




**Industrial Heat Pump System  
using CO<sub>2</sub> refrigerant "Eco-cute", "Eco-Sirocco"  
and H<sub>2</sub>O refrigerant "Adref-Noa"**

**2014.02.04**

**Mayekawa Mfg. Co., Ltd.  
Fujio Komatsu**

# Commitment on Natural Refrigerants



-  **NH<sub>3</sub>** Semi-Hermetic Screw Compressor Unit
-  **CO<sub>2</sub>** Commercial / Industrial Eco-Cute System
-  **H<sub>2</sub>O** Adsorption Chiller
-  **HC** Commercial / Industrial Air-Conditioning / Water-Supply Heat Pump
-  **Air** Dehumidifying Air Refrigerant System

# "Natural Five" Refrigerants and Product Solutions

Refrigerant (Natural Five)	NH <sub>3</sub> R-717	CO <sub>2</sub> R-744	HC Hydrocarbon	H <sub>2</sub> O R-718	Air R-728
90°C		Utility hot water			
60°C	Utility hot water Heating		Utility hot water Heating HVAC	Heat recovery	
10°C	Chilled water Ice making	Chilled water Ice making		Chiller	
-15°C	Cold storage, Freezer, Fish boat				
-25°C	Specific Refrigeration needs				
-40°C	Freezer, Freeze-dry, Super Low temp storage				
-50°C					
-60°C			Cryogenics		Cryogenics
-100°C					
Notes		•Eco-Cute	•Nat'l Proj. •Butane + Propane	•Nat'l Proj. •Adsorption •Heat recovery	•Nat'l Proj. •Air-cycle



CO<sub>2</sub>

- Hot water and Hot dry air supply Heat-Pump
- Source : Air and Water

Carbon dioxide

# “CO2 Heat Pump” **unimo**

**Eco-Cute “unimo A/W”**



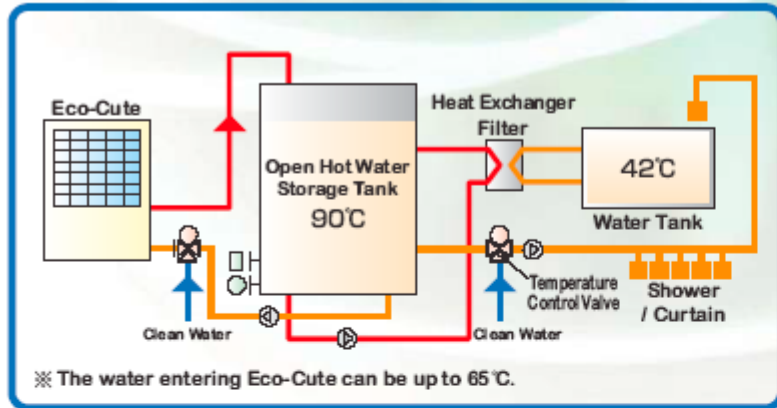
**Eco-Cute “unimo W/W”**



**Eco-Sirocco**



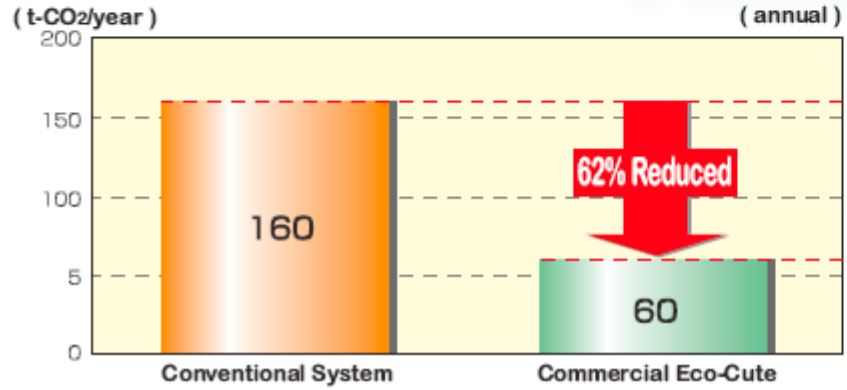
# 62% Reduction of CO2 Emission



**Targets:** Hospitals, hotels, welfare institutions, sports facilities, bathing facilities, facilities for boarding, food factories, etc.

- The best water supply ability in Japan (Air heat source 80kW, water heat source 90kW).
- Very little CO<sub>2</sub> emission, compared with equipments run by burning the energy source. Emission could be cut by more than 60% than heavy-oil boilers.
- Circulation heating operation (Water entering Unimo at 65°C, exiting at 90°C).
- Flexible design of water supply system and storage tanks to meet your needs.
- Entering medium to large-scale water supply market as the electric equipment replacing hot-water boilers. The complete electrification is possible.

## Efforts to Reduce CO<sub>2</sub> Emission

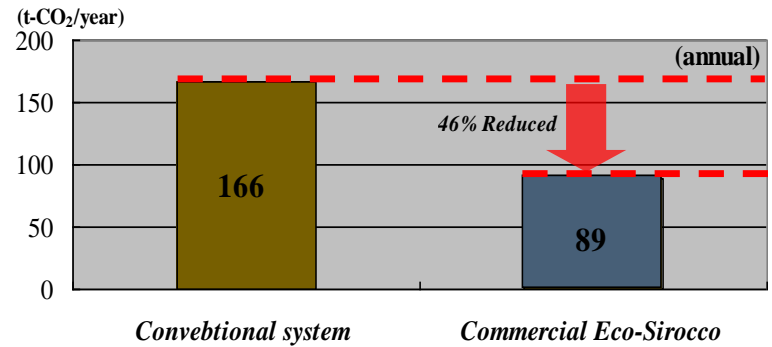
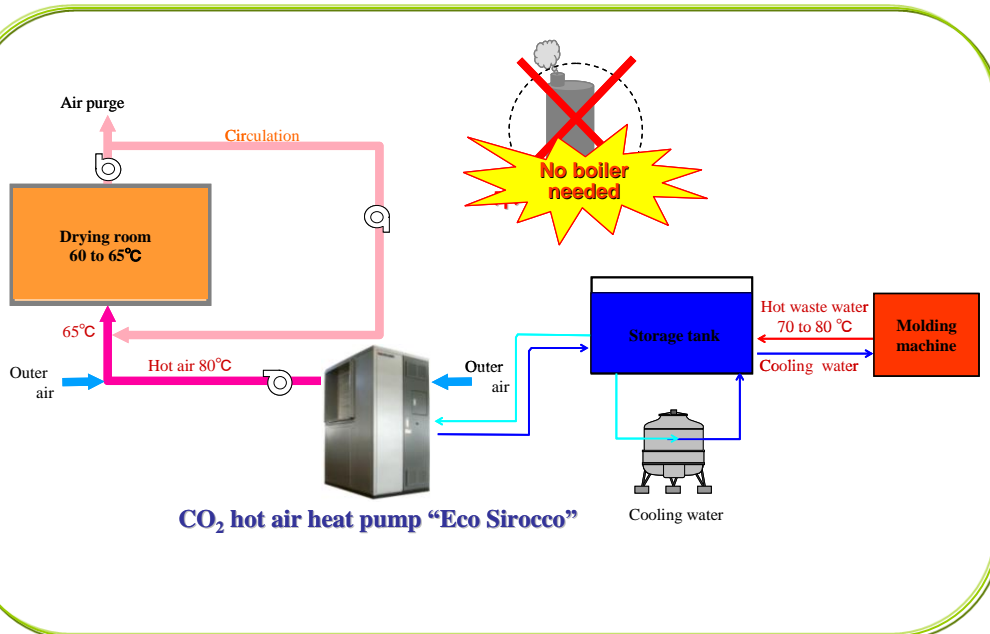


## Case Study

A Company Housing where Hot Water Supply is 20m<sup>3</sup>/day  
The Number of People: 200

<Conventional System>	<Commercial Eco-Cute>
Fuel Oil Boiler	Crude Oil Equivalent
Crude Oil Equivalent	Crude Oil Equivalent
<b>59,040 ℓ /yr</b>	<b>22,153 ℓ /yr</b>

# 46% Reduction of CO2 Emission



<p><b>A company drying room where hot air supply is 6,870m<sup>3</sup>/hr</b></p> <p>Annual running time : 6,500hr</p>	
<p>&lt;Conventional system&gt;</p> <p>Fuel City-gas boiler Crude oil equivalent</p> <p><b>86,200 L/yr</b></p>	<p>&lt;Commercial Eco-Sirocco&gt;</p> <p>Fuel City-gas boiler Crude oil equivalent</p> <p><b>46,550 L/yr</b></p>

**Targets;** Material drying and heating, Painting drying, Food drying, Heat source of dehumidification systems, etc.

- Safe without combustion process
- Energy consumption is reduced by about 50%.
- Water rate and water treatment cost, which used to be required at steam heating, are not needed.
- CO<sub>2</sub> compressor, which has "high reliability" and sales achievement as Eco Cute for industrial and business use, is employed.
- Equipment has long service life without possibility of damages due to combustion.
- Setting air heating temperature and heating air volume enables automatic operation.

# CO2 Heat Pump in Switzerland



ZÜRCHER UNTERLAND  
MEDIEN



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«ZÜRCHER UNTERLÄNDER » SCHLAGZEILEN VOM DONNERSTAG, 15. DEZEMBER 2005

Donnerstag, 15. Dezember 2005

**Niederhasli: Warmes Wasser im GC-Campus durch moderne Technologie**  
**CO2-Wärmepumpe installiert**

Im GC-Campus in Niederhasli liefert eine der ersten CO2-Wärmepumpen in der Schweiz pro Tag 4000 Liter Warmwasser. Die Maschine stammt aus Japan.

**Inga Struve**



EWZ-Projektleiter Georg Dubacher (von links), Masao Maekawa, Vorsitzender der japanischen Firma Mycom, und EWZ-Direktor Conrad Ammann erläutern die CO2-Wärmepumpe. (David Baer)

- GOOG**
- 
- WI
- WI
- WEIT**
- Nieder  
Wasser  
durch I
- Bülach**  
Zwisch  
Arbeits  
Planun
- Bülach**  
Compu  
Primar
- Stein**  
Gemüs  
werde  
beheizt
- Obere**  
Ferien  
Embra



H<sub>2</sub>O

- Adsorption Chiller Utilizing Solar Energy

Water

# Adsorption Chiller Packaged Unit



Cooling capacity: 100kW

**Model : 3515**

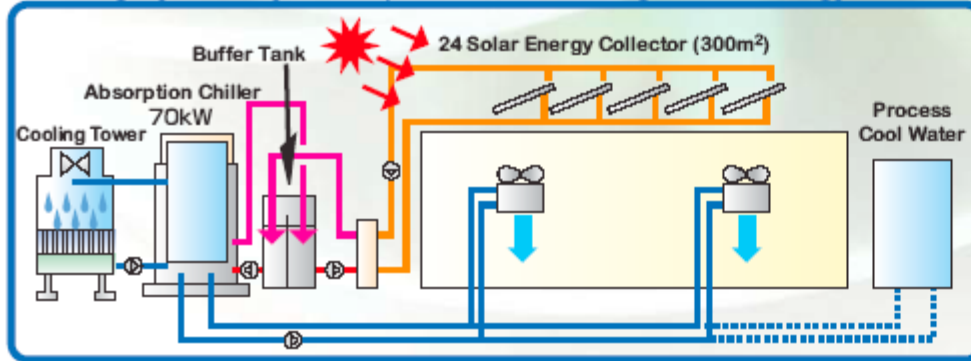


Cooling capacity: 400kW

**Model : 4520**

# 64% Reduction of CO2 Emission

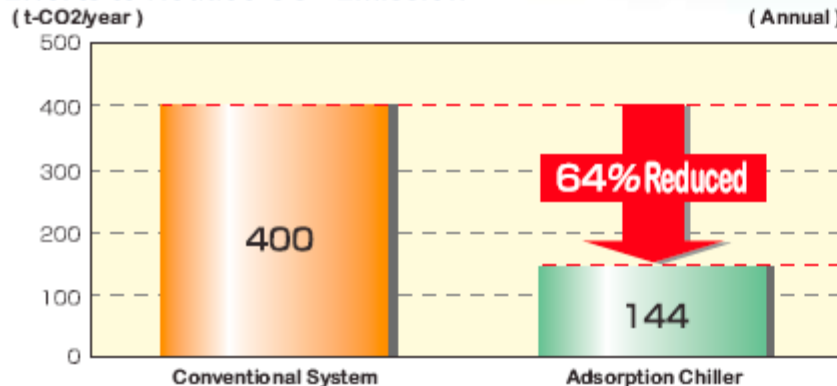
## Cooling System by Adsorption Chiller Using Solar Energy



**Targets** : Industrial furnace, incinerator, distillation tower, air-conditioning or cooling using warm discharged water from cooling water of engines etc.

- produces cool water from low-temperature heat source (below 75°C).
- water as refrigerant, zeolite as adsorbent, therefore environmentally friendly.
- The body itself needs little electricity. Also, almost ZERO maintenance cost.

## Efforts to Reduce CO2 Emission



## Case Study

100USRT Industrial Process Cooling  
Cold Water Temperature : 9 °C

### Power Consumption

<Conventional System>  
R134a Cooling Water

**100kW**

<Adsorption Chiller>

**36kW**

# Installation in Japan



High school



Heat source : Solar energy  
Supply chilled water : Air conditioning

2010-2011 MOE [Development Program for Global Warming Prevention Technology ]

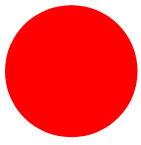
**Demonstration of adsorption refrigeration system for heating and cooling by using solar heat**

# Installation in Japan

Factory

Heat source : Waste heat of the gas engine  
Supply chilled water : Process cooling



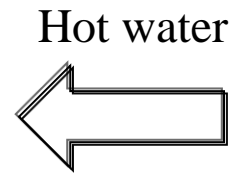
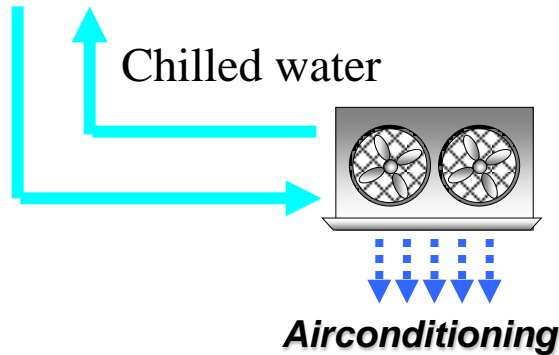


# INSTALLATION IN MEXICO

SUSTAINABLE REFRIGERATION SYSTEM



Adsorption chiller "Adref-Noa"



Waste heat recovery  
Heat exchanger



Oven

**Conclusion**

In the industrial refrigeration application natural refrigerants can be selected without green house gas.

In the view of prevention of global warming we would like to offer a proposal below;

**Promoting natural working fluids aggressively in the proven industrial field**

Thank you very much for  
your Attention.

**MAYEKAWA**

NATURE IS WHAT WE DESIGN FOR



みんなで止めよう温暖化

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