MECHANICAL INSULATORS
LMCT
Labor Management Cooperative Trust
ENERGY CONSERVATION SPECIALISTS

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The following pages will outline a case study, which shows the benefits in energy and cost savings of properly installed mechanical insulation.

Insulation is a proven means for conserving energy, reducing greenhouse gas emissions, increasing process productivity, providing a safer and more productive work environment, controlling condensation (which can lead to mold growth), supporting sustainable design technology and a host of other benefits.

Mechanical insulation does all of this, while providing a return on investment (ROI) rate, which is seldom rivaled. Despite the proven ROI, insulation is often overlooked and its benefits undervalued. Insulation is truly the lost or forgotten technology. Can you think of a more important time than now to think about how insulation can help you?

An insulation system is a technology, which needs to be engineered and maintained throughout the entire process. Several studies have estimated roughly 10 to 30 percent of all installed insulation is now missing or damaged.

The practice of not replacing or maintaining an insulation system in a timely and correct manner reduces the full benefits of insulation, and in return, decreases the ROI. In many cases, significant other issues - such as excessive energy loss, corrosion under insulation (CUI), mold development, increased cost of operations and reduced process productivity or efficiency - develop.

You can learn more on www.MechanicalInsulatorsLMCT.com, where additional case studies can be viewed.

Please do not hesitate to contact me should you have any additional questions.
Thank you,

Peter Ielimi

Executive Director
Mechanical Insulators Labor Management Cooperative Trust

DOW CHEMICAL COMPANY: ASSESSMENT LEADS TO STEAM SYSTEM ENERGY SAVINGS IN A PETROCHEMICAL PLANT

BENEFITS

- Saves $1.9 million annually
- Achieves annual natural gas savings of 272,000 MMBtu
- Achieves a simple payback of 1.5 months

KEY FINDINGS

- Quantifying potential energy savings, especially with the assistance of an outside expert, can provide the impetus for management to take action.
- Although Dow Chemical has an active energy manage-ment program, a Save Energy Now energy assessment was able to uncover substantial additional opportunities for energy savings by focusing on a specific system.
- Repairing leaks and failed steam traps and making those activities permanent can yield substantial energy savings.
- Once positive results are achieved, projects implement-ed as part of an active energy management program are more likely to be sustained.

APPLICATION

At some chemical plants, steam systems account for the most end-use energy consumption. By conducting energy assessments of their steam systems, chemical plants can uncover important opportunities to improve energy ef-ficiency, which leads to significant energy savings, lower emissions, and better productivity.

SUMMARY

In late 2005, a Save Energy Now energy assessment was performed at Dow Chemical's St. Charles Operations pet-rochemical plant in Hahnville, Louisiana. The main objec-tive was to identify opportunities for natural gas savings in the plant's steam system. The assessment, performed by U.S. Department of Energy (DOE) Energy Expert Riyaz Papar of Hudson Technologies, quantified several oppor-tunities for increasing steam system efficiency. By capital-izing on some short-term opportunities, the St. Charles plant achieved impressive natural gas savings.

The personnel at the St. Charles site improved their steam trap program and enhanced their ongoing leak repair campaign. Although Dow was aware that the

Dow St. Charles Operations in Hahnville, Louisiana

Project Drivers

To meet their corporate energy efficiency goals, employees at the Dow St. Charles site knew that they needed to act decisively. The analysis conducted using DOE's Steam System Assessment Tool (SSAT) identified the magnitude of energy savings that were possible from repairing the failed steam traps and leaks.

This validated and increased attention on the company's steam trap maintenance and leak repair policy. The savings opportunities from repairing the steam traps and leaks quantified in the Save Energy Now assessment encouraged the plant to replace the failed traps immediately and bolstered the steam leak repair program. This decision was justified by the energy savings achieved by the plant.

efficiency of these systems could be improved, the assessment quantified the potential energy savings in a manner that made it more compelling to implement the improvements. The combined annual energy and cost savings resulting from these two efficiency measures amount to 272,000 MMBtu and $1.9 million, respectively. With project costs of approximately $225,000, the simple payback was around six weeks.

COMPANY AND PLANT BACKGROUND

Dow Chemical Company is a diversified company that offers a wide range of chemical, plastic, and agricultural products and services in many essential consumer markets. With cus-tomers in more than 175 countries and 42,000 employees around the world, the company has annual sales of $46 billion. Over the past 30 years, Dow has been proactive about energy efficiency. In 2005, the company established a goal of improving its energy intensity by 25% by 2015.

Formerly owned by Union Carbide Corpora-tion, the 2,000-acre St. Charles facility has been in operation since 1966 and produces glycol ethers and amines. With nearly 3,000 employ-ees, the St. Charles site produces approxi-mately 10 billion pounds of these intermediate chemical products annually. Because steam is required for many processes—including elec-tricity generation, distillation, evaporation and concentration, process heating, and catalytic cracking—it is critical to the site's production.

A utility pipe rack at Dow Chemical's St. Charles Operations in Hahnville, Louisiana.

ASSESSMENT OVERVIEW

The Save Energy Now energy assessment at the St. Charles site was sponsored by the U.S. Department of Energy's Industrial Technolo-gies Program (ITP). It involved an Energy Expert who is a qualified specialist on the use of DOE's Steam System Assessment Tool

(SSAT). Because a secondary objective of the assessment was to teach steam system analysis using the SSAT software, the Energy Expert formed an assessment team with six of the site's employees and installed the SSAT software on their computers. This enabled the project team to learn the software, model the facility, and perform what-if scenarios to determine the most optimal implementation measures for energy savings.

ASSESSMENT RECOMMENDATIONS

Once the data collection was complete, the assessment team evaluated the steam system using SSAT and identified several energy efficiency opportunities. The team then calculated the expected savings and payback periods for each opportunity and divided them into near- and medium-term opportunities based on payback periods.

NEAR-TERM OPPORTUNITIES*

- **Implement a Steam Trap Repair Project**—A recent steam trap audit performed before the assessment took place identified all failed steam traps. An accurate estimate of steam leakage stemming from the failed traps was generated by inputting the number of failed traps into the SSAT and modeling the impact of implementing a steam trap repair proj-ect. Annual savings in natural gas and costs were estimated to be 112,128 MMBtu and $881,000, respectively.
- **Improve the Steam Leak Management Program**—The amount of steam lost to leaks in the system was estimated in the SSAT by subtracting the amount of steam used in the applications from the total amount of steam generated. The Save Energy Now assessment initially showed that repairing all of the plant's steam leaks could yield annual energy and cost savings of up to 451,100 MMBtu and $3.3 million. However, subsequent data col-lection revealed that some steam meters were not functioning optimally and that parasitic demand from other plant assets accounted for a significant portion of the estimated leak load, thus reducing the potential for energy savings.
- **Improve Insulation**—During an inspection of the plant, several areas of the steam distribu-tion network were found to lack sufficient insulation. Using 3EPlus, DOE's insulation calculation program, the team estimated total insulation losses

to be approximately 1.0%. By reducing these insulation losses to 0.1%, the assessment showed that annual natural gas and cost savings of 3,030 MMBtu and $25,000 could be achieved.

- **Increase Condensate Recovery**—At the time of the assessment, about half of the low-pressure condensate was being recovered. Based on the analysis done using the SSAT, a condensate recovery rate of 75% was found to be possible for the entire site. Annual natural gas and cost savings from the increased condensate recovery were estimated at 87,600 MMBtu and $649,000.

MEDIUM-TERM OPPORTUNITIES*

- **Install a Blowdown Heat Recovery Exchanger**—Although the blowdown was being sent to a flash tank to recover low-pres-sure steam, the energy assessment found that significant amounts of thermal energy were being lost because there were no heat exchangers in the blowdown systems. By in-stalling a heat recovery exchanger upstream of the blowdown tank, significant heat from the blowdown water could be captured and used to preheat boiler make-up water. The assess-ment estimated annual natural gas and cost savings resulting from the use of a blowdown heat recovery exchanger at approximately 31,000 MMBtu and $200,000.

If all these measures were implemented, the total annual energy savings were estimated at more than $5 million.

- **Preheat Reactor Feed with 75-psig Steam**—The assessment found that some of the heat needed to preheat the reactor feed from ambi-ent to reaction temperatures could be supplied by 75-psig steam instead of depending only on the 600-psig steam generated at the site. While this opportunity would not save natural gas, it could allow additional electricity generation from the 600-psig steam that was not being used to preheat the reactor feed. This could reduce electricity purchases, leading to estimated an-nual electricity and cost savings of 1,277 MWh and $79,000.
- **Install a Back-Pressure Turbine Drive**—Although the site generates steam at 600 psig, most applications require steam at 200 psig. The assessment found that, by installing a back-pressure turbine drive, the chemical plant could generate enough electricity to serve some of its specific critical powered equip-ment. Annual electricity and cost savings were estimated at 1,946 MWh and $121,000.

If all these measures were implemented, the total annual energy savings that would result were estimated at more than $5 million.

The east heat recovery unit at Dow's St. Charles Operations in Hahnville, Louisiana.

RESULTS

The implementation of some Save Energy Now assessment recommendations with short paybacks is already yielding important energy savings. By repairing steam leaks and replac-ing nonfunctional steam traps, the St. Charles plant was able to reduce energy costs and improve process efficiency. The steam trap retrofit resulted in annual energy savings of 109,000 MMBtu and energy cost savings of approximately $792,000. The steam leak repairs resulted in annual energy savings of 163,000 MMBtu, worth a little more than $1.1 million. Total annual energy and energy cost savings were 272,000 MMBtu and $1.9 million, respectively. With total implementation costs of approximately $225,000, the simple payback is slightly more than six weeks. In the future, Dow may pursue some other opportunities identified in the Save Energy Now assessment.

While the implemented measures and the resulting energy savings are significant, another important result of the Save Energy Now as-sessment is the permanence of both measures. Steam trap maintenance and leak management are now ongoing programs. As a result, steam leakage from failed traps or fissures in steam headers are identified and repaired in real time. In addition, Dow is sharing the results of the SSAT-based analysis from the Save Energy Now assessment at the St. Charles plant with its other facilities that use steam.

Increasing condensate recovery could save nearly 88,000 MMBtu per year.

LESSONS LEARNED

Repairing steam traps and leaks in steam headers is one of the quickest ways that an industrial plant can reduce its energy con-sumption. Compared with other steam-related energy efficiency opportunities, steam leak and trap repair are easy, cost-effective, and yield a quick payback. At Dow Chemical's St. Charles plant, the value of energy efficiency was well understood. However, when steam losses from failed steam traps and leaks were fully quanti-fied with DOE's SSAT software, the energy savings became more compelling. SSAT and other DOE software tools such as AIRMaster+, the Pumping System Assessment Tool (PSAT), the Process Heating Assessment and Survey Tool (PHAST), MotorMaster+, the Fan System Assessment Tool (FSAT), and 3EPlus can similarly be used to determine how to optimize industrial systems and processes (to download software, visit www.eere.energy.gov/industry/bestpractices/software.html).

About Save Energy Now

Through Save Energy Now, DOE's Industrial Technolo-gies Program (ITP) helps industrial plants operate more efficiently and profitably by identifying ways to reduce energy use in key industrial process systems. Visit www.eere.energy.gov/industry/saveenergynow for more information.

A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

For more information, contact the EERE Information Center, 1-877-EERE-INF (1-877-337-3463), www.eere.energy.gov And visit the DOE Industrial Technologies Program home page: www.eere.energy.gov/industry

DOE/GO-102008-2520
Revised May 2008