Effective, Efficient and Pragmatical Energy Saving Methods in Factories’
by Panasonic

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1. Panasonic’s Philosophy and Vision: Action Plan
2. Measures to Conserve Energy at All Panasonic Facilities
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1. Panasonic Vision and Action Plan
The No.1 “Environmentally Innovative” Electronics Company

Positioning “Environment” at the core of all business operations for innovation

**Green Life Innovation**

- Realize spirited green life-style
- Propose a sustainable living that is more secure, comfortable and fun for everyone in the world.

**Green Business Innovation**

- Practice and propose ultimate reduction of environmental impact
- Pursue to be an ideal manufacturer
  - Zero Cost, Zero Time, Zero Inventory + Zero Emissions

- Minimize CO2 in All Business Processes
- Environment Conscious Manufacturing
- Thoroughly Implementing Green work-style
- Environmental Solution from in-house know-how
Environmental Action Plan “Green Plan 2018”

Positioning of “Green Plan 2018”

Green Plan 2018

Action Plan for All Employees

• Green Index as core goals, target set for 2018
• Expedition with cooperating with the society

Global Environmental Issues

- CO2 Reduction
- Resource Circulation
- Water
- Chemical Substances
- Bio Diversity

eR = ‘eco ideas’ Relations
2. Energy Conserving Measures at All of Panasonic Facilities
1. Creating an across the board system

2. Development of Tools and companywide implementation

3. Development and implementation of energy conserving technology.

4. Energy conserving HR development.
Energy Conserving Measures at All of Panasonic Facilities

1. Creating an across the board system

2. Development of Tools and companywide implementation

3. Development and implementation of energy conserving technology.

4. Energy conserving HR development.
Visualizing Energy Usage of All Locations

- Implementation of tens of thousands of devices & initiatives in all global facilities
- Development of in-house & low-cost visualizing software
  Able to see real-time overseas energy usage from Japan

【Measurement Device】

【Software Screen for Visualizing】

【Visualizing System (Image)】

View from Anywhere within Network

Data Device

Various devices connect
Global Implementation of **Fundamental Agenda** to Raise the Standard Through Out the Company

- **Fundamentally Required 33 Energy Conserving Themes Prioritized & Administered**

**【33 Items of Energy Conservation (Idea)】**

<table>
<thead>
<tr>
<th>大項目</th>
<th>中項目</th>
<th>具体策</th>
<th>100%達成管理</th>
<th>近期</th>
<th>未達</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.エネルギー管理体制</td>
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</tr>
<tr>
<td>2.計測・評価の実施状況</td>
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</tr>
</tbody>
</table>

- **Set factory based goals**
- **Important Factor is to Operate on All Company Basis**
  (Eg.: Air Leak Elimination)

**<Company Wide Case Study>**

**Air Leakage Elimination**

- All Global Leak Monitoring and Measures

<table>
<thead>
<tr>
<th>Tags at leak points</th>
</tr>
</thead>
</table>

**<2011>**
600Milion Yen Loss Discovered
Continued Kaizen at All Locations

Global Energy Saving Diagnoses Reduced Usage of 10% Avg.

- From “Energy Conserving Tech Support Team” to Diagnoses Expert Team
- Implementing at energy heavy plants, 10 countries and 50 locations.
- Implementing business group based diagnoses in subsidiary plants. (Energy Conservation Caravan)

【Diagnoses Results & Developments】

- Reduction Proposals: Over 1,000 cases
  ⇒ All except low ROI proposals implemented

- CO₂ Reduction: Avg. ▲ 10 % *
  (converted to crude Oil = 35,000KI equivalent)
  *
- Proposals from Diagnoses to a Manual
  (Energy Saving “Secret Scroll”)

Implementing 100 condensed reduction ideas
Visualization of Low Investment Initiative from Diagnoses

Proposal Analysis from the Energy Diagnoses

Plenty More Energy Saving Measures w/out Any Cost

# of Proposals
- 54% (amt. of investment 0 yen category)
- 36% (amt. of investment 500 thousand yen)
- 10% (amt. of investment over 500 thousand yen)

Amt. of CO₂ Reduction
- 71% (amt. of investment 0 yen category)
- 23% (amt. of investment 500 thousand yen)
- 6% (amt. of investment over 500 thousand yen)

Cost Effectiveness
- 66% (amt. of investment 0 yen category)
- 30% (amt. of investment 500 thousand yen)
- 4% (amt. of investment over 500 thousand yen)
1100 Outstanding Energy Savings Examples Incorporated Globally

- Most Effective Examples is Data Based as “BA Chart*”
- 1100 Outstanding Energy Saving Examples are registered. (JPN, ENG, CHN)
- Establishing of Intranet for Global Access by Free Keyword

* BA Chart Before & After; Charts’ usefulness: Illustrates improvement with a snap shot
Achieving Energy Conserving Goal at All Companies Globally

- Savings conversion to Crude Oil -370,000kl, CO2 reduction -960,000 tons (compared to 2006)

Global CO2 Emission Amt. 200,000 tons

(Units: Year 2000 is 100)

Crude Oil Conversion -370,000kl
CO2 Emission -960,000 tons
Cost-benefit (estimate) -19.2 bil.yen
3. Specific Examples of Energy Conservation Measures
Introduction to specific examples, mainly 33 energy conservation categories

Main energy conservation examples:

1. AC
2. Air Compressor
3. Lighting

With a focus on where energy conservation is possible by strengthening management, and where the impact of investment is high.
Reduction of AC 1

Reducing Ventilation Amount

External air amount necessary per person is approx. 20~30m³/h

Reduce fan power and AC load by reducing ventilation.
Energy Conservation of AC 2

Reducing sectional/local exhaust or displacement

Lateral vacuum

Enclosed Hood Type

Necessary Air Volume

\[ Q = 60 \times V \times (10X^2 + A) \, [\text{m}^3/\text{min}] \]

- \( V \): 1.0 m/s
- \( X \): Distance to dust source [m]
- \( A \): Entrance area volume [m\(^2\)]

- If \( X = 0.1 \, \text{m}, A = 0.04 \, \text{m}^2 \), then \( Q = 8.4 \) m\(^3\)/min

Necessary amount of sectional displacement can be reduced by installing enclosure

Fan power and AC load can be reduced by reducing the amount of ventilation

Necessary Air Volume

\[ Q = 60 \times V \times A \, [\text{m}^3/\text{min}] \]

- \( V \): 0.7 m/s
- \( A \): Entrance area volume [m\(^2\)]

- \( Q = 1.68 \) m\(^3\)/min

80% Air volume reduction
Energy Conservation of AC 4

Installation of Inverter

Controlling the flow is done with valves here

Higher efficiency when the flow is Controlled by the inverter

Inverters control the flow of pumps and fans
Energy Conservation of AC 5

Increase in the cold water temperature

- Adjust cold water temp. according to seasons
- Increase efficiency with increase in water temperature

Increasing efficiency with increase in cold water temperature

( Lowering the warm water temperature also increases efficiency )
Energy Conservation of AC 6

Decreasing Water Coolant’s Temperature

Keep the temperature low as possible

Better efficiency by lowering temp.

Increase efficiency by decreasing temperature of water coolant

Water Coolant Temperature Efficiency Comparison

- Water Coolant Chiller
- Vacuum Sys. cool/heat
Energy Conservation of AC 7

Scaling down AC coverage space

Conditioned air leaks into non-work area

Shutting down AC after work hours

Partition-off unnecessary areas & shut down AC usage
Energy Conservation of compressor 1

Reducing Pressure Loss

Reducing pressure loss lowers the pressure discharge for energy conservation

Pipes with ample thickness

0.5MPa 0.45MPa

0.43MPa

Main usage pressure 0.40MPa

To devices with instant high usage of air

Pressure stabilization w/ additional tanks

Sectional boost of pressure w/ booster

Filter maintenance for Reduction of pressure loss

0.43→0.6MPa

High pressure device

Compressor
Energy Conservation of compressor 2

Controlling the # of Units: Supplementary Info

Consumption of electricity is persistent even when lowering the load

Implementing the Use of Inverters and Controlling the # of Units to increase Efficiency
Energy Conservation of compressor 3-1

Reduction of Air Loss

approx. 2~3 yen per 1 m³ of air

Valve

Connector

Hose damage

Use of air-gun, etc. installation

Air leak

Air leak

Air leak

Constant discharge

Approx. 10~20% of total air-leak

Conduct air leak inspection periodically
Inspection Methods on air leakage spots

Using non-operating hours of factory, identify leakage by sound of air-blowing, tag & picture shots for clarification

【Simple measurement of】
Using garbage bags to measure the time it takes to fill up

【Air Leakage spot】
Attach tags
# How to Check Air Leaks

<table>
<thead>
<tr>
<th></th>
<th>Five senses (Hearing, Eyesight, Touch)</th>
<th>Sprays for detection</th>
<th>Leak detectors</th>
<th>Garbage bags</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantage</strong></td>
<td>No tools are needed.</td>
<td>Reasonable</td>
<td>Leak can be detected in the presence of noise; The direction of air leaks can be specified.</td>
<td>Simple measurement to find volume of leaks</td>
</tr>
<tr>
<td><strong>Dis-advantage</strong></td>
<td>Only big leaks can be detected.</td>
<td>Water leak</td>
<td>Heavy; One needs to know how to use it.</td>
<td>Only the volume of leaks</td>
</tr>
<tr>
<td><strong>Sensitivity</strong></td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>- - -</td>
</tr>
<tr>
<td><strong>Cost</strong></td>
<td>0 yen</td>
<td>About 1,000 yen</td>
<td>About 500,000 yen</td>
<td>Several tens of yen</td>
</tr>
<tr>
<td><strong>How to Check</strong></td>
<td><img src="image1.png" alt="Ear" /> <img src="image2.png" alt="Eye" /> <img src="image3.png" alt="Hand" /> <img src="image4.png" alt="Spray" /> <img src="image5.png" alt="Leak Detector" /> <img src="image6.png" alt="Garbage Bag" /></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Estimated Leakage/Loss

<table>
<thead>
<tr>
<th>How to Check</th>
<th>Feeling</th>
<th>Air leakage</th>
<th>Power Lost</th>
<th>Amount Lost Yearly (5,760 hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close to the ear</td>
<td>Very slightly</td>
<td>0.25 to 0.3</td>
<td>0.002 to 0.003</td>
<td>172 to 259 yen</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>0.01</td>
<td>860 yen</td>
</tr>
<tr>
<td></td>
<td>Slightly</td>
<td>1 to 2</td>
<td>0.01 to 0.02</td>
<td>860 to 1,720 yen</td>
</tr>
<tr>
<td></td>
<td>Breezy</td>
<td>2 to 3</td>
<td>0.02 to 0.03</td>
<td>1,720 to 2,580 yen</td>
</tr>
<tr>
<td></td>
<td>Strong breeze</td>
<td>3 to 5</td>
<td>0.03 to 0.05</td>
<td>2,580 to 4,300 yen</td>
</tr>
<tr>
<td></td>
<td>Gushing</td>
<td>5 to 10</td>
<td>0.05 to 0.1</td>
<td>4,300 to 8,600 yen</td>
</tr>
<tr>
<td></td>
<td>Strongly gushing</td>
<td>20</td>
<td>0.2</td>
<td>17,200 yen</td>
</tr>
</tbody>
</table>

1 kWh = 15 yen
Energy Conservation of Compressors 4

**Improvement of Air-blow**

- **Thin tube nozzle**
  - Pressure loss amount (Large)

- **Narrow tip nozzle**
  - Pressure loss (Small)
  - Achieves equal amount of colliding pressure with smaller flow

- **Constant air blow**

- **Solenoid Valve**
- **Sensor**

Shut down air blowing when there are no products

Using efficient nozzles & solenoid valves to reduce air flow
Partial Lighting

- Establish brightness standard per room & procedure
- Partially lighting to satisfy the standard
## Energy Conservation of Lighting 2

### Lighting Standards

<table>
<thead>
<tr>
<th>Illumination</th>
<th>Places</th>
<th>Work Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,000 lx</td>
<td>Precision work room</td>
<td>Precision machines, manufacturing electronics parts, very fine visual work at printing factory (Assembly of precision parts, close examination, precision test, precise selection)</td>
</tr>
<tr>
<td>2,000 lx</td>
<td>Design, drawing, entrance halls</td>
<td>Selection &amp; Inspection at textile industry, Type-setting and proofreading at printing industry, fine visual work at science industry (such as analysis)</td>
</tr>
<tr>
<td>1,500 lx</td>
<td>Office, reception room, meeting rooms</td>
<td>Common visual work at general manufacturing processes (Assembly, inspection, testing, selection, packaging, clerical work at warehouses)</td>
</tr>
<tr>
<td>1,000 lx</td>
<td>Electric rooms, AC machine rooms, Book vaults</td>
<td>Rough visual work (Limited work, packaging, packing)</td>
</tr>
<tr>
<td>750 lx</td>
<td>Passages, stairs, lavatories, restrooms</td>
<td>Very rough visual work (Limited work)</td>
</tr>
<tr>
<td>500 lx</td>
<td>Internal escape stairs, warehouses, External power equipment</td>
<td>Loading, unloading, moving packages</td>
</tr>
<tr>
<td>300 lx</td>
<td>Outdoors (for passages, guards of buildings)</td>
<td></td>
</tr>
<tr>
<td>200 lx</td>
<td></td>
<td>Note: Double the level of illumination in engaging in dangerous work.</td>
</tr>
</tbody>
</table>

Note: Double the level of illumination in engaging in dangerous work.
Installing Pull String Switches

The light is on when no one is in the room

Install a pull string switch on each light, turn it off when no one is in the room.

Turn off unnecessary lights
Placing lights on working tables and turn off the lights for the entire room.

Lighting the entire room

Reducing the no. of lights for the room

Placing lights on working tables
Energy Conservation of Lighting 5

Automatic Lighting Control By Sensor

Controls lights automatically by sensor, and save energy
Other Energy Conservation Methods

By Maintenance

Dirt build-up on heat exchanger in the freezer

Improving the decrease in efficiency with periodic maintenance

Coolant Water
Freezer

Efficiency decrease with degree of uncleanness

Consumption ratio

Thickness of defilement [mm]
Thank you for your attention

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