Intelligent Technology and the 8-5-3 Method

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ABSTRACT

This paper suggests that a reliable template exists for driving sustainability in food processing establishments using intelligent technology to measure utility cost and its embedded carbon at the package level.

The 8-5-3 Method is an actionable template for sustainable food and beverage processing. It views a food processing facility as **8 systems** in **5 zones** using a **3-phase implementation** process. This template integrates sustainability data into product costing models using intelligent efficiency systems that link utility/waste cost and carbon at the package level.

The 8-5-3 method is based on first-hand plant management experience, the lessons learned from 300 audits done in Ontario's food industry since the mid-1990s and extensive industry outreach.[1] A practice at the core of this method continues to be overlooked or ignored because its benefits are not generally understood. This practice is to network utility sub-meters for monitoring and targeting (M&T) with a software package known in the industry as an Energy Management Information System (EMIS) plus employee training to create a positively-reinforced behavior environment for sustainable action.

The outcome of the approach is verifiable data that supports:

- Data collection for retail sustainability screening,
- Cost-effective utility and waste management habits,
- Action planning for facility and corporate efficiency mandates, and
- Prioritizing efficiency projects that drive costs out of renewable energy projects.

Introduction

This paper discusses intelligent efficiency as an approach to sustainable food processing. The approach is called **8-5-3** where the **8 systems** typical to a food plant are managed through **5 zones** in **3 phases**.

North American food and beverage manufacturers are being strongly encouraged by retailers to participate in sustainability reporting. Retailers such as Walmart, Loblaw's and Sobeys with operations in Ontario view sustainable manufacturing is a pre-competitive requisite to market access.[2] Their initial focus was to look at packaging, product re-formulation and logistics for sustainability actions. While these foci have obvious financial and carbon footprint benefits, process sustainability continues to elude most food processors as a realistic opportunity.

One challenge of implementing operational sustainability gets obscured with competitive corporate agendas such as consolidation and labor productivity. Consolidation is an effective

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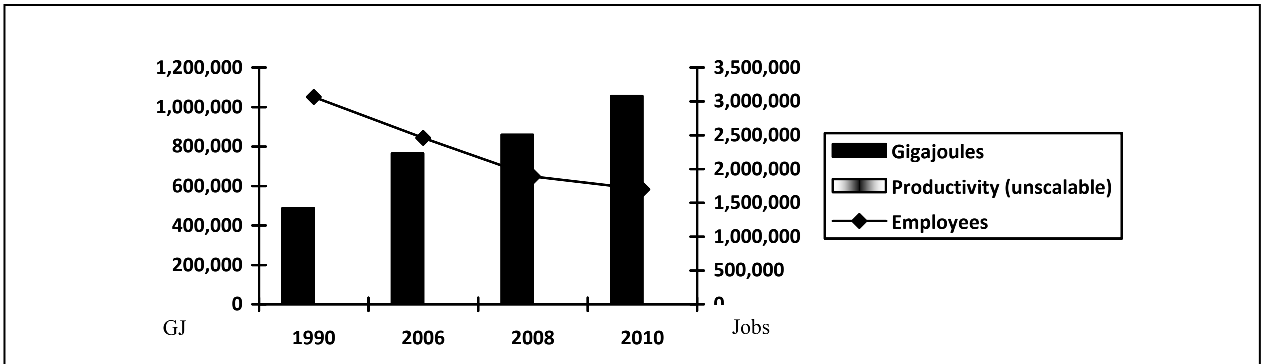
[1]Personal observation: the author has worked with and toured more than 1000 of Ontario's food and beverage facilities since 1992 on behalf of what is now the Ontario Ministry of Agriculture and Food and Ministry of Rural Affairs. Since 1992 these facility tours have included informal "walk-through" efficiency audits.

[2]David Cheesewright, President & CEO, Walmart Canada Corp. 2011. "Opening Address." Walmart Sustainability Packaging Conference V in Toronto, Ontario, Canada. June 22.

means to reduce footprints when closing a facility. Labor productivity at the remaining facility is generally an exchange of manual effort for mechanization. The invariable increase in energy demand swells the size of a facility's environmental footprint; unless the capacity for utility management is already embedded in that facility. This increase is demonstrated in **Figure 1**, below.[3] Between 1990 and 2010 overall manufacturing energy use increased 200 percent while employment declined by 55 percent. At the same time productivity per employee only rose 7.7 percent.[4] The rise in productivity does not show up in Figure 1 due to differences in scale.

Figure 1. Energy per Manufacturing Employee in Canada, 1990 to 2010



Source: Adapted from NRCan's Comprehensive Energy Use Database Table and Statistics Canada.[5]

A challenge that can impede operational sustainability and utility efficiency is the order in which projects are undertaken. Doug Dittburner, one of Ontario's leading sustainability practitioners in the food sector suggests that every dollar spent on what 8-5-3 calls **R**eadying and **O**ptimization saves $3 to $5 of integration costs.[6] The order of approach reduces financial risk and improves the return on investment.

Natural Resources Canada's sustainability trainers also note that an absence of adequate preparation such as the lack of intelligent technology linked to sub-meters or the reliance on a single champion to undertake discrete sustainability projects leads to what these trainers term utility creep.[7] Utility creep is a term used to describe how utility efficiency gains are lost over time as efficiency gain awareness wanes in a three to five year period. Natural Resource Canada's Dollars and $ense trainer attributes this to a lack of integrated metering that standardizes and benchmarks acceptable utility use.

There is an inverse relationship for Canadian manufacturers where increases in productivity are 1:25 versus energy consumption but 1:(5) for productivity versus employment.

Embedding an aptitude for utility or energy management cannot ensure processes become or stay sustainable. In a food or beverage processing establishment there are food safety and

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[3]Rubin, J. 2012. Page 37, *The End of Growth*. Toronto, Canada. Random House of Canada Ltd.: Rubin, a long-time Chief Economist for TD Capital suggests that the relationship between economic expansion and energy use is 2:1. Two percent economic expansion incurs a one percent increase in energy use. Energy use in by Canadian manufacturers appears to be increasing twenty-five times faster than productivity.

[4]Statistics Canada. 1990 through 2010. "Annual Survey of Manufacturing and Logging."

[5]Natural Resources Canada, *Comprehensive Energy Use Database Tables*. http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/trends_egen_ca.cfm

[6]Dittburner, D. (Campbell Soup). Personal communication. April 27, 2009.

[7]Dixon, S. 2010. "Customized Dollars and $ense Workshop." Ontario Ministry of Agriculture, Food and Rural Affairs. June 22.

environmental compliance requirements that mandate utility use.[8] Food safety regulations pose a unique challenge to sustainable production. Water and energy use are mandated in food safety regulations, which in turn trigger environmental compliance requirements. The food and beverage sector must use potable water (with its embedded energy load), regularly sanitize facilities (creating wastewater loads); heat, cook, refrigerate and freeze and ultimately dispose of wastes in a way that protects food from contamination.

Off-the-shelf processing technologies that are employed by the food and beverage sector are typically "stand-alone" equipment. Boilers, cookers, fryers, heaters, coolers, refrigeration systems, freezing tunnels, air compression systems and waste management equipment are designed for single functions (a boiler makes hot water, an oven bakes bread and a cooler keeps an internal temperature). Equipment is designed to shed wasted energy into external environs – which is more often than naught inside the facility.

And finally, the ability to implement change is driven by what a leading expert in positive psychology, Mark Weber, has identified as driven by situation, habit and cooperative behavior.[9] Weber argues that change is primarily driven by situations, not individuals. In order to effect change, a situation is the strongest predictor of lasting behavioral change. Ethics or moral views are the result of behavior more than the driver of behavior. The lesson for energy efficiency then follows that a habitual practice is needed to drive change. A habitual practice that also drives cooperation inside of a group (such as a corporation, its individual facilities and functional groups within an entire organization) provides individuals with the means to manage a situation.

What is the 8-5-3 Method?

The 8-5-3 Method combines intelligent technology with an intentional template to:

- Identify baselines,
- Cut invisible costs,
- Avoid risks linked to poor environmental performance for green marketing,
- Avoid financial risks due to wrong-sizing capital projects and
- Use real and verifiable data from the corporate to the facility to the package level.

From a corporate perspective, retail sustainability reporting supports the linkage of utility use to carbon management.[10] This mirrors an existing operational tool known as product costing models that are used by manufacturers at the facility level where variable costs such as

[8]Schmidt, K. (Food and Consumer Products Canada.) 2007: Personal communication. FCPC staff counted the regulations and acts that affect the food industry. They found 442 and that list has increased.
[9]Mark Weber Ph.D., University of Waterloo, 2013: Personal communication. March 4.
[10]Embedded carbon in utilities used in Ontario are as follows:

- Natural gas, 56kg/GJ. Canadian Steel Producers Association and Natural Resources Canada. 2007. *Benchmarking Energy Intensity in the Canadian Steel Industry.* http://oee.nrcan.gc.ca/industrial/technical-info/benchmarking/canadian-steel-industry/6602. Ottawa, Canada. Natural Resources Canada.
- Electricity (Ontario 2009), 100gm/kWh. Environment Canada. *Canada's national Inventory Report: 1990 – 2009. Electricity Intensity Tables* http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=EAF0E96A-1
- Water (depending upon source) 68 to 97gm/m3 and wastewater (depending upon source) 106 to 111gm/m3 found in Maas, C. Page 20. *Greenhouse Gas and Energy Co-Benefits of Water Conservation*. POLIS Research Report 09-01. Victoria, B.C., Canada.

ingredients, packaging, labor and other overhead are calculated at the package level. The 8-5-3 Method supports a change in a manufacturer's product costing model data collection that ties the operational impact of carbon to utility use and even solid waste management.

The intelligent technology component is off-the shelf equipment and software that is adapted to the site. Utility use is metered throughout a facility at discrete points that reflect the technologies used in that facility and the areas that those technologies affect or pass through. Real time metering information is compiled in a centralized data management system capable of producing a baseline facility utility profile that is readable by time of use, volume of use, cost of use and conversion to carbon coefficients for each utility type.

8-5-3 is mnemonic, developed as a memory aid to minimize risk (cost) for practitioners as they implement their sustainable processing goals. These mnemonics are as follows:

- "**8**" technology systems that include the following:

    1. Heating, Ventilation and Air Conditioning (HVAC),
    2. Lighting,
    3. Compressed Air Distribution,
    4. Combustion or heat transfer (heaters, fryers, cookers, ovens and pasteurizers),
    5. Refrigeration (cold storage and freezers),
    6. Motors and Conveyors,
    7. Sanitation and Process Water, and
    8. Energy Generation (boilers, water treatment, heat exchangers, water heaters, air/refrigeration compressors, electricity transformers and electricity ingress.)

- "**5**" zones in a food plant that include:

    1. Building shell,
    2. Processing floor,
    3. Storages and shipping,
    4. Waste management and
    5. Energy generation.

- "**3**" phases of implementation that include the following:

    1. **R**eadying,
    2. **O**ptimization, and
    3. **I**ntegration.

How 8-5-3 Works

The **8-5-3 Method** addresses water, energy and waste-flow through a facility. The complexity of 8 systems through at least 5 identifiable zones can be unraveled.

The **8 systems** can be stand-alone or composite technologies common in food plants.[11] For example, combustion equipment may include direct contact equipment such as fryers, ovens

[11] Dick, P. Page 3. *IDU Bulletin 004: Implementing and Planning Best Management Practices for Utility Efficiency in Food Processing Establishments*. Guelph, Ontario. Ontario Ministry of Agriculture and Food.

and heaters where heat loss occurs inside production areas. Similarly, gas-fired boilers, a combustion-based technology, are included in the "energy generation" category as the combustion function is not a direct contact technology, but rather to supply an energy-related product. Some technologies are exclusive to one zone, such as heat transfer equipment is often localized on the processing floor. Other technologies, such as lighting may be in all zones.

The diagram in **Figure 2** represents a schematic view of the **5 zones** in a food plant that relate to the 8-5-3 Method. These zones have been shaded to help the reader differentiate the zones. They are as follows:

- Zone 1: The building shell. Lighting; heating, ventilation, air conditioning and cooling (HVAC) are technology systems that are attributed to this zone. Utility use in this zone contributes indirectly to manufacturing processes. These are invisible inefficiencies that have a cumulative effect on production and refrigeration systems.

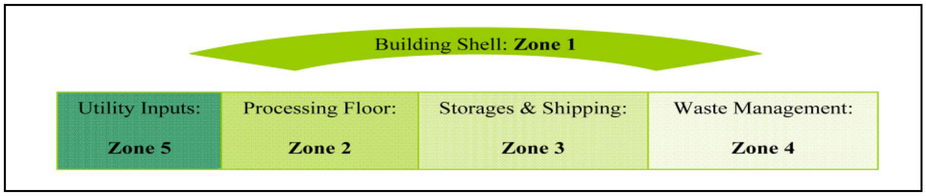
- Zone 2: The processing floor. In this zone energy and utilities are in direct contact with product. It is also one of the greatest areas of invisible heat loss in a food plant, The area also contributes most to solid and liquid wastes.

- Zone 3: Storages and shipping. This zone tends to be impacted by invisible heat loads from other areas. To properly understand the opportunities for efficiency in this zone, the mitigation of invisible loads from other areas changes the utility options that are required.

- Zone 4: Waste management. There is a comparatively low utility load in this zone. Waste is the greatest contributor to the processing footprint in a food or beverage facility.

- Zone 5: The utility inputs zone. The sequencing of Zone 5 is intentional. Technology upgrades, recycling and green energy options will change a facility's footprint. The economic and sustainable viability of such projects depends upon sequencing. This zone feeds production and storage zones with energy supply and the utility use within the zone is parasitic. Optimization of systems in all zones in Phase 2 reduces financial risk associated with the capital-intensive projects of Phase 3.

Figure 2. The Zones in a Food Plant



Source: Ontario Ministry of Agriculture and Food and Ministry of Rural Affairs, 2013.

Businesses that are very good at managing their utility costs intuitively follow a three-phase approach. The order is important. Each phase builds upon the previous phase in a way to avoid projects that undo each other. The phases are as follows:

- Phase 1: **R**eadying focuses on people and the tools to support intelligent efficiency.
  - Build a management team and workforce that use intelligent tools to see where utility use happens, when it happens. Behavior management skills learned and practiced in this phase are amplified in later phases.[12]
  - Tie utility use product costing models at the package level.[13]
  - Develop baseline and benchmark utility and waste performance.[14]
  - Identify how efficiently the facility rests.
  - Audit system efficiency for low-hanging fruit of awareness-based work habits.
  - Develop Key Performance Indicators (KPI's) that tie performance on the plant floor to cost and carbon at the package level.
  - Verify baseline and benchmark performance with a third party.

- Phase 2: **O**ptimization (Process) focuses on the efficiency of systems where they occur.
  - Leak-proof systems by insulating heat transfer surfaces; eliminate leaks in compressed air systems, steam lines and water lines; make power factor corrections; upgrade lighting and HVAC. Target parasitic loads first.
  - Upgrade equipment; install variable speed drives, close-loop boilers, install automatic lighting and motor controls; replace and/or upgrade compressors, motors, conveyors and combustion equipment (ovens, fryers, heaters, etc.)
  - Conduct pinch analysis to measure and evaluate recoverable waste heat loads.

- Phase 3: **I**ntegration (Technology) focuses on technology that re-integrates waste as an energy source across zones from one system to another.
  - Close the loop. Recycle waste heat and wastewater.
  - Install heat exchangers and cooling towers and water recovery technologies.
  - Minimize and turn wasted outputs into recovered energy and water.
  - Find alternative energy uses for wastes that cannot be recycled or used internally.
  - Invest in green energy technology after internal utility use and waste is minimized.[15]

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[12] In Ontario, food and beverage processors are directed to Natural Resources Canada's Office of Energy Efficiency. This organization offers a 5-workshop program called "Dollar and $ense." Participants learn the basics of M&T and EMIS.

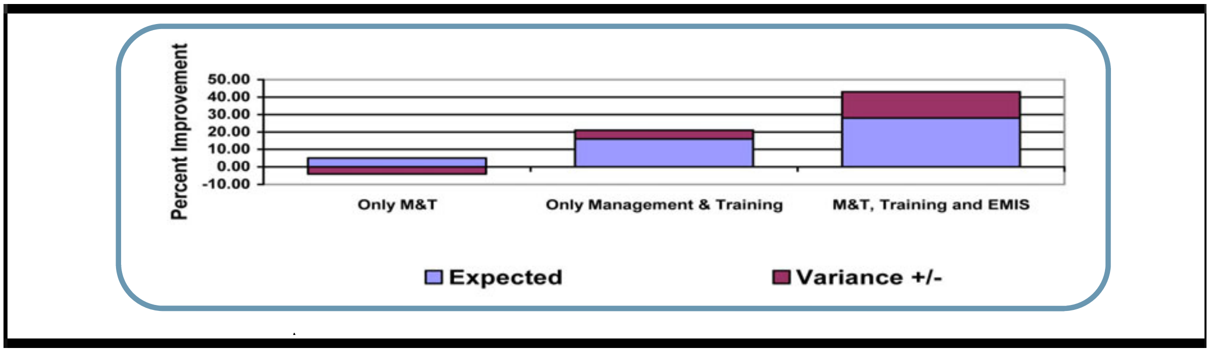
[13] Of all the possible actions that impact overall utility cost management, the ability to track utility use at the package level, which requires sub-metering of utilities at the system level by production line and process provides a level of cost control that drives utility efficiency down to the point of use. A facility that is able to integrate sub-metered utility information into their product costing models is able to provide verifiable proof of utility performance that can be measured as both cost and carbon at the package level. A third party can verify actual data that meets retail sustainability reporting requirements. The outcome is an ironclad proof of performance and avoids the cloud of greenwashing that is associated with unfounded "green" marketing claims.

[14] The ability to understand how well a facility rests provides an insight into baseline performance. While at rest, invisible and parasitic loads tend to be at their lowest point.

[15] Personal observation: one of the most costly lessons learned by sustainability practitioners is that greener energy sources have a far lower capital cost after facility utility use is minimized. In Maastricht, the Netherlands, a transnational paper manufacturer called SAPPI installed a 70 megawatt cogeneration plant in the mid 1990's with the support of a national clean energy program. In the following decade the company pursued intensive internal efficiency measures that reduced the required load to the lower end of the system's operating performance. During the same period of time, the parent rationalized its continental production, leaving the facility with a continental

The "how" of the 8-5-3 Method is in execution. Layers of inefficiency may be either invisible or parasitic and must be peeled away prior to integration actions. This is a challenging task. Most technology in a food plant is installed as a "stand-alone" system, often to ensure food (or product) safety. Prioritization enables the sustainable efficiency practitioner to identify an optimal sequence of efficiency. There are more than 160 efficiency projects that have been identified for food processors.[16] Efficiency projects undertaken in sequence that may reflect immediate payback or relative awareness contain capital risk. **Figure 3** was originally adapted from content included in a customized "Dollars and $ense" workshop that was delivered to Ministry of Agriculture and Food staff. It suggests both the downside risk of a "technology only" solution and the upside benefit of Phase 1: **R**eadying actions.

Figure 3. The Impact of utility management actions



Source: Taken from "Leaner and Cleaner is Greener", page 28.

A consideration for both risk and reward of sustainable efficiency actions is scale of utility use. Some technologies, such as centrifugal air compressors are made for a 200 horsepower load. Small waste heat loads may not be viably recovered. The recognition of the scalability of utility reduction changes a decision point for using green energy technologies. A food processor with an overall utility bill of $25,000 may not justify more than **R**eadying and **O**ptimization. **I**ntegration options may be limited to a few solar thermal panels for hot water or the purchase of renewable energy. **Figure 4** provides an indication of the impact of scale.

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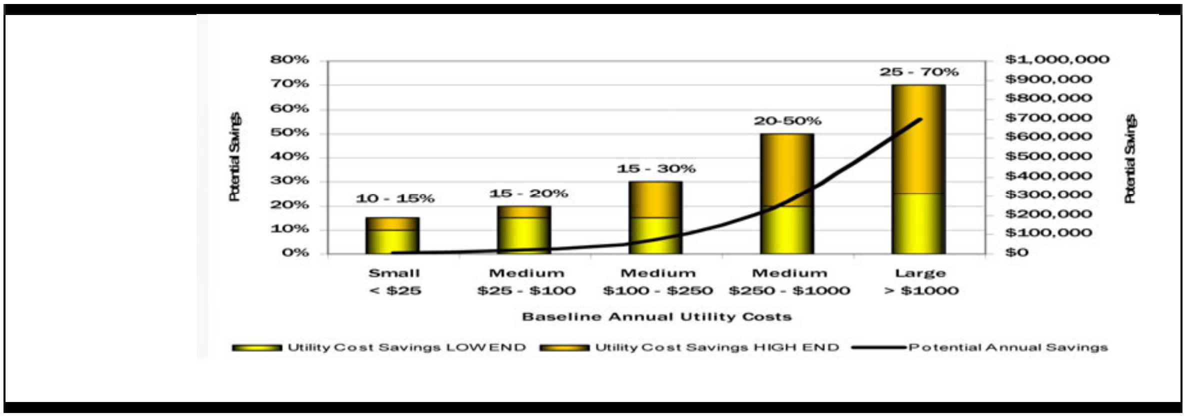
mandate for its products. The plant was then left unable to pursue further energy efficiency, creating a competitive disadvantage issue, as further efficiency would force the company to close its co-generation facility and become even less cost competitive. The author visited this facility in 2006.

[16]Dick, P. and A. Meyer. 2013. Pages 88 to 90. *Leaner and Cleaner is Greener: 8-5-3 an Operator's Primer*. Guelph, Canada. Ontario Ministry of Agriculture and Food and Ministry of Rural Affairs: Since 2002 energy efficiency experts in Ontario have focused on "what to do." This began with a ministry project by Altech Environmental Consulting Group and the Ontario Centre for Environmental Technology Advancement. It involved a media scan for environmental efficiency case studies. The lead researcher, Henry van Resnburg collected data that was incorporated into a 2003 OMAF publication *IDU Bulletin 004: Implementing and Planning Best Management Practices for Utility Efficiency in Food Processing Establishments*. Mr. Van Rensburg has since taken a position with Marbek consulting where he contributed to a Canadian Manufacturers and Exporters 2010 project entitled "Advancing Opportunities in Energy Management in Ontario Industrial and Manufacturing Sector," pages 92 to 113. These lists have since been revised for the 2013 publication to reflect sequential efficiency opportunities.

The ranges of opportunity are based on data collected from 300 food plant utility audits conducted in Ontario since 1990.[17] What the data indicates is that scale of use creates a payback opportunity for efficiency. At the lower levels of use, the "low hanging fruit" related to behavior and system optimization. Intensified utility use is linked to higher levels of mechanization.

Figure 4. The Potential for Annual Cost Savings as a Percentage of Total Utility Costs



Source: Taken from "Leaner and Cleaner is Greener", page 6.

Prioritizing "what to do first, second, third …" requires an understanding of what the opportunity for efficiency might be in a facility. While there is a wide range of technology used by the food and beverage sector; food safety and environmental regulations lead to a determinable technology profile. From bakery to bakery, abattoir to abattoir or cannery to cannery, equipment is remarkably similar. Equipment manufacturers are few and specialized equipment is standardized. Food plants vary very little between Canada and the U.S.A.

In 2010 the U.S. Department of Energy completed a carbon and energy use profile of several sectors, including food processing.[18] **Table 1** illustrates the theoretical waste factors of the **8 systems** found in food plants. The table also illustrates how much of that waste is viably recoverable with existing technology that has been proven in Ontario's food industry.[19]

[17]These audit programs included the Ministry of the Environment (1990 to 1998), Ontario Hydro (1990 to 1994), Union Gas (1999 to 2010), Enbridge (1999 to 2010), Natural Resources Canada (1999 to 2006) and The Ontario Ministry of Agriculture, Food and Rural Affairs (2009 to 2011).

[18] Found in the *Heads Up CIPEC Newsletter*, Volume XIV No 18, October 1, 2010. "U.S. Department of Energy introduces Manufacturing Energy and Carbon Footprints."

[19]The term "viably recoverable" means that utility costs can be recovered with payback.

Table 1. Loss Factors Linked to Food Plant Systems and Demonstrated Reductions[20]

System	Theoretical waste factor	Potential versus proven targets Potential	 Proven
Building shell systems	70%	60%	**42%**
Lighting	92%	30%	**28.5%**
Compressed air	80%	50%	**40%**
Combustion	70%	55%	**38.5%**
Refrigeration	50%	50%	**25%**
Motors and conveyors	25%	25%	**6.25%**
Sanitation and process water	95%	100%	**47.5%**
Thermal energy generation	65%	80%	**52%**[(Ontario)]

Source: Adapted from U.S. Department of Energy, Manufacturing Energy and Carbon Footprints, 2010.

The next step is to understand where technology systems produce waste and in the case of the U.S. Department of Energy study, what the level of heat loss a system produces.

Understanding the proportion of utility use by system, each system's unimproved efficiency, each system's carbon impact and each system's potential heat loss provides the efficiency practitioner with a baseline model that an adequately sub-metered facility can use in an EMIS model and prioritize site-specific cost and carbon savings opportunities.

Table 2 takes U.S. Department of Energy data and compares it to heat losses and carbon emissions within specific zones. The figure is based on average performance. It is important to note that as systems are improved or replaced heat losses may disappear. As those heat losses disappear, invisible impacts also disappear. For instance, a lighting upgrade from high density sodium to LED lighting may reduce lighting electricity use as much as 70 percent as it reduces heat loss from lighting to almost zero.[21] The heat loss reduction can reduce refrigeration demand, air exchange, and peak electricity loads but destabilize power factor improvements.[22] These changes need to be monitored and verified with M&T and EMIS in order to be able to make the next move.

[20]These calculations are based on more than 300 food and beverage plant audits; 160 international case studies and 40 Ontario case studies between 1990 and the present.
[21] Oliphant, B., Third Planet Energy. 2013: Personal communication. February 6.
[22] Lighting, unlike motors has no embedded electrical resistance. Where lighting loads are reduced in proportion to motor loads, a facility's power factor may decline in proportion to the change.

Table 2. System Efficiency, Facility Carbon Impacts and Heat Loss by Zone

Technology	Energy Use	Efficiency	Onsite Carbon	Heat Loss
Energy Supply (Zone 5 – Energy Generation)				
Boilers	35%	**80 to 55%**	**43%**	14%
CHP	13%	**75%**	**25%**	
Power Factor Loss	3%	**0%**	**N/A**	N/A
Process energy (Zones 2, 3 and 4)				
Heating	48%	82%	**22.5%**	**25 to 55%**
Cooling and refrigeration	6%	**65%**	N/A	9.5%
Motors	15%	**57%**	>1%	N/A
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- Pumps	*23%*	*75%*		**up to 70%**
- Fans	*11%*	***50%***		
- Compressed air	*11%*	***10%***		
- Materials handling	*9%*	*75%*		
- Materials processing	*37%*	*75%*		
- Other	*9%*	*75%*		
Non-process energy (Zone 1 – Building Shell)				
Lighting	2%	**9%**	~3%	**91%**
HVAC	6%	**64%**	~ 3 to 6%	**98%**

Source: Taken from Dick, P., *Leaner and Cleaner is Greener*, page 38.

In **Table 2**, priority targets are bolded. These vary by system, zone and carbon impact. Heat loss is one indicator that will change in a pinch analysis after system optimization. In other words, the impact of optimization is why you don't lead with system integration and why M&T with EMIS is an effective risk (cost and carbon) reduction strategy.

Sustainable Manufacturing Disrupts the Status Quo

Figure 1 (page 2) illustrates the status quo. Manufacturers in Canada trade labor intensity for utility intensity with a limited improvement in productivity. While natural gas has declined from $11.00 per gigajoule to about $3.00 per gigajoule since 2008; water, wastewater and electricity utilities have been increasing about 10 percent per year.[23] Despite a steep decline in natural gas wellhead prices, the cost of service and distribution for natural gas is included in an overall utility rate cost increase that is faster than a parallel increase in overall inflation.

A secondary effect of energy efficiency is a parallel decrease in maintenance costs.[24]

Sustainable, energy efficient manufacturing employs disruptive technology to reinforce new habits and as the positive psychologist Mark Weber has said, "*Habits affect beliefs*."[25]

Change is risk and risk is cost. At the retail level, risk is carbon. The challenge is to drive out cost along with carbon. The ability to link carbon and cost in a food manufacturing facility (industrial energy, water and organic waste management) at the facility level exists.

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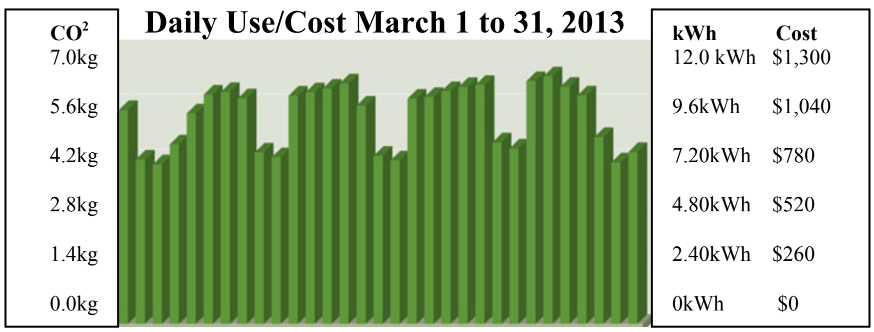
[23] These figures are based on data collected by ministry staff from Union Gas, the cities of Toronto, Hamilton and London (for water and wastewater) and published historical electricity rates from the Ontario Power Authority.

[24] According to the Aberdeen Group, a 10 percent improvement in energy efficiency has been linked to a 14 percent decline in maintenance costs (which includes both capital and labor.)

[25]Weber, J.M., 2013: Personal communication. March 3.

The technology for cost and carbon management has been available for decades, but it is only in the last few years that the situation has changed to support the adoption of this disruptive technology. **Figure 5** provides a monthly view of just HVAC utility use in an Ontario-based facility and measured between March 1 through 31, 2013. The technology is able to roll up the daily impact of a single system (as in this case) or a facility composite by CO^2, energy unit and cost.

Figure 5. Real Time M&T Plus EMIS Energy Data by Carbon, Kilowatt and Cost



Source: Used by permission of Oliphant, B., Third Planet Energy, 2013

The consulting provider, Third Planet Energy, is able to translate data into both cost and carbon. Such a depth of granularity permits the following:

- Granular data can be extracted at a sub-metered production line level.
- EMIS can be configured to produce dashboards and reports by product line and by zone.
- Utility cost, utility volume and carbon are measurable at the package level.

Product Costing Model, Intelligent Efficiency and Effective Utility Management

Product costing models are a key to the connection between cost and carbon for manufactured products. The ability to convert live data, as displayed in **Figure 5,** into the package level translates efficiency actions into the product from the plant floor. The communication of margin and sustainability using the same data set is made relevant across an organization.

Published evidence of the practice in Ontario's food sector is fragmentary. Ministry of Agriculture and Food and Ministry of Rural Affairs program staff recognizes that this as an opportunity for further research and demonstration. There are examples known to the author:

- Between 1986 and 1989 the author managed sales and procurement at a frozen vegetable facility with M&T in its processing plant. Data was manually loaded into product costing models and product line performance models. The author executed optimization projects that drove two cents per pound out of variable costs on 60 million pounds of output worth $43 million for a gross margin improvement of 5 percent.

- The Unilever facility in Rexdale Ontario reduced utility use $1million per year after installing an M&T and EMIS system between 2000 and 2005.[26]

- Repath Sugar in Toronto Ontario reduced energy use by 50 percent and water use by 60 percent after developing an in-house intelligent efficiency system.[27]

Conclusions

1. The ability to convert utility volume and cost is measurable and verifiable. Intelligent technology is available to measure manufacturers' utility use at a granular level that can include:

    - Granular product line utility use that can be translated to volume of use, cost and carbon at the package level;
    - Granular system and zonal utility data to prioritize actions, and
    - Aggregate data that can be verified by a third party for sustainable performance.

2. Granular utility data is convertible to verifiable carbon-equivalents.
3. Corporate energy/utility efficiency targets and retail sustainability reporting can use the same data set with intelligent technology.
4. The measurement of utility use at the system and zone level supports positive behavior (habits) at the point of use.
5. It may be possible to ameliorate a manufacturing trend where productivity improvement and energy intensity are less divergent and sustainability.

References

Dick, P. 2003. "Implementing and Planning Best Management Practices for Utility Efficiency in Food Processing Establishments," IDU Bulletin 004. Ontario Ministry of Agriculture and Food. Guelph, Ontario, Canada.

Dick, P. and A. Meyer. 2013. *Leaner and Cleaner is Greener, 8-5-3 an Operator's Primer*. Ontario Ministry of Agriculture and Food and Ministry of Rural Affairs. Guelph, Ontario, Canada.

Dittburner, D. (Molson Canada) 2009. Personal communication. April 27.

Hishon, B. (Repath Sugar) 2004. Personal communication. December 2.

Maas, C. 2009. *Greenhouse Gas and Energy Co-Benefits of Water Conservation*. POLIS Research Report 09-01. Victoria, B.C., Canada.

Oliphant, B. (Third Planet Energy). 2013. Personal communication. March 12.

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[26] Dittburner, D. (Unilever Canada), 2005: Personal communication. July 13.
[27] Hishon, B. (Redpath Sugar) 2004: Personal communication. December 2.

Pilat, D., A. Cimper, K. Olsen, and C. Webb. 2006/9. *The Changing Nature of Manufacturing in OECD Economies*. STI Working Paper JT03216689 Document complete disponible sur OLIS dans son format d'origine. Complete document available on OLIS in its original format DSTI/DOC OECD Directorate for Science, Technology and Industry.

Rubin, Jeff. 2012*. The End of Growth*. Random House of Canada Ltd. Toronto, Canada.

Shah, M. and M. Littlefield. August 2010. *Carbon and Energy Management in Manufacturing Operations*. The Aberdeen Group, Boston, U.S.A.

Stantec Consulting, Marbek and ODYNA. 2010. *Advancing Opportunities in Energy Management in Ontario Industrial and Manufacturing Sector*, Final Report. Submitted by Canadian Manufacturers and Exporters. Mississauga, Ontario, Canada.

Statistics Canada, *Annual Survey of Manufacturers*. 1990 through 2010.

"U.S. Department of Energy introduces Manufacturing Energy and Carbon Footprints." Heads Up CIPEC Newsletter. October 1, 2010. Volume XIV No 18.

Weber, J. M., PhD. (Associate Professor of Management and Organizations, Faculty of Environment, University of Waterloo) 2013. Personal communication. March 3.