Implementing an Effective Energy Management Information System

Presented by Mark Collins - Ekhosoft
Tembec
New Systems Strategy
Tim Brown - CIO
Energy Management - Katherine van Nes
Option 3

Mark Collins, President, Ekhosoft

Energy Management

• The opportunities in Energy Management
• Approach to tackling an EMIS initiative
• Case Example with PI & Ekho from Arcelor Mittal
Ekhosoft & the Ekho Application Solution Framework
Ekho with ERP & the PI System

- **Enterprise Management**
  - Accounting, Finance, Treasury
  - Supply Chain Management
  - Sales & Distribution
  - Material Management
  - Product Lifecycle Management

- **Operational Management & Intelligence**
  - Production, Downtime, Quality
  - Environment, Health & Safety
  - Recipe Management, Centerlining
  - Energy Management
  - Performance Analytics (KPI's, OEE)

- **Process Information**
  - Real Time Process Information
  - Powerful Analytical Tools
  - Process Displays & Trends
  - Asset Framework & Event Frames
  - Process Visualization Tools
Industries Served

Process Industries

Renewables
Justification for an Energy Management Initiative
Carbon Trust says…

• “Reducing energy use makes perfect business sense; it saves money, enhances corporate reputation and helps everyone lead the fight against climate change”.

• … and this is even more true in Energy Intensive industries like Pulp & Paper
Examples of savings

- **Honda’s** US plants consume 35 percent less energy and produce 35 percent fewer greenhouse gas emissions than similar non-certified automotive operations.

- **Molson’s** Breweries has achieved decreases of 39 per cent in natural gas use, 27 per cent in electricity use, and 36 per cent in water use.

- **Zirkle Fruit** has achieved energy reductions of 34.2 percent over a five year period.
Examples of savings

- **US National Carwash** has achieved 33% energy savings thanks to motion, drives and electrical distribution solution

- **Labatt’s** achieved 550,000 m³ in natural gas savings in 15 months through low or no-cost measures

- **Unilever** achieved $1M in first year, and $2.4M/yr sustainable savings
Efficient devices and installation (10 to 15%)  
Optimized usage via automation (5 to 15%)  
Monitoring & Maintenance (2 to 8%)

Energy Consumption

Time

100%

70%

EMIS Justification – 30% Energy Savings Potential
Factors impacting EMIS Justification

• The type of process the site is operating
• Process constraints
• The maturity of the organization in terms of its energy management systems and procedures
• The maturity of the site
• The abilities and motivation of the operational staff
Return on investment

In our experience,

a) Common sense buys you a lot of savings when it comes to energy

b) Spending on equipment, metering and systems can cost a lot of money, but the returns make the investment very worthwhile.

c) Key thing is that you follow a methodology in developing your Energy Management program.
Case Histories
Case studies

- $1M Reduction of Electricity Costs in First Year
- Saved $20 million in Energy Costs – and then some
- Eliminated $30 million in annual recurring energy costs in 3 years
• Large Pulp & Paper producer in Canada (now Resolute)

• Total annual energy spend $760 million, including $500M electricity cost per year

• 5 mills in Ontario

• $90M spent on electricity in Ontario, Canada
AGGREGATE
### IMO Price Watch - Energy

#### IMO Forecast - Energy

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**HOEP:** $76.43  10/2/2002 9:00:00 AM

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Crude Oil Falls on Expectation of Global Surplus, Even With Production Cut
Net result:

- $1 million saving on purchased energy in first 9 months after go live
- Eventually entered the energy business, selling power to the grid when the price was right, making profit rather than making paper.
• Another large Canadian Pulp & Paper company
• Over 100 production facilities in NA and Europe
• Energy costs are 25% of net sales
• Project undertaken in 2006 with a view to reducing energy usage
Energy Numbers

- Electricity: 16%
- Natural Gas: 26%
- Wood: 31%
- #6 Oil: 6%
- Steam: 6%
- Steam Residues: 15%

Big Total: 36 MGJ
The Bottom Line

- Once fully deployed Cascades expects to reduce energy usage by 3% (conservative) - 10% (aggressive)

- With energy costs of 375 MM$CDN per year the annual savings @ 3% reduction is 3% * 375 MM$CDN =

- 11.25 MM$CDN

- (10MM$USD)
Actual results:

- Achieved $20 million in savings across their energy portfolio
- Formed a separate entity to manage energy and provide consulting services
- Developed a centralized, real time monitoring system to track cost build up against standards for production runs.
- Saved $100,000 on one grade run on the paper machine
CASCADAS VIS-À-VIS THE INDUSTRY

Cascades consumes 52% less energy than the Canadian pulp and paper industry average. Cascades' North American plants consume 11.34 gigajoules per metric tonne of saleable products (GJ/mt), while the industry consumes an average of 24.75 GJ/mt.²

2X MORE EFFICIENT THAN THE INDUSTRY AVERAGE

ENERGY IS 8TH LARGEST EXPENSE FOLLOWED BY FIBRE SUPPLIES AND REMUNERATION

THE ANNUAL ENERGY CONSUMPTION OF 756,189 CANADIAN HOUSEHOLDS.³
Key lessons -

• Energy Management is a process – not a project

• Set your goals high – the sky is the limit.
• Kodak Park
  – 1,300 acres
  – 150 Buildings
  – 20 million sq ft under roof
  – 30 miles of road
  – Have their own fire dept, railroad, water/wastewater plants & two power plants

• Energy Management System built on the PI System from OSIsoft
Overview

Kodak Park Power

Total MW 98.4 Megawatts

Total Steam Flow 1,426 KPPH

Exhaust Head Steam Flow 132 KPPH

Steam Flows KPPH

- Package Boilers 0
- Boiler 13 116.0
- Boiler 14 103.1
- Boiler 15 410.8
- Boiler 41 400.9
- Boiler 42 402.5
- Boiler 43 0.0
- Boiler 44 0.0
CHILLED WATER
Actual results –

• March 2007 Shutdown One Powerhouse
• Savings in excess of $12 Million after 1\textsuperscript{st} year
• Cumulative savings over $30 million after 3 years
Lessons learned
First measure showed a huge problem
Use “makalar”

- **Measure** - involves common sense, metering, and the use of the PI Data Historian
- **Analyze** - is the process of reviewing and interpreting the data, and comparing to targets, standards or norms
- **Know** - is understanding what you have uncovered. Make sure you have a good EMIS
- **Act** - is to put into action corrective measures to improve Energy Management
- **Learn** - is to continue to monitor the corrective actions and
- **Refine** - is to continue to monitor the process and keep striving for improvement.
EMIS Components

- Energy Account Centers
- Meters and Inputs
- Data Capture and Integration
- Data Analysis and Reporting
- Management Systems, People and Procedures

Source: Natural Resources Canada’s “Energy Management Information Systems Planning Manual and Tool”
Case Study at Arcelor Mittal
Arcelor Mittal Hamilton East (AMHE)

• Part of Arcelor Mittal Long Carbon North America
• Produces variety of steel wire products
• Renowned for cold heading products and oil-tempered wire
AMHE Background

- 10 separate process areas
- Over 50 separate active energy consumers
- Electricity, natural gas, steam
- Minimal plant floor data collection
- Equipment independently controlled (No controls infrastructure)
- PI System infrastructure in Contracoeur

Existing Ekho installation in Contracoeur

Electricity vs. Natural Gas

- Monthly Average Electricity Consumption (GJ): 85%
- Monthly Average Natural Gas Consumption (GJ): 15%

Electricity Cost vs. NG Cost

- Electricity cost annual (actual 2011, 5): 53%
- Natural gas annual cost (actual 2011, 5): 47%
Objectives

1. Reduced base load
2. Reduced variability (against energy drivers)
3. Increased efficiency (via operational opportunities)
4. Reduced cost
Energy Account Centers

- Cleaning
- Wire Drawing
- Strandig & Stabilizing
- Oil Tempering
- Straighten & Cut
- Annealing
- Bundling
- Finished Goods Storage
- Electrical General
- Natural Gas Unaccounted
Metering

- Meters are expensive
- Strategic planning needed to identify needed meters

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<th>Description</th>
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Data Capture & Integration

Energy Data Management

- Totalization
- Conversions
- Calculation of Derived / Virtual Metering Points
- Aggregations by Unit, Work Cell and EAC Entities
- Normalisation of Energy Data
- Correlations against baselines, targets and thresholds
- Events and Alarms

Data Collector

- Electrical Consumption Data from Meters
  - 9 Meters, 24 Pts
- Natural Gas Consumption Data from Meters
  - 11 Meters
- Steam Gas Consumption from Meters
  - 4 Meters

Interfaces

- Union Gas
- Environment Canada
- IESO
- SAP
PI Infrastructure

- No additional onsite physical infrastructure
- Connection to sub-metering (no PLCs)
- Bring back all available variables
- Detailed variable analysis
- Calculations
  - Derived meters (today and future)
  - Totalisations in required contexts (kW to kWh, flow to scf/lbs)
  - Conversions (steam to natural gas)
Key EMIS Functionality – Phase 1
Key EMIS Functionality – Phase 2
Energy Consumption
Energy Conservation Measure

Energy Management Portal

Energy Conservation Measure

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<th>End Time</th>
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<th>During</th>
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Timeline

- #1 Cleaning Line: From Dec 31 2013 9:09PM To Sep 20 2013 8:59PM
- #1 Pusher Furnace: From Dec 31 2013 9:09PM To Nov 1 2013 8:50PM
- Plant Air: From Jun 30 2013 9:09PM To Nov 30 2013 8:50PM
- Hot House: From Jul 30 2013

Graphs:

- #2 Cleaning Line - From Sep 6 2013 9:00PM To Sep 20 2013 9:00PM
- #2 Cleaning Line - From Sep 6 2013 9:00PM To Sep 20 2013 9:00PM
Energy Intensity and Baseline Calculation
CUSUM Analysis
Wrap Up
Remember This
Remember This
and... Remember This

MAKALAR

Measure Analyze Know Act Learn and Refine
Mark Collins

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- President
- Ekhosoft
- www.ekhosoft.com
THANK YOU