3M Knoxville

COMPANY BACKGROUND

3M employs more than 79,000 people at plants in over 60 countries. The company produces many familiar brands including Post-it™, Thinsulate™, Nexcare™, and Scotch™, which generate annual sales exceeding $25 billion. The 3M plant in Knoxville, Iowa employs more than 500 people and produces a variety of tapes and fastening systems including very high bond tapes, transfer tapes, acrylic foam tapes, laminating adhesives, tinted window films for commercial and automotive uses, blackout films, diaper-fastening systems and many more.

These products are manufactured using advanced coating and extrusion processes and are used at consumer, commercial and industrial levels.

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PROJECT BACKGROUND

3M has achieved remarkable success in reducing energy usage and utility costs. 3M has realized financial savings while reducing the company's environmental footprint. This year's Pollution Prevention intern at 3M Knoxville focused on opportunities to improve the efficiency of the compressed air system.

INCENTIVES TO CHANGE

Energy costs have been rising as the competition for resources increases. Reducing energy consumption in a cost-effective way is essential in order to reduce production costs and stay competitive. Energy conservation and efficiency are also consistent with 3M Knoxville's sustainability goals to conserve resources and reduce environmental impact. One goal set by 3M in 2005 was to improve energy efficiency by 20 percent by 2010.

RESULTS

Compressed Air Leaks: Compressed air is widely used at 3M in processes, controls, and equipment. Given the cost of compressed air, it is important to ensure that it is not wasted. An air leak survey revealed that more than 25 percent of the compressed air was escaping. An ongoing leak detection program is recommended.

Compressor Cooling: The majority of the air compressors at the plant are cooled by the chilled water system, due to past water quality issues affecting compressor performance. Since the compressors were put on the chilled water system most water quality issues have been resolved. It is therefore recommended to find another source of cooling water, since the energy required to provide chilled water to the air compressors significantly increases the cost of compressed air in the plant. A process requiring makeup water that would not be adversely affected by the warmer water was identified, allowing the compressors to use fresh, clean, city water for cooling.

Compressed Air Dryers: To increase the effectiveness of the air dryers it is recommended that the discharge air from dryers not be used as intake air for other units. Auto drains would reduce the need for the current receiver drain method.

Duct Outside Air to Compressor Five: Currently all air compressors except number five receive the intake air from outside. The outside temperature is generally cooler than the temperature in the boiler room, which allows for a greater mass flow rate through the air compressors and better utilizes the existing equipment. It is recommended that outside air be ducted to compressor number five.

Improve Compressor Controls: The compressors are controlled by a PLC that targets a set pressure. The PLC would frequently bring additional compressors online when the system pressure was increasing so that it would arrive at the target pressure more quickly. Since the pressure level was still being maintained at an acceptable level, this was unnecessary.

Steam Traps: Approximately one-third of the steam traps in the plant were checked using an ultrasonic gun. About one-half of the traps surveyed were out of service because they served heating applications. Of the traps that were in service, 20 percent were found to have failed in some way and 15 percent had failed while open. The cost savings shown in the summary table were extrapolated to include all steam traps in the plant.

AIR POLLUTANTS DIVERTED IN TONS

Total for all sectors	
SO2	18.0
CO	1.84
NOx	8.6
VOC	0.30
PM	0.45

GREEN HOUSE GASES DIVERTED IN TONS

(CO2 Equivalent)

Total for all sectors	
CO2	3330
CH4	125.2
N2O	1.67
CFC	41.0

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
REPAIR COMPRESSED AIR LEAKS	$32,750	505,000 KWH	IN PROGRESS
COMPRESSOR COOLING	$24,750	615,000 KWH	RECOMMENDED
IMPLEMENT AN ONGOING AIR LEAK DETECTION PROGRAM	$21,000	525,000 KWH	RECOMMENDED
DUCT OUTSIDE AIR TO COMPRESSOR 5	$2,400	60,000 KWH	RECOMMENDED
IMPROVE COMPRESSOR CONTROLS	$875	21,900 KWH	IMPLEMENTED
DRYER AUTO DRAINS	$775	19,400 KWH	RECOMMENDED
RECEIVER AUTO DRAIN	$120	3,000 KWH	RECOMMEND METHOD CHANGE
DRYER CONDENSER COOLING AIR	$315	7,900 KWH	RECOMMENDED
REPAIR LEAKING STEAM TRAPS	$200,000	200,000E THERMS	RECOMMENDED
IMPLEMENT A STEAM TRAP MAINTENANCE PROGRAM	$50,000	50,000E THERMS	IN PROGRESS