

# "Life" is Our Ultimate Customer: From Lean to Sustainability

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**F**or decades, Lean Manufacturing has been the best way to run a manufacturing company, and lean principles have been successfully applied in many other industries, including banking, hospitals, and government. However, we have two fundamental challenges:

1. In spite of our best efforts, the U.S. economy as a whole is massively inefficient. Only six percent of materials actually end up in products.<sup>1</sup> Total wastes in the United States, excluding wastewater, now exceed 50 trillion pounds per year.<sup>2</sup>
2. Short-term financial returns always trump longer-term issues such as caring for the environment and social well-being until the long term suddenly becomes short term — like Hurricane Katrina. Then our short sightedness becomes glaringly obvious. We must start becoming serious about our environment and society in order to sustain our companies, our nation, and our world. The irony and tragedy inherent in this situation is that most decision-makers assume that sustainability has a low financial return. In reality, sustainability can return its investment within 6-to-12 months, enabling a company to justify the investment on a purely short-term economic standpoint.

Sustainability is "meeting the needs of the current generation without compromising the ability of future generations to meet their needs."<sup>3</sup> It's the Golden Rule applied across generations. Lean leads us toward sustainability initiatives. Lean tools apply to any kind of problem, including environmental ones. The lean mantra of eliminating waste fits sustainability initiatives perfectly. Because it is much like lean both in concept and practice, sustainability can be thought of as lean extended to a much broader objective.

Sustainability (like lean) has a good track record of improving company finances because of the emphasis on eliminating waste and the substantial increase in creativity by employees at all levels. For example, Timberland, which is trying to "use the resources, energy, and profits of a publicly traded footwear-and-apparel company to combat social ills, help the environ-

## In Brief

Environmentally sustainable practices are a natural extension of lean operational philosophy and techniques. Sustainability can pay off in the short term, not just the long term. Using examples, the article is an overview of both the why-to and some of the how-to of sustainability, with emphasis on how it follows from lean manufacturing.

ment, and improve conditions for laborers around the world," has achieved the financial results shown in Figure 1 over the last five years.<sup>4</sup>

A study of companies over an 11-year period demonstrates that "stakeholder-balanced companies show four times the sales growth and eight times the employment growth of companies that focus solely on shareholders."<sup>5</sup>

Sustainability continues broadening a company's outlook, which has begun with lean. It is a four-way win:

- Owners: Profitability and stock values normally increase.
- Executives: Better financial performance enhances careers. Additionally, executives create a legacy of passing on real value to their grandchildren.
- Employees: People prefer to work with environmentally-sustainable and socially-supportive operations. Like lean, sustainability requires their commitment.
- Communities: They support companies that care about their long-term health and viability.

Sustainability is important to all of us; therefore it applies to all sizes of organizations. As with lean, no operation is too small to engage in it and to benefit from it. As with lean, sustainability requires a change in outlook, thinking, and working culture. Lean focuses on the economic customer; in sustainability, life itself is our ultimate customer.

## What is Sustainability?

The viewpoint of sustainability is the opposite of financial short-term thinking. Like lean, it stresses closed-loop, cyclical thinking rather than linear, goal-oriented thinking. It actually goes even farther, into whole-system thinking, which causes practitioners to look for long-term unintended consequences of their decisions.

Conventional business has assumed an inexhaustible supply of raw material from nature. It has used a "take-make-waste" model, in which virtually all materials eventually wind up in a landfill from which they cannot easily be used by future generations. For 200 years we have been able to find substitutes, often better ones, for materials that were running out, like petroleum for whale oil, or synthetic rubber for natural rubber during World War II. We will continue to improve materials, but this model is not sustainable for the long term, because every material that is easy to obtain will already be in use.

In contrast, sustainability assumes that resources are finite, and therefore that resources should be re-used, and re-used again, and again, so that they are kept in use "forever." Linear thinking transforms to closed-loop thinking or cradle-to-cradle, as it is sometimes called. Additionally, in sustainability thinking, anything that damages the ability of earth to sustain life should be reduced or eliminated. Viewed in this way, the take-make-waste model is both appallingly wasteful and highly detrimental.

Instead we can intentionally redesign our processes so that our outflows become useful inflows to other processes. In CFO terms, instead of us paying to have trash hauled away, customers should pay us for raw material that they can use. Like some lean practices, this sounds highly simplistic, and it is; it takes time to implement, and implementation uncovers one practical problem after another in need of solution. But like lean, it is not impossible, and its benefits can be exceptionally rewarding.

The first rule of sustainability is to preserve our "natural capital," our finite natural resources, especially the soil, air, and

### Financial Results of Timberland, An Environmentally Responsible Company

Sales	Up 9.7% per year
Earnings per share	Up 20% per year
Stock price	Up 64%

Figure 1.

water on which life depends. When we despoil those, we irrevocably reduce the ability of earth to support both present and future life.

In addition to natural capital, sustainability uses the concept of "natural income." Natural income is the resources that nature replaces daily in large quantities, mostly solar energy and derivatives from it, like wind and water power. Earth receives about 15,000 times more solar energy daily than all the energy we use in all forms. We just don't tap it effectively at the present time. Our fossil energy sources are merely stored versions of natural income; however, their supplies are finite, and burning fossil energy impacts our environment. Therefore, sustainability encourages organizations to reduce or eliminate reliance on fossil energy, replacing it with natural income energy. This will leave those marvelously complex hydrocarbons for future generations to use in other, creative ways. (And the economics are starting to favor renewable energy, because of the relentless increase in price of both oil and natural gas.)

The second rule of sustainability is to eliminate the release of toxic materials from our products and our processes. There is no "away" where we can throw them.

Despite progress, we have a long way to go toward reducing toxic disposal. In 2003, U.S. industry released only 4.4 billion pounds of reported chemicals, compared with 6.6 billion pounds in 2000.<sup>6</sup> That one-third reduction is a good start, but we're still dumping too much. These releases have a cumulative effect, like a slow accumulation of mercury in your body. In the four years, 2000-2003, the United States alone released 21.3 billion pounds of toxins; we have no idea how much we have released in the last 100 years. We have no idea how much other countries have released. We have no idea about the long-term effects these toxins may have, and pollution knows no boundaries. For example, the air in the United States now carries pollution from coal-burning power plants in China.

Sustainability is still relatively early in its adoption cycle, like Just-In-Time (the predecessor of lean) was in the 1980s. Predictably, companies fall into one of the following categories:

- Some ignore environmental and/or social regulations, hoping that no top manager assumes the role of CJO — Chief Jailable Officer.
- Most comply with regulations, seeing little benefit in doing more than is minimally required (as they did with quality 30 years ago).
- Some go beyond compliance, and are environmentally-oriented and/or socially-oriented; these companies gain a green image, or benefit from being one of the 100 best companies to work for in the United States.
- A small but growing number are seriously pursuing a true sustainability strategy.

### ***Why Go for Sustainability?***

However, from a long-term global perspective, a sustainable strategy is the best, and perhaps only, choice. For example:

- If China used the same amount of oil per capita as the United States, it would consume the entire present world production of 83 million barrels a day. Even the most optimistic projections of oil production don't see it doubling, and some experts think we're very close to maximum production.
- If everyone on earth lived to the U.S. level of consumption, we would require the resources of five planet earths. Western Europeans have basically the same standard of living, using only about half the resources per capita as Americans.
- Earth's population has doubled since 1960, but the amount of arable land continues to decrease, and the world yield of five major grains is down 15 percent since 1985.
- The United Nations estimates that job-related deaths (accidents and illnesses) claim more than *two million* lives per year, and that number is rising.<sup>7</sup>

- Finally, all the world religions view the earth as a gift from the creator of life, strongly implying that we should treat it respectfully.

We read such things with disbelief, as if from some other world, fearing to take action lest we plunge our company into a financial tailspin. On a planning horizon longer than a few budget cycles, it's obvious that something very different has to start happening, but to start pursuing sustainability, we usually need some nearer-term reasons. An organization's outlook broadens when it adopts the well-known triple bottom line: profit, people, *and* planet, rather than being financially directed toward a single stakeholder (the owners).

The quantifiable business benefits from a well-designed sustainability program fall into the following three classic categories.

**Reducing Operating Costs:** When done by eliminating waste, environmental improvement should also reduce cost unless the anomalies of the cost system mask the effect. For example:

Oki Semiconductor Manufacturing in Portland, OR, implemented one of the first ISO 14001 environmental management systems in the United States. After a year, its ongoing annual savings were double the out-of-pocket costs.

Baxter International saved \$17,000 in three months by reducing water usage in one plant, with no capital investment. Its wastewater treatment plant no longer needed to expand.<sup>8</sup>

The Collins Companies, a wood-products company founded in 1855, reclaimed heat from ovens that cure hardboard coating. It saved \$118,000 in electricity cost per year by installing a single, 300hp electric motor to replace six motors. Altogether, it saved an estimated \$1 million in the first year of implementing sustainability principles.

Rejuvenation, America's largest manufacturer of period reproduction lighting, adopted more environmentally benign manufacturing processes. Results included:

- Higher quality products
- Selling selenium, which had been a

contaminant in their wastewater, to a reclaiming processor. This allowed them to recycle and reuse their water, dramatically reducing the amount of wastewater generated.

- An electrostatic spray system for lacquering reduced VOC (Volatile Organic Compounds) emissions 60 percent, allowed them to use water-based coatings, and produced a more durable coating.

Likewise, companies that adopt socially-friendly policies reduce operating costs due to lower employee turnover, and improve profitability due to their ability to attract and retain brighter and more creative employees (without having to pay a salary premium). For example, Jeff Swartz at Timberland believes that the idea of helping others will create a "more productive, efficient, loyal, and committed employee base, which in turn helps produce 'real' results."<sup>9</sup>

**Attracting and Retaining "Better" Customers:** A company focused on the Triple Bottom Line offers more than price/delivery/quality to potential customers and potential suppliers. Customers interested in more than price are better long-term partners. They have a lower credit risk and a better chance of enduring.

In global markets, U.S. companies can no longer assume that the United States sets environmental standards. Europe has become the leader, passing tough laws for a wide range of products, including chemicals, automobiles, electronics, tools, and cosmetics. All automobiles and electronics either manufactured in or sold in Europe must be taken back *by the manufacturer* at their end of life! Cosmetics and chemicals must pass the "precautionary principle:" they are assumed to be hazardous unless proven otherwise.<sup>10</sup> How long will U.S. consumers willingly lag the protections afforded Europeans?

Both Nike, a leading footwear manufacturer, and Norm Thompson, a leading Northwest retailer, are replacing conventional clothing with environmentally-friendly clothing. Norm Thomson's initial product offering using organic cotton was

so successful that it has expanded that product line.

Lumber companies in Oregon and the Oregon Department of Forestry are investigating the possibility of seeking environmental certification for Oregon forests, a green seal of approval that would help give them an edge in a highly competitive market.<sup>11</sup>

**Reducing Risks:** Companies that have embraced Corporate Social Responsibility ("CSR") have outperformed the broader stock market indices since the inception of the Dow Jones Sustainability Index. And market analysts are starting to realize that socially responsible businesses are lower risk than "profit-is-the-only-goal" businesses, which includes Enron and their ilk.

In its financial cost calculations in loan reviews, J.P. Morgan is including the risk of a company losing business to a competitor that has lower greenhouse-gas emissions.<sup>12</sup> And Swiss Re is starting to charge higher insurance premiums to companies that emit excessive greenhouse gases, because greenhouse gases cause global warming, which increases weather-related insurance claims.

Europe's precautionary principle for cosmetics requires that a chemical be proven safe *before* it can be used on the skin. Some U.S. cosmetics manufacturers, such as Revlon, voluntarily insure that all their products sold anywhere meet that standard. Others, such as Procter and Gamble, produce products that only meet the standards in the market in which they are sold. How will American women react when they realize that companies knowingly sold them products that were deemed unsafe in Europe?<sup>13</sup> Are the companies with dual safety standards opening themselves to future lawsuits, reminiscent of the Ford Pinto lawsuits?

A company that embraces sustainability does not worry about increasingly stringent regulations. At times sustainability can mean the difference between receiving building permits and not receiving them. And sustainable companies are positioned to favor tighter environmental and social regulations that can seriously damage

competitors. Imagine the positive public relations impact of a business that openly favors tighter environmental regulation.

The less quantifiable, but perhaps even more important, aspects of implementing sustainability include:

- Reputation management
- Investor relations and access to capital
- Learning and innovation
- License to operate.

### ***Why Start Sustainability Now?***

Sustainability is rapidly transitioning from a fringe, avant-garde practice to mainstream. Most Fortune 500 companies now have an executive in charge of sustainability. The early adoption phase is rapidly ending. Just like lean in the late 1980s, the companies that adopt sustainability now will enjoy a major, long-term competitive advantage in their industries, which will force the laggards to adopt it.

### ***From Lean to Sustainability***

A company familiar with lean will easily grasp sustainability. Lean works when individuals and teams throughout an organization start asking questions such as "How does this add value to the customer?" and, "How can we do this better?" Lean works when those individuals and teams have the resources, time, and encouragement to identify opportunities, investigate them, and implement improvements. Lean works when management walks the talk.

Sustainability works the same way — the only difference is the decision-making criteria. Rather than focusing on the economic customer (the one who is buying our product or service), sustainability focuses on three bottom lines — profitability, people, and the planet. It focuses on the longer term, on life.

Like lean, Sustainability starts with educating people at all levels to see with different eyes, ask pointed questions, and make decisions based on sustainable criteria. It aligns efforts at all levels toward an easily-understood goal. It depends on, and

rewards, the creativity of people at all levels. However, unlike lean, it taps much deeper into the powerful, deep-seated human desire to help our children and our children's children thrive. Norm Thompson's employees "feel good about working for a company that cares about the health of people and the planet. One said, 'I love this company. It stands for the right things — sustainability and work/life balance.'" <sup>14</sup>

When a company implements sustainability, its employees at all levels start receiving compliments from their neighbors and the community; they work for a company that cares. Few people have ever experienced such an influx of goodwill. Much more than lean, this is a powerful motivation to insure that sustainability produces the promised results.

Sustainability is a new mental model that spreads. When an organization teaches its employees how to use sustainability in their decisions at work, they take them home and use them in the community — in schools, volunteer organizations (scouts, Little League, Rotary, Kiwanis, church, etc.), and in their own lives. They encourage government officials to start using sustainability in their decisions. More naturally than with lean, a company starts to have a substantial, positive, impact on its community at almost no cost.

### ***Extending the Tool Set***

For a company that has started on its lean journey, moving toward sustainability is relatively easy. Many lean tools are easily adapted and extended for sustainability, as illustrated by the following examples.

*Value Stream Mapping:* Widely used in lean thinking to see a whole picture and decide where to focus improvement efforts, it readily extends to sustainability, especially to the environmental side. Just add appropriate metrics, such as hazardous material used/generated, water used, and energy used.

*Work Teams:* Just as in lean, work teams are the heart of sustainability — they do most of the thinking, the data gathering, the analysis, the idea generating, and the

implementing. And work teams, by their very nature, implement the social side of sustainability.

*5S:* For sustainability, some companies add a sixth S, Safety, to classic 5S, which implements the social side. A few add a seventh S, Sustainability. However, this reduces sustainability to a tactical tool, rather than an overarching objective and compelling vision.

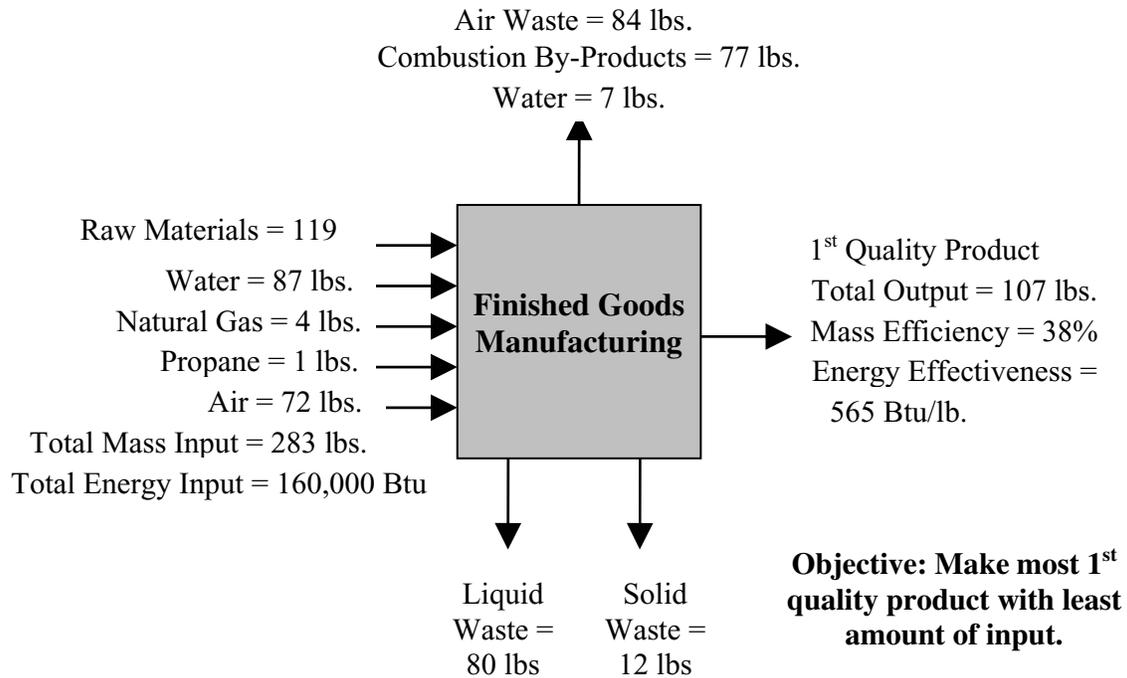
*Analysis Tools:* Teams focusing on sustainability can incorporate traditional lean analytical tools, such as Pareto charts, Ishikawa diagrams, and the "5 why's" into their analyses. For example, hazardous material and releases of toxic substances can be analyzed as if they were process defects. As with correcting quality problems at the source, the preferred solution for hazardous materials is to eliminate the need to use them. If that can't be done, kaizen the usage, inventory, and handling to the minimum possible.

### ***Additional Tools for Sustainability***

Since one main objective of sustainability is to live within nature's income, use of key resources, such as materials and energy, must be monitored as processes are improved or redesigned. The preferred approach is a mass and energy balance on a process, an input-output analysis like chemical engineers perform with a chemical process. This can range from very simple to highly complex.

A "gray box" example of resource usage is shown in Figure 2. It is taken from carpet manufacturing at Interface, Inc., one of the environmental leaders of U.S. industry. To analyze the overall picture, it regards the entire process as a big gray box. Of course, sub-processes can be analyzed the same way with a mass-energy balance to come up with improvement ideas, subject to the usual problem of being able to measure the inputs and outputs, as shown in Figure 3.

To lean practitioners, Figure 4 looks more familiar. It is a Value Stream Map from Baxter Health Care, modified to track the usage of just one material, water, in the



*This figure is courtesy of Dave Gustashaw, chief engineer of Interface, Inc. Dave prepared it using data from Interface, Inc. and it is taken from slide 15 in Dave's presentation, "Applied Sustainability in Lean Operations," AME Conference 2005, Boston, MA.*

Figure 2.

**Breakdown and Simplification of the Gray Box**

*This hypothetical example assumes a bicycle manufacturer. The top diagram is a simplified breakdown of processes inside the overall gray box. The bottom diagram is a breakdown of processes in the paint department.*

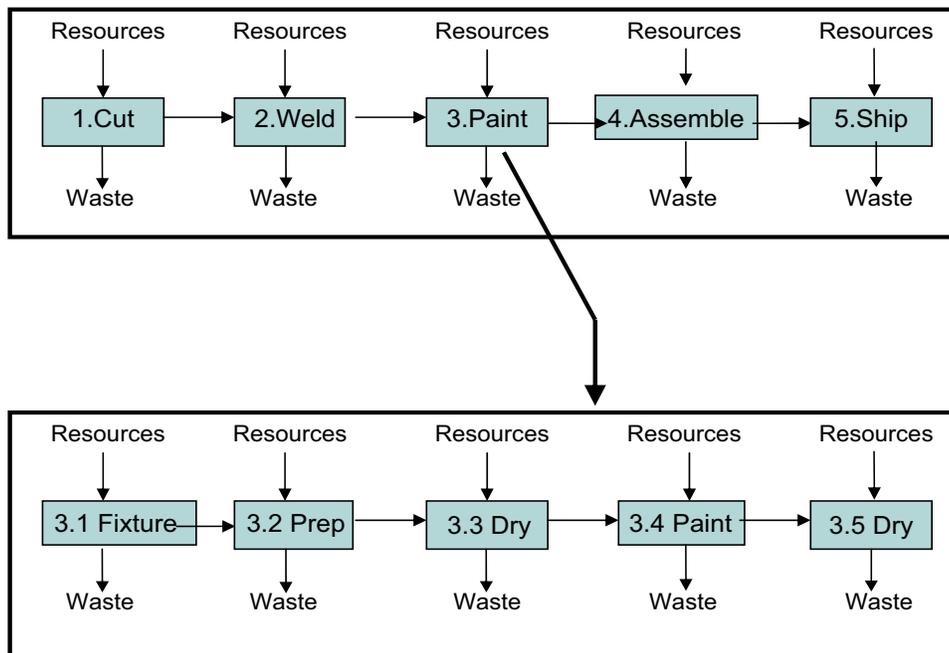
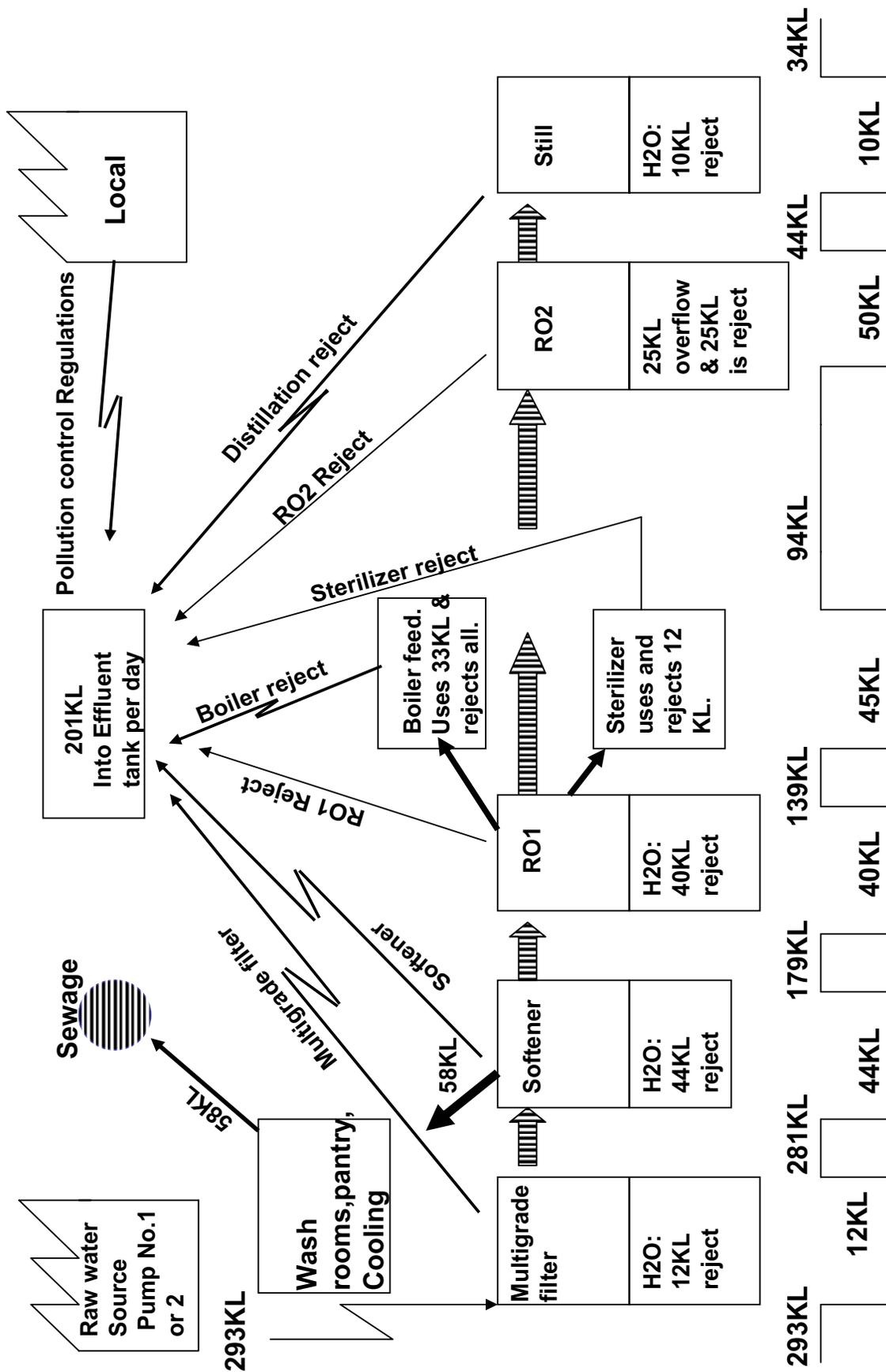


Figure 3.



Initial Usage (KL/day) = 300KL Per Day  
 Product Need Per Day = 34K L Per Day

Figure 4.

production of a product line, rather than a complete mass/energy balance. Note that Baxter discovered that their product needed only 34 KL per day, but that they were consuming 300 KL per day, of which 201 KL went into the effluent waste stream. The opportunities were enormous; they were wasting 125,000 gallons of water per day.

Metrics make a vision become real in practice. Besides the metrics that usually guide lean operations, a few others are often associated with sustainability:

- Environmental:
  - Energy used per unit of output
  - Percent of energy from renewable resources
  - Yield: Mass of finished goods per mass of raw material consumed
  - Percent of raw materials reused or from recycled sources
  - Emissions, especially greenhouse gas emissions, both total and per unit of output
  - Effluents discharged per unit of output
  - EPA(Federal)/DEQ (State) awards

- TRI/SARA (toxic substances) reporting — number and names of substances, and pounds used, discharged in waste, or lost, both total and per unit of output.
- Social/people
  - Percent of pension funded
  - Workplace safety — number of lost time accidents/year
  - Investment in people (education: number of hours of training and education per person per year)
  - Rank in 100 best places to work
  - Number of product recalls in the last five years
  - Number of community service hours per employee
  - Employee turnover. <sup>15</sup>

**Costs, Paybacks, and Risks**

From a business strategy viewpoint, sensibly starting down the sustainability path is a no-lose proposition, as shown in Figure 5. Of course, long-term, sustainability is something we all have to do, but companies worry about how it will affect the

**Should We Risk Being a Sustainability Leader?**

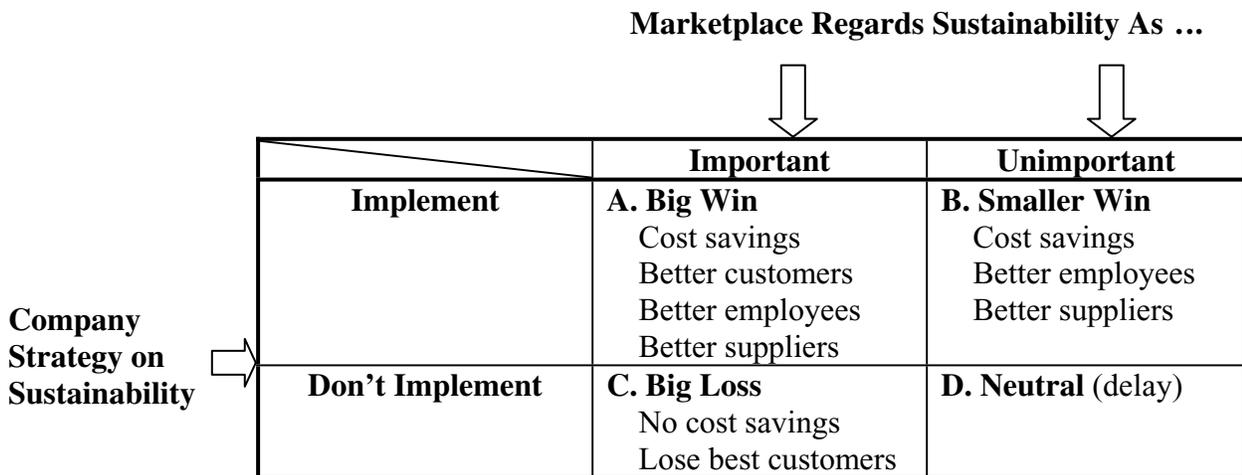


Figure 5.

business in the next 5-10 years. Can a company risk being a sustainability leader?

Figure 5 is oversimplified. If a company's customers and investors expect it to be a sustainability leader, and it is not, its public relations black eye is not easy to fluff over.

By contrast, a sustainability leader attracts environmentally-minded and socially-minded customers, employees, and investors. However, if the company is not really serious about sustainability, it may be accused of "greenwash."

But, as with lean, with an honest effort toward sustainability, a company attracts customers with similar values. It can also obtain better supplier partnerships, and if it must survive using more limited resources, it has a head start learning how to do so. The real risk is in being a sustainability laggard. For example:

- Lagging the marketplace in thought leadership, U.S. automobile manufacturers were caught without a line-up of offerings the market wanted to buy during the oil crisis in 1974, a situation that is starting to replay in 2005.
- "Also-ran" customers and suppliers will be forced to partner with other "also-rans."
- A lagging employer will have great difficulty attracting and retaining the best and brightest employees.
- A laggard will carry higher risk for insurance premiums, higher rates from financial institutions, higher risks from regulatory fines and penalties, and worst, higher risks of exclusion from markets that are strictly regulated.
- Laggards risk greater disruption if the cost and availability of raw materials and natural resources rises.

The major tactical question is how to prioritize sustainability compared to other initiatives, and whether it can be successfully implemented while other programs are also being implemented. Like lean, sustainability is a journey rather than a discrete project. Like lean, it requires more management leadership than financial investment.

Like lean, a major risk is the organizational impact of a "failed" implementation.

Then risk-avoiders will hesitate to embrace a second effort at sustainability.

There are always potential technological risks — if a company pushes the state of the art, the result might be costly, or even a failure. However, most of the gains in a typical sustainability implementation carry little technological risk. For example, technological risks are very low from categorizing each chemical as red, yellow, or green, based on its toxicity, with the intention of phasing out all red chemicals. Working to reduce the waste of resources throughout the supply chain does not inherently require technological risk. Implementing an Environmental Management System, such as ISO 14001, does not require technological risk.

### **How to Start**

Even more than lean, sustainability can start in an individual department of a company, then spread. Because sustainability is basically asking the right questions, balancing society, company profits, and the environment, many people inherently want to support it. It's not a "hard sell," except to overcome the assumption that it is economically unattractive.

For example, the U.S. Army now has embraced sustainability as a strategic initiative. But this initiative did not start at the top level, or even with military personnel. It began with a mid-level civil servant who read a book, then invited friends to start a book group, reading and discussing a book a month. Members of this group told others and gave them books to read. One such book recipient was the commander of a fort landlocked in a populous area, constantly criticized by the community for its impact on the environment, so he tried a pilot sustainability program. He and the community were both pleased with the results, so he told another base commander, who tried a pilot program with similar results, and the idea began to spread.

Sustainability works in organizations of all sizes, profit and non-profit. It works in offices, stores, manufacturing plants, transportation companies, schools and universities, hospitals, and government at all

levels. You can start asking the right questions in any operation, coach people on the tools, and then letting the practice start to spread naturally.

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*Gary Langenwalter is a principal in ConfluencePoint, a Portland, OR consulting group specializing in creating the business and economic case for companies evaluating sustainability, then assisting them to successfully implement sustainability. For nearly 25 years before that he was both an industry executive and a consultant involved in lean strategy and lean implementation.*

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**Footnote:**

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15. For a complimentary copy of a sustainability check sheet, contact Gary Langenwalter — ([glangenwalter@confluencepoint.org](mailto:glangenwalter@confluencepoint.org)).

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