



JONATHAN CHAN

SCHOOL: Iowa State University

MAJOR: Mechanical Engineering

DEE ZEE, INC.



DES MOINES

COMPANY PROFILE:

Dee Zee, Inc. is a premier truck accessories manufacturer, known as the world's largest manufacturer of running boards and side steps. The company is headquartered in Des Moines, Iowa, with seven buildings, comprising more than one million square feet, dedicated to manufacturing, packaging, warehousing, and shipping. With approximately 1,000 employees, Dee Zee serves large sectors of the automotive industry as an Original Equipment Manufacturer (OEM) and also supplies products to the retail consumer sector.



PROJECT BACKGROUND

The intern was tasked with analyzing energy consumption and associated costs in automation systems and establishing a baseline to prioritize improvement opportunities. This project primarily focused on reducing energy consumption in automated cells and utilities at the Broadway plant. The intern conducted feasibility studies and assessments by

evaluating controls, set-points, occupancy and run-times, and motor efficiencies. The intern also explored improvement opportunities in the heating, ventilation, and air conditioning (HVAC) and compressed air systems.

INCENTIVES TO CHANGE

Dee Zee is committed to environmental sustainability, integrating LEAN practices, source reduction, and recycling efforts throughout its operations. As an ISO 14001 certified company, Dee Zee uses vendors certified by the Sustainable Forestry Initiative to meet their paper and cardboard packaging requirements. Through collaborative efforts from their sustainability team, they establish and pursue sustainability initiatives and projects, effectively steering Dee Zee towards achieving its environmental objectives. This year's project to reduce energy consumption and associated costs aligns with Dee Zee's ongoing commitment to continuous environmental improvement.

RESULTS

Install Energy Meters: Energy usage is currently measured using a single energy meter located outside the plant. More accurate data of energy usage could be achieved by installing in-line energy meters to track current status in each automated

cell. The energy meters can be installed on the main power panel boxes which serve as the primary power source to ensure a more accurate measurement of the current flow and track past energy consumption, allowing an energy baseline to be established. Pairing the system to Building Manager Online, a web-based software package with a beneficial data logging feature, would allow users to quickly access data, generate data-based reports and plot charts. One meter was set up for testing purposes and in addition to demonstrating the benefits of monitoring the energy data, the testing provided clarity of the desired features for additional meters. The intern used the information from the test meter to recommend meters to be purchased and installed for comprehensive data logging from all the automated cells within the plant.





Repair Compressed Air Leaks: Compressed air serves as a vital energy source across Dee Zee’s production process, supplying air to cooling systems, hand tools, and various pneumatic equipment. Air leaks were identified by the intern using an ultrasonic leak detector. Leaks in the compressed air system make the compressors work above their optimal setpoint, resulting in unnecessary energy consumption. The majority of leaks were found in connection points between the air drop down lines and the fittings of the air wands. Teflon tape and new fitting connectors can be used to seal the threading

where the leaks are occurring. Proper handling of hand tools can prevent damages to the fittings. Leak maintenance and inspections can be done in house during off shift hours by the maintenance team.

Automated Cells Shut Off: The automated cells at the Broadway plant currently remain powered on, even when not in use, resulting in unnecessary energy usage. Powering down automated cells when not in operation can lead to substantial savings in both cost and energy. The cells generate a lot of heat, which adversely affects the surrounding temperature. Overheating not only damages components and causes wear and tear but also results in unexpected downtime. By shutting off the cells, the heat output can be reduced and equipment can cool down, preventing cooling systems from overworking and overheating. With lower heat generation, the cooling systems may require less energy, and have lower maintenance needs. This would result in cost savings and overall improvement in system efficiency. Significant energy could be saved by disabling the lasers, drives, robots, and light sources while the machine is idle. The robots must be set at rest in their initial cycle position through the controllers before powering down to avoid disrupting the cycle orientation. By powering down the automated cells, Dee Zee could prevent downtime, reduce idling cost and decrease energy consumption.

Preventative Maintenance: Preventative maintenance for the automated cells can eliminate unexpected downtime and unnecessary energy usage. Daily cleaning can help maintain the optimal operating conditions of the automated machines by reducing the amount of dust and debris in and around the system. Weekly maintenance inspections can help prevent wear in the system’s equipment, including sensors, motors, and cooling systems. Regular maintenance facilitates better heat dissipation and proper airflow, as blocked air vents, clogged ducts, or dirty filters force HVAC systems to work harder, consuming more energy. By training workers to clean equipment and workspaces, energy needs and production downtime can be reduced.

ENVIRONMENTAL AND ECONOMIC SAVINGS TABLE

PROJECT	ANNUAL COST SAVINGS	ANNUAL ENVIRONMENTAL RESULTS	STATUS
INSTALL ENERGY METERS	\$10,129	144,700 kWh	IN PROGRESS
REPAIR COMPRESSED AIR LEAKS	\$5,719	81,699 kWh	RECOMMENDED
AUTOMATED CELLS SHUT OFF	\$37,992	541,742 kWh	RECOMMENDED
PREVENTATIVE MAINTENANCE	\$31,653	452,188 kWh	RECOMMENDED

