# Controlling the Impact of Energy Costs

## Auditing and actively managing energy costs can increase beverage plant efficiencies.

By Harry DeLonge

Reducing the cost of energy is a hot issue that affects both operating costs and business planning/growth strategies. Smart business leaders include energy as a critical variable in both their strategic and tactical thinking. Companies can reduce energy use through "smart" technology, equipment changes and operating protocols. Tying these efforts into programs addressing the sustainability initiative will save valuable resources and increase profitability.

Too often in industrial cost savings projects, the projected dollars to be returned are impressive but never realized. The actual impact on earnings, contribution to the bottom line, or the effect on budget is either nonexistent—there is a loss—or costs have simply been moved from one account to another. A good rule of thumb for a cost savings initiative is that it should bring other tangible benefits along with the promised financial reward.

Addressing an issue as complicated and as extensive as energy usage in an industrial plant, especially a beverage facility, requires a narrowly defined focus in three areas:

**Energy audit:** Prepare and maintain a database that shows how much energy you use, where you use it and for what purpose. **Operational/engineering changes:** Be prepared to consider changes in equipment, operating protocol and conventional wisdom if there is clear quantification of improved performance, cost savings or "avoidance" and conservation opportunities. It will be necessary to confirm and redefine what each usage of energy is engineered to accomplish. **Energy bill:** Zero in on process and facility portions of your energy usage, addressing critical areas such as in heat exchange.

As you proceed, ask yourself, "How do I address the cost of energy and do a better job?" and "Should I be doing things differently?"

### The Energy Audit

The first step in an energy audit is to develop a solid database on what it is costing you to operate your plant. Monitoring your process to determine where your energy goes can be a humbling experience. Often, there is significant waste that can be eliminated by implementing simple "house rules" and methods to reduce waste in all areas. Sensors that turn lights out when there is no activity, cutting wastewater to drain, automatic controls whereby processes are programmed to your actual protocols impacting time, pressures and temperatures, and that tie pump and drive motors into the actual demand, all result in reduced energy costs, better process control and operational improvements.

The cost of water can be in the US$5.00 per 1,000 gallons range and also include wastewater surcharges nearing 50 percent. If you treat your wastewater, you have an additional charge to deal with. Realistically, even the smallest wastewater stream totals hundreds of thousands—more likely millions—of gallons per year. Water, energy and money go down the drain at the same time.

### Changing the Way You Operate

In a plant environment, the "domino" effect is both a danger and an opportunity. When you make changes in the way you operate your plant or equipment, something else will happen. For example, when you conserve water, the first result is an increase in the wastewater effluent biochemical oxygen demand (BOD) values. The loading stays the same, but the BOD or chemical oxygen demand (COD) strength increases per volume of water. While this is not necessarily a problem, what else happens? Your mindset should be that changes always will impact the next domino, but if you are prepared, that too can bring advantages. Reducing the volume of wastewater and increasing BOD/COD can result in financial and energy savings. In this example, reduced gallons to drain may delay a costly expansion, allow for a smaller treatment system or identify the use of a more efficient treatment technology, perhaps switching from aerobic to anaerobic.

When you save energy, especially in an area as critical as managing the plant's water supply, you should make a commitment that your actions will impact favorably on production efficiency, water or product quality, plant maintenance programs or operational controls.

Water reclamation and reuse becomes difficult and expensive once you have made the plant's wastewater "soup." A smart approach to saving on total plant costs and the energy associated with treating and using water (water management) is to use smart technology while streams are isolated and present minor issues.

Selecting isolated streams before they join your "soup" allows for large reductions in water consumption with cost-effective solutions. Often, such programs can minimize capital expenditures and be a major step in driving toward sustainability. This will be different for each type of industry, and often will change for the different products produced.

Only the industry, company or plant knows what is best for its product line, but its current practices should be questioned and challenged. Always ask, "How can I get better results plus save my energy dollars?" Huge savings can be realized in the re-capture of "once-through" waters that have been heated or chilled. Tactics which can prove cost effective range from the simplified use of countercurrent flows to sophisticated reconditioning using filtration, separation, clarification and membrane processes. Actual process testing, when challenging the status quo, provides analytic and microbiologic databases that make sure safety has not been sacrificed. Again, your goal would be cost, water and energy savings with a corresponding increase in productivity, safety and quality assurance. **BW**

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## Example 1: Discharge Opportunity Assessment in a Beverage Plant

A beverage plant was identified by the local publicly owned treatment works (POTW) as a significant wastewater contributor. Faced with the prospect of providing a complete wastewater treatment plant to handle all discharges, the plant had USFilter (Warrendale, PA, USA) conduct an audit. This audit revealed a number of effective alternatives. This resulted in considerable savings in water and energy and a more focused operation.

| Project Goals | New Capital Equipment and Operating Changes | Payback |
|---|---|---|
| • Avoid construction of new wastewater plant | • None<br>• Water reclaim and reuse (heat exchange, backwash)<br>• Operational changes | • Cost avoidance at US$2-5 MM |
| • Remain in compliance | • Controls/automation to minimize COD/BOD discharge | • Operating cost avoidance projected at >US$300,000/year |

## Example 2: Steam vs. Hot Water

A beverage plant not only was using steam for stripping volatiles from activated carbon, but for sanitation purposes as well. Use of hot water sanitation, with automatic controls, allowed the plant to save on energy, water and manpower and allowed for a cleaner, more sanitary and efficient carbon.

| Project Goals | New Capital Equipment and Operating Changes | Payback |
|---|---|---|
| • Substantial water, energy and cost savings, reduced wastewater to drain | • HOT technology installed to automatically backwash and sanitize carbon (80°C) while carbon suspended in backwash mode | • Water savings of 75% = >3 MM gallons yearly, less wastewater to drain (>3 MM gallons) |
| • Better performance and cleaner, more sanitary carbon | • Smart automation set for plant preferred operating parameters | • Better "kill" and cleaning, less labor and maintenance |

## Example 3: Water Savings

A food plant needed to both: 1) upgrade its treated water to "purified" quality, and 2) reduce water consumption and wastewater to the drain. This was accomplished by installing a continuous electrodeionization (CEDI) unit directly after the reverse osmosis (RO) and using a brine recovery RO on the concentrate from the existing RO.

| Project Goals | New Capital Equipment and Operating Changes | Payback |
|---|---|---|
| • Upgrade of produced water to "purified" quality | • Upgrade of RO permeate quality with CEDI technology | • Water quality attained, 100% reclaim of CEDI concentrate |
| • Reduced water usage, reduced wastewater to drain | • Brine RO for recovery of RO concentrate | • Water savings at >3 MM gallons/year, greater than 3 MM gallons (less wastewater to drain) |