton facility which is described to the right.



Ken O'Donnell – Lead Maintenance/Reliability Engineer – analyzes motor operating costs to make repair and replace decisions before a motor fails.

Project Overview

O'Donnell targeted a process using industrial tank lines for printed circuit board manufacturing in one of Boeing's Renton facilities. Several room temperature control supply and exhaust fans were operating at less than optimal loads. In the late 1990's, several tank lines had been removed from service. However, no corresponding adjustments were made to the fans to account for the reduced air flow requirement. While significant savings could be achieved by addressing the system imbalance, the cost of implementation was prohibitive given internal payback criterion for energy-related projects.

The initial plan for Boeing's Renton plant was to transfer the loads from one supply-exhaust fan system to another. This would effectively allow decommissioning of one 20-horsepower (hp) make-up air fan and a 40-hp scrubber exhaust fan, both of which were operational 365 days a year. Furthermore, speed reduction of the remaining two fans appeared to be necessary and would reap additional savings. Projected energy savings were calculated using **MotorMaster+**, a motor management software program developed by the U.S. Department of Energy. Based on this scope, the modifications were expected to decrease energy usage by 336,820 kWh/yr (an estimated \$19,272 annually). Still, total savings would not have fallen under the company's payback parameters, even after expected reductions in maintenance and savings from heating and cooling of process air were factored in. Fortunately, with financial assistance from Puget Sound Energy and Boeing's willingness to extend the duration for payback, the project became viable.

Boeing brought the project proposal to their utility, Puget Sound Energy (PSE). PSE offers incentive funding of up to 50% of project costs for Schedule 250 industrial customers with specific projects dedicated to increasing the energy efficiency of their operations above and beyond those measures required by the Washington State Non-Residential Energy Code. Projects with a payback of less than one year are not eligible, since that low of a payback would hardly need a subsidy.

"Boeing's thorough and innovative plan, presented with a remarkably detailed proposal for the project, made it a natural for our grant program," noted Al Dunlap, Senior Energy Management Engineer at PSE.

O'Donnell estimated the cost to overhaul the system at approximately \$60,000, with design, project management and routine system modifications done in-house. More specialized work was to be subcontracted. However, requirements were altered during implementation. End-users in Boeing's Renton plant were more comfortable with keeping both tank line systems in use, with one as a back up. The scope of the project was revised accordingly and resulted in less, but still significant, savings. These changes caused a rise in the energy consumption estimates of the active fans since increased airflow was needed to compensate for the actual loss of total airflow that occurred with both tank lines operational. Calculations done with **MotorMaster+** (version 4.0) indicated an amended savings of 136,984 kWh/yr.

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Results

While a good deal less than the original savings estimate of 336,820 kWh/yr, the final number is still considerable. When the savings from reduced maintenance and heating and cooling costs are added to the electrical energy savings, O'Donnell estimates yearly cost cutting to be \$16,578 line item breaking down as follows:

Savings from reduced heating & cooling (9,329 therms nat. gas):.....	\$ 3,740
Maintenance savings (idled fans):	\$ 5,000
Electrical energy savings (136,984 kWh/yr):.....	\$ 7,838
TOTAL:	\$16,578

Despite the change in scope, final project costs were only slightly above the original estimate of \$60,000. With PSE's \$30,000 grant, Boeing will realize a simple payback of 1.9 years. "Had it not been for the availability of an energy conservation grant from PSE, we would not have been able to proceed with this project," concluded O'Donnell.

Lessons Learned

A number of issues here are noteworthy. From participation in a motor management seminar, Boeing's Ken O'Donnell learned to use an initial software tool to estimate motor operating costs: the Electric Motor Manager (**EM2**) software. From there, he saw other possibilities to improve motor efficiency with the use of yet another free software tool: the **MotorMaster+** software. With these two software programs, O'Donnell was able to quantify the financial benefits of a system improvement project and bring his findings to a utility willing to encourage such projects. While final savings results were lower than initial estimates due to the change in project scope, good results were still attained and energy efficiency increased.

For O'Donnell, the ability to project actual cost and savings numbers was key in taking advantage of the PSE financial incentive. With the tools at hand, the means are there for the taking.

Project Partners

Puget Sound Energy
Northwest Energy Efficiency Alliance

Motor Management Success Story, March 2004.



Electric Motor Management is a Drive Power Initiative funded by the
NORTHWEST ENERGY EFFICIENCY ALLIANCE
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Dan Voss – Condition-Based Maintenance Motor Technician at Boeing – uses an electronic clipboard loaded with EM2 software to collect motor nameplate data during routine preventive maintenance. CBM staff entered over 180 of the larger motors in the plant in a matter of months.