Smart City Solution - Yokogawa Community Energy Management System

Submitted by: Yokogawa Electric Corporation
Smart city solution

Yokogawa
Community Energy Management System

Shoko Matsunaga
Yokogawa Electric Corporation
Renewable Energy, Power & Water Business Center
Energy & Sustainability Business HQ
September 15, 2021
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Yokogawa Electric Corporation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Founded</td>
<td>September 1, 1915</td>
</tr>
<tr>
<td>Incorporated</td>
<td>December 1, 1920</td>
</tr>
<tr>
<td>Paid-in Capital</td>
<td>43.4 billion yen</td>
</tr>
<tr>
<td>Sales</td>
<td>374.2 billion yen (consolidated)</td>
</tr>
<tr>
<td>Operating Income</td>
<td>31.6 billion yen (consolidated)</td>
</tr>
<tr>
<td>Ordinary Income</td>
<td>34.1 billion yen (consolidated)</td>
</tr>
<tr>
<td>Profit Attributable to Owners of Parent</td>
<td>19.2 billion yen (consolidated)</td>
</tr>
<tr>
<td>R&amp;D Investment/Sales</td>
<td>7.4 % (consolidated)</td>
</tr>
<tr>
<td>Number of Employees</td>
<td>17,715 (consolidated)</td>
</tr>
<tr>
<td>Capital Ratio</td>
<td>59.4 % (consolidated)</td>
</tr>
</tbody>
</table>

(Results of fiscal year 2020)
Global Business Expansion and Innovation

1915 Dr. Tamisuke Yokogawa established an electric meter research institute in Shibuya, Tokyo
1955 Signed a technical assistance agreement for industrial instruments with Foxboro, USA
1957 USA
1966 Japan 1st Process gas chromatograph
1969 World’s 1st Vortex flowmeter
1974 Singapore, Europe
1979 China
1980 Brazil
1983 Formed Yokogawa Hokushin Electric Corp. through merger with Hokushin Electric Works
1985
1990 Middle East
1992 World’s 1st Fully digital transmitter with silicon resonant sensor
1993 Started research and manufacture of aircraft instruments and flow, temperature, and pressure controllers
1995
1996 Confocal scanner unit
2002 Acquired 100% of Ando Electric’s stock
2005
2013 Formed Yokogawa Solution Service Corporation to handle sales, engineering, and services for the Japan industrial automation business
2015
2016 Acquired KBC Advanced Technologies
2021

Founding principles
Quality first
Pioneering spirit
Contribution to society

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Yokogawa Employees Worldwide

Worldwide breakdown:
- Europe, Russia & CIS: 2,439
- North & South Americas: 1,004
- Middle East & Africa: 985
- Asia & Oceania: 6,876
- Outside Japan: 11,304
- Group companies in Japan: 3,875
- Yokogawa Electric Corporation: 2,536

(As of March 31, 2021)
Worldwide Business Operations

Global network supporting business growth

Subsidiaries and Affiliates

11 offices in Japan
107 offices outside Japan

Yokogawa Europe (The Netherlands)
Yokogawa Electric CIS (Russia)
Yokogawa China (China)
Yokogawa Electric Korea
Yokogawa Corporation of America (USA)
Yokogawa America do Sul (Brazil)
Yokogawa Middle East & Africa (Bahrain)
Yokogawa India (India)
Yokogawa Electric International
Yokogawa Engineering Asia (Singapore)
World Headquarters
Yokogawa Electric Corporation (Japan)

(As of March 31, 2020)
Our manufacturing operations span 13 economies

- **The Netherlands**: Analytical instruments
- **Germany**: Field instruments
- **Russia**: Field instruments
- **Saudi Arabia**: Field instruments
- **Korea**: Controllers, measuring instruments
- **United States**: Field instruments, analytical instruments
- **Bahrain**: Field instruments
- **India**: Field instruments
- **Singapore/Indonesia**: Control systems, analytical instruments, measuring instruments, field instruments, aviation instruments
- **China (Sichuan)**: Field instruments
- **China (Suzhou)**: Field instruments, meters
- **China (Shanghai)**: Field instruments
- **Brazil**: Field instruments

*Main factories in Japan*

(As of March 31, 2021)
Services Anywhere - global reach, local delivery

- Service Offices: 180+
- Service Partners: 50+
- Economies: 200+
- Service Engineers: 2500+

Regional Response Centers:
- The Netherlands
- Russia
- China
- Korea
- USA
- Bahrain
- India
- Singapore
- Brazil

Security Competence Laboratory
Security Operation Center

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EMS to connect power suppliers and consumers

Virtual Power Plant

Fossil power plants

Variable renewable energy and storage

Hybrid Control

Controllable renewable energy

FEMS

HEMS

BEMS

EMS
Real-time Energy Demand-Supply Adjustment

Supply/Demand
Communities

Supply/Demand
Buildings

Supply/Demand
Factories (with/without private generator)

Community EMS (CEMS)

Smart City
What does CEMS realize?

Demand Forecast
Demand Forecast from:
- Past demand history data
- Weather forecast
- Other events history data

- Display
- Store
- Forecast & schedule
- Optimize
- Data gathering
- CEMS

Example
- Optimize electricity procurement costs
- Optimize income from electricity sales
- Maximize CO2 reductions

Demand (Consumers)
STABILIZED POWER
BEST ENERGY MIX

Generation Resources
- Wind turbine
- Solar PV
- Battery
