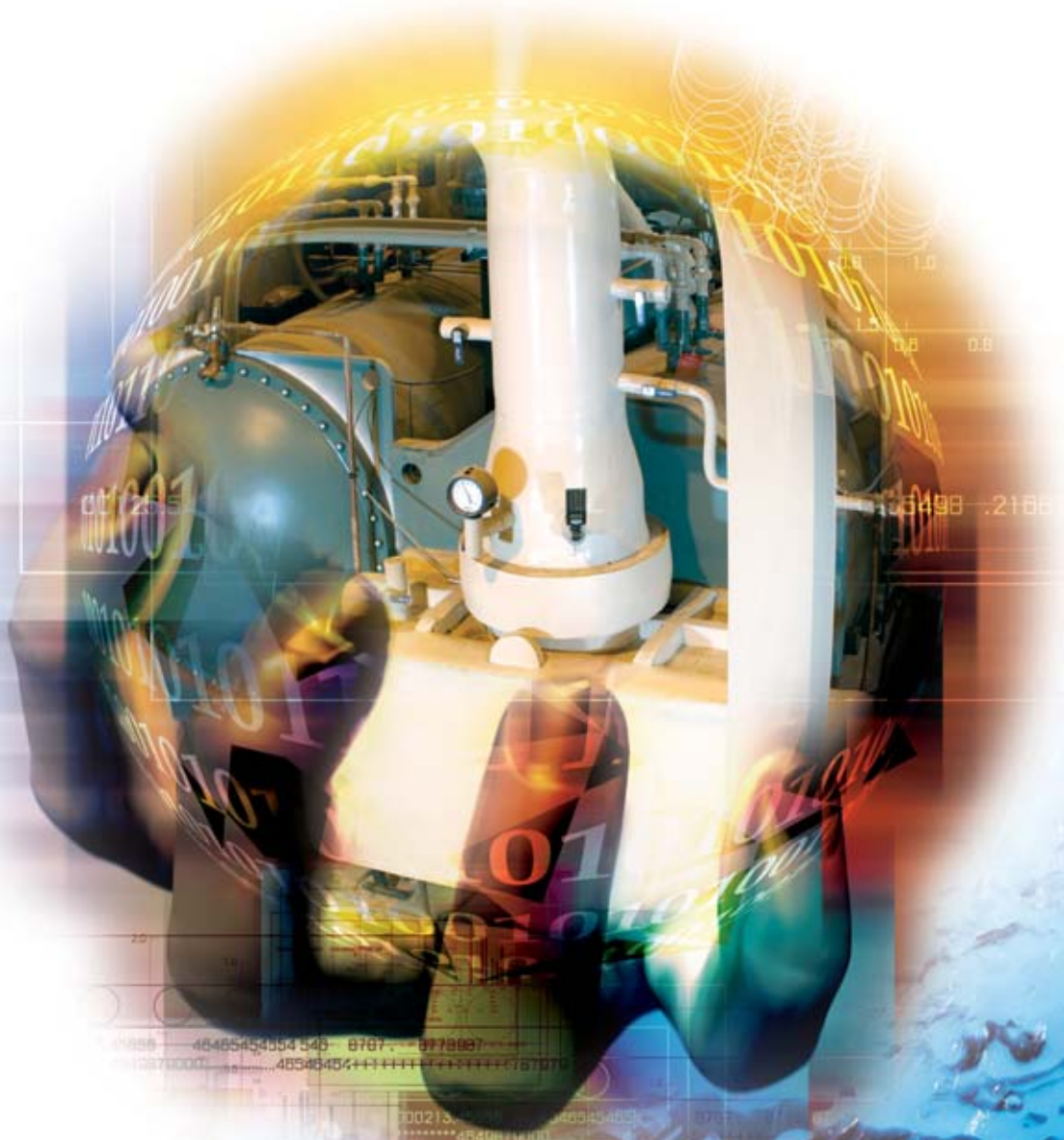




EffTrack[®]

The Internet-based Chiller Efficiency Tool

Chiller Performance and Accountability at Your Fingertips



Efficiency Technologies, Inc.

For more information call
1.866.EffTec.1 toll free
or visit www.EffTec.com

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What is EffTrack™?

EffTrack is an Internet-based analysis and trending tool for water-cooled chillers that:

- Collects, stores and analyzes hourly chiller operating data,
- Calculates and trends chiller performance,
- Diagnoses the cause of inefficiencies,
- Notifies plant contacts when problems occur,
- Recommends corrective actions,
- Measures the results of corrective actions,
- Provides cost analysis of operational improvements.

It's as easy as logging into www.EffTrack.com with a user name and password to view chiller performance and efficiency reports.

EffTrack provides a flexible hierarchal access structure, which will accommodate both large and small organizations. This allows different users in an organization to have unique levels of access to one or multiple locations.

Users can set their own preferences including measurement standard (U.S. or Metric), country, time zone and alert frequencies.

EffTrack includes email and telephone consulting and support.

How EffTrack Reduces Energy Costs

A minimum 15% percent savings is estimated utilizing 3 methods:

Restorative – identifying heat transfer problems, i.e., off-design water flow, scaled or fouled chiller, non-condensable gasses, low/high refrigerant levels, etc.

Opportunity – identifying optimal chill water set points, chiller sequencing and load balancing, tower basin water management, reduced peak demand, condition-based maintenance versus scheduled preventive maintenance, etc.

Preventive – identifying problems before they become expensive (cost avoidance), maintaining optimum efficiency.

Typical Chiller Energy Management

The current standard practice is to provide enough cooling capacity to meet the needs of the facility while minimizing ton hours. This is either achieved manually by experienced operators or by a Building Automation System (BAS) with operator oversight.

Modern BASs May:

- Collect chiller operating data,
- Calculate a kW/Ton (and other calculation blocks),
- Sequence multiple chillers with auto on and off capabilities,
- Control chiller and tower setpoints,
- Notify plant personnel when limit alarms are exceeded,
- Provide simple trending (e.g., chill water temps, loads, etc.).

EffTrack Does:

- Identify bad sensors,
- Perform complex engineering analysis from numerous points,
- Compare actual chiller performance to a design performance,
- Identify heat transfer problems and compressor inefficiencies,
- Provide corrective actions and measure the results,
- Provide cost analysis and comprehensive reporting.

EffTrack is the missing piece of the puzzle in a comprehensive chiller energy management program.

6 Steps to Maximizing Efficiency with EffTrack

Step 1 - Set Up Chiller Design Data

The chiller full load design specifications along with other performance data are entered into the EffTrack chiller setup. This information can typically be collected at the facility or from the chiller manufacturer.

Step 2: EffTrack Collects Chiller Operating Data

EffTrack automatically collects operating data every hour and uploads the data to the EffTrack servers for processing.

Accurate data is critical for producing reliable performance analysis, diagnostics and cost reporting. Industrial quality sensors* including evaporator and condenser water temperatures, refrigerant pressures, water flows, amps, volts and power factor are required.

Other options for integrating with a BAS and collecting the operating data may be available pending a plant survey.

EffTrack provides the flexibility to accommodate virtually any IT security requirement.

Graphic Interface

A graphic interface is included with the Data Acquisition Board that allows operators to view real-time operating data from the plant computer and remote locations.



* EffTrack industrial sensors have a 5-year manufacturer warranty.

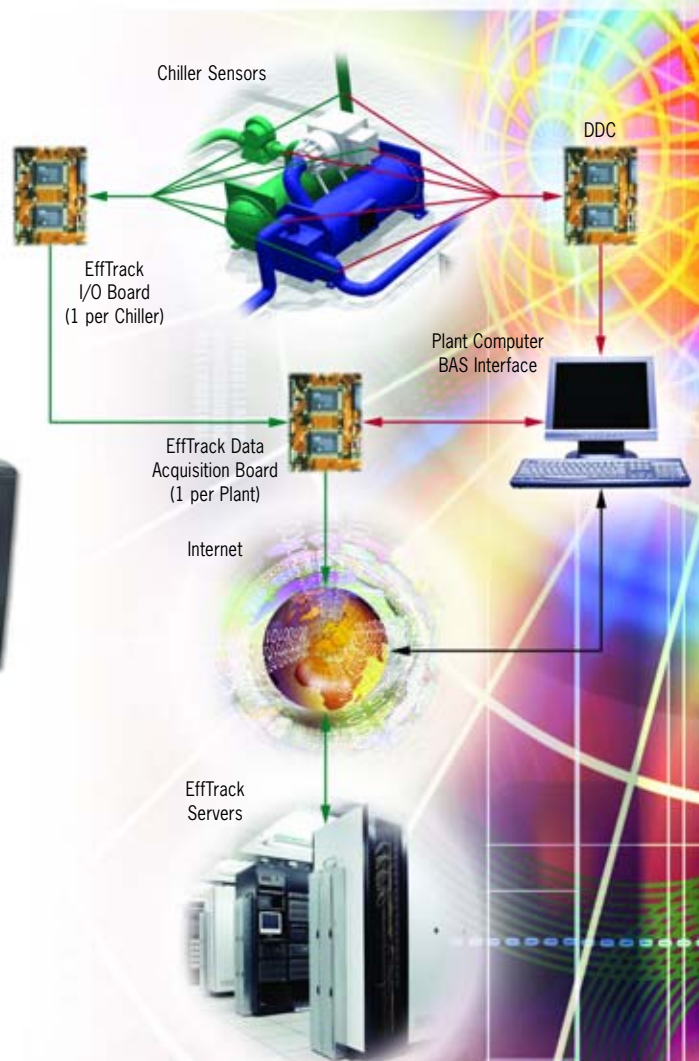
Step 3: EffTrack Processes the Data Using Proprietary Calculated Part Load Value (CPLV) and Diagnostics Software.

EffTrack utilizes a combination of the full load design specifications and other data to create a CPLV kW/Ton profile, which is the foundation for cost reporting and diagnostics.

The actual chiller operating data is compared against the CPLV profile to measure operating efficiency under ALL operating conditions (not just full load).

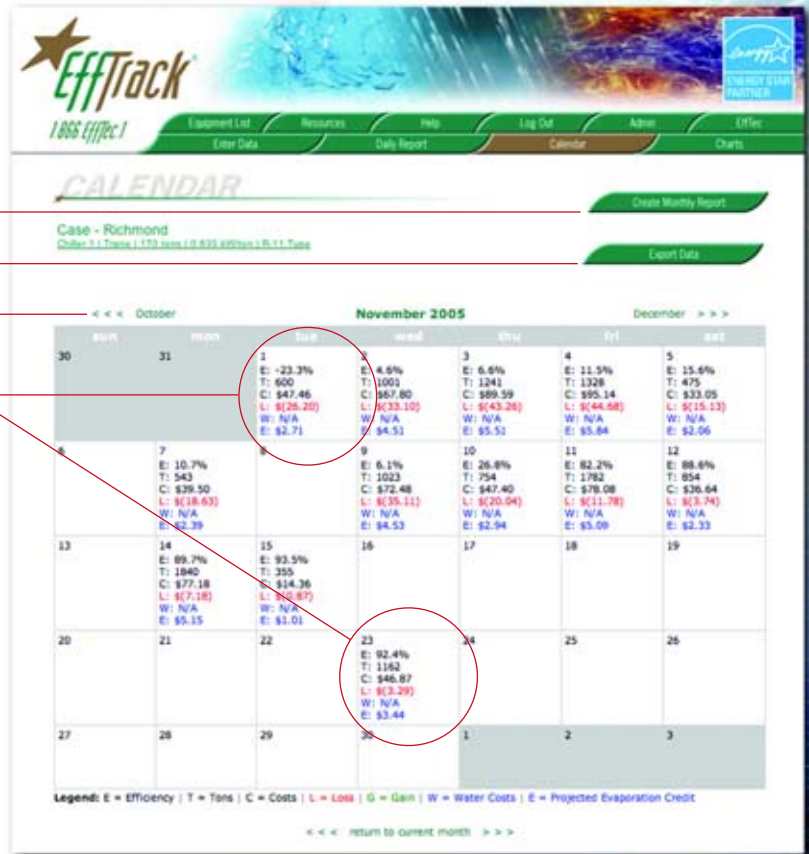
Diagnostics determines the cause of inefficiency between the CPLV and Actual kW/Ton.

“Maximize manpower by EffTrack automatically collecting and analyzing chiller operating data.”



The Calendar Report

The Calendar is the archive of the Daily Reports. Clicking on any day accesses the Daily Report.



Create Monthly Report

Export Raw Operating Data to a Spreadsheet

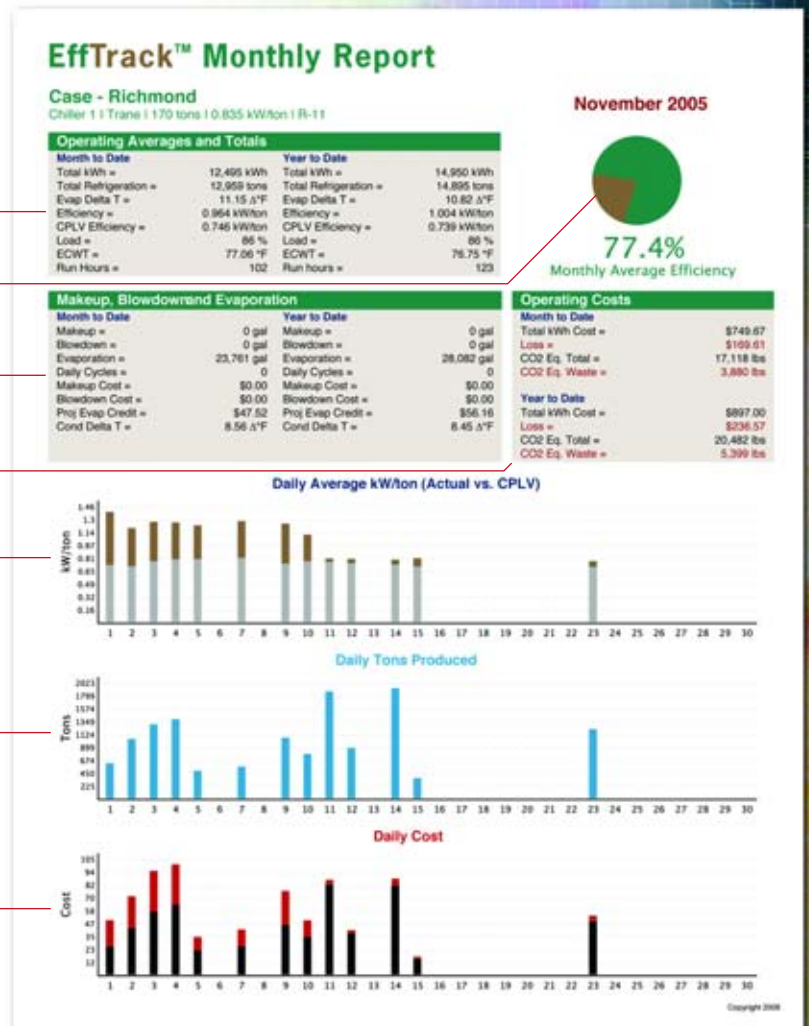
Navigate Equipment History

Condensed Case Study

This plant started using EffTrack on November 1 with an initial operating inefficiency of more than double the CPLV kW/Ton (-23.3%). EffTrack diagnostics identified the causes of inefficiency and recommended corrective actions. Evaporator chill water flow rates were much higher than design, and entering condenser basin water temperatures were too low causing refrigerant stacking. After implementing corrective actions, plant efficiency reached greater than 90% with a lower kW/Ton, improved capacity, and lower energy costs (see Monthly Report bar charts below).

The Monthly Report

A summary of monthly and year-to-date performance statistics are displayed in a concise, single-page PDF.



Month and Year to Date

Operating Averages and Totals

Weighted Efficiency Pie Chart

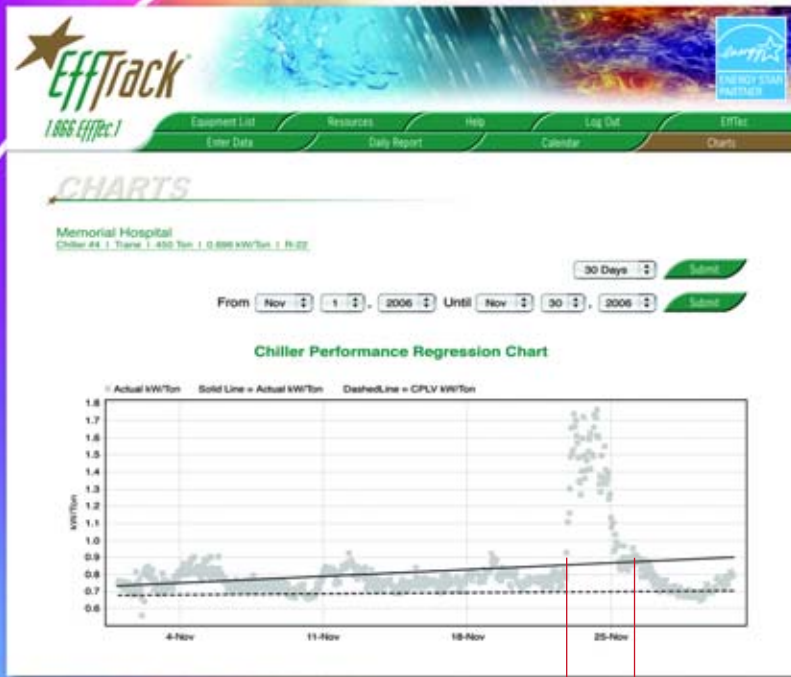
Month and Year to Date Water Usage

Month and Year to Date Costs and CO₂ Eq.

Daily Average kW/Ton Bar Chart

Daily Tons Produced Bar Chart

Daily Cost Bar Chart



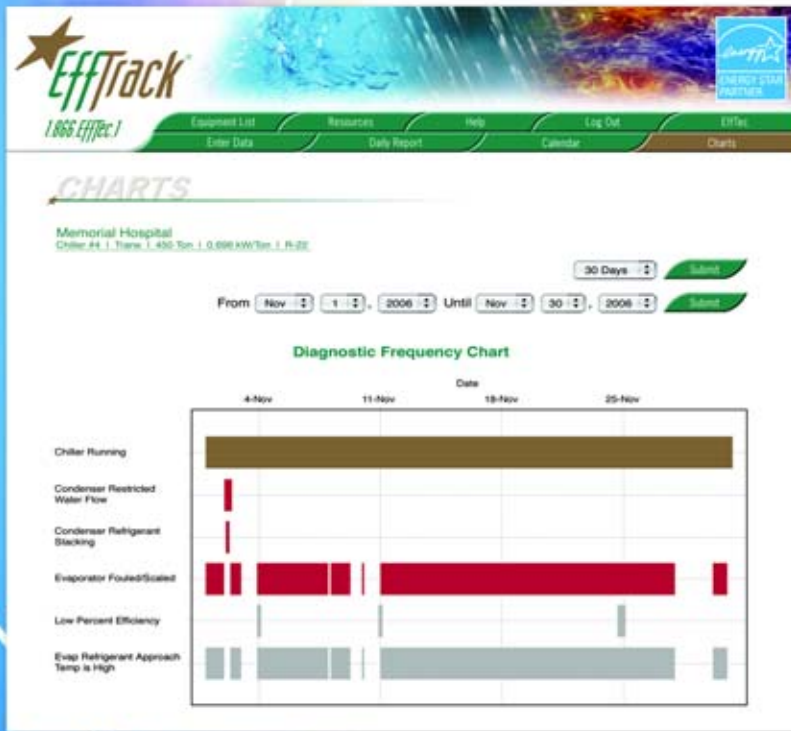
Problem Occurred and Notification Sent Problem Corrected

The Regression Chart

The Regression Chart shows the Actual kW/Ton for every entry in the selected date range (grey squares).

It compares the Actual kW/Ton Regression Line (best line of fit) to the average CPLV kW/Ton Regression Line to indicate the direction of performance.

If the Actual kW/Ton Line is approaching the CPLV kW/Ton Line, the performance is improving for that time period. If it is spreading from the CPLV Line, then performance is degrading.



The Diagnostics Frequency Chart

The Diagnostics Frequency Chart shows the occurrence of Diagnostics and Limit Alarms during the selected date range. It makes it simple to see what problems EffTrack identified, their frequency and whether they have been corrected.



The Monthly Management Report

The Monthly Management Report is a three-page PDF per chiller, emailed at the first of every month. It includes the Monthly Report, Regression Charts and Diagnostic Frequency Chart. See at a glance chiller performance and cost reporting, regression trending and what operational problems may have occurred.

Step 5 - Make Operational Improvements Based on the Reports

This example demonstrates the sequence of events for correcting a problem with multiple possible causes.

A chiller manufacturer technician on a routine service call changed the refrigerant level controller set point back to a factory default setting. This caused the liquid refrigerant level in the condenser to drop, allowing hot gasses to bypass with the liquid refrigerant to the evaporator.

The trend chart immediately indicated a kW/Ton spike with an approximate 15% decrease in efficiency. The only symptoms were a slight increase in evaporator refrigerant pressure and increased compressor amp loads.

Because the plant was monitoring their chiller performance, the operators quickly took steps to identify and correct the problem. Temperature sensors and flows were verified, which suggested the problem may be with the compressor. An evaluation of the refrigerant level controller revealed that it was not reading the refrigerant level correctly.

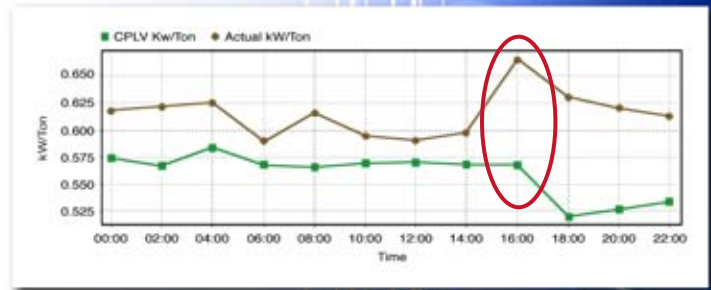
Adjustments were made to compensate for the problem and efficiency returned to normal.

Step 6 - Measure Improvements and Cost Savings

The excess energy cost from the ~15% inefficiency averaged ~\$160 per day. Without trending the chiller's performance with EffTrack, this obscure problem may have continued undetected indefinitely.

This 2,000-ton chiller ran 6,144 hours last year. They avoided ~\$40,960 per year in energy costs by identifying and correcting the problem.

EffTrack makes it easy to calculate and prove the cost savings of operational improvements, which will increase management's awareness and appreciation of the operations and maintenance program.

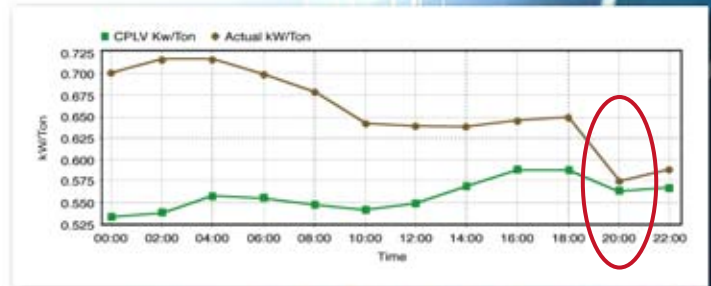


Problem Occurred

Corrective Actions

- Step 1 Lost heat transfer efficiency problems (red warning diagnosis) in the evaporator or condenser may be the primary cause of efficiency loss in the compressor. These problems should be addressed before compressor inefficiencies.
- Step 2 Check the Chiller Setup, especially the IPLV/NPLV value in the chiller setup for validity. If the chiller has had a retrofit (i.e., refrigerant change, glycol, etc.), confirm that it has been verified in the Chiller Setup.
- Step 3 Check the condenser refrigerant level control for proper operation and setting if applicable. If the refrigerant level is too low in the condenser, then hot gas may be mixing with the liquid refrigerant while returning to the evaporator. This can cause the evaporator pressure to rise and evaporator delta T to narrow forcing the compressor to load and work harder to maintain the required chilled water leaving temperature.
- Step 4 Check for above design motor temperature in semi hermetic applications.
- Step 5 If the affected efficiency is caused by compressor age/wear, then it may be necessary to contact your chiller manufacturer to take corrective action such as compressor inspection and/or overhaul.

Troubleshooting Guidelines after Problem Occurred



Problem Corrected

Day Before Problem Occurred	Day Problem Occurred	Day After Problem Occurred
26	27	28
E: 99.9%	E: 91.2%	E: 81.9%
T: 41634	T: 13382	T: 36058
C: \$1211.88	C: \$409.49	C: \$1164.09
L: \$(1.02)	L: \$(33.19)	L: \$(178.58)
W: \$93.85	W: \$31.28	W: \$92.11
E: \$124.55	E: \$41.42	E: \$121.62

Day Before Problem Corrected	Day Problem Corrected	Day After Problem Corrected
10	11	12
E: 78.6%	E: 83.7%	E: 99.1%
T: 34118	T: 35303	T: 39220
C: \$1119.54	C: \$1149.77	C: \$1183.98
L: \$(197.41)	L: \$(161.41)	L: \$(10.62)
W: \$89.21	W: \$85.79	W: \$94.52
E: \$110.77	E: \$112.66	E: \$121.79

EffTrack Benefits Summary

Reduce Energy Costs

Incorporate the enormous potential energy savings from improving chiller performance into your energy management program.

Accountability

Chiller performance knowledge provides accountability to ensure quality services.

Maximize Manpower

Automated data collection and analysis allows operators to attend to other duties such as tuning the plant.

Monitor Equipment Performance

The ability to trend data over time and knowing how a chiller performs under all conditions are powerful tools.

Identify and Troubleshoot Problems

Diagnostics identifies problems and provides recommendations and troubleshooting guidelines for making corrections.

Refine Operating Procedures

EffTrack's performance reports are a valuable tool for refining chiller operating procedures.

Extend Equipment Life

Identifying and correcting problems early will extend equipment life and reduce maintenance costs.

Develop Load Profiles

Know the facility load profile to properly select the chiller type and capacity when purchasing new equipment.

Determine the Most Efficient Equipment Configurations

By knowing each chiller's performance, a plant can develop procedures to provide the most efficient configurations.

Compare Equipment Across Multiple Locations

Identify priorities for plant improvements.

Justify Expenditures

Energy savings can be leveraged into capital improvements that further enhance efficiency ... creating additional savings.

Forecast and Budget

Predict how changes in energy costs, hours of operation, load balances, manpower, parts, repairs, etc. will affect your future costs.

Increase Property Value

Lower operating costs create an increased net operating income. Multiply this increase 10 to 12 times when determining property value.

Be Environmentally Responsible

Reduce demand on our nation's energy requirements, limit depletion of our natural resources and minimize greenhouse gasses.

EffTrack is Easy to Use and Understand



Call Now for More Information
1.866.EffTec.1 (1.866.333.8321) Toll Free

Efficiency Technologies, Inc.
1611 South Utica Avenue #241 * Tulsa, Oklahoma 74104
Phone: 918.712.7774 * Fax: 918.712.7775
Email: info@EffTec.com * Web: www.EffTec.com