Energy saving in industries
Fuji Electric in India Milestones

1985 to 2000: Technical Transfer with Instrumentation Ltd. (Kota) for instrument Products
1987 to 1997: Technical Transfer with Instrumentation Ltd. (Kota) for UPS Products
1990 to 1995: Technical Assistance agreement with Kirloskar for Drive Products
(Subsequently Kirloskar made “KRENIC” Series Drives in India upto 2009)
1996 to 2000: Joint Venture with Thermax for manufacturing Transmitters
2007: Establishment of Fuji Electric FA Singapore branch (Mumbai, Delhi, Chennai) and start local operation for Drive & Motion (Servo, PLC, HMI) Products

2009: Became wholly owned subsidiary “Fuji Electric India Pvt. Ltd.”
2011 1. Top share for Elevator Industry (ThyssenKrupp, Johnson, Omega, OTIS etc.)
2. Establishment of branch office at Kolkata, Ahmadabad, Pune, Hyderabad.

2012 1. Introduce Instrumentation product with Fuji India operation
2. Introduce Medium Voltage Inverter product with Fuji India operation
3. Reach every part of India through Network of more than 50 Channel Partners
4. Establishment of Engineering Centre.


2014 Taken one of the biggest Port Crane order from Anupam-MHI for TIL Project, Turkey and so on...... Exceeded 1.5 Billion INR Sales.


2016 Achieved 1.85 BINR Sales along with strategic JV as FGEM & Own SKD mfg. of Frenic ACE AC Drive up to 15kW.

2017 Expanded operations for System Business with FGEM & done Indian Business to 2 BINR Sales (1.75B INR w/o GST).

2018 Started Semiconductor Buy & Sell and Achieved Mile Stone of crossing 2 Billion INR Sales. Closed @2.11 Billion INR Sales.
Consul Neowatt Milestones

### Pan-India Sales & Service Network
- **1981 - 2011**
  - Manufacturing of voltage stabilizers, transformers and lower kVA UPS
  - Trading of imported UPS

### Foundation / Capabilities for High Value Products
- **2012 - 2014**
  - Acquisition of Megatech & Neowatt
  - Built state-of-the-art manufacturing facility in Chennai
  - End-to-end SAP and CRM implementation
  - Started manufacturing in Pune
  - Built in-house R&D capabilities
  - Investment by Peepul Capital
  - New management on-boarded

### Attained Status as a Premium 3 Ph UPS Company
- **2015 - 2018**
  - Launched comprehensive range of 3 Ph UPS
  - Established as a credible alternative to MNCs for 3 Ph business applications
  - 250+MVA of Falcon 3 Ph UPS sold over FY15-18
  - Expanded sales and service network pan-India

---

**Sales of ~1B INR**
- 1981: Established as a trading company with one manufacturing facility in Chennai
- 2011: Established pan-India direct sales & service network
- 2012: Acquisition of Megatech
- 2013: Acquisition of Neowatt
- 2014: End-to-end SAP and CRM implementation
- 2015: Legal merger of Consul, Megatech and Neowatt as Consul Neowatt
- 2017: Establishing technology enabled service delivery platform
- 2018: Amongst top 5 – 3 Ph UPS companies in India

**Sales of 4.25B INR**
- Fastest growing UPS company in India over last 5 years

---

ASP – Authorised Service Provider

(1) Source: Management estimates
Green House Gases In Industry – An Overview

Sector Context

The industry sector is notable for the sheer diversity of activities, processes, and technologies. This is a sharp contrast to electricity and heat, where the end product is homogeneous, and transport, where the technologies are relatively uniform. In addition to chemicals, cement, steel, and aluminium, other significant contributors to industry emissions include food and tobacco, pulp and paper, and machinery. Naturally, given the lack of uniformity in the manufacturing and industry sector, there are a large number of diverse actors operating in a multitude of regulatory contexts.

Source: CAIT

Source: WRI
Energy Dilemma

By 2050

\[ \times 2 \]

Task to reduce CO\(_2\) Emission by 2050

\[ \div 2 \]

Fuji Electric offer solutions for Energy efficiency

- Energy Audits
- Energy Efficiency with ESCO
- Enabling Products
- Energy Management solutions

--- For the Industrial Buildings

--- For Industrial process
Energy and CO$_2$ Emission Challenge

- World consumption up by 45% since 1980, 70% higher by 2030
- CO2 up by 33% since industrial revolution, rising faster than ever
- Emerging markets >75% of new demand
- Natural Resource competition and political instability keep prices high

Coal used continues to grow in emerging markets
Buildings and Industry are the 1<sup>st</sup> GHG emission contributors...

- **≈ 44%** GHG contribution comes from buildings & Industry
  - 3x larger than GHG contribution from transportation

- **In industry & buildings:**
  - **70%** of electricity is generated via coal or hydrocarbons
  - **90%** of heat and process activities burn hydrocarbons

Source WRI

Energy Use Split Up

Industry and infrastructure: 31%
Buildings: 18%
Data center and network: >2%
Residential: 21%
Transportation: 28%

Main energy consumption is for Heating, Cooling, Motors, Lighting, Electronics and appliances.

Source: EERE
Earthquake Engineering Research Institute
Transmission and Distribution losses

Coal

100 Units

Power Plant

35 Units

Transmission

33 Units

End User

1 saved unit  ➞  3 Unit saved at Power plant
Life cycle Solution for Energy Efficiency

**Fix the Basics**
- Low consumption devices
- Power factor correction

**Optimize through Automation and regulation**
- Industrial Building Management
- Greenhouse Gas Control
- Variable speed Drive
- AHF

**Energy Audit Measurements**

**Monitor, Maintain, Improve**
- Energy Monitoring
- Remote monitoring
- Fast and efficient After Sales Support

**Energy Monitoring**
- Remote monitoring
- Fast and efficient After Sales Support
Where are the savings....

**Industry and Infra**
Aim to reduce consumption by 10 to 20%

- Motor account for 60% of electricity usage
- VFD can save about 35% electricity
- AHF improves the Power quality

**Data centers and Networks**
Power and Cooling can reduce consumption by 30%

- Power and Cooling systems is 50% of electricity usage
- Saving is achieved by high efficiency UPS and VFD for Chiller

**Commercial Buildings**
Renovation will save about 30% energy

- Consumes about 20% of energy
- Cooling, Lighting solutions
- AHF can improve quality of power, VFD improve savings in Lifts, Escalators, Pumps, Chillers

....The Fuji way
Solution for Industry and Infrastructure

**Enabling Products**
- Variable Speed drive for Motors
- PLC for production throughput
- Power compensation and filtering
- Auto switchover Static Switches
- Analyzers to monitor GHG

**Management**
- Power Monitoring and Analysis
- Processes supervisory system

**Value Added Services**
- Fast TAT
- Site Audits
- Remote monitoring
Product Range
## FECN Products

<table>
<thead>
<tr>
<th>POWER ISSUES</th>
<th>Power Failure</th>
<th>Under Voltage</th>
<th>Over Voltage</th>
<th>Line Noise</th>
<th>Switching Transients</th>
<th>Frequency Variation</th>
<th>Harmonic Distortion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online UPS &amp; Static Transfer Switch</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Industrial Online UPS</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Offline UPS</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Servo Stabilizers</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolation Transformer</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off-grid &amp; Hybrid Solar Inverter</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active Harmonic Filters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>
FEI Products & Solutions

Automation
- LV Inverter
- Motors
- Instruments & Sensors

System
- (Servo) FA Components
- EMS / Logistics
- EGCS

Plant
- Drive Control System
- Process Control Systems
- PCS
- Plant Inverter
- MV INV
- Induction Heating
- Monitoring Control System
- Compact DCS

Social Solution
- Railway
- Automobile
- Power Generator

Information Solution
- Company
- Factory

Major References

Automation
- Assembly Factory (Automobile, Electronics)
- Building HVAC / Lifts
- Water Treatment
- Industrial Machinery
- Material Plant (Steel, Non Metal, Chemical)
- Incinerator

Information Solution
- MES / I o T / O&M / EMS
Energy measurement & Optimization instruments

- Ultrasonic flowmeter
  - Air measurement
  - Pulse and analog output

- Vortex flowmeter
  - Water and condensate measurement
  - Pulse and analog output
  - Communication Modbus

- Pitot tube
  - Orifice plate
  - V-Cone
  - Venturi
  - Steam, water and gas application
  - Analog output

- Gas analyser
  - CEMS gas analyser
  - Laser gas analyser
  - Zirconium & paramagnetic gas analyser
How to construct Energy Management System

**Phase 0:**
- EMS : Energy Management System
- FeTOP-ems
- Total Power Optimizations
- Small Start System

**Phase 1:**
- FEMS
- SCADA
- Energy Monitoring System

**Phase 2:**
- MainGate
- Monitoring System
- Power Monitoring

**Phase 3:**
- POD
- Programmable Operation Display
- Partial Power Optimization

**EOS:** Energy Optimizations System

- Highly effective motor
- Highly effective Inverter
- Large capacity UPS
- Water
- Oil
- Gas
- Steam
- Cogeneration
- Boiler
- Compressor
- Pressure Transmitters
- PLC
- Production facility

**Quantity control**

**Total Power Optimizations**

**EMS : Energy Management System**

**FeTOP-ems**

**Phase 3**

**MainGate**

**Phase 2**

**Phase 1**

**Energy Monitoring System**

**Small Start System**
**Device and Systems for Energy Saving Solution**

**Power stabilization**
- Extra-High-Voltage Substation
- High-Voltage Distribution Panel
- In-house power generation
- UPS
- Optimal operation of energy demand and supply
- Wind Power
- Fuel Cell
- PCS
- Solar Cell
- Battery

**Energy Management**
- Energy Management System
- Data collection and monitoring system
- Measurement devices (Electricity/Water/Steam/Gas/Air)

**Energy saving and control**
- Production management system
- Diagnose service of energy saving (e.g. Auto parts manufacture)

**High voltage inverter**
- Incinerator fan
- Boiler ID fan
- Chiller pump
- Cooling tower fan
- Metalworking Dust collector

**Low voltage inverter**
- Various (Motor, Fan, Pump, Blower, Loader, Conveyors)

**Production management system**
- Quality analysis
- Operation management
- Quality traceability

**MainGATE-Assembly**
- Heat pump
- A/C
- Lighting
Feedback the measured value

- Indoor temperature and humidity
- Outside air wet-bulb temperature
- Cold water temperature
- Coolant temperature
- Cold water flow rate
- Electric valve opening
- End pressure
- Discharge pressure
Energy Saving Orders For BLOWER Applications

- VFD Rating: 90KW Model: FRN90G1S-4A
- Customer: VSP, Vishakhapatnam
- Installation: Sep 2015
- End User: VSP, Vishakhapatnam

- Repeat Orders in 2015, from VSP, SSP-Salem etc.

- 132KW VFD for Blower in JSP, Salem. (FEB 2015)
- 250KW VFD for SP-2 for Finished Sinter Dedusting fan @ Kalyani Steel Ltd.
- Various Ratings up to 45kW AHU Panels @ Yokohama Rubber, Bahadurgarh
Customer: Carrier.
End User: Safdarjung Hospital.
Application: Chiller
Frenic Mega Drives with CN - AHF used.
Commissioning Done – July’15.

As the chiller is used in the Hospital area, to maintain the Harmonic i.e. THiD in the said level, so that it do not harm the power supply and in terms of other medical equipment.

Need to have the THiD < 5%, using AHF (Active Harmonic Filter) we have to control the harmonic less than 5%. 

INDUSTRIAL VERTICAL - HVAC
Case Study: SAIL – Burnpur – EMC Project

Steel Plant Energy Optimization System – Under Implementation

- Fuji Electric (Japan)
- Fuji Electric (India)

Operational planning
Plant operation planning

Energy Center

Terminal equipment

Demand/supply forecast system
Operation Optimization system
Data collecting system

To extract data from each facility for sharing the data.
(apply also for the maintenance)

Unified management for each facility data

To install the PLC for collecting each facility data and send to energy center

PLC

Coke oven
Sinter
Blast furnace
Basic Oxygen Furnace
Continuous casting

Private power generation

Boiler
Turbine
Blower

Electric power generator

Oxygen
Case Study: Jindal Infra– Incineration Project

Municipal Solid Waste to Energy – Pending Commissioning
Guntur & Visakhapatnam - Automatic Combustion Control of waste incinerator

Problems

◆ The calorie content of wastes fluctuates, and the wastes contain water and incombustibles such as metals.
◆ It takes time to incinerate wastes and respond to the fluctuation in the stoker speed and air amount.
◆ If the incineration temperature drops or wastes are not complete combustion, CO and dioxin are generated.
◆ If the incineration temperature rises, NOX is generated.
◆ The amount of boiler outlet of steam depend on the waste incineration amount and calorie of wast.

Countermeasures

◆ The optimal incineration is calculated and predicted based on various data (incineration amount, boiler water-supply amount, air temperature, etc.) to provide the proper setting values for the stoker speed and the incineration air amount.

ACC

Big-data (operation data) analysis technology
Model prediction control Fe-TOP
DMC Prediction of many variables

Calorie calculation
Control of steam amount
Compensation for dioxin
Compensation for NOX

Incineration control system

Control of stoker speed and air flow rate
Manufacturer of synthetic spun yarn in 100% rayon, 100% polyester, polyester-viscose and open end (OE) rayon yarn. The company exports more than 80% of its production to customers across 24 countries including Korea, Japan, Belgium, Spain, Turkey, Brazil, the US, China and Italy.

<table>
<thead>
<tr>
<th>Sr No.</th>
<th>Loss Due to</th>
<th>Annual Savings in MINR</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power Savings due to Harmonic current reduction</td>
<td>5</td>
<td>Plant operation is 24X7X365</td>
</tr>
<tr>
<td>2</td>
<td>Transformer Loss Reduction</td>
<td>3</td>
<td>2% increament in efficiency for every 30% reduction in Harmonic current</td>
</tr>
<tr>
<td>3</td>
<td>Sensitive equipment failure – Downtime + replacement cost</td>
<td>1</td>
<td>Actual cost incurred to replace Inverter cards, machine PCB’s, control cards etc</td>
</tr>
<tr>
<td>4</td>
<td>Cable cost reduction, Transformer life increase</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Expected Annual Savings</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>