COMPANY: Dr. Pepper/Snapple Group

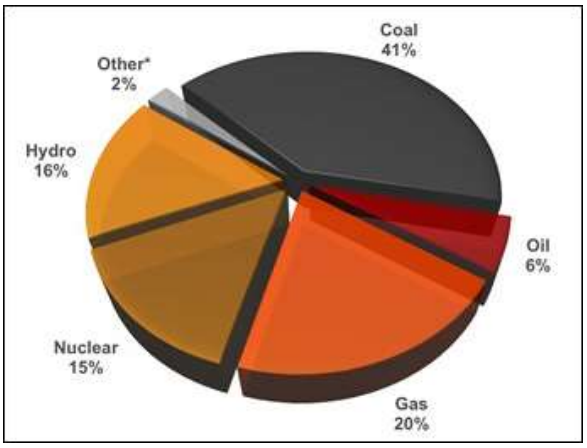
A case study from Johnson Controls

PRACTICE

Installing energy-efficient compressor technology at manufacturing plants

PROBLEM

Conventional compressors use more energy and generate more emissions than alternative technologies. Cooling compressors are energy-intense equipment and account for a great portion of the energy use and cost for industries which require cooling and refrigeration of its product. Globally, electricity is generated most by the burning of fossil fuels (Graph 1). Global emissions of greenhouse gas from electricity generation is more than 30 gigatons of carbon per year.



Graph 1: Global Electricity Generation by Fuel type
http://wgsi.org/blog/looking-energy-above-earth-hour

A carbonated beverage bottling plant represents one of the most rapidly fluctuating loads in Industrial Refrigeration. This is particularly true of the direct-refrigeration process where the loads may go from no-load to full-load in a matter of seconds. The refrigeration system needs to be capable of reacting to these changes as quickly as they occur. At the heart of these systems are the compressors. Reciprocating compressors have historically been the only compressors capable of this level of reaction. The ability of these compressors to rapidly load and unload banks of cylinders made them the practical choice for the carbonated beverage bottling industry. However, due to an abundance of internal moving parts along with the constant rate of loading and unloading, the reciprocating compressors require an intensive maintenance program.

DESCRIPTION

A carbonated beverage bottling facility increased production by 20% while decreasing the combined annual energy and preventative maintenance costs by an estimated $170,000.

In February 2010, the engineering staff at the Dr. Pepper Snapple Group of Plano, TX decided to look at other possible compression solutions for an upcoming renovation project of the 800-ton refrigeration system at their

Los Angeles, CA facility. The Dr. Pepper Snapple Group contracted Alliance Refrigeration of Walnut, CA to engineer and install the best solution for their new refrigeration system with the following objectives:

1. Quicker Reaction to Load Changes
2. Reliable Operation
3. Improve Process Conditions (minimize overshoot)
4. Increase Production
5. Increase Product Quality
6. Reduce Energy Costs
7. Reduce Maintenance Costs

During this renovation, Dr. Pepper Snapple Group replaced the existing reciprocating compressors with new reciprocating compressors and improved controls. They also replaced the existing reciprocating compressors with twin rotary screw compressors using variable speed drives for capacity management, along with modern computerized controls. Whether for new construction or a renovation to an existing facility, Dr. Pepper Snapple Group plans to use this technology as the foundation for any future carbonated beverage bottling project.

RESULTS

REDUCE ENERGY COSTS

Minimizing the overshoot of the process conditions has reduced Dr. Pepper Snapple Group's monthly electrical cost by an estimated $10,000. In addition, the fundamental difference between reciprocating and screw compressor operation is lower discharge temperatures. The screw compressors operate at a discharge temperature 60-85°F lower than the previous reciprocating compressor. The result is 60-85°F less superheat that the condenser needs to remove prior to reaching the condensing temperature. Lower superheat means reduced load on the condenser. When combined with the variable speed drive control of the condenser fans, the condenser operates more efficiently, using less energy.

REDUCE MAINTENANCE COSTS and INCREASE PRODUCTION

By comparing the historical preventative maintenance cost of the previous reciprocating compressors to the cost of performing the annual scheduled preventative maintenance on the new rotary screw compressors, Dr. Pepper Snapple Group estimates a reduction in preventative maintenance costs of $50,000 annually. Altogether, the Dr. Pepper Snapple Group is experiencing an increase in production of 20% with estimated annual savings in energy of $120,000 along with the annual savings of $50,000 on preventative maintenance costs. The project is a definite success in the eyes of all parties.

Other interesting practices at Dr Pepper Snapple Group:

In manufacturing, distribution and sales operations, DPS strives to continuously improve every aspect of its business. DPS has invested heavily over the last several years to align and integrate its operations to serve customers and consumers better while increasing energy efficiency, reducing waste stream and lowering the amount of water and other resources used per gallon of finished product:

- To reduce emissions and save energy during deliveries, Dr Pepper Snapple Group is upgrading its service and delivery fleet with more fuel-efficient vehicles. In addition, new trucks are set with five-minute idle shutdowns.
- By working to replace existing coolers and vending machines with Energy Star-rated equipment, Dr Pepper Snapple Group's efforts will have an environmental impact equal to removing the CO_2 emissions of 11,000 cars from the road each year.
- In 2007 alone, Dr Pepper Snapple Group's Plano office recycled nearly 190 tons of paper – exceeding its 2006 total by 28 percent. These efforts saved 3,199 trees; 696,118 pounds of lumber; 565 barrels of oil; 771,374 kilowatts of energy; 1.3 million gallons of water; 565 cubic yards of landfill space; and reduced air pollution by 11,288 pounds.
- DPS has reduced the weight of its Deja Blue water bottles by 40 percent and its one gallon Hawaiian Punch containers by 19 percent, taking approximately 6 million pounds of plastic out of the waste stream each year

RESOURCES

Vendors: Johnson Controls (Frick): A First in Carbonated Beverage Bottling!
www.johnsoncontrols.com/frick