

Air-Conditioning & Refrigeration Systems Business Operation

June 6, 2011

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 **MITSUBISHI HEAVY INDUSTRIES, LTD.**



- 1. Introduction to Air-Conditioning & Refrigeration Systems**
- 2. Summary of FY 2010**
- 3. Prospects for FY 2011**
- 4. Strategy for FY 2011 Business Plan**
- 5. Specific approaches**
- 6. Summary**

1. Introduction to Air-Conditioning & Refrigeration Systems (1)



* Domestic - Overseas sales ratios are based on FY 2010 results (consolidated). Market size: MHI estimate.

Air-conditioners (PAC/RAC)

PAC

RAC

“Beaver” Brand

By far the top niche player in a large market

[Global market size: 2010] approx 8 trillion yen plus hot water supply, heating market is 2 - 3 trillion yen

Domestic-overseas sales ratio

Overseas 65% Domestic 35%

Mass produced products

Centrifugal Absorption Liquid Chiller (CALC)

Easily the largest share in domestic market

[Global market size: 2010] approximately 0.2 trillion yen

Domestic-overseas sales ratio

Overseas 11% Domestic 89%

Made-to-order products

Automotive thermal systems (CAC)

No. 2 in the world for scroll compressors and electric compressors

[Global market size: 2010] approximately 3 trillion yen

Domestic-overseas sales ratio

Overseas 23% Domestic 77%

Made-to-order products

Transport refrigeration units (TRU)

Easily the largest share in domestic market

[Global market size: 2010] approximately 0.2 trillion yen

Domestic-overseas sales ratio

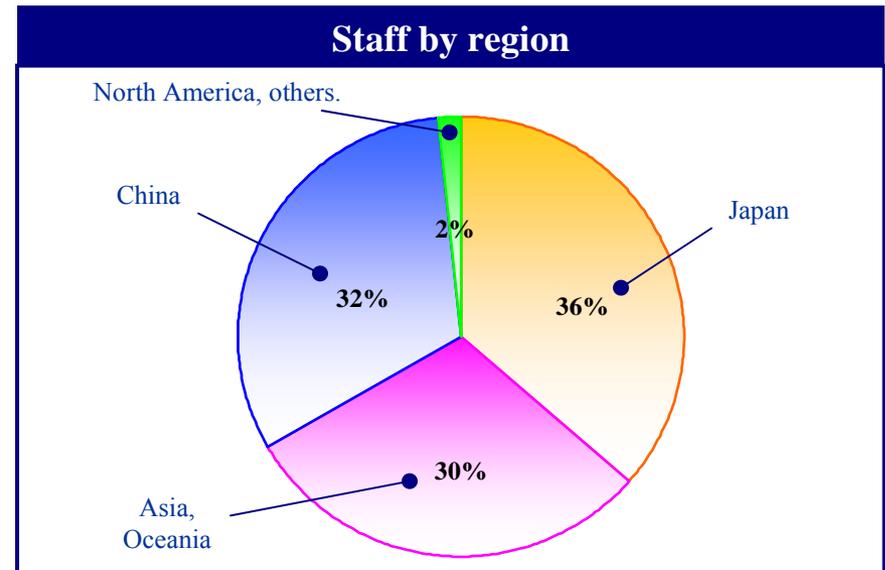
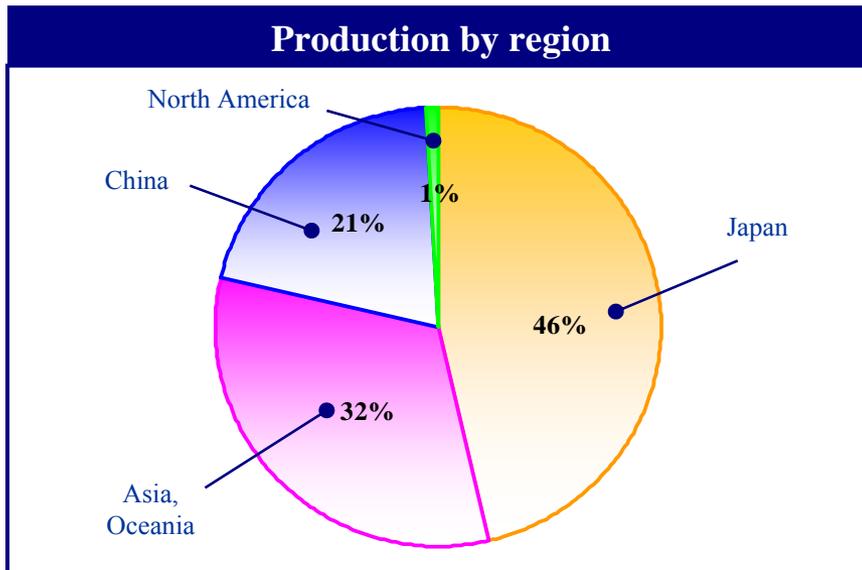
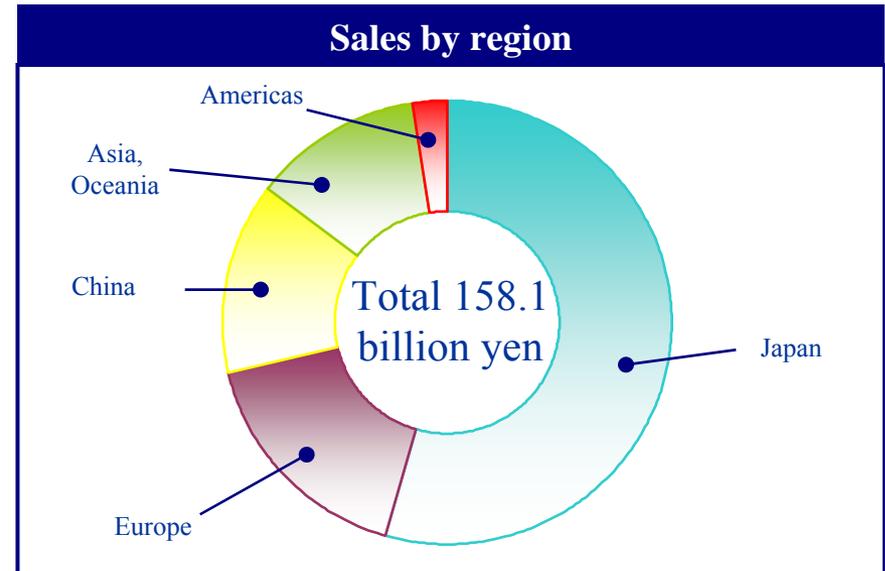
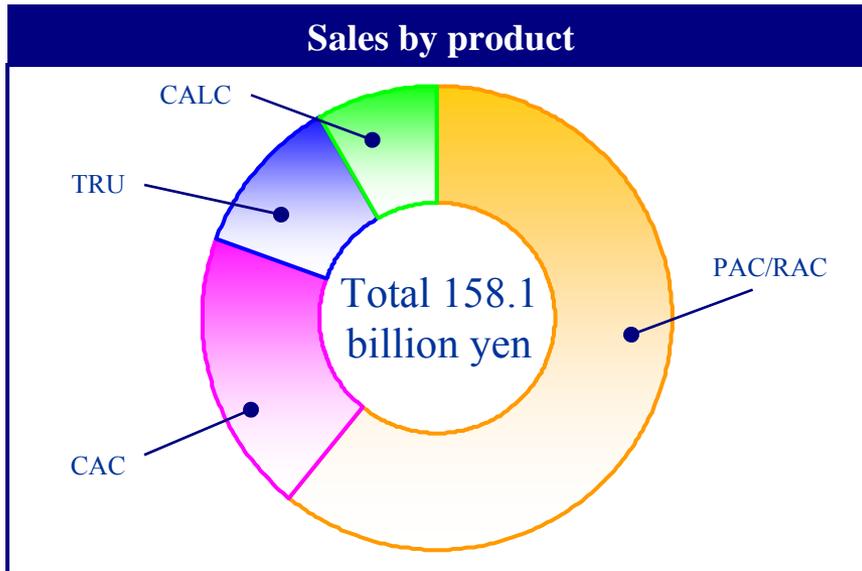
Overseas 9% Domestic 91%

Mass produced products

1. Introduction to Air-Conditioning & Refrigeration Systems (2)



* Figures shown are FY 2010, consolidated.

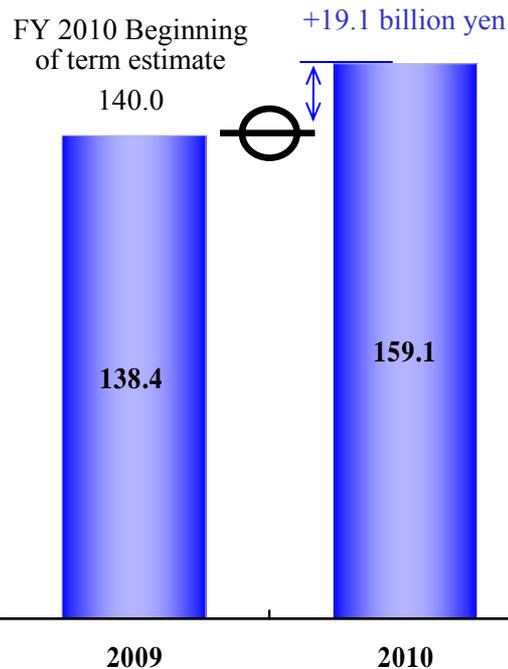


2. Summary of FY 2010 (1)



Orders received

unit: JPY billion

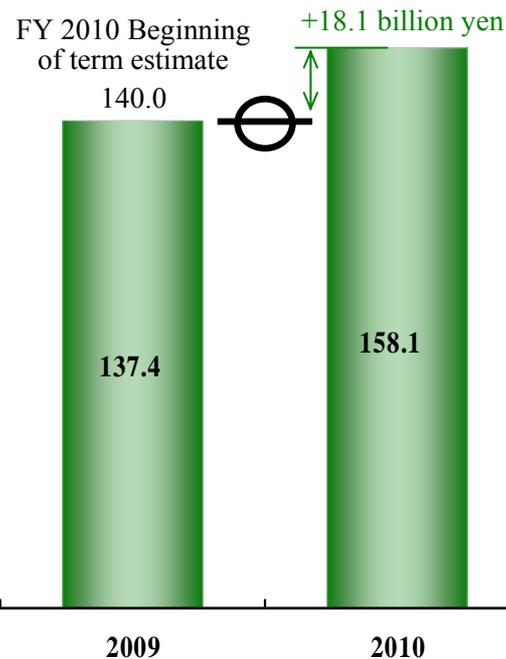


Net sales

unit: JPY billion

Increase of 20.7 billion yen from previous fiscal year.
(+18.1 billion yen from beginning of term estimate)

- Recovery of PAC/RAC market
- Increased production of car manufacturers.

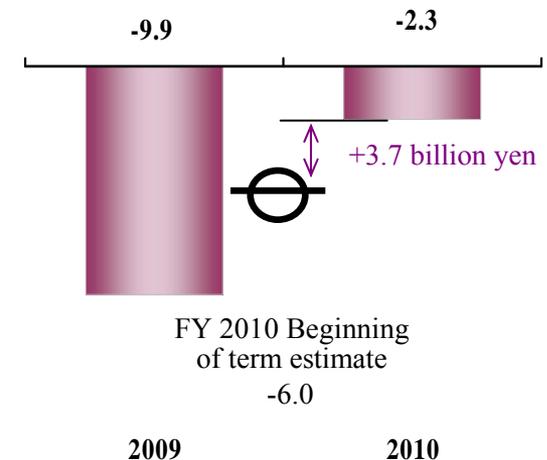


Operating income

unit: JPY billion

Loss decreased by 7.6 billion yen compared to previous term
(+3.7 billion yen from beginning of term estimate)

- Although unfavorable exchange rates and increase of material costs had effects, increased sales, cost reduction, and cuts in various expenses resulted in a significant improvement from the previous term.



2. Summary of FY 2010 (2)



-  The market for air-conditioners bottomed out in 2009 and began to rise in 2010, fueled by the economic recovery in Europe and America after the Global Financial Crisis, the effects of extreme heat wave of last summer, and the growth in China and other emerging Asian markets.
-  With growth in demand and the recovery of automobile manufacturers, MHI's net sales increased to 115% of the previous year. However, profitability was squeezed by the high yen rate, the price hike in copper and aluminum market. This was offset by increased amount of sales, cost cutting, and a reduction in expenses, and operating income improved 7.6 billion yen year on year.
-  The strategy for FY2011 is being pursued with a concentration on the following:
 - (1) Creation of a light, nimble business structure.
 - (2) Operate as the dominant niche player.

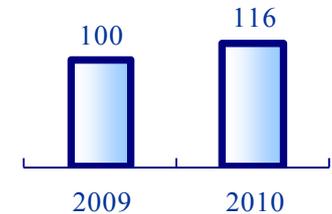
2. Summary of FY 2010 (3)



PAC/RAC

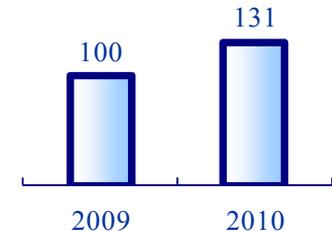
- ◇ Overall, demand is trending higher, led by emerging countries. RAC has shown especially large growth both in Japan and overseas. In addition, in China, the world's largest market, MHI's exclusive sales network K-POINT increased the number of dealers beyond the original plans. (144 stores as of end May, 2011)

Sales index of 2010
when 2009 = 100 (results)



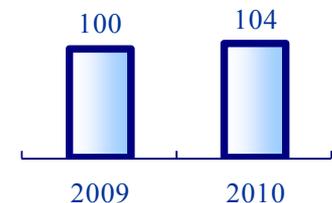
CAC

- ◇ With the rebound in the production of automobile manufacturers, electric compressors for EV and HEV for both domestic and overseas markets have grown. Have also succeeded in developing new customers in emerging countries. Also continuing sales activities for new European customers.
* EV/HEC = Electric Vehicles / Hybrid Electric Vehicles



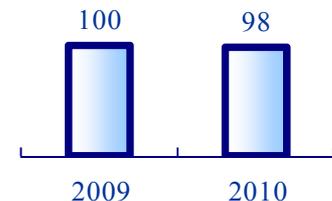
TRU

- ◇ Although the truck subsidy system was terminated, the domestic truck refrigeration unit (TRU) market grew to 104% of the previous year, supported by steady demand for freezer and refrigerated trucks. MHI maintained its leading domestic share by expanding its sales with the introduction of a new series of compact, lightweight, high-performance TRU with low operating noise all those achieved by a new 3D compressor.



CALC

- ◇ Limited investment by IT, semiconductor and home appliance manufactures due to the recession caused a considerable contraction in the domestic centrifugal chiller market. Net sales decreased, although MHI retained the largest market share. However, orders increased, with orders from Sky Tree in Japan, and from Heart of Doha, Qatar, among others. In addition, the world's first centrifugal-driven Water to Water Centrifugal Heat Pump ETW (Heat Recovery Type), was released.

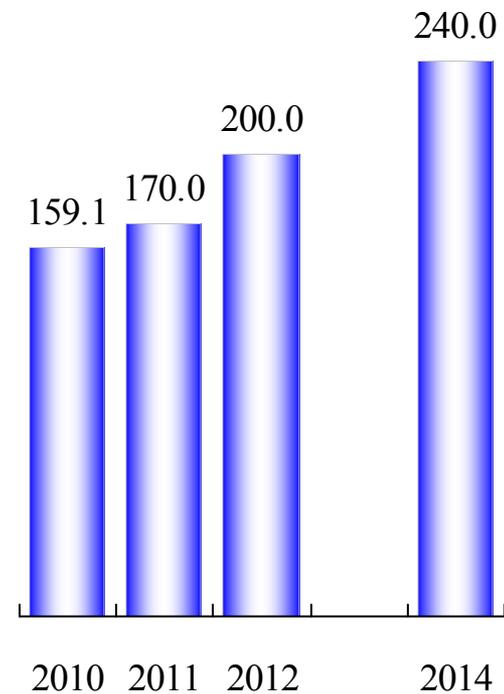


3. Prospects for FY 2011 (1)



Orders received

unit: JPY billion



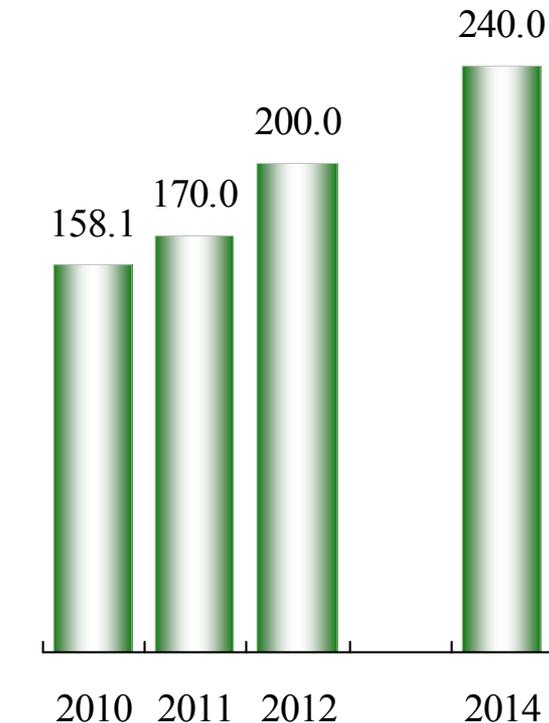
(actual result)

Net sales

unit: JPY billion

FY 2014 240.0 billion yen

- Expand sales focusing on high-performance models, capitalizing on global move to reduce CO₂ emissions.



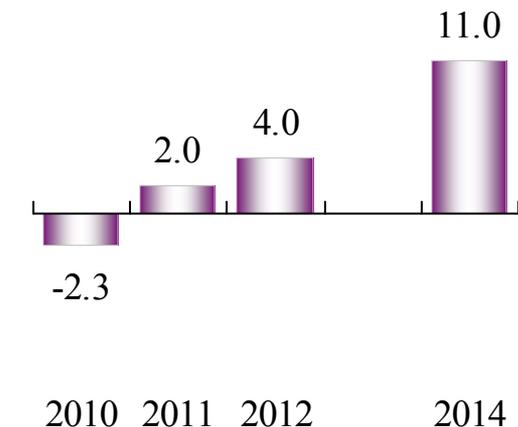
(actual result)

Operating income

unit: JPY billion

FY 2014 11.0 billion yen

- Improve earnings based on increased sales and cost-cutting activities. (actual result)



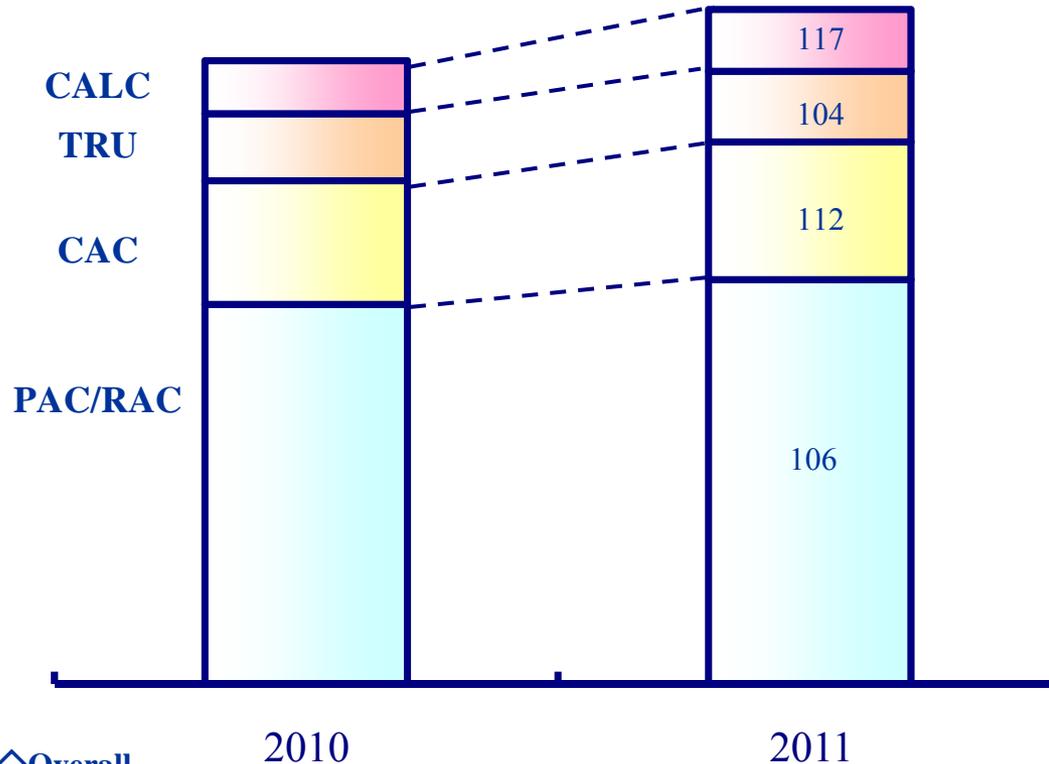
(actual result)

3. Prospects for FY 2011 (2)



2010 Consolidated Sales Forecast for Air-Conditioning & Refrigeration Systems

Sales index forecast for 2011 when 2010 = 100



◇ Overall

- On the whole, increase in sales achieved in overseas business, mainly with PAC/RAC and CAC.
- Maintain and expand domestic share of TRU and CALC as the base, and focus especially on overseas deployment of CALC.

◇ PAC/RAC

- Respond to China and Asian emerging country demand and aim to boost market share in existing markets of Europe and Japan.
- Started sales of commercial-use heat pump-type water heater to respond to wide range of demand from household to industrial use.

◇ CAC

- Although the decrease of auto production is expected following the Great East Japan Earthquake, MCC in the US is scheduled to resume production this autumn, and investment is planned to bolster production of electric compressors for EV and HEV.

◇ TRU

- Almost all models had undergone model changes by the end of previous year. Concentrating on expanding sales of these energy saving, high-performance models.

◇ CALC

- Focusing on expanding the overseas market as well as continuing the expansion of service business in the domestic market.



■ Basic Policy

- Taking advantage of global environmental regulations as a rare opportunity, promote global sales of high-performance, high value-added products that make a major contribution to environmental conservation, and develop a business that will **play a role in MHI's energy and environmental business**.
- To this end, as a niche manufacturer of air conditioning and refrigeration systems with a scale suited to its own management resources, MHI will work to acquire and maintain its position as the **dominant niche player** in specific business domains.

Reform process

- Convert fixed costs to variable costs using overseas facilities (reform of production formation).
- Shift from management based on sales/profit to a diversified management structure that includes B/S and C/F (adopt ROIC as a management indicator).

Growth process

- To achieve a low-carbon society, enter the environment and energy fields (Air /Water to Water Heat Pump, CAC for EV/HEV), which are growing around the world.
- Change from independent management to cooperation with partners to accelerate business development and disperse business risks.

5. Specific Approaches (1) Reform process (i)

FY 2010 “Reform process”

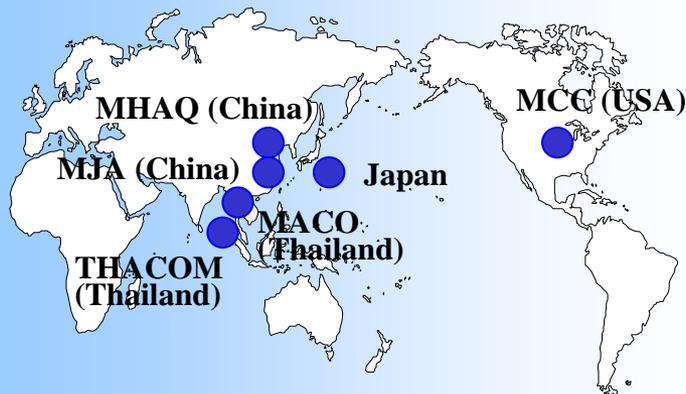
(Presentation material for Business Operation Meeting for FY 2010)



✓ Adopting reforms to optimize production and improve fund efficiency

Reform of production structure

- Pursuing the world’s optimum production
 - Use overseas facilities that can flexibly respond to changes in demand.
→ Convert fixed costs to variable costs.
 - Improve production of air-conditioners at overseas facilities.
(Global sourcing from MACO and China-regional sourcing from MHAQ)
 - Continue to increase the local sourcing ratio at overseas plants.
 - Partial outsourcing for spare parts supply.



ROIC improvement

- Inventory reduction
 - Supply chain rationalization
Build a system of direct delivery from overseas plants to distributors in each market.
 - Shorten production lead time through innovative activities in manufacturing in the entire company. (Application of the *yatai* system of MACO to TRU products).



- Fund efficiency improvement
 - Share investment with business partners by reconsidering the make-or-buy decisions.
 - Collect funds earlier by reducing lead-time.

* The *yatai* system: A production system in which, in principle, one worker assembles a product in a cell location, which adds flexibility to production schedule / production volume changes.

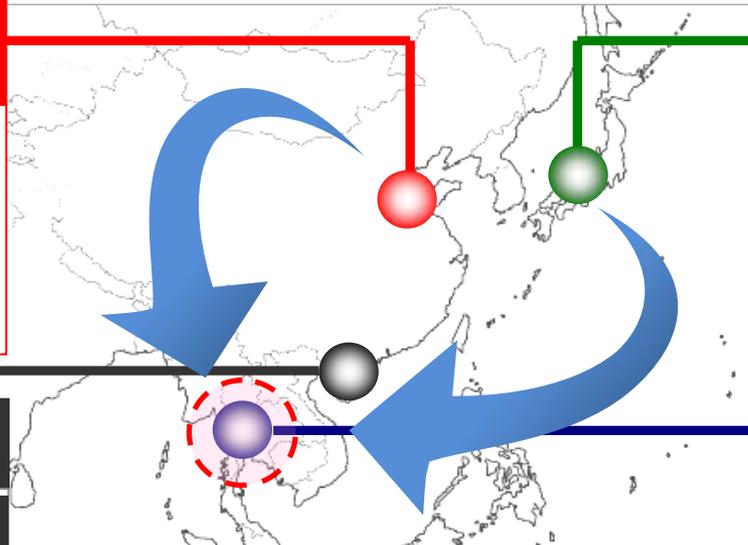
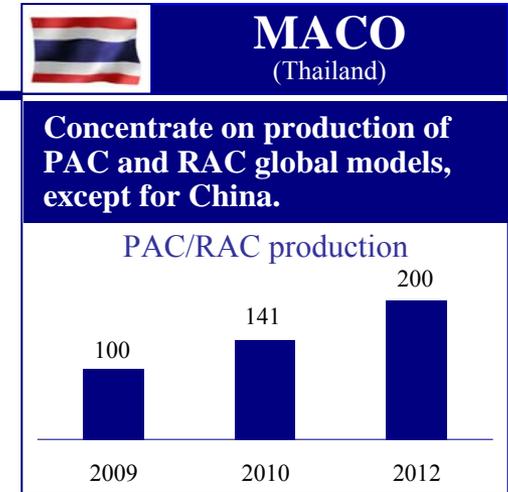
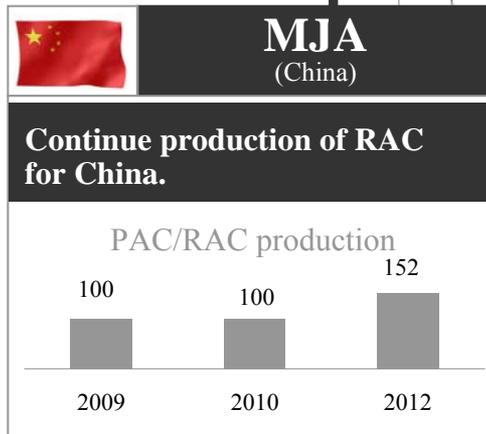
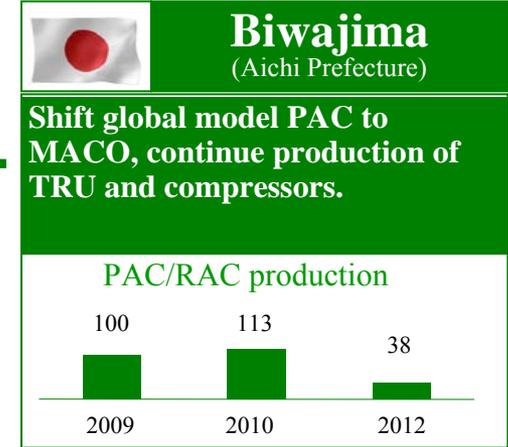
5. Specific Approaches (1) Reform process (ii)

Reform of Production Structure



Concentrate production of “global model air-conditioner products, except for China” from Japan (Biwajima) and China (MHAQ) to Thailand (MACO) and achieve production efficiency and cost reduction.

Figures in chart are index with 2009 as 100



| | | PAC | | RAC | | Compressor | |
|----------|----------|--------------|-------------|--------------|-------------|------------|--------|
| | | Global model | China model | Global model | China model | Rotary | Scroll |
| Biwajima | Japan | ○ | | | | | ● |
| MHAQ | China | ○ | | | | | |
| MJA | China | | | | ● | | |
| MACO | Thailand | | | ● | | | |
| THACOM | Thailand | | | | | ● | |

Production shift this time

5. Specific Approaches (1) Reform process (iii)

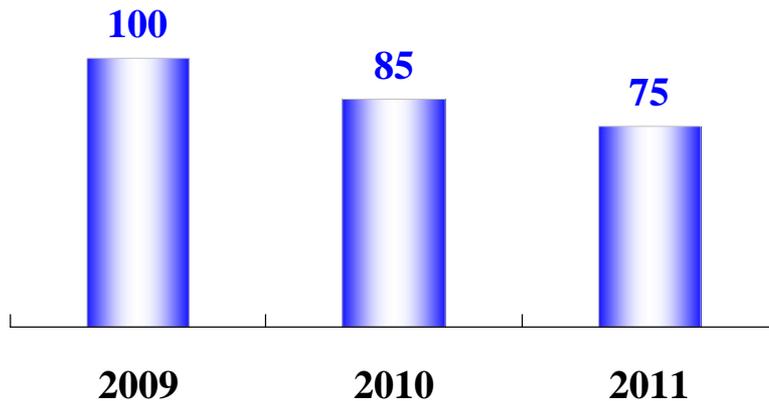
ROIC Improvement



Efforts are focused mainly on improving production lead time to reduce inventory.

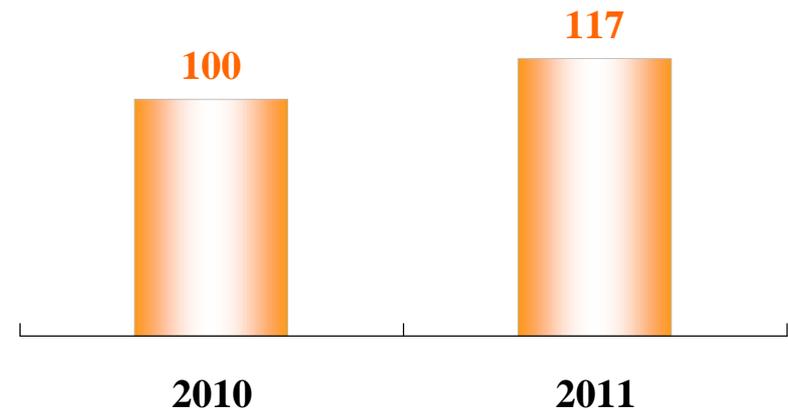
Months of inventory held

Index with 2009 as 100



Total asset turnover

Index with 2010 as 100



Details of activity:

1. Shift from make-to-stock production to made-to-order production with an inventory cover system using RINKS (Refrigeration Integrated Keikaku System), a production management system developed jointly by Air-Cconditioning & Refrigeration Systems and Technology & Innovation Headquarters.
2. Adopted *Yatai* production, instead of line production, enabling a flexible response to fluctuations in demand. (horizontal deployment of production method adopted at MACO (Thailand)).

5. Specific Approaches (2) Heat Pump Business (i)

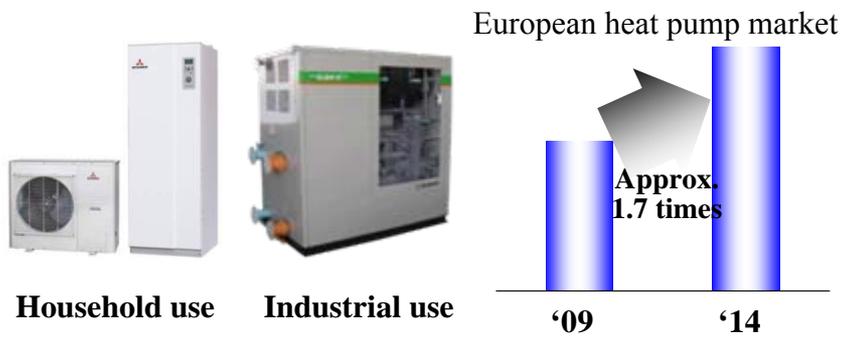
FY 2010 “Growth process (1) Heat Pump”

(Presentation material for Business Operation Meeting for FY 2010)



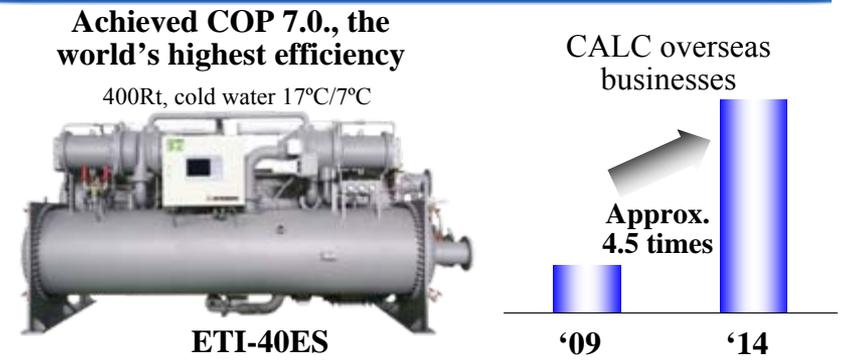
- ✓ Focus on air/water to water heat pump hot water supply systems and centrifugal chillers, which are currently niche but which will be growth products in the future.

Heat pump hot water supply



- High-performance products at the highest level offering a variety of applications from household to industrial use will be provided.
- MHI sells household heat pump hot water supply systems in Europe in cooperation with NIBE, the large heater manufacturer. MHI also seeks collaboration with major power companies and local heat pump manufacturers.
- A dedicated sales team will be set up to boost heat pump sales. Group and power companies will implement collaborative projects.

Centrifugal chillers



- In Europe, started sales cooperation with multiple partners and received inquiries for MHI turbo chillers for power plants abroad.
 - In Asia, the Singapore office will lead the effort to increase sales to serve demand for chiller replacement through service activities primarily for existing Japanese customers.
 - For customers who use the products for a relatively long period of time, MHI's high-efficiency units have an advantage in LCC evaluation compared with cheaper overseas products.
- LCC: Life Cycle Cost refers to the total cost including the initial cost and running cost.

* Household heat pump hot water supply systems heat water by collecting heat in the air just like air-conditioners, which allows a substantial reduction in CO₂ from the conventional combustion water heaters. Consequently, they are expected to experience rising demand as energy saving products.

5. Specific Approaches (2) Heat Pump Business (ii)



By shifting from conventional combustion (boilers, gas systems) system to heat pump (electric) system, substantial CO₂ reductions and energy savings can be achieved. With a product line-up ranging from household to industrial use, look to expand the business.

Household use for Europe
8-16 kW



~ 8 kW 9 kW ~ 16 kW
(max 11 kW)

Cooling, heating and hot water supply system
Air heat source heat pump hot water supply

(R410A)

Industrial use
30~480 kW

(30 kW x 16 units)



Developed a heat pump hot water supply system fitted with the world's first new 2-stage scrollary (screw-rotary) compressor using CO₂ as refrigerant. This unit maintains its performance even down to an external temperature of minus 7°C, and can be used down to external temperatures of minus 25°C.

In addition, achieved intermediate season COP of 4.3, leading the industry in the 30 kW class, with high efficiency year round.

Scrollary compressor



Adoption of gas injection construction

Improved performance under low external temperatures by increasing coolant recirculation amount.

Compared to heavy fuel oil boilers:

Energy saving: 40% less , CO₂ reduction: Approx. 70% less

Industrial use CO₂ hot water supply heat pump

Nick name: "Q-ton"



(CO₂, R744)

By integrating "scroll," which is efficient with a high pressure ratio, and "rotary," efficient with a low pressure ratio into one unit, achieved high efficiency under all operating conditions.

Industrial use
627 kW~



Compared to heavy fuel oil boilers:

* Including 30% reduction in night time electricity unit price.

Energy saving: 70% less *, CO₂ reduction: Approx. 70% less

Waste heat recovery warm water heat pump
ETW

(R134a)

5. Specific Approaches (2) Heat Pump Business (iii)-1



Feature
1

Technological breakthrough in operating performance under low external temperature conditions with the adoption of two stage “Scrotary” CO₂ compressor.

Suitable for cold weather regions where heat pump hot water systems are uncommon.

Feature
2

Uses CO₂, a natural coolant, and has achieved a COP 4.3 rating, leading the industry in the 30 kW class.

Excels in both energy saving and environmental friendliness.
Global warming coefficient:
CO₂ = 1 R410A = 2090

Feature
3

The 30 kW rating is exempted from High Pressure Gas Safety Act restrictions.

Combines the strengths of broad application with ease of after-sales service.

Feature
4

By connecting a maximum of 16, 30 kW units, able to respond to a maximum of 480 kW hot water load

5. Specific Approaches (2) Heat Pump Business (iii)-2



Touch panel controller



Feature
5

Improved operability with the adoption of a touch panel type remote

Feature
6

16 unit coupled control is possible, making it adaptable for large facility use.

Feature
7

Compatible with remote monitoring system!

Allows quick response to failures and by monitoring running data, enables user to schedule the parts replacement in advance.

By analyzing operation log, energy savings proposals suited for each season may be made.

5. Specific Approaches (2) Heat Pump Business (iv)-1

Field test being conducted at three locations, focused on cold weather locations.

- Use: **Boiler water feed humidification**
- Equipment outline: **30 kW x 1 unit + Heat exchanger**
- Installed location: **Hokuriku area**

A low external temperature, high humidity area, characteristic to the coastal areas facing the Sea of Japan.



- Use: **Hot water supply for kitchen and wash rooms**
- Equipment outline: **30 kW x 1 unit + Heat exchanger**
- Installed location: **Doto area of Hokkaido**

A very cold area where the highest temperature of the day below minus 20°C is not uncommon.



- Use: **Hot water supply for kitchen and bath**
- Equipment outline: **30 kW x 1 unit + sealed tank**
- Installed location: **Northern part of Iwate Prefecture**

An area subject to very heavy snow in Tohoku.



5. Specific Approaches (2) Heat Pump Business (iv)-2



Around the field test site, Doto area, Hokkaido



[System configuration]

- 30 kW heat source machine: 1 unit
- Sealed hot water holding tank: 500 liters x 5 units

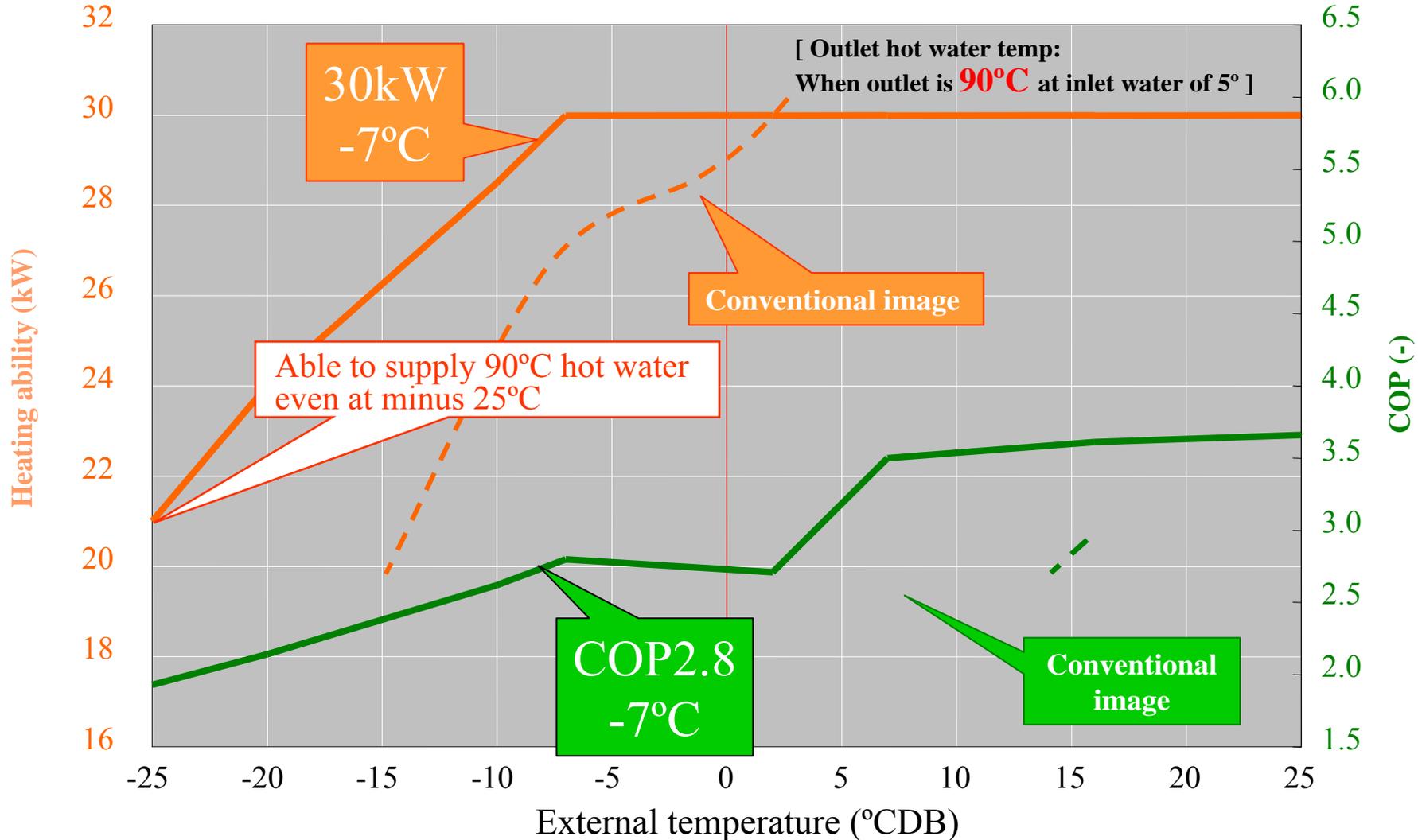
[Use]

Hot water supply for kitchen and wash rooms

5. Specific Approaches (2) Heat Pump Business (v)



Performance does not deteriorate until the outside temperature falls below minus 7°C





■ Influence of the Great East Japan Earthquake on heat pump hot water system

1. With the instability of power supply within Japan, there are risks of adverse conditions confronting efforts at expansion, especially in the Kanto area.
2. Globally however, the shift from boilers (combustion type) to heat pump hot water supply (electric type) to cut down CO₂ is steadily advancing, and there is no change to the fact that the global market is on a growing trend.
3. With its high energy conservation and CO₂ reduction effect, the drive to expand sales for “Q-ton,” the second to none product, especially in the very cold areas, through collaboration with boiler manufacturers, will continue, using diverse sales and service routes such as energy conservation consultants, engineering companies, local air conditioning and plumbing contractors, and others.
4. MHI has selected Europe and Korea as initial areas for promoting the expansion of sales, to make up for the headwind in Japan.

5. Specific Approaches (2) Heat Pump Business (vi) -2



[Europe]

- (1) Start sales from December 2011.
- (2) Plan to send first sales promotion team during June-July, 2011 for market survey and sales promotion activities.
- (3) Key sales promotion targets are UK, France, Germany Spain, and Sweden, where energy conservation advantages can be expected.

[Korea]

- (1) The same specification as the Japanese market can be applied to respond to the market.
- (2) Of the agents for PAC/RAC and CALC, cooperation is being made with companies that are able to design, construct, and maintain the system and promotion is conducted.

[North America]

- Warm water/hot water market is large but priority is low for the following reasons:
- Regulatory barriers are high.
 - Sales and service network not established.
 - Boilers are popular and their price is low.

Europe: 47%

China:
16%

Japan, etc: 8%

North
America:
29%

[China]

- Warm water/hot water market is large but priority is low for the following reasons:
- Small energy conservation merit (difference between fossil fuel and electricity cost).
 - Unstable infrastructure (voltage fluctuation).
 - Boiler cost is extremely low.

5. Specific Approaches (3) Automotive Thermal System operations (i) FY 2010 “Growth process (3) Automotive Thermal Systems”



✓ Promote the scroll compressor (QS, electric driven), currently in the minority with automotive thermal systems but expected to grow in the future.

QS Compressors (scroll)



- Addition of volume by the global compact car program of auto manufacturers.
- Expand into emerging countries where new demand is set to rise.

Electric compressors (scroll)



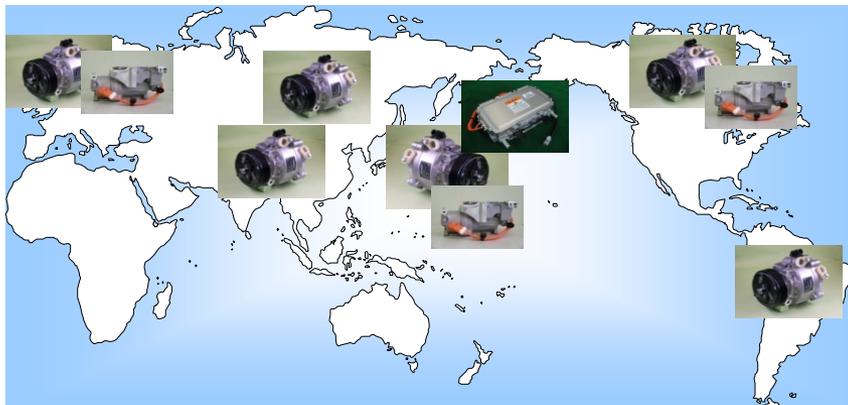
- Sustained support for existing customers to gain additional programs and secure next programs.
- Win business from major automakers.
- Approach new automakers that plan to produce EV/HEV.

Electric water heater



- Promote as an EV/HEV-compatible heating device together with electric compressors.
- Focus on development for small packaging, performance improvement, weight reduction, and cost reduction.

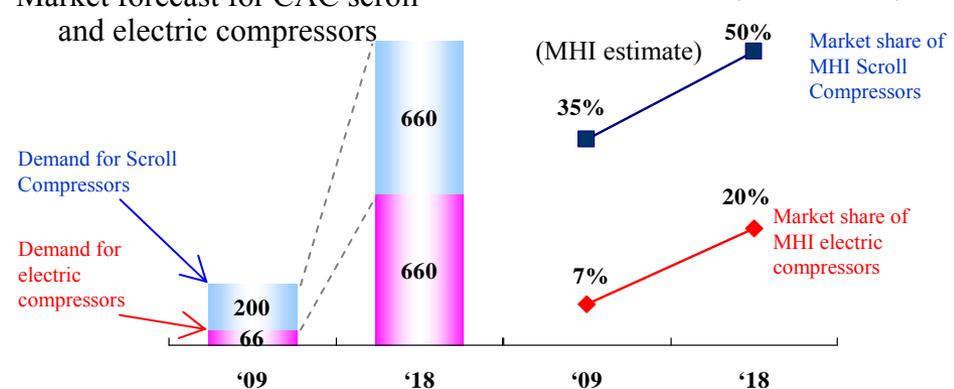
Sales of MHI's automotive thermal systems



Scroll compressor market and MHI's share

Market forecast for CAC scroll and electric compressors

(Unit: 10,000 units)





Currently gearing up to win orders for QS compressors (belt driven), electric compressors, and PTC heaters for eco-cars (EV and HEV), demand for which is expected to keep growing. Also enhancing production facilities. In addition, we have completed development of a heat pump system that enables cooling and heating under external temperatures of minus 10°C. Sales will now be getting underway.

Matsusaka Plant



Plan to upgrade production facilities for electric compressors for EV and HEV, where production is rising, by the second half of FY 2011

Europe, US and Japan market

Concentrate on increasing share for US and domestic clients. (Large order won for USA). Succeeding with European manufacturers will be the big task going forward.

MCC (USA)



Suspended production of compressors for automotive thermal systems from 2009 but having won a large order, will resume production in 2011.

For emerging countries

Have obtained orders from emerging countries such as India and Brazil. Developing new customers for Asia and China, etc.

5. Specific Approaches (4) Air Conditioning Operations (i)

FY 2010 “Growth Process (2) Air Conditioning Operations”

(Presentation material for Business Operation Meeting for FY 2010)



- ✓ Promote multi-function systems with high added value in the air-conditioner market in China, which is set to grow in the future.

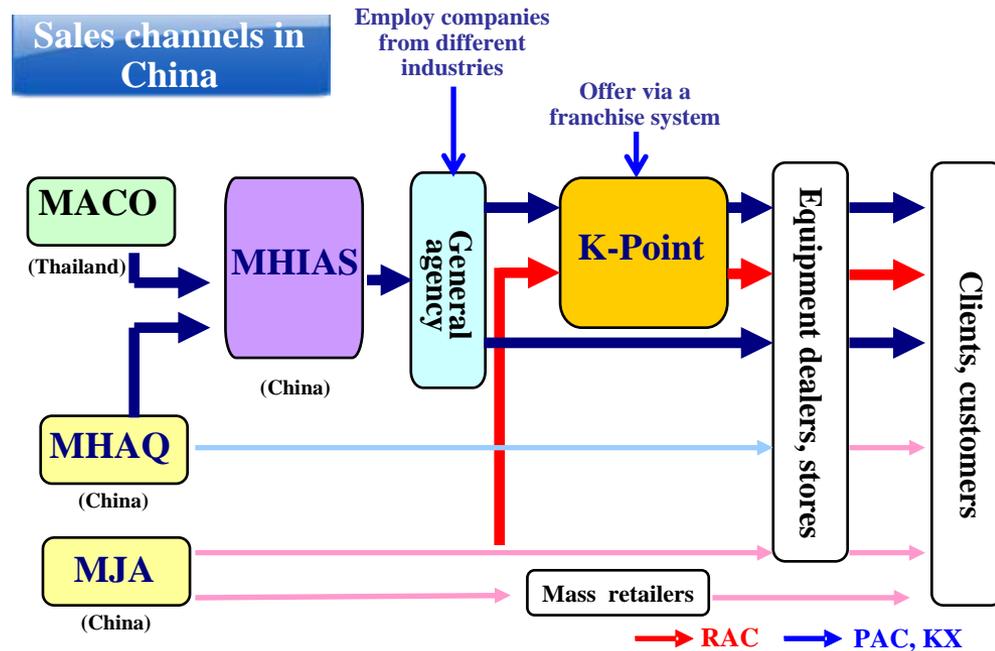
Expand air conditioning operations in China

Strengthen sales promotion [K-Plan]

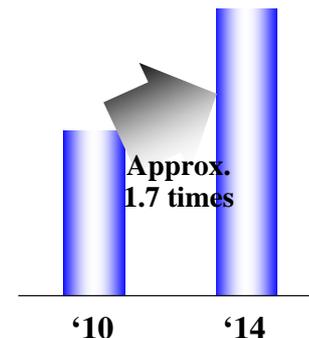
- Define a high-end product strategy and establish brand strategy.
- Increase the number of exclusive dealers (K-Point) (200 locations by 2012).
- Increase the number of products for residential houses of the new affluent class, in addition to buildings and luxury homes.

Establish a new AC & refrigeration company (May 2010 –)

- Establish a new AC & refrigeration company (May 2010 –)
- Adopt personnel and wage systems geared to local conditions in China.
- Employ a Chinese person as the general manager of organization



Air-conditioner sales in China



5. Specific Approaches (4) Air Conditioning Operations (ii)



MHI's exclusive sales network K-POINT is growing as planned, with 144 stores opened as of end of May 2011.





- **Aim to be an air conditioning and refrigeration manufacturer that plays a role in MHI's environment business and contribute to protecting the environment.**
- **Establish a light, nimble structure, operating as a dominant niche player**

Thank you very much for your attention.



Our Technologies, Your Tomorrow

Forecasts regarding future performance in these materials are based on judgment made in accordance with information available at the time this presentation was prepared. As such, those projections involve risks and insecurity. For this reason, investors are recommended not to depend solely on these projections for making investment decision. It is possible that actual results may change significantly from these projections for a number of factors. Such factors include, but are not limited to, economic trends affecting the Company's operating environment, currency movement of the yen value to the U.S. dollar and other foreign currencies, and trends of stock markets in Japan.