

**Doug V. Bloss, Corporate Vice President Sales & Marketing
Armstrong International, Inc.**

ENERGY OPTIMIZATION STRATEGIES

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The outsourcing of central plant operations and maintenance functions has experienced rapid growth over the last several years.

This trend has accelerated most in the process industries, where reliable utility services are essential for product quality, plant production efficiency, and ultimate market competitiveness.

The typical process industry plant, say in the food or chemicals industries, experiences process changes to meet demands of a variety of products. Process needs drive the business and are the necessary core focus of the enterprise. Utility support services must adapt to these changes without compromising product quality or increasing costs. Unfortunately, demands on utility services are rarely met with a corresponding commitment of corporate capital. Thus, aging utility infrastructure often operates sub-optimally, resulting in increased costs and, in severe cases, "plant bottlenecks."

The choices are to optimize plant utilities with internal resources or contract with operations and maintenance professionals who routinely respond to these challenges across many industries.

Unlike institutional and commercial buildings, process plants must provide more than building comfort to occupants.

The following service requirements are typical:

- 1) Electric service which may demand redundancy to assure uninterruptible status.

- 2) Steam at varying pressures to serve multiple thermal processes.
- 3) Compressed Air for instrumentation and process.
- 4) Process Chilled Water.
- 5) Process Hot Water and Washdown Water.
- 6) Large Refrigeration systems, frequently using Ammonia.
- 7) Wastewater treatment.
- 8) A mix of fuels depending on availability and cost (i.e. natural gas, coal, fuel oil, alternative fuels).

Sophisticated tariff structures, volatile commodities pricing, and changing state and federal environmental requirements can overwhelm plant operators who often share other plant responsibilities. The emerging trend to outsource utility O&M functions leverages professional firms with experienced support staffs to meet today's challenges.

For an example of a successful O&M partnership, we will profile the Midwestern site of a Fortune 500 food processor. The site's energy infrastructure was originally built in the 50's and modified to address several plant expansions. Periodic boiler repairs were no longer sufficient to assure reliable steam service. The average plant steam load of 70,000 lbs./hr. peaked at 125,000 lb./hr. and was serviced by five boilers. Three water tube natural gas fired boilers @ 30,000 lb./hr., one 80,000 lbs./hr. and one 100,000 lb./hr/ gas boiler. All boilers were permitted to burn #6 Fuel oil as backup. Two new boilers were slated to retire boilers beyond their useful life.

The O&M partner was responsible for boiler replacement, permitting and commissioning.

A comprehensive approach to the project highlights the O&M partner's ability to leverage specialist staff support functions that have become victims of staffing reductions at many well run corporations. This may appear a conflicting statement, but well run corporations in highly competitive global markets must commit their limited resources to core business activities . . . utility systems simply provide vital support to these core business activities.

ASSESS STEAM DEMAND

Prior to boiler selection, the O&M partner assembled a small team of thermal specialists to review the plant's "point of use" applications for steam. The team was comprised of Professional Engineers with CEM status that have audited over 300 steam systems. Inefficiencies in the steam distribution system and condensate return system were identified and quantified. Opportunities for heat recovery, resulting in reduced steam demand were also developed. The following projects were implemented to optimize the steam distribution system.

- Improved condensate return
- Replace failed steam traps
- Waste heat recovery from compressors used to heat washdown water
- Modify warehouse heating
- Flash steam recovery

These steam distribution and point of use projects had favorable impacts to the plant's total operating costs and, when coupled with other energy demand projects, helped the site offset increased capital costs for the boilers.

BOILER REPLACEMENT

The OEM partner applied the same efficiency vigilance to the boiler replacement. Economizers and continuous blow down systems were incorporated in the new design.

A real time "Energy Optimization System" provides online remote monitoring of key steam and condensate system criteria. This permits the O&M partner to lower O&M costs, once again, by leveraging staff resources that are skilled at monitoring process industry utilities across multiple plants, . . . then dispatching the "right resource" to a qualified event.

ENVIRONMENTAL PERMITTING

Environmental regulations at the local, state, and federal levels require continuous review for compliance. Most site utilities staffs have difficulty keeping current with

these requirements which, in severe cases, can result in profound operating cost impacts.

The O&M partner maintains a current database on State and Federal environmental regulations throughout the country and an accomplished Environmental Manager, conversant in compliance requirements, and skilled in the most cost effective compliance strategies. Prior to engagement with the O&M partner, the client was resigned to having to undergo major permitting under the Clean Air Act, including the need for continuous emission monitors and air pollution control equipment. However, the partner was able to recommend a project environmental strategy that resulted in the addition of over 40 percent more steam generating capacity than the older boilers could provide, without either the use of CEM's or add-on controls. The results represent a savings of over \$1 Million, or over 50 percent of the final cost of the project. Today, the site boasts the lowest emissions boilers in the state for both nitrogen oxides and carbon monoxide. Indeed, tests show that the boilers could produce two-thirds of a million tons of steam annually, with lower CO emissions than a family of four would generate from driving their cars and pickup trucks. Now utilities are contributing to both a cleaner neighborhood and an enhanced public image for the corporation.

EMPLOYEE MORALE

While there are multiple approaches to O&M staffing, the site's O&M partner agreed to interview the current client staff and transfer qualified candidates to its payroll.

One of the most positive outcomes of this approach is the improved morale of transferred O&M employees, who graduated from non-key support personnel to prime assets of their new employer.

The O&M provider is committed to training and motivating these employees with performance incentives. Skill levels are consequently enhanced, and a never seen before career path is available with potential to improve responsibilities, compensation, and even relocation.

"ALIGNED GOALS" AND "SUSTAINED PERFORMANCE"

The partnership identified "key performance indicators" (KPI's) and the utility monitoring system captured real time performance data to measure these KPI's. The plant has provided performance incentives to assure reliability and cost competitiveness.

Plant management meets quarterly with the O&M provider to review performance and share strategies for achieving additional efficiencies.

While commodities pricing will fluctuate over time, the plant's O&M partnership assures competitive advantage through optimal usage of its utilities.

Plant utilities are run with a "P&L" mindset. For example, the site experienced condensate contamination, but could not locate the source. The site utility supervisor offered a \$100 reward to any O&M personnel who could find the source. Within three days, a resourceful maintenance technician collected his bonus after identifying a coil leak in a process kettle.

CAPITAL AVAILABILITY

All too frequently, site management of multi site corporations can not get capital allocation for utilities projects, even though many projects are virtually risk free and deliver returns well above corporate internal rate of return hurdles.

In this case, the O&M provider furnishes all capital for utilities infrastructure improvements. Monthly utility service fees include a capital recovery payment, fuels, electricity, consumables and O&M labor. Savings from efficiency projects and improved performance have entirely offset capital for new boilers, a new compressor, and distribution system improvements. Thus the site's reliability has improved while avoiding imminent capital improvements in the plant's aged infrastructure . . . a partnership that wins for both parties. Success with the program has expanded to two additional sites with other sites under development.

O&M partnerships with aligned goals for the management of utilities will be one of the fastest growing markets of this decade. The application of today's best technology, when coupled with trained, motivated professionals, drives inefficiencies out and improves competitiveness.