SHOWCASE PROJECT: OZINGA BROTHERS: DATA LOGGER PROJECT

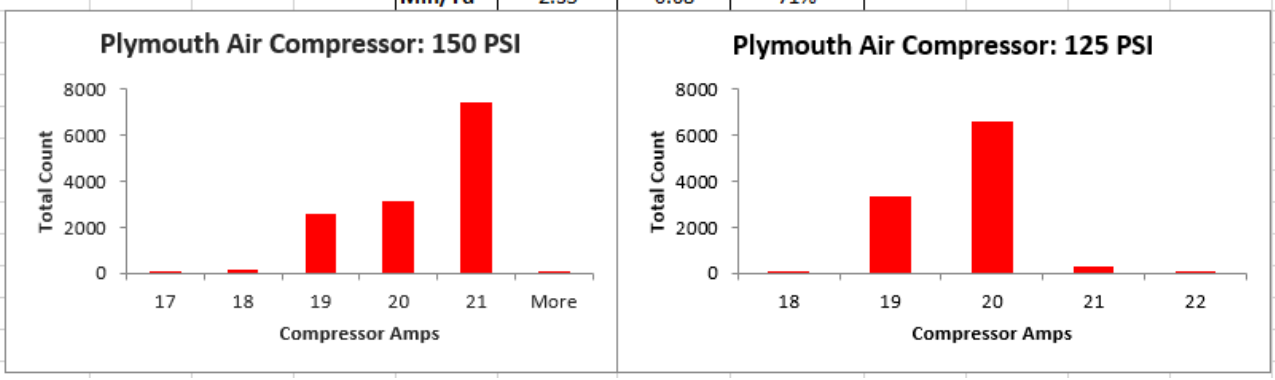
SOLUTION OVERVIEW

BETTER PROJECT WINNER 2020 Founded in 1928, Ozinga is a concrete producer with 85 plants operating in Michigan, Illinois, Indiana, Wisconsin, and Florida. Each plant operates a variety of 10-75 horsepower motors for air compressors, conveyors, and other processes. Historically, the company had little visibility into how these systems used energy, and they lacked a system in place to quantify the benefits of equipment upgrades and process improvements. Ozinga recognized this as a significant barrier to achieving the company's stated energy efficiency mission to implement reliable, sustainable, and cost-effective measures to reduce energy use in production facilities, office buildings, and fleet vehicles. Ozinga laid out two specific actions to address the issue at their production facilities: one, to collect data to better understand plant energy usage and identify any significant energy users at the plant; and two, to act upon data logging findings by fine-tuning plant operations and equipment settings.

Changes to air compressor settings are low cost and easy-to-implement, so the company made them a primary focus for energy savings. The process began with the monitoring of a reciprocating air compressor system for two weeks. For the first week, the air compressor discharge pressure was set between 125-150 pounds per inch gauge (psig) and subsequently, the compressors' energy consumption in kWh per yard was recorded. The purpose of this was to establish a baseline of energy usage against which future pressure adjustments can be compared. During the second week, Ozinga followed the same procedure but changed compressor discharge to between 100-125 psig. Relative to the baseline, the 100-125 psig change resulted in average kWh per yard dropping from .55 to .15 (73% drop). The average run time per yard also dropped from 2.35 minutes to .68 minutes (71%) meaning the compressor motor experienced a reduced load from the pressure changes.

Figure 1: Reciprocating Air Compressor Results

	150 PSI	125 PSI	Savings
kWh/Yd	0.55	0.15	73%
Min/Yd	2.35	0.68	71%



SECTOR TYPE
Industrial

LOCATION
Elkhart, Indiana

FINANCIAL OVERVIEW
$1,000 for dataloggers, specific projects vary widely

SOLUTIONS
Ozinga utilized the Better Plants Diagnostic Equipment Program to test a variety of data logging tools and instruments. They borrowed data loggers to monitor motor and compressor utilization, run times, and compressed air demands. Data logging enabled Ozinga to collect data on how much time equipment runs in unloaded vs loaded scenarios. The company started by establishing data logging procedures for their highest horsepower rated equipment and created a cost per hour rating for each compressor. The equipment was then ranked by their respective true energy cost to operate and how well they are utilized during operating hours. As a result of collecting and analyzing these data points, Ozinga is now able to better identify and quantify energy saving opportunities.

Ozinga's second goal was to act upon data logging findings by fine-tuning their operations. The company hoped that by finding and addressing disproportionately high energy users they could maximize equipment utility and minimize excess equipment run time. Their first target of fine-tuning was the compressed air system, which was served by a combination of reciprocating and rotary screw compressors. Various compressed air pressure bands, storage sizes, and control set points were changed and tested for optimal energy usage. Using the data logger, results were collected and evaluated to determine the effectiveness of changes to compressor settings. Evaluation of compressor settings changes showed kWh used per yard fell by 73% for the reciprocating compressor and 65% for the screw compressor. These adjustments came at little to no cost as many of these changes involved simply adjusting equipment set points.

Building off the success of the first data logging experience, Ozinga purchased five data loggers that

could be rotated throughout their plant portfolio. Using these data loggers, the company investigated opportunities to adjust one of its screw compressors by expanding the pressure range and adjusting the operating mode. Screw compressors operate most efficiently during full load and it was discovered that this compressor was running a short load cycle and spent 80% of its operating time running idle. The solution was to enable the compressor to shut off during periods of low air demand and expand the pressure range so that the compressor motor would cycle on and off less and run loaded for longer each cycle. The longer cycle times reduced the amount of air lost during the compressor oil sumps blowdown cycle and reduced the energy needed to ramp the compressor up to full load. In total, these screw compressor changes resulted in kWh per yard being reduced from 0.74 to 0.26 (65% reduction) and run time per yard being reduced from 0.074 to 0.023. (68% reduction).

Figure 2: Screw Compressor Pre- and Post-Adjustment

South Bend Base Line					
	CF/Yd	CF/Min	Utilization	kWh/Yd	Run Time/Yd
2/15/2020	57.85	14.66	17%	0.65	0.07
2/16/2020	47.40	14.09	16%	0.55	0.06
2/17/2020	80.73	18.88	21%	0.72	0.07
2/18/2020	75.56	19.65	22%	0.66	0.06
2/19/2020	89.13	18.61	21%	0.81	0.08
2/20/2020	77.51	18.00	20%	0.72	0.07
2/21/2020	137.36	16.18	18%	1.41	0.14
2/24/2020	70.65	17.90	20%	0.66	0.07
2/25/2020	83.99	19.30	22%	0.75	0.07
2/26/2020	76.15	18.92	22%	0.68	0.07
2/27/2020	99.14	21.99	25%	0.78	0.07
2/28/2020	91.05	16.54	19%	0.91	0.09
3/2/2020	59.17	9.69	11%	0.95	0.10
3/3/2020	58.44	18.11	21%	0.54	0.05
3/4/2020	105.29	17.84	20%	0.99	0.10
3/5/2020	17.20	22.31	26%	0.13	0.01
3/6/2020	72.81	16.42	19%	0.74	0.07
Averages			20%	0.74	0.074

South Bend Vario Mode Test					
	CF/Yd	CF/MIN	Utilization	kWh/Yd	Run Time/Yd
4/9/20	20.25	15.75	23%	0.17	0.02
4/13/20	33.91	13.81	31%	0.23	0.02
4/14/20	33.91	17.69	35%	0.20	0.02
4/16/20	25.50	18.56	29%	0.18	0.02
4/17/20	75.26	9.38	35%	0.46	0.04
4/20/20	38.57	10.54	33%	0.24	0.02
4/21/20	26.20	15.27	31%	0.17	0.02
4/22/20	30.01	11.89	31%	0.20	0.02
4/23/20	38.19	12.55	30%	0.26	0.02
4/24/20	32.62	12.60	33%	0.20	0.02
4/27/20	31.84	13.64	32%	0.21	0.02
4/28/20	57.96	24.56	35%	0.35	0.03
4/30/20	176.09	29.67	90%	0.56	0.04
Averages			38%	0.26	0.023

OTHER BENEFITS

Not only did Ozinga's data logging initiative lead to significant savings in their compressed air system, but it also sparked company-wide interest in the topic of energy usage and evaluation. Employees are now providing more insights into how their plants are using energy with the hopes of

implementing similar energy saving initiatives. Technical assistance in the use of the data loggers by one of the Better Plants Technical Account Managers also led to a better understanding of plant air usage via a mapping and modeling process. By analyzing the data collected from the data loggers, Ozinga's employees realized that the compressors were oversized for the demands of the plant. The company is using this analysis to guide future equipment purchases and make sure compressors are properly sized to avoid this oversizing issue. When oversized compressors are discovered and have additional useful life, they will be moved to a smaller plant and replaced with a properly sized compressor.

The continued operation of data loggers has led the company to identify conveyors as having large, untapped efficiency gains. It was found that some conveyors were running unloaded up to 80% of the time. Ozinga is investigating soft starters for conveyor motors and tying motor control into their batching sequence. This would reduce electricity demand created by the in-rush currents needed upon frequent startup and excessive wear on the motor, allowing empty conveyors to be automatically shut down. Overall, this would reduce energy waste from idle operation and improve conveyor performance over time. While there are variations in how each plant and the equipment within it is configured, Ozinga is confident that their success with data logging and re-tuning of equipment can be a blueprint for plants looking to improve system efficiency.

Annual Energy Use

Baseline()

0.55 kWh per yard

Actual()

0.15 kWh per yard

Energy Savings

73%

Annual Energy Cost

Baseline()

1

Actual()

0.27

Cost Savings

73%