TASK4 OVERVIEW
JAPAN NATIONAL TEAM

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WASEDA University
Kiyoshi Saito
CONTENTS FOR TASK4

- Goal
- Scope
- Questions

Contents of R&D of DHW for country report
- History of development
- System technologies
- Component technologies
- Refrigerant

- End-user focused technologies
- Installer focused technologies
- Water quality management technologies
- Smart technologies

- Other supportive technologies
- Big public projects
- Funding support
GOAL

• Share knowledges of state of the art technologies
• Share knowledges to predict future technologies

In this case, we have to consider

✓ Cost
✓ Size
✓ Efficiency
✓ Common or special technologies? for situation of each country

• Share some other supportive technologies or financial supports to develop of DHW
SCOPE

For heat pump technology itself
- From elemental to system technologies
- From conventional to future technologies

For total hot water supply system
- Including end-user focused technologies
- Including installer focused technologies
- Water quality management technologies
- Smart technologies
QUESTION ABOUT CONTENTS

- Are there anything -custom or climate- to restrict the system development?
- What is suitable size and capacity for each country
In Japan,

1986: Development of two stage compression system-Refrigerant was Freon
1995: Research on CO₂ refrigerant system started
2001: CO₂ refrigerant heat pump system started to be put on market
2013: 4 million systems CO₂ refrigerant heat pump systems were in market
Main system configuration

In Japan,
Most of water heater heat pump system consists of heat pump and thermal storage tank

System is classified by tank size

Manufacturers
• CHOFU
• CORONA
• Daikin
• Denso
• Hitachi
• Mitsubishi
• Panasonic
• Toshiba
SYSTEM TECHNOLOGIES

Smaller type

<table>
<thead>
<tr>
<th>Size, weight</th>
<th>177L</th>
<th>370L</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>430mm</td>
<td>630mm</td>
<td>▲200mm</td>
</tr>
<tr>
<td>Depth</td>
<td>630mm</td>
<td>760mm</td>
<td>▲130mm</td>
</tr>
<tr>
<td>Wight</td>
<td>53kg</td>
<td>68kg</td>
<td>▲15kg</td>
</tr>
</tbody>
</table>

About 22% lighter
Thin type unit whose depth is 430mm
Since Japanese house is very small, we have to make system smaller

エコキュートの薄型タイプを貯湯タンクユニット寸法業界最薄「奥行寸法430mm」で開発。ターゲットを「都市部狭小地」とし、薄さにとことんこだわりました。
COMPONENT TECHNOLOGIES

Compressor & Heat exchanger

<table>
<thead>
<tr>
<th>原因</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>圧縮機</td>
<td></td>
<td></td>
<td></td>
<td>ロータリー式CO2圧縮機</td>
</tr>
<tr>
<td>スクロール式 (高効率向上にOEM)</td>
<td></td>
<td></td>
<td></td>
<td>広げた鉄心にコイルを巻いてから丸める (高密度で整列巻を容易に)</td>
</tr>
<tr>
<td>多くのメーカーにOEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>可動スクロール</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>固定スクロール</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2-水熱交換器</td>
<td></td>
<td></td>
<td></td>
<td>水配管(ツイスト管)</td>
</tr>
<tr>
<td>2003年モデル〜</td>
<td></td>
<td></td>
<td></td>
<td>冷媒配管</td>
</tr>
<tr>
<td>冷媒(銅)</td>
<td>水配管に冷媒配管を埋込み</td>
<td>水配管に冷媒配管を巻き付け</td>
<td></td>
<td></td>
</tr>
<tr>
<td>水(銅)</td>
<td></td>
<td></td>
<td></td>
<td>冷媒配管</td>
</tr>
</tbody>
</table>

初号機はキャビリチューブの束を水チャネルが囲む方式

Compressor & Heat exchanger
COMPONENT TECHNOLOGIES

Thermal storage

<table>
<thead>
<tr>
<th>Type</th>
<th>Insulator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>EPS</td>
</tr>
<tr>
<td>Premium</td>
<td>EPS+VIP+EPS</td>
</tr>
</tbody>
</table>

Triple layer with EPS and VIP

※VIP: Vacuum Insulation Panel
EPS: Expanded Poly-Styrene

Image

内側のEPSとその周辺を覆うVIPのイメージです。実際にはさらにその外側にEPSがあり、三重構造となっています。
In Japan,

- Refrigerant of most of DHW is CO$_2$
- Recently, R32 system has been just put on market
Multi function type  
Water supply + floor heating + air-conditioner
In the DHW system, some bubble generates This gives the comfortableness
Color monitor indicates water usage in a week, some advice for energy saving and so on.
Tablet can be used to control DHW system

【2014年】
タブレットと別売のLAN接続アダプターを利用することで宅内のどこからでも簡単に給湯機の操作が可能。
Piping of hot water is easy to connect because space between each piping is wider
Bubble cleans up piping between heat pump and bathtub
HEMS controller controls heat pump, air-conditioner, water heat and so on simultaneously - 16 systems can be connected -.

三菱 HEMS
省エネを
すすめる
みんなが
使える
業界最多の
16機種連結
が可能！

三菱 HEMSシステム図

HEMSアダプター

HEMSアダプター

情報収集ユニット

※三菱エコキュートで三菱HEMSをご使用いただくには、別売部品、タブレット機器及び工事が必要となります。
OTHER SUPPORTIVE TECH.

Simulation technologies
OTHER SUPPORTIVE TECH.

Simulation technologies - Energy flow + M
PUBLIC SUPPORTS FOR R&D

NEDO (Governmental) Project

For Mild Climate

- **Matsushita Electric (Panasonic)**
  - Development to Downsized CO₂ HPWHs using High-density Mounting Technology
  - Energy Savings: 115ML (Crude oil equivalent)
  - FY2005-2007

- **Denso**
  - Development of Downsized CO₂ HPWH using Ejector
  - Energy Savings: 173ML (Crude oil equivalent)
  - FY2005-2007

- **Hitachi Appliances**
  - Study on Field Tests of High-Efficiency Heat-Pump Water Heating System Using Natural Refrigerant R744(CO₂) for Cold Region
  - Energy Savings: 86ML (Crude oil equivalent)
  - FY2004-2006

For Cold Climate

- **Mitsubishi Electric**
  - Practical Application Development of Two-Stage Compression Type HPWH for Cold Regions
  - Energy Savings: 30ML (Crude oil equivalent)
  - FY2005-2006

- **Daikin**
  - Development of Compact, Space-saving, and High Efficiency CO₂ Refrigerant HPWH
  - Energy Savings: 62ML (Crude oil equivalent)
  - FY2005-2007

- **Sanyo**
  - Development of Compact CO₂ Heat Pump Water Heater Using a New Type of Gas/Water Heat Exchanger
  - Energy Savings: 150ML (Crude oil equivalent)
  - FY2005-2007

- **Corona**
  - Study on Hot-Water Supply and Heating System Using CO₂ Heat Pump for Cold Region
  - Energy Savings: 62ML (Crude oil equivalent)
  - FY2005-2007
From 2002 to 2010, we had subsidy for CO$_2$ heat pump water heater.

1/2 of difference balance between conventional water heater and CO$_2$ heat pump water heater.