Partnership for Smart Energy and Energy Efficiency

Power and Cost Saving Solution
Intelligent Energy Management System (IEMS)
Successful Project Implementation 2015-16

Institute for Information Industry (III)
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1. Successful IEMS Project Implementation 2015-16
   - Annual Power and Cost Saving 12%
2. IEMS - Intelligent Energy Management Service Process
3. Phase 1 – Demand Power Management
4. Phase 2 – Compressor System Diagnosis and Analysis
5. Phase 3 – Transformer Efficiency Diagnosis and Analysis
6. IEMS – Insnergy Provides 4 + 1 Energy Solutions
## 1. Successful IEMS Project Implementation 2015-16
- Annual Power and Cost Saving 12%

<table>
<thead>
<tr>
<th>Smart Gateway installation</th>
<th>DC power supply installation</th>
<th>Split CT installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart Gateway communication wiring</td>
<td>ST-12 Smart Meter power transmission test</td>
<td>IEMS System installation inspection and acceptance</td>
</tr>
</tbody>
</table>
This project implementation has three phases: monitoring>management>improvement. The factory has successfully saved power cost by 3,300,000PHP/year, 12%.

- overall power cost saving benefit $3,319,558 = power cost saving through demand management $776,595 + air compressor system improvement $2,250,448 + compressor replacement and improvement $292,515

Implementing intelligent cloud energy management system can effectively control power costs in the short-run and substantially realize power cost saving in the long-run.

I-Cloud, Intelligent, Integration to enhance collective management and help save power consumption and manpower.

Facing future low carbon economy (saving 1kWh can reduce carbon emission by 0.521kg, according to Bureau of Energy’s 2015 power emission factors in Taiwan), introducing energy management system and mechanism can ensure effective and continuous energy savings, and further increases corporate competitiveness as well as contribute to the sustainable environment.
2. IEMS - Intelligent Energy Management Service Process

Phase 0
- Assess power usage history
- Analyze optimal power rate structure
- Propose power-saving improvement plans

Phase 1
- Estimate and control power costs
- Alert abnormal power consumption
- Energy statistics and analysis report

Phase 2
- Allocation of power demand
- Establish power improvement base line
- Design optimal air compressor system routes
- Analyze energy consumption equipment efficiency

Phase 3
- Replace with high efficiency variable-frequency air compressor
- Replace with high efficiency amorphous transformer
- Optimal equipment operation management

Phased service procedure saves money effectively and instantaneously!!!
2. Phase 1 - Demand Power Management

Traditionally power bill only shows the highest power consumption record, but does not indicate time of peak consumption, reason behind high consumption nor consumption structure. Without this information, factory users have difficulty to effectively control and reduce power consumption costs.

Power saving should begin from setting up an intelligent cloud computing system for energy management, then use smart meter to automatically and instantaneously monitor power consumption statistics. Reports generated can be used to analyze the factory’s overall power consumption (see charts below), in order to adjust factory equipment operation procedures and models for effective power and cost saving.

The sharp peak is mainly caused by COMP2 circuit powering on suddenly.
IEMS System Display – Report Management

- Daily power demand report: Hourly records of power consumption and time of maximum demand, with trend diagrams.
IEMS Demand Power Management Benefit

IEMS system analysis charts, professional diagnosis and suggestions for power consumption management are provided to help factory users to adjust equipment power on-and-off strategies. New strategies (without replacing equipment) have been proven to save yearly average power rate by 14.57% and save 776,595 PHP/year (see charts below).

<table>
<thead>
<tr>
<th>Item</th>
<th>Month</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Total/Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) Before Max Demand (2013/12~2014/10)</td>
<td></td>
<td>901.25</td>
<td>845.25</td>
<td>915.25</td>
<td>1,022.00</td>
<td>1,062.25</td>
<td>1,111.25</td>
<td>871.50</td>
<td>924.00</td>
<td>883.75</td>
<td>1,088.50</td>
<td>1,128.75</td>
<td>977.61</td>
</tr>
<tr>
<td>(B) After Max Demand (2014/12~2015/10)</td>
<td></td>
<td>801.25</td>
<td>833.00</td>
<td>931.00</td>
<td>883.75</td>
<td>813.75</td>
<td>831.00</td>
<td>810.25</td>
<td>785.75</td>
<td>850.50</td>
<td>794.50</td>
<td>852.25</td>
<td>835.18</td>
</tr>
<tr>
<td>(C) Max Demand reduction Remark: G=B-A</td>
<td>-100.00</td>
<td>-12.25</td>
<td>15.75</td>
<td>-138.25</td>
<td>-248.50</td>
<td>-280.25</td>
<td>-61.25</td>
<td>-138.25</td>
<td>-33.25</td>
<td>-294.00</td>
<td>-276.50</td>
<td>-142.43</td>
<td></td>
</tr>
<tr>
<td>(D) Transmission Charge (PHP/kW)</td>
<td>332.27</td>
<td>350.50</td>
<td>383.91</td>
<td>386.85</td>
<td>360.38</td>
<td>382.02</td>
<td>361.92</td>
<td>357.55</td>
<td>328.89</td>
<td>319.32</td>
<td>325.91</td>
<td>353.60</td>
<td></td>
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<tr>
<td>(E) Transmission fee reduction Remark: E=C*D</td>
<td>-33,227.00</td>
<td>-4,293.63</td>
<td>6,046.58</td>
<td>-53,482.01</td>
<td>-89,554.43</td>
<td>-107,061.11</td>
<td>-22,167.60</td>
<td>-49,432.39</td>
<td>-10,935.86</td>
<td>-93,882.43</td>
<td>-90,116.33</td>
<td>-548,106.20</td>
<td></td>
</tr>
<tr>
<td>(F) Distribution Charge (PHP/kW)</td>
<td>205.83</td>
<td>205.83</td>
<td>205.83</td>
<td>205.83</td>
<td>205.83</td>
<td>205.83</td>
<td>205.83</td>
<td>205.83</td>
<td>182.66</td>
<td>182.66</td>
<td>182.66</td>
<td>197.40</td>
<td></td>
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<tr>
<td>(G) Distribution fee reduction Remark: G=(974.16-A)*F</td>
<td>-5,575.93</td>
<td>0.00</td>
<td>-8,457.55</td>
<td>-30,429.91</td>
<td>-38,714.56</td>
<td>-48,800.23</td>
<td>0.00</td>
<td>-9,103.77</td>
<td>-1,751.71</td>
<td>-39,151.34</td>
<td>-46,503.41</td>
<td>-228,488.43</td>
<td></td>
</tr>
</tbody>
</table>

Source: HCG PHP Crop’s electricity bill of Meralco
4. Phase 2 – Compressor System Diagnosis and Analysis

- Compressor Group Operation Improvement (Turn off COMP1)
- Compressor Hunting (Reduce On-off Frequency)
- Reversing Air Pressure (Abnormal Pipe Pressure)
- Compressor Efficiency Evaluation for Replacement

Low Efficiency
Compressor System Efficiency Improvement

Multi-machine optimization control

Optimization design of piping systems

Energy Saving 44%

281,306 kWh annual saving

2,250,448 PHP annual saving

ROI >33%

The improvement was implemented in 2015-10
5. Phase 3 – Transformer Efficiency Diagnosis and Analysis

- Input = 587.32 kW
- Output = 415.27 kW
- System Loss = 587.32 - 415.27 = 172.05 kW
- 172.05 / 587.32 * 100% = 29%

Transformer Loss 29%
Transformer Efficiency Improvement Suggestion

SiFe (SiFe Transformer) : 2,000kVA
AMT (Amorphous Transformer) : 1,250kVA

- The unload loss of AMT transformer is only 20% of the SiFe transformer.

- The improvement has started since 2015-10.

- 25% ROI
- 36,502 kWh annual saving
- 292,515 PHP annual saving

Table of Total Loss

<table>
<thead>
<tr>
<th>Load Factor (%)</th>
<th>AMT</th>
<th>SiFe</th>
</tr>
</thead>
<tbody>
<tr>
<td>5%</td>
<td>879</td>
<td>1,755</td>
</tr>
<tr>
<td>15%</td>
<td>1,424</td>
<td>2,850</td>
</tr>
<tr>
<td>25%</td>
<td>2,312</td>
<td>4,625</td>
</tr>
<tr>
<td>35%</td>
<td>3,625</td>
<td>7,250</td>
</tr>
<tr>
<td>45%</td>
<td>5,595</td>
<td>11,190</td>
</tr>
<tr>
<td>55%</td>
<td>8,075</td>
<td>16,150</td>
</tr>
<tr>
<td>65%</td>
<td>10,749</td>
<td>21,490</td>
</tr>
<tr>
<td>75%</td>
<td>12,919</td>
<td>25,825</td>
</tr>
<tr>
<td>85%</td>
<td>15,399</td>
<td>30,250</td>
</tr>
<tr>
<td>95%</td>
<td>18,159</td>
<td>34,685</td>
</tr>
</tbody>
</table>

The improvement has started since 2015-10.
6. IEMS - Insnergy Provides 4+1 Energy Solutions

Global Services

Renewable and Solar Energy Solutions

Enterprise Energy Management Solutions

Smart/Green Home Solutions

Smart Lighting Management Solutions

Green IOT Cloud Services

API

SDK

Strtaus

Green IOT Applications

Liza
Renewable and Solar Energy Solutions

Ectuary
Enterprise Energy Management Solutions

iFamily
Smart/Green Home Solutions

In-Light
Smart Lighting Management Solutions
In-Snergy (Internet Smart energy):

- Green IOT (Internet of Things) Platform
- Internet-based cloud technology offers always-on 24 hours a day year-round service in monitoring and optimizing electricity usage environment to raise power usage efficiency and help to ensure comfortable outdoor and indoor environments
- Simple, adaptable, ready-to-use energy monitoring and management solution, applicable in various environments
- A scalable cloud platform, that is easily installed to offer the desired features based on end-customers' needs
- Capable to interact with and manage large-scale sensor equipment
- Based on Open data communication interface (JSON/ SOAP) that can easily integrate with commercially available sensor devices, electric meters, and others
Customers of Insnergy

Located in Taiwan, China, USA, Africa, Europe, Asia

Up-to-date our worldwide clients are categorized as:

• Enterprise—300+
• Home users—3,000+
• Street lights—2,800+
• Solar users—12+

South Africa
Namibia

Czech Republic
Romania
The Philippines
Thank You