Improving Environmental Management Systems & Technology

Launch Event
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Context: Managements Systems

- Eco-capacity
- Efficiency
- Equity
- Etc.

- Global and National Policies / Agreements
  - SDG
  - Sustainable Consumption
  - CO2e market

- Cleaner Production
- Eco-efficiency
- CSR
- Shared Value

- Sustainability Management Systems (Guidelines)
- Quality Management Systems
- Environmental Management Systems
- CSR

- Audits
- Cleaner Production / Energy Efficiency / Eco-design / Applied Science
- Materiality Assessment
Environmental Management System (EMS)

• Is a system and database which integrates procedures and processes for training of personnel, monitoring, summarizing, and reporting of specialized environmental performance information to internal and external stakeholders of a firm *

Evolution of Pollution Management

Historic evolution of pollution management:

- Precaution
- Prevention
- Recycle
- Treatment
- Disposition
- Dilution
Benefits of EMS

• Improves environmental performance (legal compliance and waste minimization)
• Increase efficiency (when system is not excessively bureaucratic)
• Cost reduction
• Creates environmental buy-in from management and employees and assigns accountability and responsibility.
• Focuses on continual improvement of the system and a way to implement policies and objectives to meet a desired result. This also helps with reviewing and auditing the EMS to find future opportunities.
• Facilitates reporting (internal and to stakeholders)
• Access to new markets
EMS examples

• ISO 14000: Certification (private) most common at international scale.
• Environmental Management Audit Scheme (EMAS): Certification (government), operated in Europe
• Responsible Care Program: Certification for Chemical Industry (private)
  • A new version RC14001®, which combines Responsible Care and ISO 14001 certification into a single, cost-effective process.
• Cleaner Production: Non certification (private), promoted by UNIDO/UNEP mainly oriented to SMEs.
EMS: Certification System?

• EMS is useful for all companies, and for today's competitiveness it is a must that all companies should implement.

• Certification however represents a high cost and a big effort. Its utility should be carefully analyzed to decide when is the right moment to certify any EMS.

• Some factors to consider:
  • Objective: comply with legislation? Access to new clients/markets? A tool to inform to government or clients?
  • Market: compete per price? Value proposition based in sustainability values?
  • Brand reputation: Can I compete with other corporate companies of the same sector?
EMS and Technology

EMS audits will lead to improvements

Technological changes are limited by science, technology and economy.

- Potential of improvement (science)
- Best Technology (technology limit)
- Best Available Technology (economic limit)

Economic limit is usually at what any efficient company must aspire.

Potential
- Science limit
- Theoretical potential impossible to achieve in real systems (efficiency 100%)

Best Technology
- Technology limit
- Frequently technologies are not available in the market (in development), and their cost is privative to compete in the market

Best Available Technology
- Economic limit
- Technologies available to compete in the market conditions
EMS Audit Results by Type of Opportunity

**Good practices**: mainly based in human factor
- Reduce pollution 1-5% but tend to decline with time. Influenced by staff turnover. Low cost.

**Process control**: Based in control of process variables (temperature, weight, humidity, etc.)
- Reduce pollution 5-30%. Frequently related to control systems and automatization to eliminate human factor. Medium cost.

**Raw materials substitution**: Frequently to reduce risk or toxicity:
- Reduce pollution 30-90%, and sometimes eliminates pollution source. High cost.

**Recycling**: Internal/externa valorization of waste flows:
- Reduce pollution 20-40%. Low to high cost. Frequently not economically feasible.

**Technology**: Technology changes to improve process and procedures.
- Reduce pollution 20-80%. Medium to high cost.

Based in more than 700 companies of WEC’s projects
Study Cases
Examples of technologies appliances
Study Case 1: Olive Oil Quepu (Chile)

- Facility promotes the use of water
- High water consumption
  - 60% of water was used for cleaning
  - ≈ 50% water for cleaning (30% of total) used to « push » solid waste (olives)
    - This water represent 35% of waste water
    - Pollution added by solid waste (olives) and dilution to a level that makes any waste water treatment more difficult to separate olive oil.
Study Case 1: Olive Oil Quepu (Chile)

- Changes in facility sewer system and reduction of pressure (control systems)
- Results
  - Savings of 17 % of water consumption
  - Solid waste recovered (olives)
    - Increase in production 0.25% = 1.98 ton olives/yr
    - Improvement of water treatment (waste of olive oil used for a biocombustible)
Study Case 2: TerraMater (Chili)

  - 4 h / 16 h operation at 30% of nominal capacity
- Problems and inefficiency in all the productive chain
  - Cleaning machines running all time
  - Energy used to move/operate machines at low level
Study Case 3: TerraMater (Chile)

Temperature:

- Boiler (biomass) don’t deliver constant temperatures (between 22°C - 40°C)
- Long distance of pipelines that don’t justify insulation
- Low priority for internal team
Study Case 3: TerraMater (Chile)

Solution: Temperature control at process level and insulation of pipelines

- Extraction performance depends of temperature
- Product lost justifies insulation
- Average lost of olive oil (final product) 1.7% of production = US$ 40,000 year
Study Case 4: TerraMater (Chile)

Reuse of olive seed:

- 20% – 30% of olive weight
- 20% of production covers facility needs
## Study Case 4: TerraMater (Chile)

<table>
<thead>
<tr>
<th>Source of energy</th>
<th>Cost</th>
<th>Energy</th>
<th>Cost considering the cost to transform energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomass (seed of olive)</td>
<td>$2/kg</td>
<td>4.5 kWh/kg</td>
<td>$0.60/kWh (boiler efficiency = 75%)</td>
</tr>
<tr>
<td>Electricity – Heat pump</td>
<td>$68/kWh</td>
<td>1 kWh/kWh</td>
<td>$27/kWh (performance coefficient = 2.5)</td>
</tr>
<tr>
<td>GPL - boiler</td>
<td>$541/kg</td>
<td>7.4 kWh/L</td>
<td>$86/kWh (boiler efficiency = 85%)</td>
</tr>
</tbody>
</table>
Study Case 5: Bogaris Agriculture (Chile)

Automatisation is not always the best solution
Study Case 6: Tong Niu (China)

• Dyeing:
  ✓ Machine batch (100 kg)
  ✓ High consumption of water, steam, chemicals, etc.
Study Case 6: Tong Niu (China)

- Dyeing:
  - High pressure machine (400 kg)
  - Savings: 50% water, 40% energy (combustible) 30% electricity, 25% chemical products

<table>
<thead>
<tr>
<th>Item</th>
<th>Estimation using Beck dyeing machine (A)</th>
<th>Estimation during environmental feasibility study (B)</th>
<th>Evaluation after rapid dyeing machine is installed (C)</th>
<th>% of reduction (before and after installation of rapid dyeing machine) (C-A/V/A x 100%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual reduction (ton)</td>
<td>140</td>
<td>140</td>
<td>140</td>
<td>N/A</td>
</tr>
<tr>
<td>Annual steam consumption (ton)</td>
<td>3,500</td>
<td>1,750</td>
<td>308</td>
<td>80%</td>
</tr>
<tr>
<td>Annual water Consumption (ton)</td>
<td>35,000</td>
<td>17,500</td>
<td>18,200</td>
<td>48%</td>
</tr>
<tr>
<td>Annual chemical consumption (ton)</td>
<td>210</td>
<td>147</td>
<td>140</td>
<td>33%</td>
</tr>
<tr>
<td>- NaCl</td>
<td>140</td>
<td>112</td>
<td>21</td>
<td>20%</td>
</tr>
<tr>
<td>- Na₂CO₃</td>
<td>42</td>
<td>21</td>
<td>21</td>
<td>50%</td>
</tr>
<tr>
<td>Annual COD generated (kg)</td>
<td>11,802</td>
<td>8,261.4</td>
<td>4,200</td>
<td>64%</td>
</tr>
</tbody>
</table>
Conclusion

• High potential for technology opportunities
• Technology is very linked to process control, but process benefits (hidden costs) must be considered in the economic assessment
• No need to make technology upgrades, retrofits are very common and are very cost effective in the short and middle term
• Best available technologies must be taken in count