Reshmi, Vijay & Aravind
29, 30 & 31 Aug 2018

CII 19th National Award for Excellence in Energy Management 2018
Energy efficiency and clean energy generation

With nearly 50% of our portfolio dedicated to energy solutions, Honeywell is leading the charge in energy efficiency and clean energy generation.

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- **China**: Shanghai, Beijing, Other locations
- **Mexico**: Mexico City, Chihuahua, Juarez, Tijuana
- **India**: Bengaluru, Hyderabad, Madurai, Guru gram

**1994**
Established in India

**+9,000**
Employees globally

**50%+**
Engineers focused on software

**100%**
CMMI Maturity Level 5 certified

**Businesses We Serve**
- Aerospace
- Performance Materials and Technologies
- Home and Building Technologies
- Safety and Productivity Solutions

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PRESENTATION ON

CII NATIONAL AWARD FOR EXCELLENCE IN ENERGY MANAGEMENT
29th to 31st August 2018

BY
Reshmi Shankar
Sholapur Vijay Kumar
Aravind Mamidi
# Site infra - HTS Orion Campus, Bangalore

<table>
<thead>
<tr>
<th>Building 1</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Area</strong></td>
<td>595,520 Sq. ft.</td>
</tr>
<tr>
<td><strong>Year of operation</strong></td>
<td>2008</td>
</tr>
<tr>
<td><strong>Contract demand</strong></td>
<td>3500 KVA</td>
</tr>
<tr>
<td><strong>Recorded MAX Demand</strong></td>
<td>2170 KVA</td>
</tr>
<tr>
<td><strong>DG capacity</strong></td>
<td>1500 X4 KVA ,750 X 1 KVA</td>
</tr>
<tr>
<td><strong>Operating Hours</strong></td>
<td>9 hours 5 days week</td>
</tr>
</tbody>
</table>

Annual energy use is around 11 million KWH with the spend of 7.8 crores, including diesel cost
# Energy projects overview in 2014-2017

<table>
<thead>
<tr>
<th>Year</th>
<th>Project title</th>
<th>Investment in INR</th>
<th>Savings in KWH</th>
<th>Savings in INR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>· Artic Master for air-conditioners at café &amp; UPS room</td>
<td>1.24M</td>
<td>64690</td>
<td>0.44M</td>
</tr>
<tr>
<td></td>
<td>Times for all AHUs</td>
<td>0.10M</td>
<td>25194</td>
<td>0.27M</td>
</tr>
<tr>
<td></td>
<td>Cogged belt for AHUs</td>
<td>1.65M</td>
<td>80000</td>
<td>0.68M</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>2.99M</strong></td>
<td><strong>169884</strong></td>
<td><strong>1.39M</strong></td>
</tr>
<tr>
<td>2015</td>
<td>Implementation of occupancy sensor</td>
<td>0.77M</td>
<td>41929</td>
<td>0.28M</td>
</tr>
<tr>
<td></td>
<td>Insulation improvement in chilled water piping system</td>
<td>0.20M</td>
<td>30189</td>
<td>0.49M</td>
</tr>
<tr>
<td></td>
<td>Implementing VFD control for Cooling tower fan</td>
<td>0.62M</td>
<td>9317</td>
<td>0.08M</td>
</tr>
<tr>
<td></td>
<td>Installation of VFD for chiller (1 Nos)</td>
<td>1.47M</td>
<td>71500</td>
<td>0.57M</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>3.06M</strong></td>
<td><strong>152935</strong></td>
<td><strong>1.42M</strong></td>
</tr>
<tr>
<td>2016</td>
<td>VFD for chiller (2 no’s)</td>
<td>2.99M</td>
<td>58800</td>
<td>0.49M</td>
</tr>
<tr>
<td></td>
<td>EC fans for UPS and Battery room AHU</td>
<td>1.00M</td>
<td>86731</td>
<td>0.69M</td>
</tr>
<tr>
<td></td>
<td>Replacement of CFL in to LED lights</td>
<td>5.49M</td>
<td>204070</td>
<td>1.7M</td>
</tr>
<tr>
<td></td>
<td>Non Chemical water treatment for cooling towers</td>
<td>3.30M</td>
<td>70000</td>
<td>1.8M</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>12.78M</strong></td>
<td><strong>419601</strong></td>
<td><strong>4.68M</strong></td>
</tr>
<tr>
<td>2017</td>
<td>EC fans for lab AHUs</td>
<td>6.88M</td>
<td>118000</td>
<td>1.99M</td>
</tr>
<tr>
<td></td>
<td>Replacement of CFL in to LED lights</td>
<td>3.30M</td>
<td>129412</td>
<td>1.10M</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>10.18M</strong></td>
<td><strong>247412</strong></td>
<td><strong>3.09M</strong></td>
</tr>
<tr>
<td>2018</td>
<td>Automatic condenser tube cleaning system or chillers</td>
<td>3.35M</td>
<td>164,517</td>
<td>1.48M</td>
</tr>
<tr>
<td></td>
<td>EC Fan for workstation AHU’s</td>
<td>13.06M</td>
<td>328,375</td>
<td>2.63M</td>
</tr>
<tr>
<td></td>
<td>Replacement of CFL into LED lights</td>
<td>0.89M</td>
<td>262,800</td>
<td>1.7M</td>
</tr>
<tr>
<td></td>
<td>Chiller Plant Optimizer</td>
<td>5.60M</td>
<td>234517</td>
<td>2.0M</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>22.9M</strong></td>
<td><strong>990,209</strong></td>
<td><strong>7.81M</strong></td>
</tr>
</tbody>
</table>
Specific Energy Consumption overview in 2014-2017

ENERGY PERFORMANCE INDICATOR (KWH/SQ.MT)

- 193 (2014)
- 200 (2015)
- 200 (2016)
- 198 (2017)
Energy savings trend
2014 compared to 2013 – 181,280 Kwh

Baseline-2014 KWH: 10,848,167
2014 Actual Consumption in KWH: 11,345,606
2014 Normalized consumption in KWH: 10,666,888
Savings Achieved in KWH: 181,280
Savings Achieved in INR: 1,359,600
% of savings achieved in 2014 compared to 2013: 1.67%
### Energy savings trend

**2015 compared to 2014 – 255,113 Kwh**

<table>
<thead>
<tr>
<th>Baseline-2015 KWH</th>
<th>11,345,606</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015 Actual Consumption in KWH</td>
<td>12,246,622</td>
</tr>
<tr>
<td>2015 Normalized consumption in KWH</td>
<td>11,090,493</td>
</tr>
<tr>
<td>Savings Achieved in KWH</td>
<td>255,113</td>
</tr>
<tr>
<td>Savings Achieved in INR</td>
<td>1,913,348</td>
</tr>
</tbody>
</table>
| % of savings achieved in 2015 compared to 2014 | 2.25%   

The chart above illustrates the energy savings trend for 2015 compared to 2014. The baseline for 2015 is 11,345,606 KWH, which increased to 12,246,622 KWH in 2015. After normalization, the consumption in 2015 was 11,090,493 KWH. The savings achieved were 255,113 KWH, corresponding to a 2.25% savings compared to 2014.
Energy savings trend
2016 Compared to 2015 – 1,154,901 kWh

Baseline 2016 KWH: 12,246,622
2016 Normalized KWH: 11,091,720
2016 Actual KWH: 11,450,783

KWH
12,400,000
12,200,000
12,000,000
11,800,000
11,600,000
11,400,000
11,200,000
11,000,000
10,800,000
10,600,000
10,400,000

Increase in working days & Occupancy
Increase in operation hours
Load addition

Baseline-2016 KWH

2016 Actual Consumption in KWH

2016 Normalized consumption in KWH

Savings Achieved in KWH

Savings Achieved in INR

% of savings achieved in 2016 compared to 2015

12,246,622
11,450,783
11,091,720
1,154,901
8,661,758
9.43%
Energy savings trend
2017 Compared to 2016 – 296,903 kWh

Baseline 2017 KWH: 11,450,783
2017 Normalized KWH: 10,987,235
2017 Actual KWH: 11,153,880

Increase in working days & Occupancy
Increase in operation hours
Load addition

Baseline-2017 KWH: 11,450,783
2017 Actual Consumption in KWH: 10,987,235
2017 Normalized consumption in KWH: 11,153,880
Savings Achieved in KWH: 296,903
Savings Achieved in INR: 2,523,676
% of savings achieved in 2017 compared to 2016: 2.6%
Energy projects implemented in 2014

• **Artic Master for air-conditioners at café & UPS room**
  It reduces the consumption of power and energy by
  Lowered temperature and pressure by attracting the gas in
  the HVAC equipment.
  ➢ Investment in INR: 1.24M
  ➢ Savings in KWH: 64690 Units
  ➢ Savings in INR: 0.44M
  ➢ ROI :2.98 years

• **Timers for all AHUs**
  AHU fan on/off via an interval timer to save energy.
  ➢ Investment in INR: 0.1M
  ➢ Savings in KWH: 25194Units
  ➢ Savings in INR: 0.27M
  ➢ ROI:4 months
Energy projects implemented in 2014

• Cogged belt for AHUs

Cogged belts are a low-investment way to reduce the inefficiencies in ventilation fans caused by belt slippage and bending resistance.
- Investment in INR: 1.65M
- Savings in KWH: 80000 Units
- Savings in INR: 0.682M
- ROI: 2.41 years
Energy projects implemented in 2015

• Implementation of occupancy sensor
  Occupancy sensor used for various indoor motion detecting devices used to notice the presence of a person in a room or space, in order to automatically turn lights.
  - Investment in INR: 0.775M
  - Savings in KWH: 41929 Units
  - Savings in INR: 0.28M
  - ROI : 2.76 years

• Insulation Improvement in chilled water piping system
  - Investment in INR: 0.2066M
  - Savings in KWH: 30189 Units
  - Savings in INR: 0.496M
  - ROI : 5 months
Energy projects implemented in 2015

• Implementing VFD control for Cooling tower fan
  VFD is a type of motor controller that drives an electric motor by varying the frequency and voltage supplied to the electric motor.
  ➢ Investment in INR: 0.62M
  ➢ Savings in KWH: 9317 Units
  ➢ Savings in INR: 0.0806M
  ➢ ROI: 7.69 years

• Installation of VFD for chiller (1 Nos)
  ➢ Investment in INR: 1.47M
  ➢ Savings in KWH: 71500 Units
  ➢ Savings in INR: 0.57M
  ➢ ROI: 2.57 years
Energy projects implemented in 2016

• VFD for chiller (2 no's)
  ➢ Investment in INR: 2.99M
  ➢ Savings in KWH: 58800Units
  ➢ Savings in INR: 0.49M
  ➢ ROI : 6 years

• EC fans for UPS and Battery room AHU
EC fans offer over 40% savings in conventional AHUs. Efficient speed control achieved with electronically commutated motors.
  ➢ Investment in INR: 1.004M
  ➢ Savings in KWH: 86731Units
  ➢ Savings in INR: 0.69M
  ➢ ROI : 1.45years
Energy projects implemented in 2016

• Replacement of CFL to LED lights
LED bulbs last longer and uses less energy than other types of lighting.

  ➢ Investment in INR: 5.49M
  ➢ Savings in KWH: 204070 Units
  ➢ Savings in INR: 1.7M
  ➢ ROI: 3.2 years

• Non-Chemical water treatment for cooling towers
Bac-Comber uses Ultra Low Frequency (ULF) technology to treat the water without harming the environment & is proven to be effective & efficient in scaling, corrosion, & biological control.

  ➢ Investment in INR: 3.3M
  ➢ Savings in KWH: 70000 Units
  ➢ Savings in INR: 1.8M
  ➢ ROI: 1.83 years
Energy projects implemented in 2017

EC fans for LAB AHU’s

EC fans offer over 40% savings in conventional AHUs. Efficient speed control achieved with electronically commutated motors.

- Total Investment: 6.88 M
- Estimated Savings in KWH: 1,18,000
- Estimated Savings in INR: 1.99 M
- Estimated ROI: 3.5 years
Energy saving project 2018

• **Chiller Plant Optimizer (CPO)**
  - Total Investment: 5.6 M
  - Estimated savings in KWH: 234,517
  - Estimated savings in INR: 2 M
  - Estimated ROI is around: 2.8 years

• **Outline**
CPO is a software and hardware system solution designed to provide an optimized control system using the equipment commonly found in a Chiller Plant: Chillers, Pumps, Cooling Towers and Valves. The control strategy is customized as per the site requirement.
Energy saving projects - 2018

Automatic Condenser Cleaning System for Chillers

1. ATC System using Soft Balls to clean tubes Online
   - On Line Automatic cleaning thru Soft balls
   - Reach to all tubes thru Ball collector and dispensing system

2. Energy Savings
   - Maintains lowest possible Approach in shells thru low Fouling
   - Enhances tube life thru cleaner tubes
   - Chemical free cleaning
   - 100% Re-use of water
   - Indirectly enhances machine reliability

- Total Investment: 3.35 M
- Estimated Savings in KWH: 164,517 KWH
- Estimated Savings in INR: 1.48 M
- Estimated ROI: 2.9 years

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EC fans for Workstation AHU’s

EC fans offer over 40% savings in conventional AHUs. Efficient speed control achieved with electronically commutated motors.

- Total Investment: 13.065M
- Estimated Savings in KWH: 328,375
- Estimated Savings in INR: 2.627M
- Estimated ROI: 4.97 years
Energy saving project - 2018

CFL replacement with LED lights

- Total Investment: 0.89 M
- Estimated Savings in KWH: 262,800 KWH
- Estimated Savings in INR: 1.7 M
- Estimated ROI: 1.62 years
Energy saving projects planned in 2019

**EC fans for Workstation AHU’s**

- Total Investment: 13.065M
- Estimated Savings in KWH: 328,375
- Estimated Savings in INR: 2.627M
- Estimated ROI: 4.97 years
Innovative projects

Chiller plant optimizer (Completed)
CPO is a software and hardware system solution designed to provide an optimized control system using the equipment commonly found in a Chiller Plant: Chillers, Pumps, Cooling Towers and Valves. The control strategy is customized as per the site requirement.

VFD for centrifugal chillers (Completed)
As the site cooling load is variable, its evident if the chillers are operated at the part load condition could yield more energy efficiency than at full load. VFD for compressor are ideal operating mechanism for part load condition. Which is found unavailable in the current chillers. Therefore its decided to external VFD for the 400TR chiller compressor.

VFD for cooling tower (Completed)
As per the site there are more cooling towers operates than it required and also the load & weather is variable it is necessary to operate more cooling tower or less as per the load. Therefore we have introduced the VFD for cooling tower and control as per ambient and condenser temperature
Renewable energy projects

• Utilization of solar water heater
  ➢ Investment in INR: 1.2 M
  ➢ Savings in KWH: 39,145
  ➢ Savings in INR: 0.34 M

• Solar fencing for boundary wall
  ➢ Savings in KWH: 3285
  ➢ Savings in INR: 0.03 M
Involvement of employee and monitoring activities

- Established dedicated energy team across facility regular weekly review of Energy trend and Energy saving measures which includes the projects and operational controls by Energy team
- Awareness to the employees on importance of energy saving to switch OFF the desktops while leaving the office.
- Posted energy awareness posters in the lift lobby & cafeteria like:
  - Burn calories not the electricity, Use the stairs.
  - Lighting an office overnight waste enough energy to heat water for 1000 cups of tea.
Energy monitoring and reporting

- Dedicated BMS team to monitor & control the HVAC trend of the energy consumption
- Capturing and analysis of consumption details for all equipments
## GHG Inventorisation

### Scope 1: Diesel Consumed for Electricity = 4.64 Mt CO₂e

<table>
<thead>
<tr>
<th>Year</th>
<th>Fuel consumed in liters</th>
<th>Emission factor (CO₂e/unit)</th>
<th>Total GHG emission in Mt CO₂e</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>404,932</td>
<td>0.00268963</td>
<td>1.09</td>
</tr>
<tr>
<td>2014</td>
<td>450,186</td>
<td>0.00268963</td>
<td>1.21</td>
</tr>
<tr>
<td>2015</td>
<td>340,365</td>
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<td>0.92</td>
</tr>
<tr>
<td>2016</td>
<td>292,305</td>
<td>0.00268963</td>
<td>0.79</td>
</tr>
<tr>
<td>2017</td>
<td>233,325</td>
<td>0.00268963</td>
<td>0.63</td>
</tr>
</tbody>
</table>

### Scope 2: Indirect Emissions from Electricity = 46.98 Mt CO₂e

<table>
<thead>
<tr>
<th>Year</th>
<th>Energy consumption in KWH</th>
<th>Emission factor (CO₂e/unit)</th>
<th>Total GHG emission in Mt CO₂e</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>10,695,820</td>
<td>0.00082839</td>
<td>8.86</td>
</tr>
<tr>
<td>2014</td>
<td>11,538,508</td>
<td>0.00082839</td>
<td>9.56</td>
</tr>
<tr>
<td>2015</td>
<td>12,349,145</td>
<td>0.00082839</td>
<td>10.23</td>
</tr>
<tr>
<td>2016</td>
<td>11,256,480</td>
<td>0.00082839</td>
<td>9.32</td>
</tr>
<tr>
<td>2017</td>
<td>10,987,235</td>
<td>0.00082839</td>
<td>9.01</td>
</tr>
</tbody>
</table>

### Scope 3: Fleet Vehicle Emissions = 2.36 Mt CO₂e

<table>
<thead>
<tr>
<th>Year</th>
<th>Fuel consumed in liters</th>
<th>Emission factor (CO₂e/unit)</th>
<th>Total GHG emission CO₂ (Mt CO₂e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>164,912</td>
<td>0.00269</td>
<td>0.44</td>
</tr>
<tr>
<td>2014</td>
<td>168,210</td>
<td>0.00269</td>
<td>0.45</td>
</tr>
<tr>
<td>2015</td>
<td>170,733</td>
<td>0.00269</td>
<td>0.46</td>
</tr>
<tr>
<td>2016</td>
<td>168,172</td>
<td>0.00269</td>
<td>0.45</td>
</tr>
<tr>
<td>2017</td>
<td>211,824</td>
<td>0.00269</td>
<td>0.56</td>
</tr>
</tbody>
</table>
Environmental projects

• Installation of aerators for taps
  ➢ Investment in INR: 0.072M
  ➢ Savings in KL: 1669
  ➢ Savings in INR: 0.183M

• Utilization of STP water for gardening area & flush
  ➢ Investment in INR: 0M
  ➢ Estimated savings in KL: 8300KL
  ➢ Estimated savings is around 0.94M

• Drip Irrigation
  ➢ Investment in INR: 0.29M
  ➢ Estimated savings in KL: 157.25KL
  ➢ Estimated savings is around 0.13M
Recognition to HTS from British Safety Council

HTS, Orion location in Bangalore was conferred with two awards

- “International Safety Award, Merit”
- “Sector Award” for the year 2017 by British Safety Council

- A total of 578 applications were received from the United Kingdom, Africa, Asia, India and the Middle East and 92% of these successfully achieved a Pass grade or higher. The grading distribution among the applications in 2017 were as follows –
  - Distinction 31 (5%)
  - Merit 300 (52%)
  - Pass 200 (35%)
  - Fail 47 (8%)
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THAT’S THE POWER OF HONEYWELL.

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Connected Plant | Connected Supply Chain | Connected Worker

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