Present and Future of PAFC at Fuji Electric

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How was Fuji Electric founded?

Fuji Electric was founded as a joint venture company by the Japanese company Furukawa Electric and the Germany company Siemens A.G. in 1923, to manufacture electrical machinery and telecommunications equipment for Japanese customers.

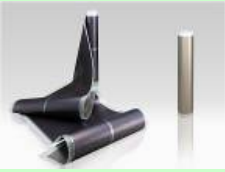
Fu rukawa Electric Co., Ltd. and Si emens A.G.

Fu ji Electric

Fuji's technologies and products

Fuji Electric Systems

Flexible solar modules



Geothermal power generation equipment

IGBT modules

Fuel-cell packages FP-100i

Inverters

Fuji Electric Device Technology

Magnetic Disks

Fuji Electric Retail Systems

Refrigerating showcases

Vending machines

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Development of PAFC at Fuji Electric

1973 1990 1998 2010

Field tests → Commercialization → Business expansion

☆Development of fuel-cell stacks

☆Accomplishment of long lifetime (40,000h)

☆Extension of lifetime (60,000h)

☆Shipment of *"FP-100i"*

Field Tests
over 90 sites

All-in-one packaging
Operable in cold climates
[-20 to +40 deg C]

Focused on 100kW PAFC fuel cells, because of prospects for a large market and for cost reduction by mass-production.

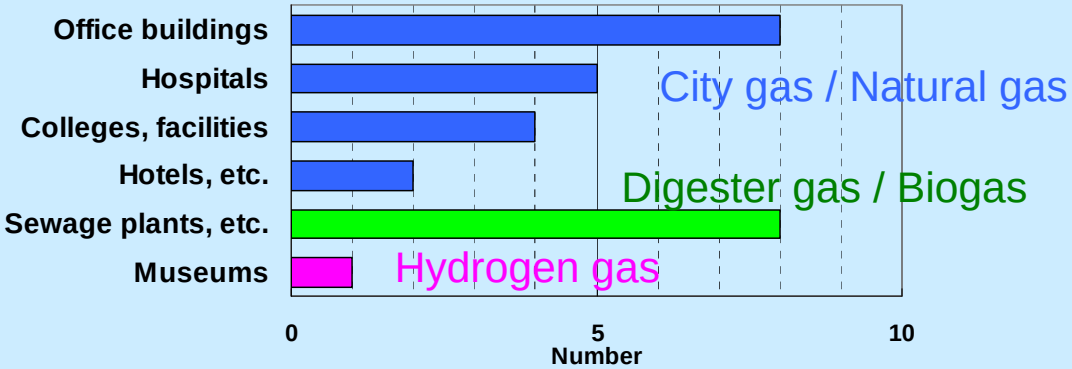
How many packages have we shipped so far?

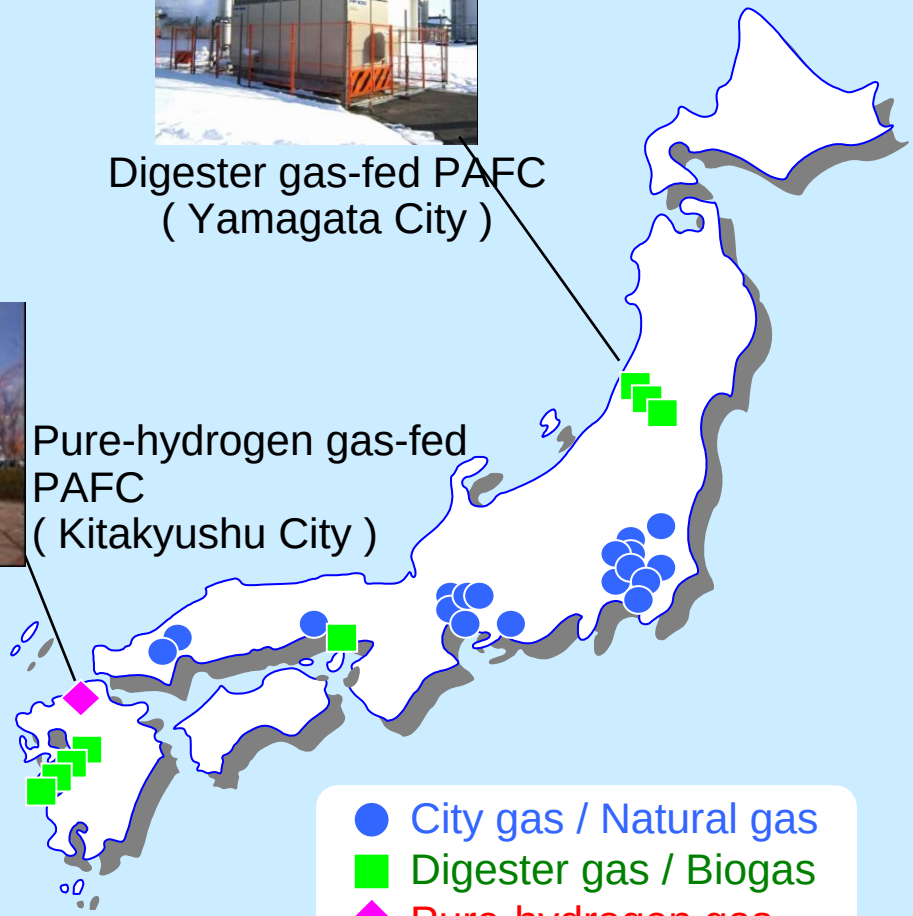
We have shipped 28 packages since 1998.

Natural gas-fed PAFC
used to prevent fires
(Wismar, Germany)

Digester gas-fed PAFC
(Yamagata City)

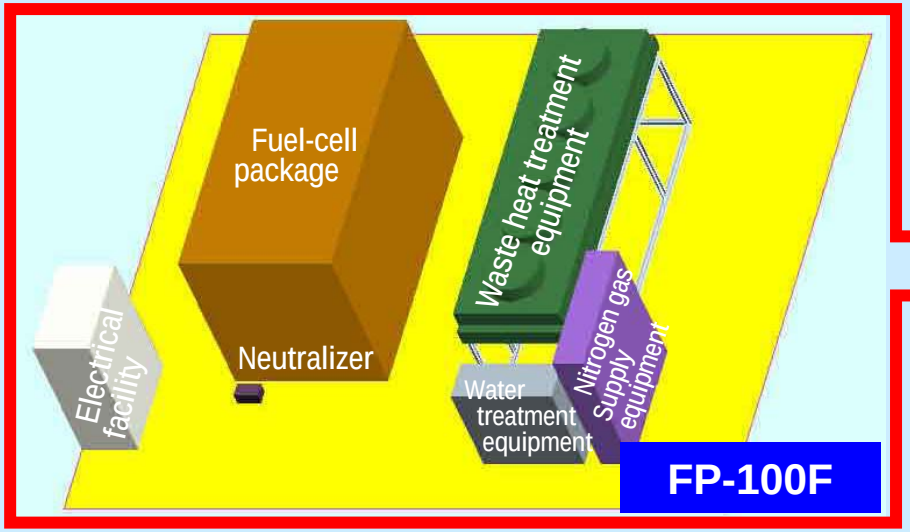
Pure-hydrogen gas-fed
PAFC
(Kitakyushu City)



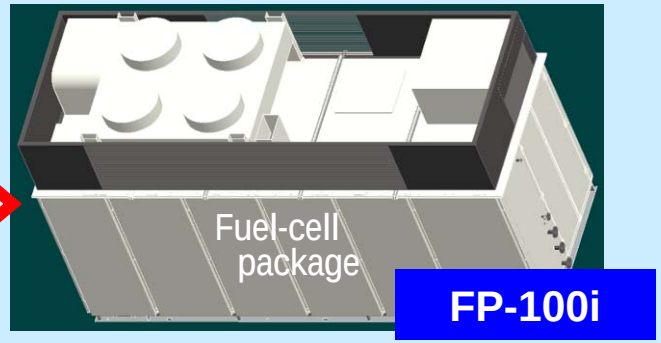


Configuration of new 100kW PAFC package

All-in-one package



Installation area
90m² reduced to 47m²



- ◆Reduced installation area
- ◆Simplified installation

Operable in cold climates

- ◆Operable at -20 deg C

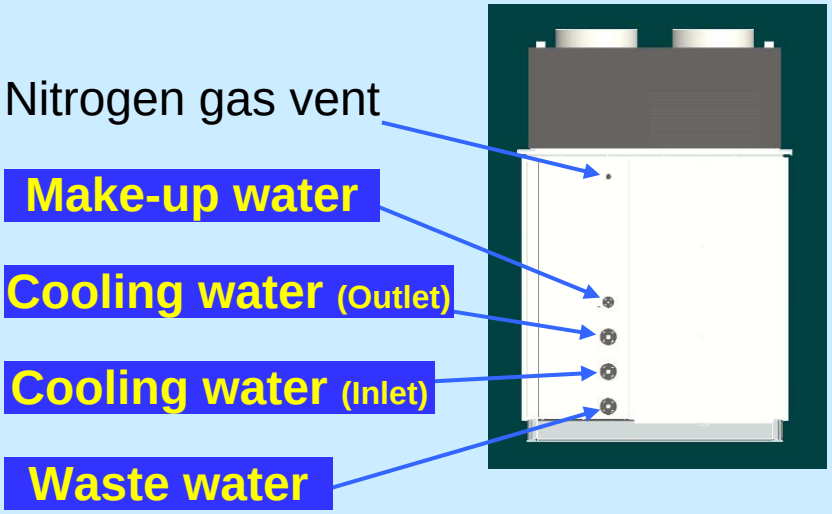
Operable with multiple sources of energy

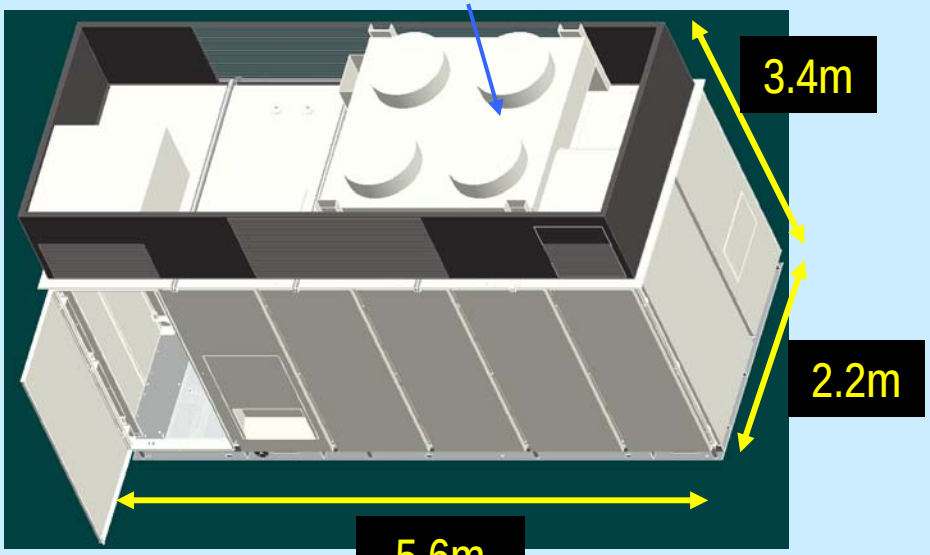
- ◆City gas / Natural gas
- ◆Propane gas (for backup systems)
- ◆Digester gas / Biogas
- ◆Pure-hydrogen gas
- ◆By-product gas (Under planning)

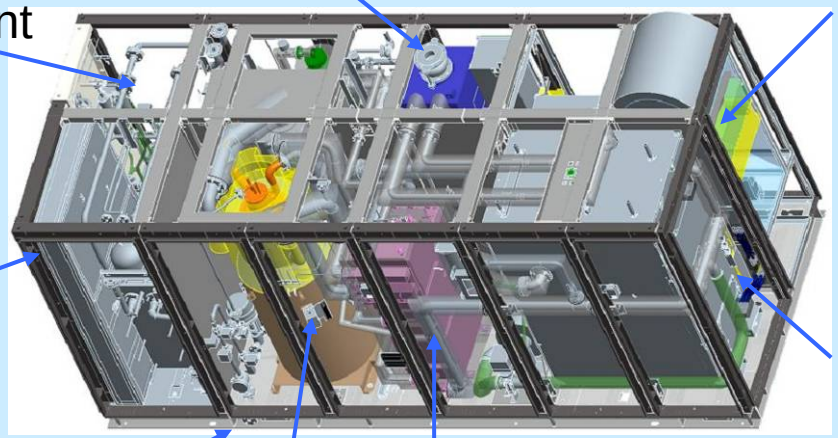
Able to generate multiple outputs

- ◆Electric power supply
- ◆Heat supply
- ◆Low-oxygen air supply
- ◆Hydrogen supply

Structure of natural gas-fed FP-100i package







Specifications of new 100kW PAFC package (FP-100i)



Type	Natural gas-fed	Digester gas-fed	Pure-hydrogen gas-fed
Rated output power	AC 105kW		
Output voltage/ frequency	210V or 220V / 50Hz or 60Hz		
Electrical efficiency	42% [LHV]	40% [LHV]	*48% [LHV]*
Total efficiency	91% [LHV] ,123kW [When 60 deg C water is used] If 90 deg C water is used, then 50kW	90% [LHV] ,130kW [When 60 deg C water is used] If 90 deg C water is used, then 50kW	99% [LHV] ,113kW [When 60 deg C water is used] If 90deg C water is used, then 68kW
Exhaust gas	NOx : less than 5ppm [O_2 0%] SOx,dust : less than the detection limit		NOx, SOx, dust : none
Consumption of fuel	22m^3/h (Normal)	44m^3/h (Normal)	74m^3/h (Normal)
Operating system	Fully automated／grid-connected		
Volume W x L x H	2.2m（W）x 5.6m（L）x 3.4m（H）		
Weight	15 tons	16 tons	14 tons

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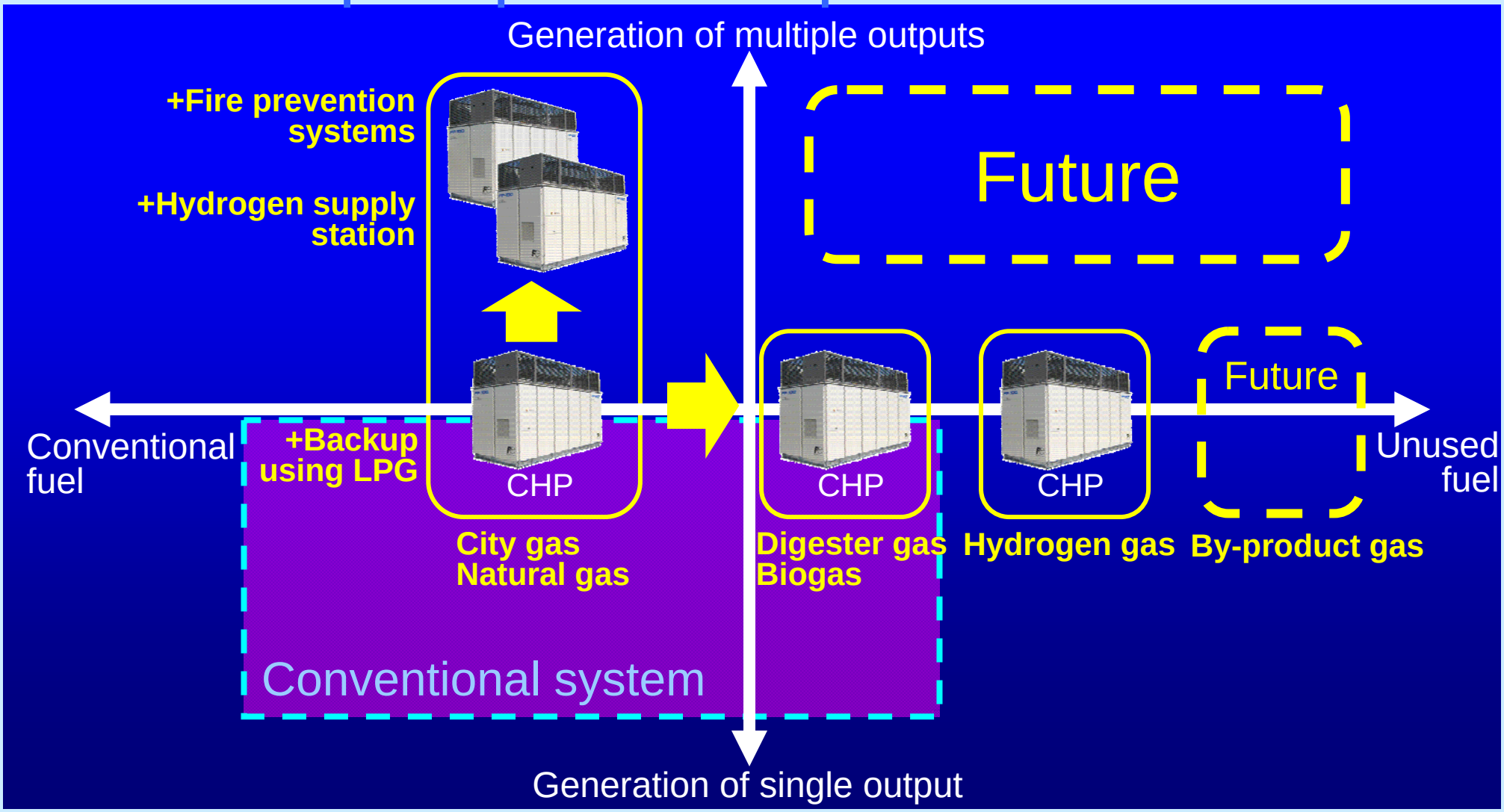
Target market

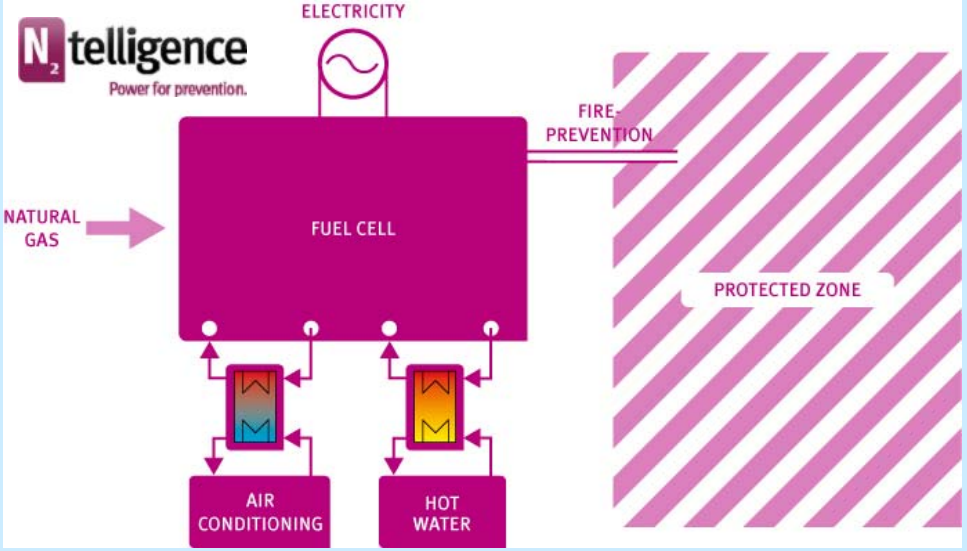
Our PAFC packages are capable of performing functions conventional power plants cannot perform.



Application to supply low-oxygen-concentration air

Fire prevention in 21st century

- ◆A PAFC package generates low-concentration-oxygen air as well as electricity and heat.
- ◆Low-concentration-oxygen air makes data centers and warehouses fire-free.
- ◆The first package began to operate in Germany in July 2010.

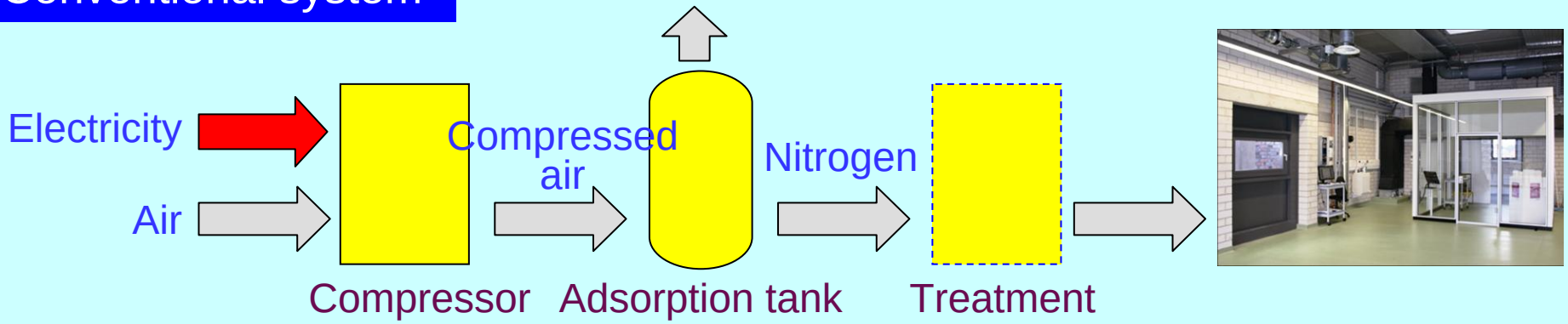


We have authorized N_2telligence exclusively to use our PAFC packages for their fire prevention systems

Configuration of new fire prevention system

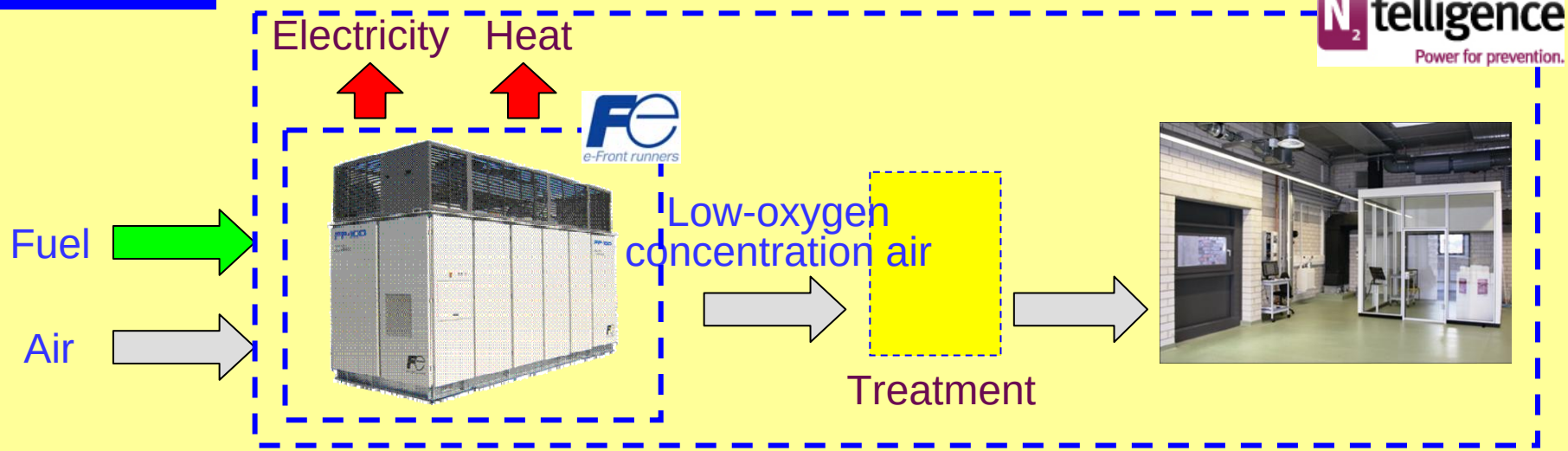
Conventional system

◆ **Noisy and energy consuming**



New system

◆ **Environmentally friendly and highly efficient**

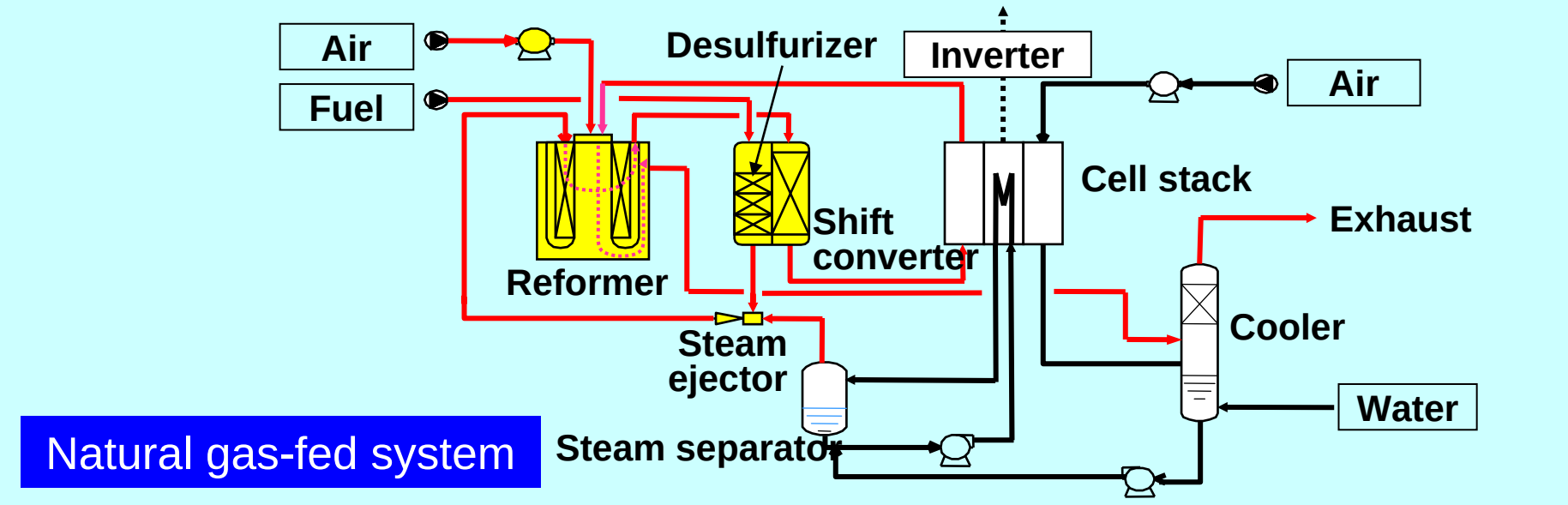


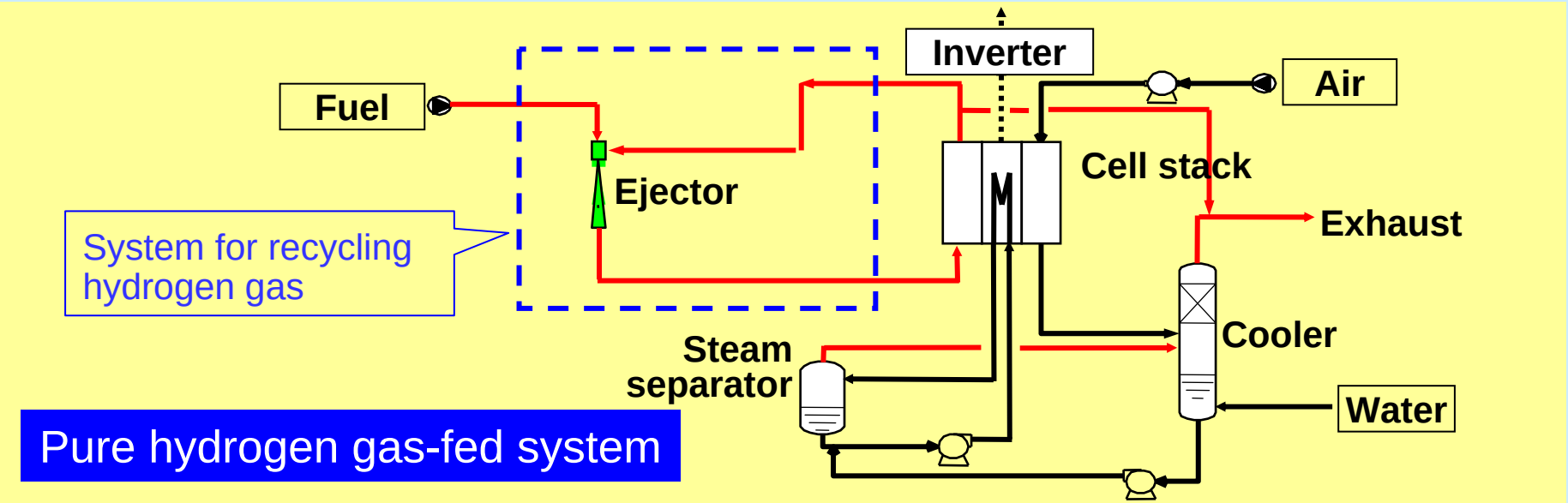
Application using pure hydrogen from steelworks

High efficiency hydrogen-power generation

- ◆High electrical efficiency: 48%
- ◆Steelworks supplies hydrogen gas through a pipeline
- ◆The first package began to operate in 2011

Pure hydrogen gas-fed fuel-cell system





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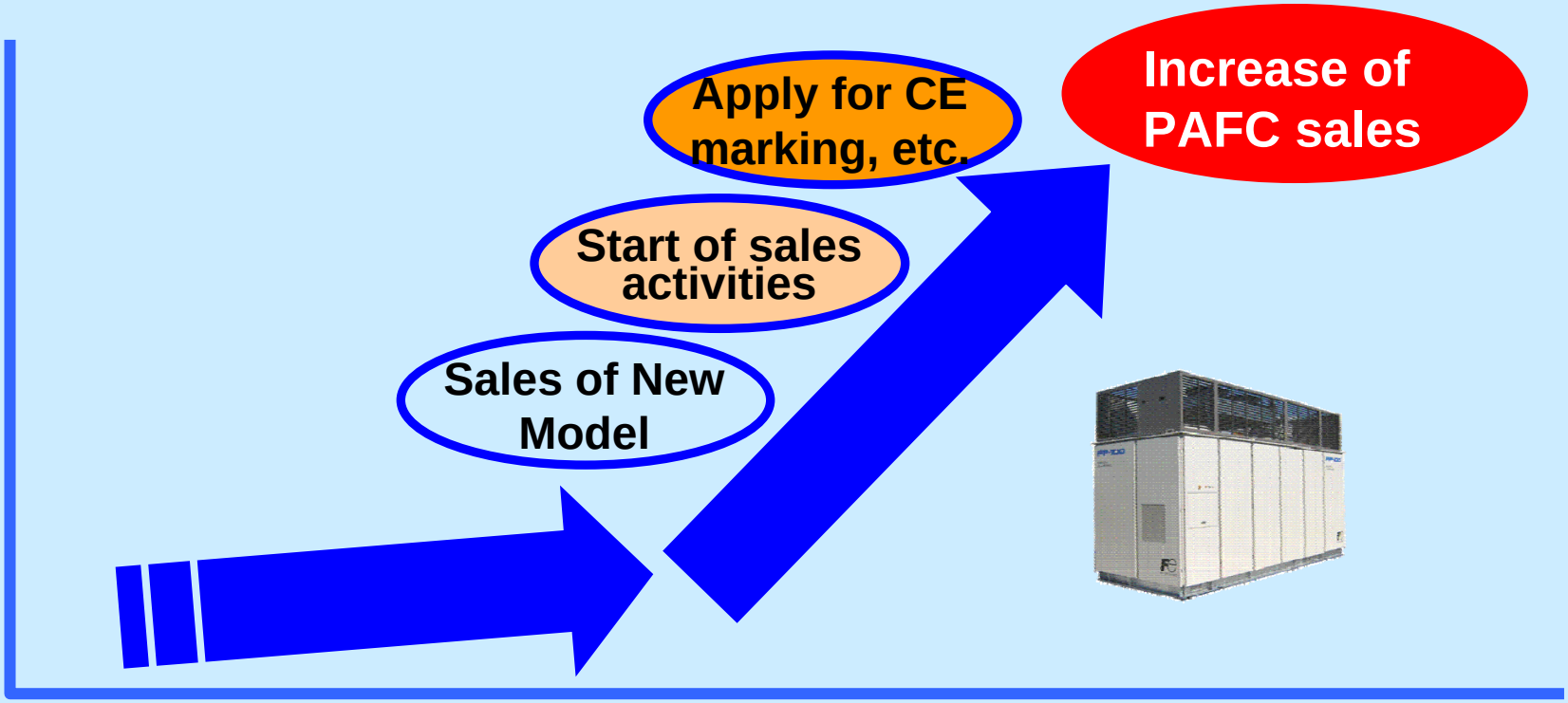
Summary

- We will create larger markets by providing customers with additional value;
- We will increase our production capacity to satisfy the increasing demand for fuel-cell packages;
- We will reduce costs by producing in large quantities.



～2009　2010～