Green Technologies of Elevators & Escalators
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• Company Profile
• Green Technologies
Company Profile
WHY MITSUBISHI?

- 30% market share
- Over 800 employees
- Over 800 nominated Sub-contractor mechanics
- The most equipped Training Center
- Over 20000 accumulated sales
- Over 80% customers in service contract
- 28 service centers Nationwide and continuing
TRAINING CENTER
MITSUBISHI ELEVATOR (THAILAND)

The fully-equipped vertical transportation in Thailand
TRAINING PROGRAM
SHOW ROOM
We are **The No.1** Elevators Service & Maintenance in Thailand

28 Service Centers
And counting
<table>
<thead>
<tr>
<th><strong>Bangkok</strong></th>
<th><strong>Upcountry</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Bangna</td>
<td>• Phuket</td>
</tr>
<tr>
<td>• Silom</td>
<td>• Pattaya</td>
</tr>
<tr>
<td>• Sukhumvit</td>
<td>• Chiang Mai</td>
</tr>
<tr>
<td>• Ladprao</td>
<td>• Hua Hin</td>
</tr>
<tr>
<td>• Rama 3</td>
<td>• Udon Thani</td>
</tr>
<tr>
<td>• Pinklao</td>
<td>• Surat Thani</td>
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<td>• Phahonyothin</td>
<td>• Hat Yai</td>
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<tr>
<td>• Donmuang</td>
<td>• Phitsanulok</td>
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<tr>
<td>• Bangkapi</td>
<td>• Khon Kaen</td>
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<tr>
<td>• Ploenjit</td>
<td>• Chonburi</td>
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<tr>
<td>• Udomsuk</td>
<td>• Ubon Rachathani</td>
</tr>
<tr>
<td>• Ratchnadapisek</td>
<td>• Nakhon Pathom</td>
</tr>
<tr>
<td></td>
<td>• Nakhon Ratchasima</td>
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<tr>
<td></td>
<td>• Chiang Rai</td>
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<td></td>
<td>• Nonthaburi</td>
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<tr>
<td></td>
<td>• Rayong</td>
</tr>
</tbody>
</table>

**Upcountry**

- Phuket
- Pattaya
- Chiang Mai
- Hua Hin
- Udon Thani
- Surat Thani
- Hat Yai
- Phitsanulok
- Khon Kaen
- Chonburi
- Ubon Rachathani
- Nakhon Pathom
- Nakhon Ratchasima
- Chiang Rai
- Nonthaburi
- Rayong
Mitsubishi is accredited by respected international agencies.

ISO 9001:2015
Quality Management system

OHSAS 18001:2017
Occupational health and safety Management system

ISO 14001:2015
Environment Management system

We are The Best Elevators Quality & Safety in Thailand

Mitsubishi is accredited by respected international agencies.
Green Technologies
We strive to be green in all of our business activities.

We take every action to reduce environmental burden during each process of our elevators’ and escalators’ lifecycle.
ELEVATORS & ESCALATORS
GREEN TECHNOLOGIES
Eco Products

**Energy Savings**

**Regenerative Converter**
The Regenerative Converter transmits the power regenerated by the traction machine via distribution transformer to the electrical network in the building.

**Electricity recycling system for elevators <ELESAVE>**
ELESAVE is designed to store electricity generated during regular elevator operations. The electricity stored in nickel-hydrogen rechargeable batteries can be used as an auxiliary power supply for running elevators, providing approximately 20% power savings.

**PM motor with joint-lapped stator**
With the joint-lapped motor in traction machines, the iron core is split like a hinge, which allows coils to be wound around the core more densely, resulting in greater motor efficiency and compactness.

**Permanent magnet (PM) door motor**
The direct-drive PM door motor and the VVVF inverter realize efficient door opening and closing.

**Variable traveling speed elevator system**
This system allows elevators to travel faster than their rated speed depending on the number of passengers in the car, thereby improving transport efficiency.

**Car light/fan shut off**
The car lighting and ventilation fan are automatically turned off if there are no calls for a specific period.

**LED lighting**
Energy-efficient and long-life LEDs are used for car lighting in elevators and under-handrail lighting on escalators.

**Materials**

**Less oil**
The guide shoe and rope require only minimal oil, significantly reducing environmental impact.

**Size and weight-saving**
The size and weight of doors, cars, car frames, rails, and some other components have been reduced based on test analysis of their shock-absorption performance.
Eco Products

Traffic Efficiency

Σ AI group control system  
Effective control of multiple elevators reduces energy consumption.  

Energy-saving operation  
Smart control technology  
According to each car’s location and passenger load, the group control system assigns a call to the elevator that best balances operational efficiency and energy consumption.

Destination oriented prediction system (DOAS)  
When a passenger enters a destination floor at a hall, the hall operating panel indicates which car will serve the floor.

Automatic operation  
Our newly-developed, innovative escalator inverter enables a unique way of controlling the escalator speed in Automatic and Variable-Speed Operations.
### Milestones of Energy-saving Technologies

<table>
<thead>
<tr>
<th>Year</th>
<th>Drive system</th>
<th>Traction machine</th>
<th>Machine</th>
<th>Power consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>AGC control</td>
<td>Relay circuit</td>
<td>Machine-room type</td>
<td>100%</td>
</tr>
<tr>
<td>1970</td>
<td>ACV* control</td>
<td>Worm-gearred</td>
<td>Machine-room type</td>
<td>63%</td>
</tr>
<tr>
<td>1980</td>
<td>Microcomputer</td>
<td>Helical-gearred</td>
<td></td>
<td>74%</td>
</tr>
<tr>
<td>2000</td>
<td>VVF* control</td>
<td>PM gearless</td>
<td></td>
<td>37%</td>
</tr>
<tr>
<td>2016</td>
<td>2000 Traction</td>
<td>WYF* control</td>
<td></td>
<td>32%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&amp; less type</td>
<td></td>
<td>30%</td>
</tr>
</tbody>
</table>

**Note:**
- ACV*: Alternative current variable voltage
- VVF*: Variable voltage, variable frequency
- PM: Permanent magnet
- WYF*: Post-free automatic operation

- **CO₂ emissions:** Calculated from the power consumption with a coefficient of 0.49 kg/kWh.

### Escalators

<table>
<thead>
<tr>
<th>Year</th>
<th>Control/Drive system</th>
<th>Power consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>Worm-gearred Drive</td>
<td>100%</td>
</tr>
<tr>
<td>1970</td>
<td>Worm-gearred Drive</td>
<td>100%</td>
</tr>
<tr>
<td>1980</td>
<td>Helical-gearred Drive</td>
<td>80%</td>
</tr>
<tr>
<td>2000</td>
<td>VVF*</td>
<td>80%</td>
</tr>
<tr>
<td>2016</td>
<td>WYF*</td>
<td>80%</td>
</tr>
</tbody>
</table>

- **CO₂ emissions:** Calculated from the power consumption with a coefficient of 0.49 kg/kWh.
Eco Factory

Elevator testing tower - SOLAÉ - [INAZAWA works]

Rooftop garden (5,537 m²) [INAZAWA works]
The garden on the factory building shields from heat and improves air conditioning efficiency.

High efficiency ceiling lights
Old lights were replaced by high-frequency inverter lights, as the illuminance sensors help optimize the use of natural light and save 270,000 kWh of electricity per year.

Ventilation tunnels
Large voids (ventilation tunnels) allow the tower to breathe fresh air through window louvres, ventilating the tower and cooling off the indoor temperature.

Photocatalytic tiles
Photocatalytic tiles on the outer walls resist and decompose dirt and even bacteria, helping reduce the use of cleaners.

VOC* removal system
A VOC removal system was installed. It not only eliminates approximately 90% of the VOCs, it also deodorizes the gases emitted. As a result, the deodorizing furnace is no longer required, which ultimately reduces the natural gas consumed by Inazawa Works.  

Waste reduction
We have reduced waste in our manufacturing processes to protect the environment.

ISO 14001 certification
Mitsubishi Electric's products, comprising the world's leading elevator and escalator technologies, are now manufactured in nine countries and regions, and sold in 88 countries. Since the achievement of ISO 14001 certification at the Inazawa Works, other overseas manufacturing plants and affiliated companies in Japan have also been certified.
Logistics

Reduction in wood consumption for packing (3Rs – reduce, reuse, recycle)

By reusing wood from crates, Mitsubishi Electric reduced wood consumption by 240 m³ per year.

The packaging for small parts of escalator trusses was changed from wooden crates to cardboard boxes, which reduced wood consumption by 69 m³ per year.

Increasing load capacity to reduce the number of trucks used

We formulated guidelines on how to stack multiple containers or crates depending on their shape to improve load capacity. These efforts reduced the number of trucks used, and CO₂ emissions accordingly.
Installation / Maintenance

Development of installation engineering
In order to reduce the time and energy required for installation, installation equipment was made smaller and lighter. Mitsubishi Electric developed its installation method and equipment to have less impact on the environment.

【WOS method】
(Without-scaffolding installation method)
An elevator is installed by using the elevator’s car platform, instead of scaffolding. It can eliminate the time for installation and removal of scaffolding.

High-performance maintenance service
Monitoring each elevator's condition at the central control center, we provide efficient and reliable service without wasting energy.
Modernization

Proposing the most suitable solution

Modernization allows an elevator to be refurbished by replacing some of its components so that usable components can be retained.

Benefits

- Energy savings
- Improved traffic efficiency
- Minimal wasted parts
- Safety
- Reliability

<table>
<thead>
<tr>
<th>Existing elevators</th>
<th>Modernization: Case A</th>
<th>Modernization: Case B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replaced components</td>
<td>____</td>
<td>Control panel (VVVF)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Door motor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Signal finish</td>
</tr>
<tr>
<td>Energy-saving</td>
<td>100%</td>
<td>62%</td>
</tr>
<tr>
<td>Reuse rate</td>
<td>100%</td>
<td>88%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Traction machine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Gearless)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Control panel (VVVF)</td>
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<tr>
<td></td>
<td></td>
<td>Door motor</td>
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<td>Signal finish</td>
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<tr>
<td></td>
<td></td>
<td>54%</td>
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<tr>
<td></td>
<td></td>
<td>46%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>71%</td>
</tr>
</tbody>
</table>
Initiatives to Prevent Global Warming

Aim to Reduce Total CO₂ Emissions from Production by 30%

Raising the efficiency and performance of air conditioning, lighting and other utility equipment, as well as improving production lines reduces the amount of CO₂ emitted during production and helps prevent global warming.

Initiatives to Achieve a Recycling-based Society

The 3Rs:
Reduce, Reuse and Recycle Products
Utilizing 'Design for Environment' and 'Life Cycle Assessment' Technologies

Produce products that incorporate the 3Rs throughout their lifecycles

Zero Emissions:
Measures to Reduce the Direct Landfill of Waste to Zero

Restricting generation of waste and promoting the efficient reuse and re-sourcing of waste

Groupwide Plan to Reduce CO₂ Emissions from Production

<table>
<thead>
<tr>
<th>Year</th>
<th>Base Year</th>
<th>Goal of 4th Environmental Vision Plan</th>
<th>Goal of Environmental Vision 2021 (FY2031)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>514</td>
<td>290</td>
<td>230</td>
</tr>
<tr>
<td>2011</td>
<td>470</td>
<td>390</td>
<td>300</td>
</tr>
<tr>
<td>2015</td>
<td>470</td>
<td>470</td>
<td>470</td>
</tr>
</tbody>
</table>

Reduce
Cut amount of raw materials used by 10% by setting the goal of size and weight reduction for each product, and to not using more materials than necessary

Reuse
Introduce product remanufacturing program and expand maintenance service

Recycle
Expand closed-loop recycling program for plastics and move toward recycling all waste plastic from appliances
THANK YOU
FOR YOUR ATTENTION