Justifying Steam Efficiency Projects to Management

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Abstract

Industrial plant engineers often must convince top management that investing in steam efficiency is an effort worth making. Communicating this message is often more difficult than the actual engineering behind the concept. A corporate audience responds more readily to a dollars-and-cents impact than to a discussion of Btus and efficiency ratios.

By adopting a financial approach, the plant engineer relates steam efficiency to corporate goals. Collaborating with the financial staff yields the kind of proposal that is needed to win over corporate officers who have the final say-so over such capital investments as steam system upgrades.

Before any recommendations can be made about how to justify steam improvement projects, it is first necessary to understand the world as management typically sees it.

Understanding Corporate Priorities

Corporate officers are accountable to a chief executive, a board of directors, and an owner (or shareholders, if the firm is publicly held). These officers create and grow the equity value of the firm. The corporation's industrial facilities contribute to this equity by generating products with a market value that exceeds the cost of owning and operating the plant itself.

Plant equipment—including steam system components—are assets that must generate an economic return. The annual earnings attributable to the sale of goods produced by these assets, divided by the value of the plant assets themselves, describe the rate of return on assets. This figure is a key measure by which corporate decision makers are held accountable.

Financial officers in particular are conservative decision makers. They shun risk and resist spending money on the plant itself, if possible. When forced to do so, they seek investments that are most certain to demonstrate a favorable return on assets. When presented with multiple investment opportunities, they favor those options that lead to the largest and fastest returns.

This corporate attitude may impose sometimes-unpleasant priorities on the plant engineer or facility manager. Priorities include reliability in production, avoiding unwanted surprises by primarily adopting familiar technology and practices, and contributing to cost control today by cutting corners in maintenance and repair. No wonder industrial decision makers often conclude that steam efficiency is a luxury they cannot afford.

Fortunately, the story does not end here. Industrial steam efficiency can save money and contribute to corporate goals while effectively reducing energy use and unwanted noxious combustion emissions in a variety of ways.

Measuring the Dollar Impact

Steam system improvements can move to the top of the list of corporate priorities if the proposals respond to distinct corporate needs. The number and variety of corporate challenges open up many opportunities to promote steam efficiency as a solution. And steam systems offer many opportunities for improvement. Once target areas have been selected, the proposals need to be dressed in corporate, dollars-and-cents language.

The total dollar impact of the measure must be identified and quantified. One framework to use is life-cycle cost analysis. This analysis captures the total expenses and benefits associated with an investment. The result—a net gain or loss on balance—can be compared to other investment options or, if no investment is made, to the anticipated outcome. When used as a comprehensive accounting of an investment option, the life-cycle cost analysis for a steam efficiency measure includes several elements:

- Search and selection costs of choosing an engineering implementation firm.
- Initial capital costs, including installation and the costs of borrowing.

- Maintenance costs.
- Supply and consumable costs.
- Energy costs over the economic life of the implementation.
- Depreciation and tax impacts.
- Scrap value or cost of disposal at the end of the equipment's economic life.
- Impacts on production such as quality and downtime.

A typical boiler installation illustrates this approach. The analysis assumes a 20-year life operating at high rates of capacity utilization. Fuel costs may represent as much as 96 percent of life-cycle costs, while the initial capital outlay is only 3 percent and maintenance a mere 1percent. Clearly, any measure that reduces fuel consumption (while not negatively affecting reliability and productivity) certainly yields positive financial impacts for the company.

Presenting Efficiency Economics

As with any corporate investment, there are many ways to measure economic impacts. Some are more complex than others and proposals may use several analytical methods side-by-side. The choice of analyses depends primarily on the sophistication of the presenter and the audience.

A simple (and widely used) measure of project economics is the payback period. This term is defined as the period of time required for a project to break even. It is the time needed for the net benefits of an investment to accrue to the point where they equal the cost of the initial outlay.

For a project that returns benefits in consistent, annual increments, simple payback equals the initial investment divided by the annual benefit. Simple payback does not consider the time value of money. In other words, it makes no distinction between a dollar earned today and one earned in the future, making earnings figures uncertain. Still, the measure is easy to use and understand, and many companies use it for making a quick decision on a project. The following factors are important to remember when calculating a simple payback:

- The figure is approximate. It is not an exact analysis.
- All benefits are measured without considering their timing.
- All economic consequences beyond the payback are ignored.
- Payback calculations do not always find the best solution (because all factors are not considered).
- Payback does not consider the time value of money or tax consequences.

More sophisticated analyses take into account such factors such as discount rates, tax impacts, and cost of capital. One approach involves calculating the net present value of a project, which is defined by the equation:

$$NPW = PWB - PWC$$

NPW (net present worth)
PWB (present worth of benefits)
PWC (present worth of costs)

Another commonly used calculation for determining economic feasibility of a project is internal rate of return. It is defined as the discount rate that equates future net benefits (cash) to an initial investment outlay. This discount rate can be compared to the interest rate at which a corporation borrows capital.

Many companies set a threshold (or hurdle) rate for projects. This rate is the minimum required internal rate of return for a project to be considered viable. Future benefits are discounted at the threshold rate, and the net present worth of the project must be positive for the project to be given the go-ahead.

Relating Steam Efficiency to Corporate Priorities

Saving money, in and of itself, should be a strong incentive for increasing steam efficiency. Still, that may not be enough for some corporate observers. The case can be strengthened by relating a positive life-cycle cost analysis to specific corporate needs. Consider the following suggestions for interpreting the benefits of fuel cost savings:

- **A new source of permanent capital**. Reduced fuel expenditures—the direct benefit of steam efficiency—can be thought of as a new source of capital for the corporation. An investment that reduces fuel costs yields savings each year over the economic life of the improved steam system. Regardless of how the investment is financed (borrowing, retained earnings, or third-party financing), the annual savings are a permanent source of funds as long as the savings are maintained on a continuous basis.

- **Added shareholder value.** Publicly-held corporations usually embrace opportunities to enhance shareholder value. Steam efficiency is an effective way to capture new value.

  Shareholder value is the product of two variables: annual earnings and price-to-earnings (P/E) ratio. The P/E ratio describes the corporation's stock value as the current stock price divided by the most recent annual earnings per share.

  For a steam efficiency proposal to take advantage of this measure, it should first identify annual savings (or rather, addition to earnings) that the proposal will generate. Multiplying that earnings increment by the P/E ratio yields the total new shareholder value that can be attributed to the steam efficiency implementation.

- **Reduced cost of environmental compliance.** Plant engineers can promote project benefits as a means of limiting the corporation's exposure to environmental emissions compliance penalties. Efficient steam systems lead to better monitoring and control of fuel use. Combustion emissions are directly related to fuel use. They rise and fall in tandem. Implementing steam efficiency lets the corporation enjoy two benefits: decreased fuel expenditures per unit of production and fewer emission-related penalties.

- **Improved worker comfort and safety.** Steam system optimization requires ongoing monitoring and maintenance that yields safety and comfort benefits in addition to fuel savings. The system monitoring routine usually identifies operational abnormalities before they present a danger to plant personnel. Containing these dangers minimizes any threats to life, health, and property.

- **Improved reliability and capacity utilization.** Another benefit of steam efficiency is more productive use of steam assets. The efforts required to achieve and maintain energy efficiency largely contribute to operating efficiency. By ensuring the integrity of steam system assets, the plant engineer can promise more reliable plant operations. From the corporate perspective, a greater rate of return on assets is achieved in the plant.

Taking Action

The following steps can help make a proposal for steam efficiency implementation attractive to corporate decision-makers:

- Identify opportunities for achieving steam efficiency.
- Determine the life-cycle cost of attaining each option.
- Identify the option(s) with the greatest net benefits.
- Collaborate with the financial staff to identify current corporate priorities (added shareholder value, reduced compliance costs, improved capacity utilization, etc.).
- Generate a proposal that demonstrates how the benefits of the steam efficiency project directly responds to current corporate needs.

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