

SIX-MONTH INTERNSHIP

# PROCTER AND GAMBLE

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## COMPANY BACKGROUND

Since its founding in 1837, Procter & Gamble (P&G) has grown to be the world's top manufacturer of household consumer products. Originally producing soap and candles, P&G has expanded its product base to include home care, beauty care, grooming, health care, snack, and pet care business segments. P&G's Iowa City plant is the second largest production plant in the company, employing approximately 740 people. Iowa City is responsible for shampoos, conditioners, and mouth and body washes that include Clairol®, Head and Shoulders®, Gillette®, and Oil of Olay® product lines.

## PROJECT BACKGROUND

In 2007, Procter & Gamble of Iowa City purchased two chillers with the capability to perform free cooling during times of colder ambient air temperatures. In free cooling mode, the machines supply chilled water to the system, but without the use of a compressor. Providing process cooling without running the compressor could supply up to one-half of P&G's chilled water demand at no cost. However, further investigation was required to determine if free cooling could meet the Iowa City facility's chilled water requirements.

## INCENTIVES TO CHANGE

Procter & Gamble has long been devoted to providing the best consumer products while fostering responsible environmental practices and policies. A recent unveiling of the company's new vision for sustainability further solidified this commitment.

In line with the company's new global vision, Iowa City P&G actively pursues projects that aim to reduce raw material and water waste. As P&G is the one of the largest water and electrical users in Iowa City, small adjustments in plant processes could produce both environmental and economic benefits.

## RESULTS

**Chilled Water System Optimization:** The catalyst for the project was to determine if the use of free cooling would be feasible at the facility. After a full chilled water loop assessment was performed, it was determined that P&G will

be unable to use free cooling in the chilling of process water, due to design limitations and system requirements.

In the course of investigating free cooling, alternative optimization strategies were identified. The use of variable frequency drives (VFD) were explored, with the goal of reducing overall electrical usage at the site. It is estimated that chilled water compressors account for one-quarter of P&G's annual energy costs. Small changes in drive efficiency could result in significant energy reduction, given the large number of annual chiller run hours.

P&G's current chillers use a soft-start mechanism before elevating the compressor drive shaft to a full, fixed speed. Reducing chilled water output capacity is based upon



internal chiller valve manipulation. Upgrading the current compressor drives to variable frequency drives would allow the compressor to control the chilled water output, thus preventing wasted energy at times of reduced chiller demand.

The ability to efficiently manipulate chiller outputs would also provide additional chiller sequencing options. This is particularly important during times when plant demand requires more than one chiller, but less than the full two chillers. Using the VFD drive to trim while running a secondary chiller full-out would increase the efficiency of both machines. If implemented, VFD recommendations could provide solid year-round cost savings.

**Water Mapping:** As a manufacturer of soaps and body washes, P&G performs chemical processing daily and many of these processes require water. In an effort to locate water losses, a full investigation of site water usage was performed, enabling the intern to identify critical opportunities for water savings.

While several opportunities were considered, the major water savings project that was recommended involves reject Reverse Osmosis usage. If P&G can locate a suitable buyer for its excess HCl, the company could save more than \$300,000 per year in caustic for neutralization alone. A large amount of scrubbing make-up water could also be avoided.

### CONVENTIONAL AIR POLLUTANTS AND GREEN HOUSE GASES DIVERTED IN STANDARD TONS

| Total for all sectors |                 |                 |                  |         |       |
|-----------------------|-----------------|-----------------|------------------|---------|-------|
| CO <sub>2</sub>       | SO <sub>2</sub> | CH <sub>4</sub> | N <sub>2</sub> O | CFC     | PM-10 |
| 181182                | 92.8            | 112435          | 58651            | 1,574.7 | 143.8 |

| PROJECT             | ANNUAL COST SAVINGS | ENVIRONMENTAL RESULTS          | STATUS              |
|---------------------|---------------------|--------------------------------|---------------------|
| FREE COOLING        | \$100,000           | 2,000,000 KWH                  | TEST RECOMMENDATION |
| CHILLER 4 VFD DRIVE | \$45,000            | 900,000 KWH                    | RECOMMENDED         |
| VFD                 | \$59,000            | 1,188,000 KWH                  | RESEARCH FURTHER    |
| HCL REUSE           | \$300,000           | 8,000,000 GAL H <sub>2</sub> O | RECOMMENDED         |

