MONEY TO BURN:
Why Manufacturing Profits Go Up in Smoke

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ABSTRACT

This article is fiction in the truest sense. "Castiform Plastics," and the characters involved, are all imaginary; any similarity to real companies and persons is coincidental. But while the "fabric" is fiction, the "threads" come from true stories—anecdotes shared at conferences, workshops, and plant visits. Understandably, no industry professional wants unflattering comments about their facilities to be published. That does not diminish the learning value that comes from observing others' mistakes. This article was assembled from confidential anecdotes collected over the past five years. The intent is to illustrate the stop-and-start nature that characterizes so many energy management efforts, ultimately resulting in business impacts that fall far short of their potential.

THE STORY

On the first Monday of each month, Jason Chandler, the general manager for Castiform Plastics' Riverdale facility, conducted a site managers' briefing. The agenda for last February's meeting was dominated by a review of the preliminary results for the fiscal year ending January 31. Combined income statements for all eight Castiform manufacturing facilities showed that healthcare and energy costs were both escalating rapidly, eroding per-unit profit margins. While corporate headquarters issued the directive to improve cost performance, each facility GM's discretion would determine the means for doing so. Castiform's corporate management style conferred a high degree of autonomy to the general managers at each facility. `

Chandler was a rising star at Castiform Plastics at age 38. He had an MBA in finance, and his reputation to date was predicated on his logistics acumen. Many believed that Chandler's stint as a facility GM was a station on the fast track to a corporate position. If the management rotation worked as expected, Chandler's tenure at Riverdale would last another two years. Accordingly, any strategic decisions about plant performance were tempered by this time horizon. He did not want a poor performance record to derail his ascent to the top.[1] While he was comfortable with product development, marketing, and finance, Chandler deferred most engineering decisions to technical staff.

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[1] "*He did not want a poor performance record.…*" All too often, the top manager's personal goals impose actions that are not in the plant's long-term interest. "Not on my watch" is the sentiment. Hence the popularity of deferred maintenance.

Castiform's business was viable because its marketing strategy successfully identified and grew customer segments. Its business culture was revenue-oriented. Executives that came to power did so as the result of their outstanding contributions to growth. Castiform's capital investment strategy *built sales capacity* as opposed to *improving operating efficiencies*. Until recently, profit volume allowed management to ignore the fact that certain costs like energy and healthcare were eroding profits on a per unit basis.

Chandler devised a straightforward response to these cost challenges. He perceived healthcare and energy problems to be price-driven issues.[2] He declared that each issue was a "project" and picked a capable person to handle it. The manager of each project was expected to present a report of recommendations at the next monthly meeting. Janet Ray, the Director of Administration, was charged with finding a lower-cost employee health program that sacrificed as little as possible as far as coverage and service. Chandler expected this task to require some sophisticated comparison shopping as well as Janet's sharp negotiating skills.

Chad Sweeney, a senior engineer at age 28, was given the task of energy cost reduction. Chad was well-versed in fuel handling and combustion issues, but he'd have to catch up on energy procurement and pricing. With a mechanical engineering degree from the state college and almost five years with Castiform, Chad was developing a reputation as a problem solver. His biggest accomplishment to date was developing a protocol for collecting stack emissions data as required by federal regulation. This exercise got him face time with the general managers at all eight Castiform facilities. By tapping Chad for the energy problem, Chandler chose a "technical" guy to handle a "technical" issue.

At first glance, the resources available to Chad and Janet were virtually identical. Each had an eight-by-eight foot cubicle that included a desk, telephone, laptop computer with a broadband Internet connection, and a view of the Riverdale's power house on the far side of the parking lot.[3] Chad's view reminded him of his earlier facility visits. Chad knew that price was only a half of the energy equation. Consumption was the other... and energy consumption was achieved primarily in the power house.

Riverdale was one of the three original Castiform Plastics manufacturing facilities that dated back to the late 1940s. Castiform expanded to eight plants during the 1990s through merger and leveraged acquisition. Lenders looked favorably at Castiform's cost cutting experience, achieved primarily through labor reductions. Castiform Plastics' ratio of staff per ton of product beat the industry average by 15 percent, although this downsizing sent some long-time operations managers—and their institutional

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[2] *"He perceived healthcare and energy problems to be price-driven issues."* Corporate leaders may understand their core business, but many don't understand energy. Many believe that control over prices equates to control over expense. This ignores a basic fact of economics: price *times quantity* equals expenditure.

[3] *"Each had an eight-by-eight foot cubicle…."* Executives are accustomed to delegating problems to one person who sits in an office making phone calls. For many issues, this works. Energy cost control is not one of them.

knowledge—into early retirement.[4] The three original plants had fairly comparable assets and procedures, thanks to their common history.

The newly-acquired plants were purchased when various competitors exited the industry. These plants were highly varied in layout, engineering, and staff culture.[5] Castiform continued to struggle with assimilation of the new plants, as evidenced in uneven per-unit cost performance comparisons. There were, in fact, whispers of overcapacity and the threat of closing one or two plants.

The power house superintendent at Riverdale was "Boss" Buehler, a cigar-chomping, former Marine gunnery sergeant and 27-year veteran of the company. Buehler was a long-time supervisor who became the defacto power house boss after the chief engineering posts at all eight facilities were consolidated into one position that was filled by an in-house, on-call consulting engineer. The Riverdale power house was Buehler's turf, and that was fine with Chandler, who in fact had never stepped foot inside that building. As long as utilities were supplied as needed, Buehler's activity went virtually unnoticed by the GM.[6] This was largely true for the other two original facilities' power houses.

The other five, however, were a mixed bag. Some were very folksy, with second- and third-generation workers on the payroll. But with that charm came an insidious patronage system that defied more objective criteria for performance evaluation and staff development. Meanwhile, the two stamping plants resembled small fortresses: each had key-pad security doors that restricted passage between the plant floor and the front office. Turnover at these plants was high, with a fair number of ex-cons on the payroll. Scrap rates and on-time performance of the stamping facilities were generally poor.[7]

Facility staff had no practical awareness of the linkage between their behavior and energy cost control. For example, compressed air leaks were endemic, but no one even imagined that this was a situation worthy of remedy, since "air is free." This conclusion ignored the fact that electricity was consumed at the rate of six horsepower for every one horsepower of compressed air produced.

Chad began his project with an Internet search for relevant information. He found a wealth of technical how-to guides published by state and federal energy offices. Of particular interest was a California State Energy Commission paper on energy

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[4] *"…this downsizing sent some long-time operations managers—and their institutional knowledge—into early retirement."* A common problem: Few facilities bother to put procedures in writing. With staff turnover, recurring problems await repeated resolution.

[5] *"These plants were highly varied in layout, engineering, and staff culture.*" Variation in assets, procedures, and plant cultures can be impediments to replicating improvements. "Reinventing the wheel" is the order of the day.

[6] *"As long as utilities were supplied as needed, Buehler's activity went virtually unnoticed…"* Remember that this is the power house-- not a core, money-making activity. The power house often assumes last-place status for investment and assignment of talented leadership.

[7] *"Scrap rates and on-time performance of the stamping facilities were generally poor."* Organizational chaos is a huge barrier to energy management.

procurement (see endnote 1). While Castiform had no California operations, Chad could pick up general concepts from this document. As for consumption issues, he discovered the U.S. Department of Energy's BestPractices resources, which included system survey guides, tip sheets, diagnostic software, and training curricula (see endnote 2). This material covered plant utilities that were common to most industries, such as steam, compressed air, process heating, and motor drive systems. Castiform plants had all of these systems. The sheer volume of the BestPractices material was at once its strength and its weakness. How could Castiform begin to apply this material? The BestPractices program's technical recommendations ranged from simple O&M procedures to large-scale asset changes. Many energy-saving opportunities required capital investment. Other solutions called for data-intensive procedures, which seemed like a tall order for the pencil-and-clipboard culture that prevailed in Castiform power houses.

As an engineer, Chad was accustomed to finding solutions through technology. He believed in the unassailable principles of mathematics, physics, and thermodynamics. Seeking corroboration, Chad tracked down Leonard Tremblay, the sole remaining chief engineer and a long-time employee with comprehensive knowledge of Castiform's processes and plant infrastructure. Chad's telephone query to Tremblay was straightforward: "why were technical solutions not a 'slam dunk' at Castiform?"

Chad heard a long sigh, followed by a chuckle. Tremblay told a story. During the late 1980s, the chief engineers led an effort at Castiform to install automated boiler controls to optimize combustion, blowdown, and other steam management functions. As a group they presented their case in the capital budgeting process, filling their justification with engineering principles that were frankly over the heads of the Finance Team.[8] But there was something compelling about their unanimity, so the funding was approved, but only at 80 percent of the recommended amount. As a result, the controls were installed, but funding limitations forced some shortcuts in the commissioning process. The chief engineers figured that their cumulative knowledge and abilities could fill the void left by abbreviated commissioning.

Tremblay continued. Within a couple short years, the recession of the early 1990s hit and staff reductions began in earnest. Among the first to go were the balance of the higher-paid technical staff, the ones who managed advanced technologies like automated control systems.[9] Within a year, the ranks of chief engineers were thinned down to one person—the overtasked Leonard Tremblay. He spent all his time in reactive mode, "putting out fires." He had no time to scout and promote strategic improvements. Without the proper skill complement, the new control systems began breaking down, or worse—generating operational problems through their misuse. The easiest solution for the remaining staff

[8] *"…filling their justification with engineering principles that were frankly beyond the Finance Team."* The engineers could have boosted their case by answering the top managers' implicit question: "What's in it for me?"

[9] *"Among the first to go were the balance of the higher-paid technical staff…"* Individuals in an organization are often hand-cuffed by the incentives and accountabilities that are peculiar to their little box on the organizational chart. In this instance, release of high-paid technical staff was consistent with a direction to reduce human resource costs. There was no one to advocate the optimization of system-wide impacts. Individual components sometimes win cost victories at the expense of the overall process.

was to shut down and bypass such controls. This meant reverting back to manual, "dead-reckoning" procedures for steam management. On top of that, the remaining utilities staff were far less adept than the chief engineers at recognizing improvement opportunities, much less developing investment proposals. Non-core technical improvements had no effective proponents from that point forward. Additionally, information technology investments dominated the investment agenda through the late 1990s, leaving little room for utility improvements. Asset management of Castiform's plant utilities reverted to a "rear-guard action," where the strategy was to ensure operational integrity with status quo technologies and within regular O&M budget authority.

"The sad part," Tremblay concluded, "was that *money was going up in smoke*" because cost control would require expertise that was either no longer available or too fractured across remaining staff who had neither the time nor incentive to tackle the issue.

Chad could not resist asking one obvious question: why did Tremblay not point this out to management?

Tremblay again chuckled. Pointing out such failings was tantamount to admitting that he had not been doing his job. Never mind the fact that poor energy performance was the result of organizational failures. There is a tendency to place blame on individuals, not the management philosophy itself. In this case, the crosshairs would center on him. Tremblay had less than two years to retirement—he had too much at risk.

Thanks to this story, Chad backed off the notion of pursuing capital projects. Tremblay's experience fit with other observations that Chad was making. He had already witnessed Tina Roth, the Riverdale controller, at work in the annual capital budgeting process. Proposals were categorized either as "revenue makers" or "cost cutters," and energy-related projects always fell into the latter category. She was jaded by earlier cost-cutter proposals that did not pan out. In her opinion, half of such proposals were likely to fail. She managed investment risk by lopping fifty percent off the savings estimate that any cost-cutting proposal promised. Only after this adjustment were cost-cutters ranked for consideration.[10] On top of this, the general manager's time horizon dictated that the only acceptable projects were those with a 12-month payback or less.

Energy management was another option. The literature presented this as a day-to-day discipline that merged energy practices with regular operations and maintenance procedures. This required benchmarking, monitoring, and remediation protocol based on any significant fluctuation in the stream of energy use data that this strategy demanded.[11] Chad pondered an earlier conversation when Boss Buehler, only half joking, said "no college boy is gonna tell me how to run *my* plant." When also considering the thinned out, time-pressed facilities staff, Chad suspected that "bean counter" assignments would

[10] *"Only after this adjustment were cost-cutters ranked for consideration."* A lot of companies handicap energy-related capital projects in some fashion. Since when is a dollar saved *less* than a dollar earned?
[11] *"This required benchmarking, monitoring, and remediation protocol…"* Six Sigma methodologies, for example, can be employed for this purpose.

be poorly received and executed. The hurdles to such activity were tremendous. Staff time was lacking. On-staff technical expertise was spread thin, since the lone chief engineer served all eight facilities. The largest hurdle was the simple lack of incentive: compensation for facility staff was driven by on-time performance. Not only were energy management duties perceived as a distraction, there was no reward for saving energy.[12]

Chad summarized his findings regarding energy commodity procurement—the "price" side of the expense equation—for Jim Koslowski, Riverdale's procurement director. Jim saw merit in scoping the deregulated fuel market to secure lowest-priced commodities. This activity resonated with Jim, who had a clear mandate for low-cost procurement practices. Still, there was much to learn about fuel spot markets, fixed contracts, and hedging instruments. Jim had time challenges, too, but more to the point, everyone knew that the energy cost problem was Chad's "project." Jim suggested that Chad should attend energy procurement seminars. Jim felt no impetus to work on a "technical" issue, and Chad had no authority to compel Jim to take action.[13]

The other cost variable—consumption—begged some resolution. Capital projects were virtually impossible.[14] Day-to-day energy management was clearly a management-by-numbers discipline that was too much for most facility staff to tolerate. Process benchmarking was best pursued in a multi-plant environment, like Castiform's. However, because the threat of plant closure put GMs on edge, suspicion preempted the sort of cross-facility cooperation that benchmarking demanded.[15]

That left a softer approach: do quick, easy, one-time projects that cost little if anything to perform. The Department of Energy's BestPractices resources included innumerable one-page tip sheets that covered such opportunities. These easy-to-read, color print documents were eye-catching, the sort thing that gets easily picked up from literature tables.

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[12] *"Not only were energy management duties perceived as a distraction, there was no reward for saving energy."* Top managers have less control over their organizations than is commonly assumed. A company usually cannot reduce energy expenses simply because the CEO demands that it be done. Individuals are most responsive to incentives attached to their specific jobs. Rarely do job incentives encourage collaboration, especially across divisional boundaries.

[13] *"Jim felt no impetus to work on a "technical" issue, and Chad had no authority to compel Jim to take action."* While energy management may be good for the organization as a whole, it requires individuals to expend effort that is in addition to current job expectations. Once again, traditional job descriptions and incentives are actually a problem in that they force individuals to see their job in a vacuum, and not as a part of a system.

[14] *"Capital projects were virtually impossible."* Big capital projects require a certain amount of salesmanship to be justified, and such activity does not play to the strengths of many engineering personalities. Engineers are generally good hands-on types who often lack the gifts of "talk and persuasion." By the same token, front-office managers lack full appreciation of mechanical realities. This gap in professional cultures can frustrate efforts to see "eye-to-eye" regarding business strategies.

[15] *"…suspicion preempted the sort of cross-facility cooperation that benchmarking demanded."* Additional complications occur if the threat of downsizing and plant closure fosters intra-corporate competition among sister plants.

At the next monthly managers' briefing, this time with Boss Buehler in attendance, Chad had fifteen minutes to present his recommendations. He introduced the BestPractices tip sheets to the audience. In his brief presentation, Chad unwittingly made the one key statement that secured success for his assignment. Chad held up a tip sheet about optimizing air-fuel ratios for combustion. "This," Chad proclaimed, "is a page straight from Boss Buehler's approach" to running a boiler room. Feeling validated before the GM, Buehler became an instant fan of the DOE tip sheets and immediately urged the power house staff to review the entire collection.

Buehler's staff snatched time during the weeks that ensued to act on many of these tips. The crew categorically ignored any improvement that required capital investment. But there were plenty of one-time, low-cost measures such as cleaning combustion chambers, repairing loose seals and compression fittings, and tending to loose or ill-fitting insulation.[16]

This burst of quick, easy fixes had an immediate impact on energy consumption at the Riverdale power house. Energy expenses, adjusted for prices, declined slightly over the next few months. At least the trend of increasing expense had crested, and that satisfied Chandler. Management priorities shifted elsewhere.[17]

Over the next year, management rotations continued.[18] Thanks to his success with the energy project and other pursuits, Chad Sweeney was promoted to Director of Outsourcing, where he excelled at performing due diligence on vendor contracts. Janet Ray enjoyed a large bonus for her successful resolution of the healthcare cost challenge. Jason Chandler landed a corporate position, due in large part to the outstanding performance of the Riverdale facility under his stewardship. Leonard Tremblay took a buy-out and retired to his mountain cabin. Finally, a new General Manager was assigned to the Riverdale plant. Peter Singh was another MBA who came of age with the "dot com" industry.

Time also had its impact on the Riverdale plant's energy performance. Constantly operating machinery was subject to vibration that loosened fittings and compression couplings. Debris built up in heat exchangers. Soot built up in combustion chambers. Insulation was pulled aside to repair pipe fittings, but not properly replaced. Steam traps failed, and friction caused new compressed air leaks. Eventually, plant utilities had to

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[16] *"But there were plenty of one-time, low-cost measures…."* This is a sampling of activities commonly referred to as "low hanging fruit." Exit surveys from BestPractices Steam workshops ask attendees what they intend to do in their plants after being exposed to "total system" management opportunities. The vast majority expect to perform quick, easy, low-cost activities. Steve Schultz, the lead energy professional for 3M, puts it best: "The low-hanging fruit grows back if you don't maintain your gains."

[17] *"Over the next few months, …management priorities shifted elsewhere."* Energy cost control is often just another management "flavor of the day," here today, gone tomorrow.

[18] *"Over the next year, management rotations continued."* Staff turnover and lack of procedural documentation can defeat energy management efforts, especially if efficiency activities are not folded into regular O&M procedures.

run longer and at higher tolerances to deliver the power demanded of them. Energy costs per unit began to creep upward.

Peter Singh, the new General Manager at Castiform Plastic's Riverdale facility, placed the energy cost problem at the top of the agenda for a monthly site managers' meeting. He perceived energy as a "technical" issue, so he sought a "technical" person to find solutions.

He declared energy cost control to be a "project assignment"…

CONCLUSIONS

- Energy management is an ongoing process, not episodic, not "as needed," nor as a "project" assignment.
- Energy cost reduction comes from consumption management as well as fuel price-shopping.
- Consumption management involves (1) little one-time, no-cost projects, (2) big capital projects, and (3) energy-smart activities that are committed to daily O&M procedures.
- In the absence of formal accountabilities and ongoing management, energy cost reduction is usually reduced to quick, easy, and cheap "projects" that have temporary benefit.
- Top management awareness of energy problems, and demand for their resolution, are certainly helpful. However, CEO awareness and demand are not sufficient by themselves to improve energy cost performance.
- Effective energy management requires staff understanding and collaboration that is usually not recognized in traditional job descriptions and performance incentives.
- The potential for energy savings increases with the degree of cross-functional collaboration and communication.
- Common belief suggests that the business goal of manufacturers is to maximize profits. That is not absolutely true. In practice, units within a company seek to optimize fiscal performance as individual components, even if this is (unwittingly) to the detriment of overall profits.
- Companies can and do overcome functional barriers to energy management. See the Alliance's online Corporate Energy Management case study series at http://www.ase.org/section/topic/industry/corporate/. The series includes companies from a variety of industries, and represent differing scales of operation.

ENDNOTES

1. California Energy Commission's energy management series: http://www.energy.ca.gov/reports/
2. U.S. Department of Energy BestPractices resources: http://www.oit.doe.gov/bestpractices

ABOUT THE AUTHOR

A five-year employee of the Alliance to Save Energy, Christopher Russell was promoted to Director of Industry Sector in 2004. In this capacity, he leads the Alliance's efforts to advance energy efficiency in the manufacturing and agricultural sectors. Russell frequently writes for trade press and speaks at industry conferences nationwide.

To complement the engineering dimension that dominates industrial energy dialogue, the Alliance Industrial Sector programs deal with managerial and financial aspects, so that the dialogue moves "from the boiler room" to corporate boardrooms.

Russell entered the energy industry in 1992 as a market analyst with Washington Gas. From 1995, he was both an industrial policy analyst and market analyst with the American Gas Association. He joined the Alliance in 1999 as a program manager. Russell holds an MBA and an MA from the University of Maryland and a BA from McGill University of Canada.

Board and Professional Affiliations:

- Certified Energy Manager (Association of Energy Engineers)
- Advisory Board Member, Texas A&M Industrial Energy Technology Conference
- Steering Committee Member, Maryland Industries of the Future Program

ADDITIONAL READING

Please see the Alliance to Save Energy's Industrial Energy Efficiency Clearinghouse: http://www.ase.org/section/topic/industry/clearinghouse/, where you will find:

- Industrial Steam Efficiency: Checklist for Getting Management Approval
- Reduce Your Industrial Natural Gas Bill: 10 Timely Tips
- Energy Management
- Financial Resources
- Training
- Cutting Edge Technologies
- Improving Current Technologies
- Professional Development