

# Global Energy Management System Implementation: Case Study

Canada



## Catalyst Paper

Achievement by Crofton Division

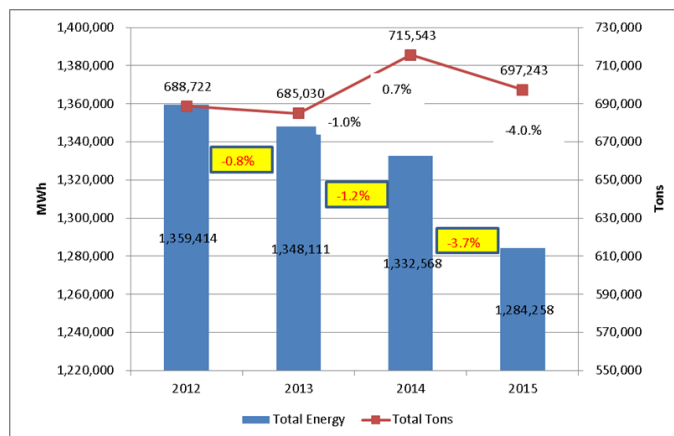


Crofton Mill, Power and Recovery Area

### Business Benefits Achieved

#### 1.1. Business Benefits (Summary)

Our initial goal was to reduce 3% of electricity consumption in three years, but exceeded these expectations. Using 2012 as the baseline year, we reduced 5.6% in this period, with a total offset of purchased power of 7.3%.



*The strategy was formulated with the clear goal of using the solid framework of the ISO 50001 to achieve continual improvement in energy performance as part of the business culture, but never was the goal to achieve a certification. We saw certification as a distraction of the real goal. Any certifications or rewards must be seen as a natural compensation for the results and success and not as a goal*

—Edinson Mahecha, Energy Manager

#### Case Study Snapshot

Industry	Manufacturing
Location	Crofton, BC
Energy Management System	ISO 50001
Product/Service	Pulp and Paper
Energy Performance Improvement (%)	5.6%
Annual energy cost savings	\$3,263,885
Cost to implement	\$28,060
Payback period	Less than a year

#### Company (or Facility) Profile

Located on southern Vancouver Island near the town of Duncan, Catalyst Paper's Crofton division is British Columbia's only integrated paper and pulp manufacturing plant and is the largest of Catalyst Paper's three Canadian divisions.

The Catalyst Crofton Mill produces pulp using the Kraft process, and paper from thermo-mechanical pulping. Catalyst is BC Hydro's larger single customer, and energy is the second largest cost.

Crofton operates two paper machines and two pulp machines, producing newsprint (349,000 tonnes per year) and Kraft pulp (335,000 tonnes), which is used to manufacture printing, writing and tissue papers. Crofton

employs 578 people.

“For companies like Catalyst, with very high energy intensity, you need systems that have long term stability and are not dependent on regional or even national policy”

—Carlo Dal Monte, Director of Energy

## Business Case for Energy Management

### Drivers/Business Case

#### Energy's role in corporate strategy

As an energy intensive industry, we recognize that energy has as a significant impact on the sustainability of our business and the environment. Significant efforts have been made to reduce energy intensity using different methods and evolving in our approach of energy management and energy performance improvement.

“Energy management is not a program in Crofton is the responsibility of everyone in our company and needs to be incorporated and supported in our day to day behaviors”

—Edinson Mahecha, Energy Manager

### Drivers

- ✓ In 2012, BC Hydro announced an electricity rate increase of 27% for the next five years.
- ✓ After emerging from a bankruptcy protection, a solid energy management framework was necessary for the long-term future of the Mill
- ✓ Global competition with decreased global paper demand makes more imminent the necessity of cost reduction and efficiency in order to survive.
- ✓ Increase energy sustainability and reduce the environment impact.
- ✓ Becoming a leader in energy efficiency in our community and industry sector

### Energy management program

The following are some of the provincial and national programs supporting energy management actions:

- ✓ BC Hydro Power Smart Program
- ✓ National Resources Canada (NRCAN) - Leaders CIPEC (Canadian industry for energy conservation)
- ✓ Fortis BC (natural gas and electricity): Energy Specialist program

### History of energy reduction approach

Since 2007, Crofton has participated in the Industrial Power Smart program with BC Hydro, which positioned the company well for implementing ISO 50001 in 2015. It also had a good experience implementing energy conservation projects and had already achieved ISO 14000 and 9000 certification.

Until recently, energy management was project-driven; success tended to depend on the particular talents of the energy manager who happened to be on staff – and whether the company had funds available for capital projects. Before 2011, we had a good plan and were making progress, but we had no framework – records, processes or consistency – integrated into our business plan.

### Keys to Success

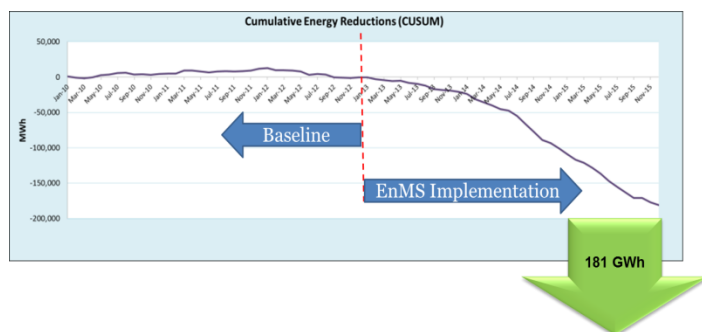
- A. Collaboration between industry and government is the surest route to a successful EnMS.
- B. The company must recognize that energy conservation is a responsibility.
- C. Crofton defined an energy policy that is realistic and useful
- D. Working with an experienced implementation coach (in Crofton's case, US energy consultant Enernoc) was essential to the company's early success. The coach had experience in ISO 50001 certification as well as in the pulp and paper industry.

### EnMS Development and Implementation

#### Business Benefits

From 2012 to 2015, the mill has achieved a 5.7% reduction in electricity consumption, using 2012 as the

baseline year. The combined strategy of consuming less while generating more has had a great benefit of offsetting purchased power in 7.2%. At the same time,. The CUSUM analysis shows a cumulated energy savings of 181 GWh in the three years of ISO 50001 implementation



“The ISO standard doesn’t save energy – it’s just one way of having a robust energy management system that drives energy savings. Creating the system is hard work – but it’s rewarding because it’s an investment for the future

—Edinson Mahecha, Energy Manager

On top of the energy and cost savings from the better energy management system, other benefits came from the ISO certification:

- ✓ Drive to improve performance: the internal and annual surveillance audits introduce a level of rigour that forces the mill to make sure that it delivers on commitments.
- ✓ Commitment with our neighbors: Certification shows that Catalyst Crofton is attaining to global standards of resource conservation.
- ✓ Market Branding with environmental responsibility.
- ✓ Customer retention
- ✓ Stronger partnerships with BC Hydro.

## 1.3. Organizational

### Crofton energy Team

The Crofton Energy Team coordinates the Energy Management System within the Crofton Mill Site. For practical reasons, the Crofton’s Energy Team has the same representation as the Senior Management Team,

and has specific monthly meeting to review the energy performance.

#### The Crofton Energy Team:

Vice President and Mill Manager	Manager, TMP & Stock Prep
Manager Technical Services	Crofton Controller
Manager, Maintenance	Manager, Utilities
Manager, Utilities & Kraft	Manager, Environment
Manager, Distribution & Fibre	Manager, Energy
Manager, Paper machines	Manager, Health and Safety
Manager, Human Resources	Energy Manager



“Our Energy objectives are perfectly aligned with the Mill’s annual financial plan. Expected energy savings are baked into our financial plan, so if a project is not delivering, then the Senior Management Team hold the process owner accountable and works with the owner to achieve the expected results

—Berk Borrett, Technical Services manager

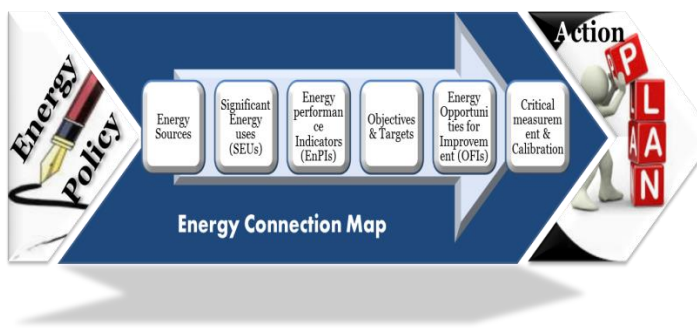
### Corporate Energy Improvement Team

The Corporate Energy Improvement Team is led by the corporate Energy Director and coordinates the Energy Management System activities across the company. It includes the energy manager from each division.

### 1.4. Energy Review and Planning

The review is a fundamental piece of the energy management system. The first step was the definition of the energy policy as our navigation card. This document is the main input for the energy planning process.

We developed a tool called the “energy connection map” where the initial input is the energy policy goals. The second step was the identification of Significant Energy Uses (SEUs) as focus areas..



#### Energy policy

The energy policy was created in 2013 and endorsed by the Mill Manager.

These goals determined the specific focus for each SEU, facilitating the definition of objectives and targets in an annual basis, tabulated in an energy score card. These targets are defined in alignment with the company's business plan and embed energy reductions in each year target to ensure the persistence of each project benefit.

1. Maximize our specific energy consumption
2. Maximize internal power generation
3. Minimize dependence of fossil fuel
4. Minimize greenhouse gas emissions.

#### Significant Energy Uses (SEUs)

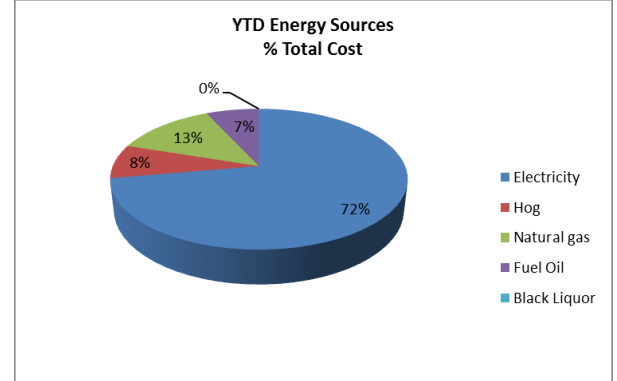
The selection of Significant energy uses in an integrated Pulp and paper facility with a cogeneration system was a little unconventional. The paper business is the biggest user in electricity, and the pulp business is the bigger user in thermal energy. Additionally, our self generation system provides clean energy to offset the BC Hydro

power. The SEU's are: TMP Refining system, Turbo-generator, Boilers and steam system.

#### Energy Sources

The main energy sources are:

Source	Consumption (GJ/Yr.)	Cost (\$/Yr.)
<b>Electricity</b>	3,574,117	54,453,964
<b>Hog</b>	2,724,498	5,894,644
<b>Natural Gas</b>	1,778,619	9,819,868
<b>Oil Fuel</b>	413,701	5,203,135
<b>Black Liquor</b>	7,274,679	0,0
<b>Total</b>	<b>15,765,614</b>	<b>75,371,612</b>



#### Monitoring, measuring and analysis

The Energy Management Information System (EMIS) provides the inputs to the Energy Review process and necessary and relevant information for the past and present evaluation of the energy sources. The simplified diagram of the EMIS is shown below.

With the implementation of the energy Management information system, we evaluated the deficiencies of the EMIS and implemented improvement in the following areas:

1. Power meter system upgrade: replacement of 64 electro-mechanical meters and software
2. Perform a site wide steam balance (process integration analysis)
3. Regression analysis for determining baseline.
4. Audit of the critical instrumentation of the SEUs and establish a phased improvement plan

## Energy Score Card

The energy score card is used as a dashboard of the main EnPIs, their contribution among the energy goals and yearly and monthly targets. Each target is defined during the energy planning process and includes the energy conservation projects of the previous years and commitment for the year. This score card uses a visual colored code system to facilitate the communication of the performance.

Area/Unit	Target Year	Target	Actual Month			YTD			
		Month	Actual	Variance	%	Target	Actual	Variance	%
Site MWh									
Demand KVA									
Site Mwh/Ton									
Paper KWh/Ton									
TMP KWh/Ton									
Pulp KWh/Ton									
Site MWh									
Gas GJ									
Oil GJ									
Electricity \$									
Fossil Fuel \$									

CO2OL CO2e		< 20%		> 20% < 100%		> 100%
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## Opportunities for improvement (OFIs)

Company has designed program where all employees contribute with the improvement of the company submitting opportunity for improvement ideas. At the end of the fiscal year, employees are rewarded based on financial performance of the company.

The energy review process uses this program to generate energy opportunities for improvement in a continual basis, and uses the EMIS as an input for the analysis and the awareness and competency training program to promote this process.

## Financing

In this budget wasn't including the internal manpower from energy manager, energy team and ISO management representatives. Sources of funding and actual cost:

Source	Activities	Cost
BC Hydro	Gap analysis, external consultant,	\$100,094

NRCAN	Training, understanding ISO 50001, Certification Audit- stage I	\$7,549
Catalyst	Internal consulting, Admin support – share point development, certification audit – stage II	\$28,060

\*BC Hydro contribution is estimated because they pay directly the consulting under the Power Smart Coaching program

\* Internal Auditor training was not delivered

## Duration

In January 2012 we started the journey of creating the business case. The idea was presented to BC Hydro, who approved the funding for the Gap analysis under the “energy management coaching program”. Two internal experts in ISO 9000 and ISO 14000 were fundamental in the visualization and simplification of the new management system.

By the end of 2012 we completed the GAP analysis and layout the implementation plan. The process took nine months, with some overlapping with the first internal audit and the first readiness evaluation (external). At this point the results in performance was very rewarding and encouraging for the certification. In January 2015 we achieved the certification as the second company in British Columbia and the first pulp and paper industry in North America.

## Development and use of professional expertise, training, and communication

The initial training was design to introduce the concept of ISO 50001 to the senior managers. SAI Global is our registrar office and also delivered this initial training.

The second step was to develop a communication, awareness and training plan with the support of the external consultant ENERNOC

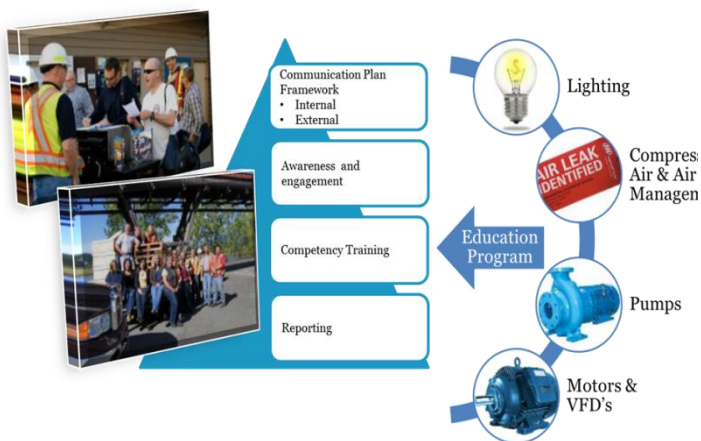
## Energy University

The energy university concept was created to provide energy competencies. We use our computer based training program (CBT) to facilitate the training.

The energy awareness program includes four areas: communication, awareness and engagement, competency training and reporting.

The awareness and engagement uses also the computer based program (CBT) and three main modules:

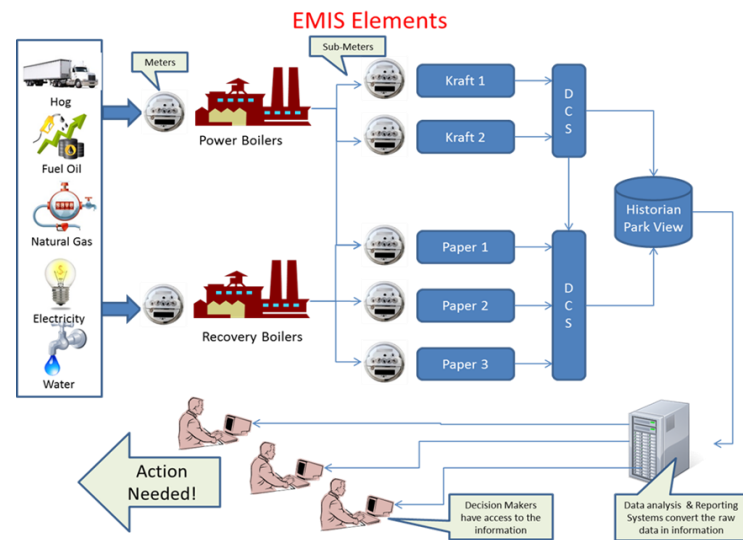
- ✓ General awareness, which is mandatory for all employees
- ✓ Awareness for visitor and contractors, which is delivered at the main gate, before accessing the plant,
- ✓ Procurement awareness, which is designed to create awareness in energy efficiency in procurement and life cycle analysis.



## Tool & resources

### Energy Management Information System (EMIS)

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### Integration ISO 9000/14000/50001

The existing culture of ISO management, the infrastructure for the documentation system and administration of existing standards facilitated the initial design for ISO 50001. Each system has the documentation in a share point application in the intranet. An initial assessment showed that fifty percent of the elements were shared between the three standards. We built the new ISO 50001 using the existing model and unifying the three systems.

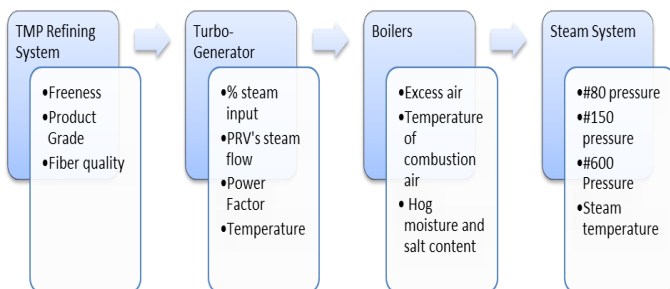
## Steps taken to maintain operational control and sustain energy performance improvement

Operational controls were identified for SEUs with specific activities that combine measurement, calibration and training requirements.

These requirements were evaluated against existing standard operational procedures (SOPs) and preventive maintenance routines. The biggest deficiencies have are reliability and calibration of critical instrumentation.



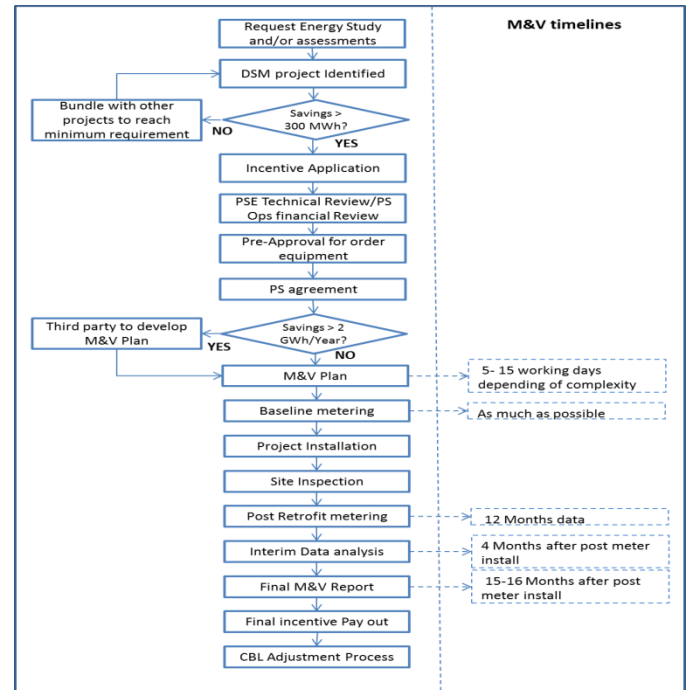
**Power & Recovery control room operating Crew** ant variables, including additional information necessary for measuring and monitoring.



Approach used to 1) determine whether energy performance improved and 2) to validate results

## Measurement and verification (M&V)

With the BC Hydro SEMP program we have establish a very specific measurement and verification process that follows international guidelines and BC Hydro requirements. Each project under the registered program is evaluated and monitored in the same way



M&V process for BC Hydro energy conservation projects

## Auditing process

Certification as an end in itself can distract employees from making improvements. However, the auditing process keep you focus, centered and accountable.

"People try to impress the auditor instead of focusing on getting energy savings. We always tell them to be honest and open with auditors with the objective of learning as much as possible. I felt this was the best way to stimulate real change."

—Edinson Mahecha, Energy Manager

The initial Gap analysis was performed with all the elements of a formal internal audit to determine the level of compliance with ISO 50001. This was a very successful way to evaluate and establish a realistic implementation plan.

Internal Audits are fully integrated for the three ISO management systems: 9000/14000/50001. We used a third party audit for objectivity. Envirochem Services has been performing this internal audit for the existing ISO

systems, but now the integrated audit reduces time and cost for the company.

### Nonconformities, correction, corrective action and preventive actions

Catalyst paper uses very practical software to report, analyze and follow up on these actions: “preventive and corrective action request (PCAR)”. This program also is integrated for all three ISO systems and is reviewed every month by the senior management team.

“Catalyst has a long history of using ISO registered management systems since the mid 1990s and one of the key pieces of our systems is the Preventive/Corrective Action Request (PCAR) engine. We have a very robust, company wide online PCAR system which provides all employees access to flag issues which we then track until their completion. What’s great about our approach is that it integrates our environment, quality and energy management systems at all sites on a single platform.”

—Graham Kissack, Vice President, Corporate Responsibility

### Cost-benefit analysis

This cost-benefit analysis is based on 2015 performance year and using 2012 as the baseline year. 2015 is the year when we achieved the certification.

	2012	2015	Difference	%
Purchased Power - MWH	1,068,870	992,217	(76,653)	-7.2%
Generated Power - MWh	290,544	307,271	16,727	5.8%
Total Energy - MWH	1,359,414	1,283,892	(75,521)	-5.6%
Demand - KVA	1,672,588	1,603,211	(69,377)	-4.1%

Using 2015 energy rates of: \$42.48/MWh and \$8.13/KVA

Energy cost savings: \$3,263,885

Demand Cost savings: \$563,710

Total Cost Savings: \$3,827,595

Catalyst Total Cost: \$28,060

Simple pay back: Less than a year

Consideration for this analysis:

- Includes only the Catalyst cost of the implementation.
- Doesn't not include capital cost for any energy conservation, energy efficiency or energy generation projects.
- Energy consumption is also directly proportional to production. However, production increased 1.2% in 2015 with respect to 2012.
- Savings are calculated based on avoided purchased power.

### Lessons Learned

#### Challenges and barriers

- With multiple divisions, the decision of implementing the EnMS wasn't corporate, it was only focused in Crofton Division
- Senior Management and employees could be confused and reacted to the implementation thinking that is complicated and demands more paper work and administrative tasks.
  - Certification can be seen as a distraction and unnecessary expense.
  - Senior managers at first could not see the financial benefits of the certification. The business case was focus on the implementation.
- Traditionally, energy had not been a business priority. A fundamental cultural change was needed.
- Few precedents in manufacturing industries, especially in pulp and paper.
- There wasn't an organized government- industry program in British Columbia

ISO 50001 certification at Crofton is a massive accomplishment for Catalyst demonstrating their leadership and how to leverage BC Hydro Strategic Energy Management program as a foundation for improved energy performance. With their ISO system in place, Crofton will continue their track record as an energy management leader and innovator, influencing others across Canada.

—Kevin Wallace, BC Hydro Manager Business Strategy, Industrial Marketing and Energy Management

### Lesson Learned

- Make sure you deliver what you promise. If you don't, you will fail to achieve buy-in and your EnMS will not be sustainable.
- Money talks. When you're making your case, frame energy management as financially beneficial.
- Embed energy management in business practices rather than treating it as a mere "program" or "project".
- Effective energy planning means being able to replicate all the steps. Effective mapping is essential to a successful EnMS.
- Senior management needs to be on board and accountable for savings. This motivates them to participate in the process.
- Focus on overall performance and savings, not the raw numbers of your energy 'score'.
- Don't try to impress auditors with sophisticated ISO language. Instruct employees and managers to ask sincere questions and expect valuable answers.
- Use ISO auditors as resources, asking penetrating questions and accruing tangible value as a result.