



DETROIT DIESEL CORPORATION: USING STRATEGIC ENERGY MANAGEMENT (SEM) TO IMPROVE ENERGY PLANNING AND ACCELERATE PROJECT IMPLEMENTATION

SECTOR

Industrial

LOCATION

Detroit

PROJECT SIZE

3.2 million square feet

BACKGROUND

Detroit Diesel Corporation operates one facility in Detroit, MI that offers mid-range and heavy-duty diesel engines, e-Powertrains, transmissions, axles, safety systems, and connected vehicle services for on-highway and vocational commercial markets. For the past 10 years, Detroit Diesel has achieved 1-2% of energy reduction annually, with a commitment to build on this trend over the next 10 years. To continue achieving savings, Detroit Diesel signed up with its local utility, Detroit Edison (DTE), to participate in a six-month Strategic Energy Management (SEM) program. Participants received free technical support and financial incentives to implement energy-efficiency improvement opportunities related to steam, HVAC, and compressed air systems. The annual energy cost savings realized in each of the systems were significant in the first year of the SEM program, with \$10,000 in steam system savings, over \$136,000 in HVAC system savings, and over \$76,000 in compressed air energy savings.

SOLUTIONS

Through Detroit Diesel's participation in the SEM program, the facility received the following types of technical support:

- Monthly assistance in analyzing energy performance data
- Identification of both low and no-cost opportunities for energy performance improvement
- Review of the facility's energy use to identify specific areas of high energy use and opportunities for improving energy performance
- Review the facility's energy information technology infrastructure and look at areas for improvement
- Development of a sustainable, continuous energy management process

Three focus areas were considered during the SEM program: steam, HVAC, and compressed air. The steam system was evaluated across two areas: the powerhouse steam operations and the process washer and dip tank conversions. The team implemented set point reductions and equipment upgrades to reduce the use of high-pressure (HP) steam. The HVAC system improvements focused on two areas: overall system operations and controls, chiller tube brushing, and chiller set point changes. The compressed air measures included updates to the compressor sequencing strategy, a compressed air leak repair campaign that enabled the plant to lower the system pressure, and the installation of a new variable frequency drive-equipped compressor.

Steam System Measures:

1) **Powerhouse steam operations.** The high-pressure (HP) steam header set points were reduced. The previous operational set points had the HP steam headers set for 95 psi year-round. New set points were established with summer set points reduced to 75 psi and the winter set points adjusted to 90 psi. This resulted in estimated savings of \$4,000 per year.

2) **Process washer and dip tank conversions.** The current part cleaning and stripping process utilizes year-round HP steam. This project involved the removal of HP steam coils in a 350-gallon chemical de-rusting dip tank, replacing the steam coils, and the installation of 15-kW electric heating coils. In addition to the dip tank, a hot water washer was also converted from HP steam to a 30-kW electric heating coil. This project resulted in a 1000 lb./hr. HP steam reduction and estimated savings of \$6,000.00 for the year-round process.

HVAC System Measures:

1) **HVAC operations and set points.** Before Detroit Diesel's involvement in the SEM program, there was no established set point for space heating and cooling used across the 3.2 million square foot site. Many air supply units had random set points ranging from 65°F to 78°F. The Energy Team decided to utilize facility engineering to establish a global site winter heating set point of 68°F and a summer cooling set point of 75°F. The air-handling units (AHUs) were another important Significant Energy User (SEU) identified during energy planning. It was determined that the set points to control AHUs were at different levels with no control strategy. In addition, operators had open access to the set points and could change them at will, resulting in additional waste and inconsistent airflow. Through SEM, and with the help of the maintenance team, a facility-wide strategy for the AHUs was established. New AHU set points were set up and are only changed upon review by the Energy Team. In addition, this allows the operators to be further engaged in energy conservation by allowing them to understand the importance of maintaining the established set points. Standard Operating Procedures (SOPs) were created and communicated to inform operators to consider the new AHU set-point strategy, to draw a parallel with setting the thermostats in their own homes. This improved AHU control and resulted in over \$85,000 in annual energy savings.

2) **Chiller tube brushing and chiller set point changes.** Before the cooling season (typically June through September) the four centrifugal chillers ranging from 200 tons to 1,500 tons had both the condenser and evaporator tubes cleaned, brushed, eddy current tested and their chilled water set points raised 3°F to 48°F. These maintenance actions and set point increases resulted in approximately \$51,000 in first-year savings.

Compressed Air Measures:

1) **Sequencing air compressors.** To operate the compressors optimally, they need to be sequenced appropriately based on the plant's demand profile. The objective of this project was to establish a real-time monitoring and compressor control strategy to ensure the compressors were sequenced optimally. The sequencing procedure specifies compressors to operate according to the compressed air demand required at any given time. Below is a table showing the new control strategy for the five compressors in operation:

	Compressed Air demand minimum (CFM)	Compressed Air demand maximum (CFM)
Regime 1	0	1,728
Regime 2	1,728	4,200
Regime 3	4,200	5,400
Regime 4	5,400	6,128
Regime 5	6,128	7,588
Regime 6	7,588	9,293
Regime 7	9,293	11,988

2) **Facility-wide compressed air leak survey.** One of the success stories for Detroit Diesel is in the management of its compressed air system. One of the most important SEM initiatives was a facility-wide compressed air leak audit, which revealed more than 900 CFM of lost compressed air. This audit identified compressed air leaks throughout the system. This was not just an excellent opportunity to improve the compressed air system's efficiency but also to actively engage the maintenance team to participate in repairing leaks identified in the audit and learn about savings opportunities through posters that illustrate the value of energy wasted due to compressed air leaks. These initiatives encouraged the maintenance team to listen for additional air leaks when performing daily tasks, tag the leaks, and add them to a database. Air leak targets have now been established for the compressed air system, and a continuous improvement process is in place to identify and repair compressed air leaks regularly. The identification and repair of leaks enabled the system to use less total compressed air horsepower and to reduce and stabilize the system pressure, leading to over \$76,000 in annual energy savings.

3) **Install a variable frequency drive (VFD) air compressor.** At the beginning of SEM program participation, the system was operating without any pre-programmed sequencing and relied on operator input to select compressor functions (e.g., on or off). If the selected compressor's generation capacity was more than the current facility requirements, a valve restricted the airflow to the compressor and the compressed air output. If the facility demand dropped, the excess compressed air vented to the atmosphere. To address this waste, a new 400HP variable frequency drive (VFD) screw compressor was installed to replace a worn compressor that did not have variable speed control. The VFD compressor can now efficiently scale down compressed air generation and better meet demand.





OTHER BENEFITS

In addition to the energy savings, Detroit Diesel's adoption of the SEM program imparted cultural change across the operational management structure and led to a new review process implemented by the Energy Team.

The Energy Team continues to evaluate the plant's SEUs to uncover more opportunities. The SEM program enabled Detroit Diesel to establish a formal process for energy planning. Detroit Diesel has further demonstrated its commitment by certifying its plant to the standards of the ISO 50001 Energy Management System and Superior Energy Performance (SEP). As a result of their 50001 certification and participation in the DTE program, Detroit Diesel has a framework to follow for energy planning and ongoing audits ensure that Detroit Diesel will continue improving the facility's operational processes and drive additional energy savings.

Detroit Diesel completed Cycle 1 of DTE's SEM program and will move on to Cycle 2; a further one-year engagement focused on continuing the work that has been started. With energy planning processes firmly ingrained into the culture, the next step of SEM will be to continue to implement energy savings projects with a strong focus on Energy Management Information Systems (EMIS) in the plant. This will not only allow for real-time energy information but also significant energy savings through improved system control.



Energy Summary: ELC

IMAGE GALLERY



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