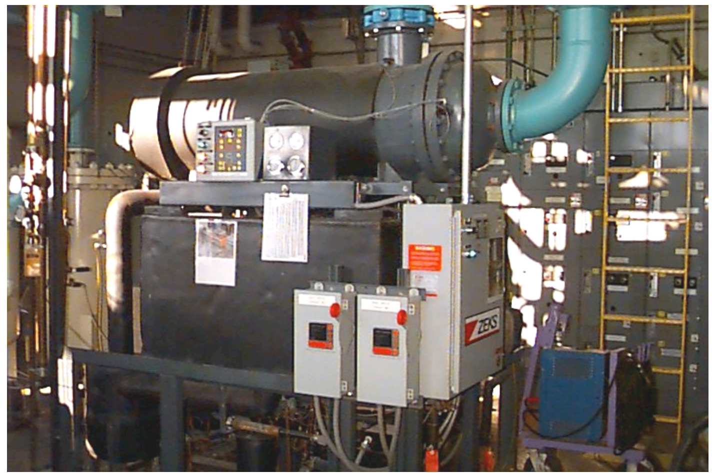
COMPRESSED AIR SYSTEM MANAGEMENT

Project Description

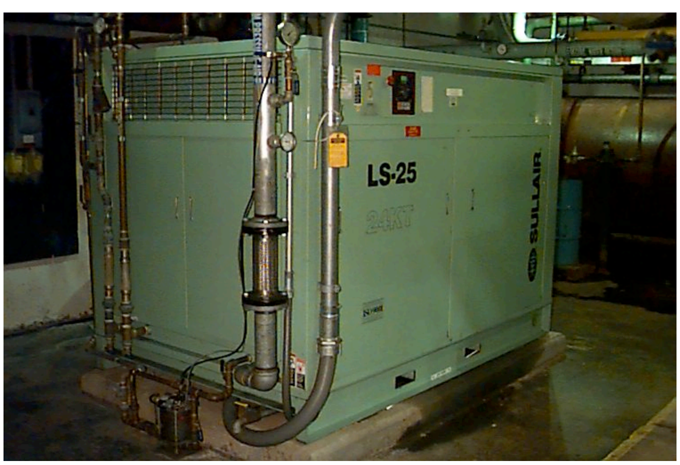
Many industries use compressed air systems as power sources for tools and equipment. In fact, compressed air is so widely used throughout industry it is often considered the "fourth or fifth utility" at many facilities. Texas Instruments (TI) utilizes compressed air at its Attleboro, Massachusetts facility for manufacturing related processes such as pneumatic tools and automation equipment in addition to other miscellaneous uses. Compressed air systems at TI consist of a supply side, which includes compressors and air treatment (air drying), and a demand side, which includes distribution, regulation, storage systems as well as end-use equipment.

Figure 1: Air Dryer



As part of its compressed air management system, TI commissioned a comprehensive compressed air system audit in 1996. The audit included an examination of both the air supply side and demand side and the interaction between the two. All components of the compressed air system were inspected individually and problem areas were identified. TI found that losses due to system leaks accounted for 22% of the entire demand on the system, which equaled an additional $165,000 in annual electricity use alone not including demand charges. The audit also identified several poor system design elements, system misuse, as well as insfficientl system dynamics issues. TI used the audit as a tool to identify opportunities to improve energy efficiency and productivity of its compressed air system.

Figure 2: High Efficiency Enclosed Compressor



TI implemented the following measures to reduce the $1 million annual electricity cost associated with the operation of its compressed air system by approximately 29%. First, TI implemented an aggressive leak control program. Next, TI removed 10-15% of unnecessary compressed air use from its facilities through an internal demand side management program. Third, TI improved its compressed air equipment by replacing its oversized and inefficient 200 horsepower (hp) air compressor with two 100 hp high efficiency air compressors and also rebuilt several compressor drive motors for higher operating efficiency. TI also initiated a rebuild of the primary base load steam turbine driven high-speed compressor located in the steam powerhouse. Based on their system approach, TI replaced their desiccant air dryers with refrigerated dryers, installed a central control system to sequence the compressor on and off as needed, installed control valves to regulate the pressure across the entire site +/- 2 psi. Finally, TI installed a central information and computer management system to allow system automation.

Figure 3: Primary Regulator Valves

Energy, Emissions and Cost Savings[1]

Delivering compressed air to a manufacturing facility is an expensive operation. As noted above, TI historically spent approximately $1 million dollars annually on the associated electric costs. According to the Department of Energy (DOE), compressed air systems account for $1.5 billion per year of U.S. energy costs.[2] Electricity costs are by far the largest expense of owning an operating a compressed air system. High-pressure air is more expensive to produce and deliver than low-pressure air. For a system operating at around 100 psig, a rule of thumb is that every 2-psi in operating pressure requires an additional 1% in operating energy costs. Optimization of compressed air systems can provide energy-efficiency improvements of 20%-50%. The combined improvements to the air compressor system have resulted in annual electricity cost savings of $289,000.

Compressed Air System Management

Total Capital Costs	**$ 650,000**	
MECo Rebates	**$ 200,000**	
Net Cost to TI	**$ 450,000**	
Electricity Savings	**3,313 MWhs/year**	
Cost Savings	**$289,000/year**	
Emissions Avoided		
NOx	**3.1**	**tons/year**
SO_2	**10.3**	**tons/year**
CO_2	**2,465**	**tons/year**
Mercury	**0.013**	**lbs/year**

[1] Estimated emission reductions are based on published fossil emission rates feeding into the New England Power Pool (NEPOOL).
[2] Department of Energy, Office of Industrial Technologies, Best Practices http://www.oit.doe.gov/bestpractices/compressed_air/