New Tool Knocks Down Barriers to Industrial Energy Efficiency Improvements

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ABSTRACT

Rising energy prices have made more industrial energy efficiency and process improvement projects viable from a cost-effectiveness perspective. Simple paybacks have dropped, sometimes greatly, and many project returns on investment are almost "no brainers." However, many industrial customers are still not implementing energy efficiency projects. Why?

Many barriers stop industrial customers from taking action. This paper discusses four primary barriers and offers one new way to overcome them: a software tool called EnComp®. This software runs on a handheld pocket personal computer for ease of use and portability. Several technology modules are currently functional and new ones are being developed, based on client requests. Twenty years' experience with conducting industrial energy audits led to EnComp's development.

Users enter data about a customer's equipment and operations into the EnComp software while conducting an on-site visit. Then, the user can begin quickly evaluating potential changes, such as energy efficiency upgrades or process adjustments. EnComp will produce quantifiable estimates of project payback and return on investment.

EnComp allows the technical expert and the customer to compare and evaluate multiple energy efficiency opportunities. This ability to run multiple scenarios and quickly assess the most cost-effective opportunities helps the customer determine how one potential improvement may complement or conflict with another one. EnComp's features address a key challenge in today's volatile energy marketplace: effectively managing rising energy costs. The volatility of today's markets demand that facility managers have the best tools at their disposal to manage energy use and costs.

Introduction

Rising energy prices have made an increasing number of industrial energy efficiency and process improvement projects viable from a cost-effectiveness perspective. Simple paybacks have dropped, sometimes greatly, and many project return on investment (ROI) calculations are almost "no brainers." However, many industrial customers are still not implementing energy savings projects. The volatility of today's energy markets suggests that industrial customers should finally be adopting energy efficiency measures more readily than in the past. But, this is not always the case. What is stopping them?

Many barriers stop industrial customers from implementing smart, cost-effective energy saving measures. These include: 1) an inconsistent focus on energy issues, costs, and impacts on facility operations; 2) a lack of time and knowledge about new technologies or practices and their energy-related impacts; 3) the inability to adequately compare technology or process improvement options and trade-offs; and 4) insufficient financial and economic information about a specific project to convince corporate decision makers to fund it. A final barrier often occurs when using a hired technical expert. This person or firm cannot quickly assess the impacts

of multiple efficiency options on a customer's process operations. It may take the technical expert anywhere from a few weeks to several months to complete the report. By the time the customer receives it, they have moved on to other, more time-critical problems.

A new software tool, called EnComp®, was created to address these barriers. EnComp's creators have worked with industrial customers across the U.S. for over 20 years on energy efficiency and industrial productivity issues. This first-hand experience with these customers and the barriers to implementing projects contributed directly to EnComp's creation, development, content, and functionality.

Barriers: A Brief Discussion

First, there has been an inconsistent focus among industrial customers on the issue of energy. Customers in highly energy intensive industries such as chemical, pulp and paper, and steel have always paid attention to energy issues; six of twenty-one industry sectors account for 85 percent of manufacturing energy use (EERE, 2003). However, customers in other, less energy intensive industries have not maintained a consistent attention on energy supply or demand issues.

Until the past five years or so, energy costs were relatively low nationally, except for in certain geographic locations. As a result, energy was often a mid to low priority on these customers' "to do" lists. Until recently, most industrial customers had no long-term strategic energy plan: they simply reacted to short-term market conditions such as seasonal price spikes, a one-time blackout, or a facility-specific emergency. Once the conditions stabilized or the emergency faded, energy went back to being a lesser priority.

Accordingly, many of these same customers, until very recently, did not know how much they spent on energy each year. Many still do not. Many are just beginning to quantify how much energy it takes to produce a product, how much energy they could save by installing different equipment, or how much they could save by making process changes. If they had this information and could benchmark it against their peers, they could use it to make good decisions and define a plan of action. But many just do not have it.

Second, the economic realities of today's business are stark. Few industrial customers have enough staff to research and study the best technology and process options to consider. Hiring in the manufacturing sector is projected to be weaker in 2007 than in 2006 (SHRM/Rutgers LINE™, 2007). Many have difficulty maintaining staff to keep the processes running for each shift. This barrier exists every year, whether through budget shortfalls or the inability to find skilled workers for specific tasks. Resources about energy efficiency and plant productivity improvements are available, often at no- or low cost, including Federal, state, and university research programs. But there are not enough hours in the day for many plant engineers and technicians to access them.

Third, too much information is just as much a barrier as too little. Customers often do not have the time, knowledge, or ability to study technology options and compare them on an "apples to apples" basis (Levy, 2006). They may or may not trust contractor or trade ally sales pitches. And so often, they just do nothing.

Fourth, business decision makers increasingly require hard financial data—not engineering estimates—before they will approve capital expenditures for new equipment purchases, process improvements, or efficiency upgrades. In the past, facility managers or plant engineers relied on engineering estimates and calculations of simple payback. Today, most chief

financial officers and financial managers want real numbers, including actual, not projected savings estimates, and financial calculations such as return on investment.

Finally, there is the issue of response time. A typical industrial energy audit can take a day or more to complete and then days, weeks, or even months, depending on the schedule of the technical expert or energy auditor, to finalize. This time lag represents a substantial barrier to both the auditor and the customer. From the auditor's perspective, the more time it takes to complete a project, the fewer new projects the auditor can begin.

The customer, on the other hand, suffers in two ways. First, when customers must wait for the audit's findings, the time lag impacts purchase schedules and decision time frames. Second, this time lag also can cause a customer's attention to energy efficiency or a productivity improvement to be shifted to another, more urgent problem. It is often extremely difficult to grab this attention back—the customer has moved on to fight the next fire. They may circle back around to the audit, but it may be months later. The moment is lost.

EnComp® Knocks Down Barriers: A General Introduction

EnComp is a software tool that eliminates many of these actual or perceived barriers. It helps technical experts, energy auditors, and facility engineers and staff gather facility data more efficiently, compare equipment and technology options, quantify financial data, and complete audits more quickly.

EnComp operates on both personal computers (PC) and handheld pocket PCs. Once the software is loaded, the process is simple. Typically, an auditor brings the handheld pocket PC to a facility audit. Using EnComp's intuitive and easy to use input screens, the auditor then enters data about the customer's energy use, equipment, and operating parameters. With all the data collected, the majority of the on-site work is now complete.

Once the auditor returns to the office, data collected from the pocket PC is then uploaded to a desktop or laptop computer. Then, the user can begin quickly evaluating potential energy efficiency upgrades or process adjustments, based on the customer's actual equipment configuration. The results of this evaluation include quantifiable estimates of project payback and return on investment. EnComp presents results, including costs and savings quantification, in a format which allows plant engineers and facility managers to obtain budget approval more quickly.

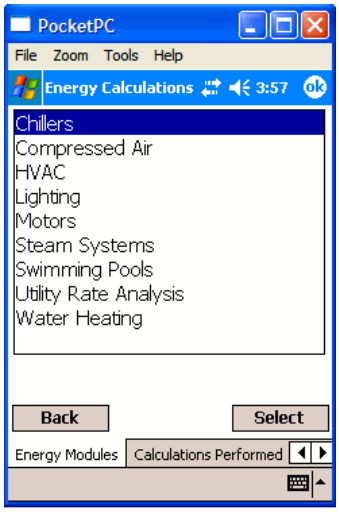
Once the auditor is satisfied with the results, EnComp can instantly generate a report in formats compatible with most word processing programs, such as Microsoft Word. This report can be customized to meet a customer's specific needs or delivered as is. EnComp's output is very flexible and user friendly. While it provides standard text that can be used in preparing a report, many technical experts do not rely on standardized reports for industrial customers. Most facilities are too different and their corresponding reports require customization. Accordingly, EnComp users have easy access to the fully customizable report builder contained within EnComp. They can modify the standard report verbiage for any module, change the introduction of a report, or add additional information including pictures and diagrams. This feature gives users the ability to customize reports to meet individual customer needs.

Once the EnComp handheld unit is synchronized with the desktop/laptop computer, all data is automatically uploaded and saved in a relational database. This ensures the data is backed up regularly and not lost.

Several technology modules are currently available in EnComp; they include chillers, compressed air, HVAC, lighting, motors, steam systems, swimming pools, utility rate analysis, and water heating. Figure 1 illustrates a screenshot of EnComp and its current modules. New modules are constantly being created to extend the usability of EnComp.

Custom modules can also be created and tailored to meet a client's specific need.

Figure 1. Screenshot of EnComp and Its Current Modules.

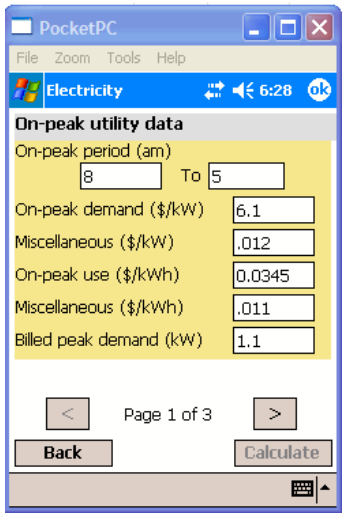


Source: EnVise LLC © 2007

Specific Examples: Utility Information Input and Motors

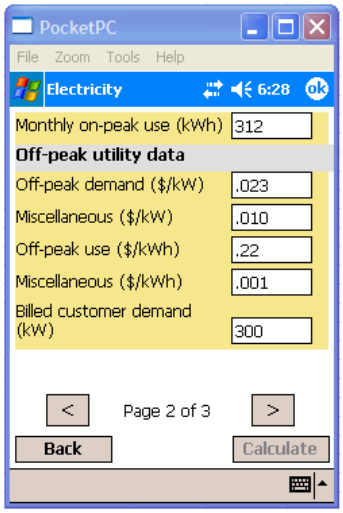
Figures 2 through 4 are EnComp screenshots of the utility rate analysis module, specifically, the information pages for electricity. Users can either elect to leave the default values in each field or enter customer and utility-specific rate information in each field. The more precise the information, the better the cost estimates will be at the end.

Figure 2. Screenshot of Data Input Into EnComp's Utility Rate Analysis Module, Page 1.



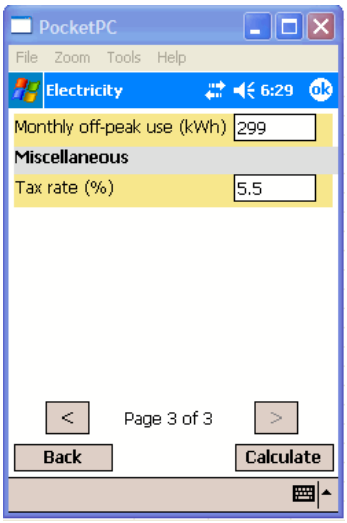
Source: EnVise LLC © 2007

Figure 3. Screenshot of Data Input Into EnComp's Utility Rate Analysis Module, Page 2.



Source: EnVise LLC © 2007

Figure 4. Screenshot of Data Input Into EnComp's Utility Rate Analysis Module, Page 3.



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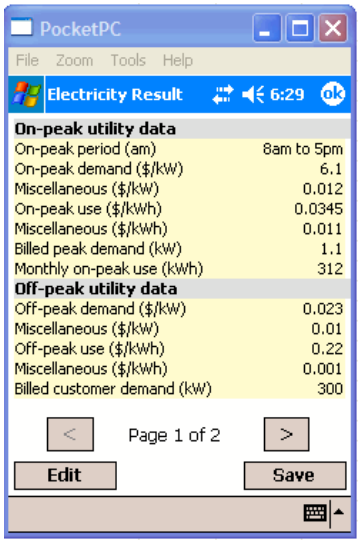
Figures 5 and 6 (on the next page) are screenshots of EnComp's output, based on the input shown in Figures 2-4. This example is also a good illustration of the flexibility built into EnComp. A user can select either an average overall rate, input a detailed rate, or track a 12 month average utility rate through the desktop application.

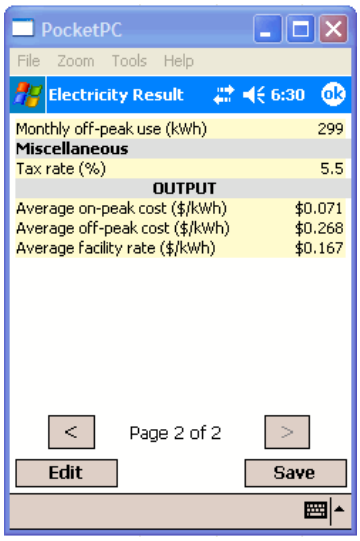
For example, all industrial facilities have motors. Every industrial engineer or technical expert will need to audit the motors in a facility and evaluate the efficiency of the motor system overall. Sometimes this step includes conducting an inventory of all motors in a system, evaluating the use of each motor, and determining if each motor is sized correctly.

Figure 5. Screenshot of EnComp Output, Based on Data Input From Figures 2-4.



Source: EnVise LLC © 2007

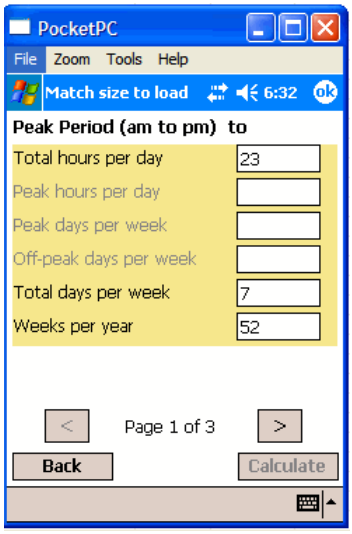
Figure 6. Screenshot of EnComp Output, Based on Data Input From Figures 2-4.



Source: EnVise LLC © 2007

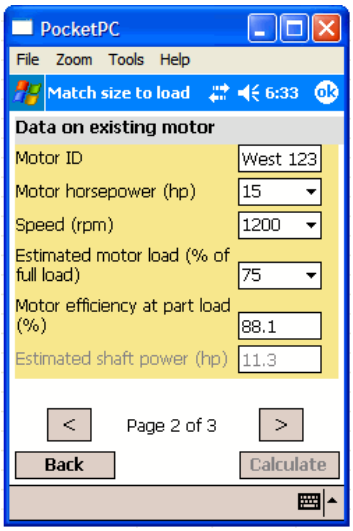
Figures 7 through 9 (on the next pages) are the screenshots for EnComp's Motors module data input screens. Figure 7 shows the operating data. Figure 8 illustrates the collection of the nameplate data on the existing motor. Figure 9 provides a comparison—the ability to compare the energy savings/costs if a more efficient motor is selected.

Figure 7. Motor Operating Data.



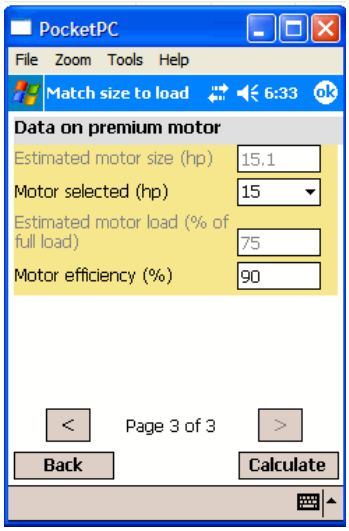
Source: EnVise LLC © 2007

Figure 8. Motor Nameplate Data.



Source: EnVise LLC © 2007

Figure 9. Screen Showing Ability to Compare Different Motor Sizes/Efficiencies.



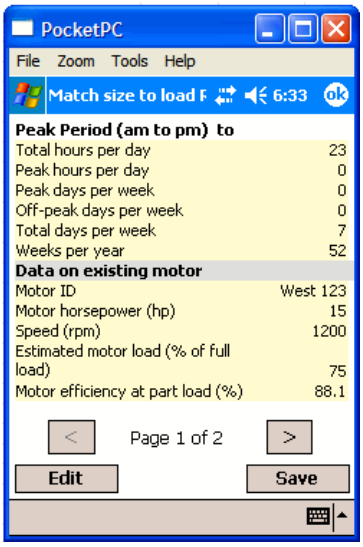
Source: EnVise LLC © 2007

This "compare and contrast" feature that is illustrated in Figure 9 is an important feature of EnComp; one that addresses multiple barriers introduced at the beginning of this paper. Customers want to know their options and the trade offs that are possible when they make different equipment choices—from both a cost and an energy efficiency perspective. This EnComp feature lets them conduct these "what if" scenarios.

Figures 10 and 11 (on the next page) illustrate the EnComp screen shots based on the input provided in Figures 7-9. EnComp employs logic to control input validation. In many cases, the user is free to enter data that logically fits within set parameters based on the module selected. However, many customers have indicated that they would like guidance in the form of default values for various inputs. EnComp provides the opportunity for a customer to input their own information or to select default values.

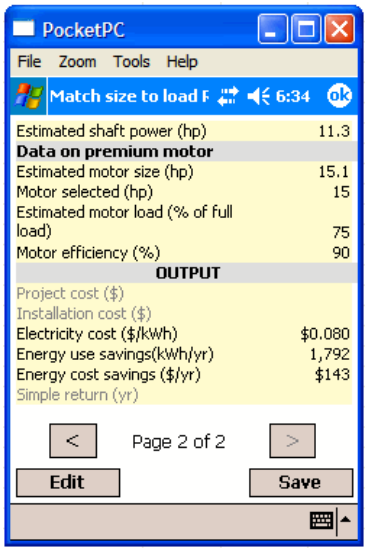
For example, this feature becomes very valuable when comparing an existing air compressor to the various high efficiency models on the market. In this case, EnComp will provide default values for the efficiencies of the new compressors as well as industry averages for the existing compressors. In many cases, a customer may have a good idea of the amount of compressed air produced per horsepower of input for existing equipment, but may lack this knowledge when considering an energy efficient option. This is where the EnComp default values becomes a useful tool.

Figure 10. EnComp Screen Shots Based on Motor Data Input in Figures 7-9.



Source: EnVise LLC © 2007

Figure 11. EnComp Screen Shots Based on Motor Data Input in Figures 7-9, Including Energy and Cost Savings Estimates.



Source: EnVise LLC © 2007

Customer Example: Usage of EnComp to Inventory Industrial Facility Equipment

Although EnComp was developed to conduct energy efficiency analysis of various equipment options, it can also be easily modified to meet additional needs. A case in point is its use as a data collection system to inventory all of the energy consuming equipment within an

industrial facility. EnComp's inventory feature allows the user to collect the nameplate information of motors, lights, boilers, process equipment and sort this information by defined cost centers. After all of the equipment is collected, EnComp uploads all of the stored data into a Microsoft Excel spreadsheet or a relational database for further use.

EnVise LLC recently used EnComp's inventory feature to assist a large dairy producer in Wisconsin inventory the equipment in several facilities. For example, EnVise staff used EnComp to log over 800 individual equipment inputs at one facility in less than a day. The uploaded data provided EnVise staff and the client with information such as process application, horsepower, amps, voltage and efficiency. This information is now being used to model this facility's energy use and costs at the cost center level. The use of EnComp provided the customer with a cost-effective process to determine where energy was being used within the facility, benchmark energy use by cost center at this facility facility, and take advantage of a recently implemented sales tax exemption credit in Wisconsin.

A Word about Data

EnComp was developed by energy auditors and engineers who hate "black boxes." As a result, each module of EnComp has been developed based on accepted engineering guidelines and standards. More importantly, the values used, including defaults and the output, indicate the assumptions that were used based on the inputs provided. For example, the efficiency of a heat exchanger varies based on the temperature differential between the two streams passing through the exchanger. EnComp takes this variable into account and adjusts the efficiency of the heat exchanger accordingly.

In regards to standards, EnComp calculates values based on national standards, including those developed by ASHRAE, NEMA, IEEE and other organizations. The EnComp service that comes standard with the purchase of an EnComp license keeps the calculations contained in EnComp up-to-date based on regular changes and updates in applicable codes.

Our goal, based on our engineering background, is that EnComp modules are not "rule of thumb" or general estimates of savings. Instead, they allow for detailed calculations that are defensible when seeking budget approval or when being reviewed by utility or state energy efficiency program evaluators.

Additional Technical Notes

Updates/Upgrades

The EnComp software is updated regularly, as changes to technology modules are made, calculations or codes change, or new modules are added. Licensed users of EnComp receive software updates as well as new modules. Updates occur via Internet download, similar to other software programs.

Website Support

EnComp is supported by a Website (www.enovationllc.com). This Website contains additional technical support, access to user forms, and member access to industry information, including energy and rate forecasts.

EnComp Flexibility

EnComp is not a typical software product that is encased in plastic and sold at a local big box retail store. Instead, it is a basic software tool that can be customized to meet clients' needs. For example, these client requests may include specific report outputs, technology modules, or the inclusion of pre-programmed utility rates or incentives. These customizations can ether be pre-bundled or delivered later to the client, via EnComp's auto-update feature. EnComp should be used to help clients identify, implement, and obtain energy savings at customers' facilities cost-effectively and efficiently.

The Bottom Line: EnComp's Benefits

The EnComp software tool saves time and money and provides more quantifiable information to customers. EnComp helps users collect data quickly, manage it efficiently, and run multiple scenarios to assess the most cost-effective opportunities for technology implementation. EnComp's technology modules also allow for comparing and evaluating multiple energy efficiency opportunities on an integrated basis. For example, a technical expert can help a customer determine how one potential improvement may complement or conflict with another one.

EnComp helps technical experts overcome common barriers to industrial energy efficiency project funding and implementation. It also helps them provide findings more quickly, and in a format that is better understood and accepted by financial decision makers. These features address a key challenge in today's volatile energy marketplace: effectively managing rising energy costs. The volatility of today's markets demand that facility managers have the best tools at their disposal to manage energy use and costs. EnComp is one such tool.

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