Ws Progress Sorption in Japan
ICR2015 in YOKOHAMA

Liquid Desiccant Systems

Speaker Hikoo Miyauchi

Dyna-air Co,.LTD

PRACTICAL STUDY
on LIQUID DESICCANT PROCESSOR
in MEDICAL FACILITIES

PROCESSOR

REGENERATOR

2.
The liquid desiccant processor adopts heat-activated heat pumps. The processor utilizes its own waste heat, but is capable of utilizing alternative heat sources. This presentation explains examples of how medical facilities can benefit from the liquid desiccant system by the processor.

Dyna-Air has developed this processor because systems that utilize pressurized ventilation are still rare for commercial use.
The pressurized ventilation has been available for industrial use. However, both the initial costs and the running costs are very high. Negative pressure ventilation is more commonly used for commercial use.

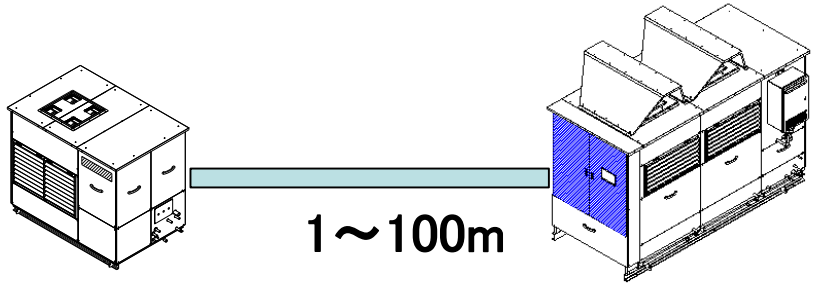
But what we think is necessary to achieve the IAQ is pressurized ventilation. In addition to that, places such as a clean-room require humidity control.

When we developed the processor, we wanted to make the exterior of the processor look pretty, unlike those used in the plants, and what's more, we wanted to develop a multi-function equipment. I will tell you more about its multi-functions later on, but at this stage, I would like you to know that the processor is much more useful if it can not only dehumidify but also humidify the room throughout the year, and our processor is capable of doing both.

Medical facilities and nursing homes, where weak and feeble patients and seniors gather, the IAQ is especially important. Of all the sites we have installed the processors to date, 70% are medical facilities, and there's no wonder there.

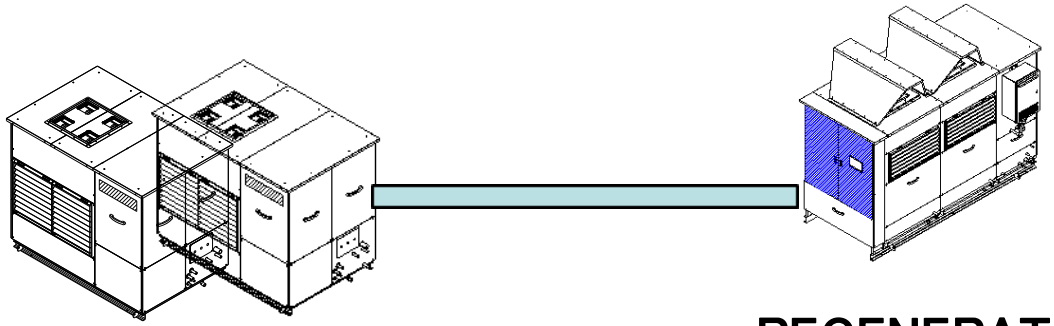
INSTALLATION PATTERN

PATTERN 1　1:1



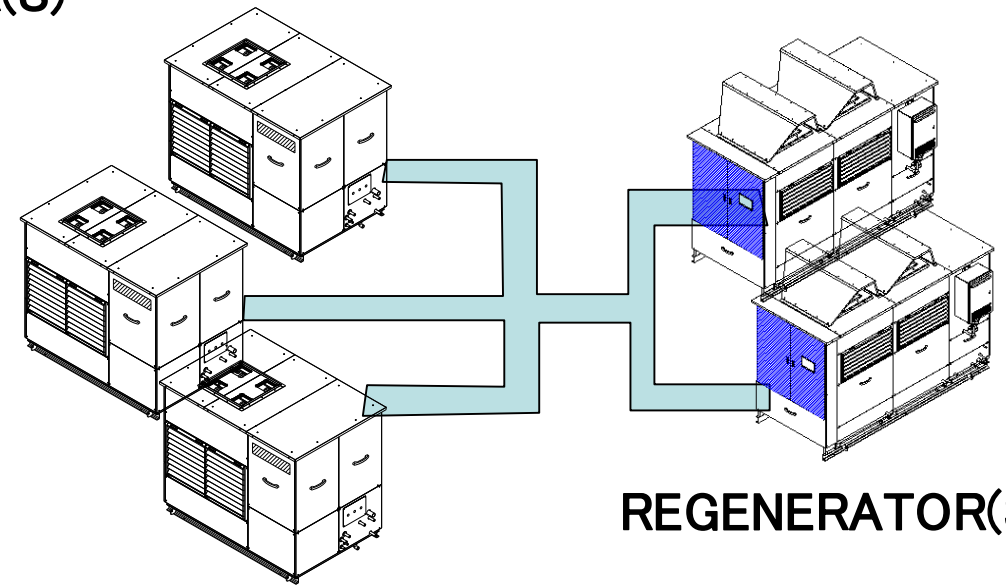
PROCESSOR　　REGENERATOR

PATTERN 2　n:1



PROCESSOR(S)　　REGENERATOR

PATTERN 3　n:m

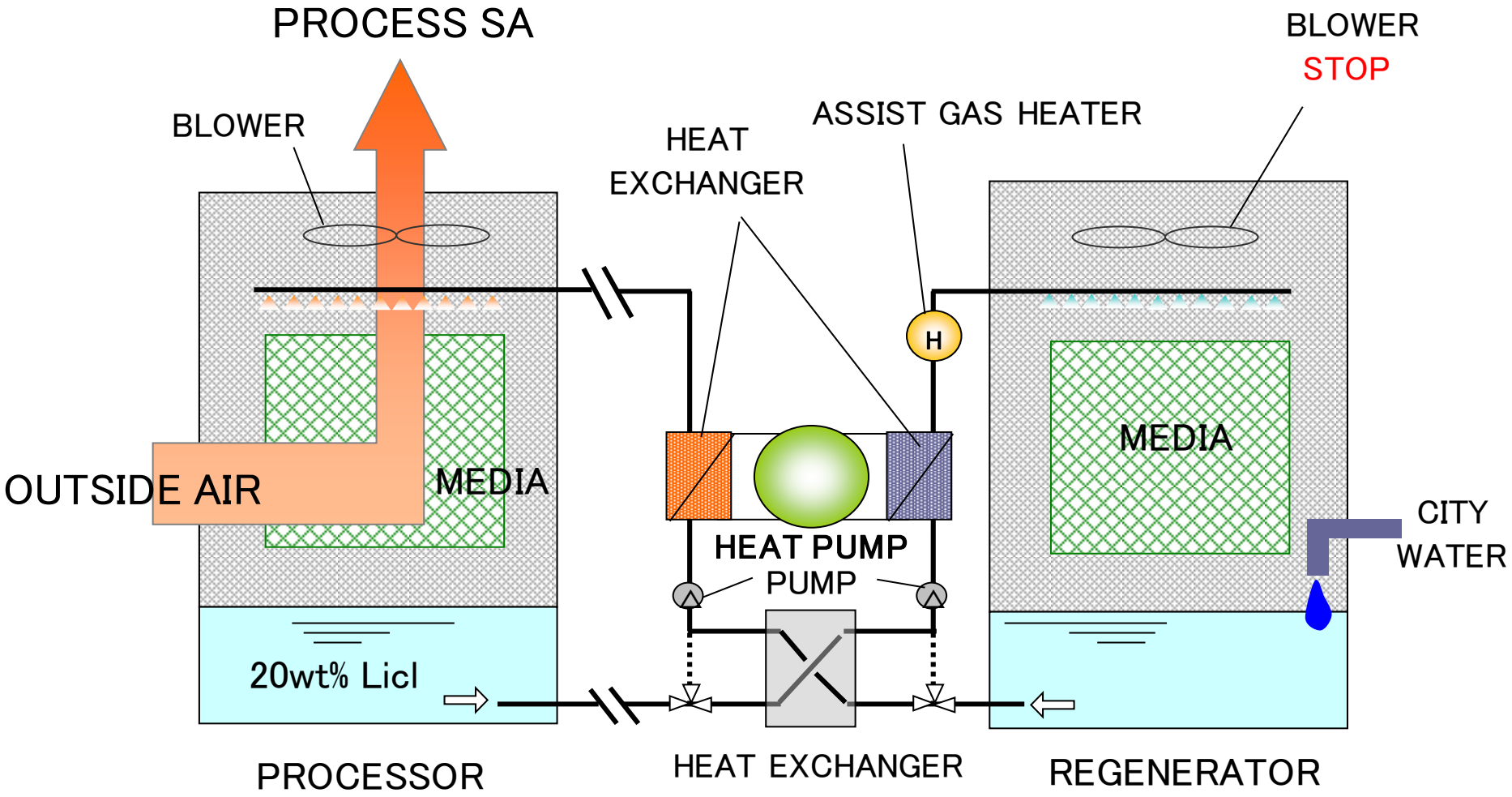


PROCESSOR(S)　　REGENERATOR(S)

3.

The processor is comprised of a pair of units, the OA processor and the solution regenerator. We have several variations as you can see in the Power Point slide. They can be installed right next to each other, or as far as 100 meters apart, practically.

HUMIDIFICATION PROCESS
in MIDWINTER



4.
Please take a look at this slide. This slide shows the schematic of a standard liquid desiccant processor operating in the humidification mode in mid-winter.

The processor is equipped with a high-efficiency heat pump and a gas heater. In the coldest winter months, gas is used as a primary heat source as it is able to maintain stable heat power. However, once it warms up in spring, the heat source can be switched to the heat pump.

What's even more remarkable about this processor is it can deal with the problem of degradation of water quality. Let me explain a little bit more on this. The water stored for humidification can go bad or putrefying bacteria inside the tank can grow in number after a while. But because this equipment (processor) mixes the water with Lithium chloride solution, which has powerful disinfecting capability, before the water inside of the tank gets evaporated, the water quality can be kept at a high level at all times.

Diluted solution used for humidification tends to carry over by nature, but the processor is able to prevent such a phenomenon thanks to a mediated impregnation method.

FEATURES

1.HIGH PERFORMANCE

Humid・Dehumid(Both⊿x＞13g/kg) suitable for OA processor

2.RUNNING on LOW- QUALITY DRIVING HEAT SOURCE

Heating source 80℃→50℃ STD type with high-efficient HP
Cooling source 5℃→15℃ easy to use for waste-heat

3.LOW STATIC INTERNAL PRESSURE

Effective energy saving Fan-long drive

4.MULTI FUNCTION

Without any single purpose equipment

5.

This Power-Point slide shows the four greatest features the liquid desiccant processor offers. For more information, please do email me later and I can forward more detailed information on this by request.

A CASE OF NURSING HOME

SUMMARY OF THE FACILITY

LOCATION NIIGATA 300km north of Tokyo

100m × 30m 5,500 ㎡ cealing2.7m

Three floors

120 people

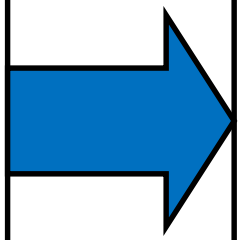
6.

What you see on this Power Point slide is a photo of a nursing home that was built in 2007. Two years later, we installed the liquid desiccant processor.

IAQ SOLUTIONS

Air-processing

- Cooling
- Heating
- Humidifying
- Dehumidifying
- Eradication of bacteria
- Dedusting
- Odor removal
- Ventilation



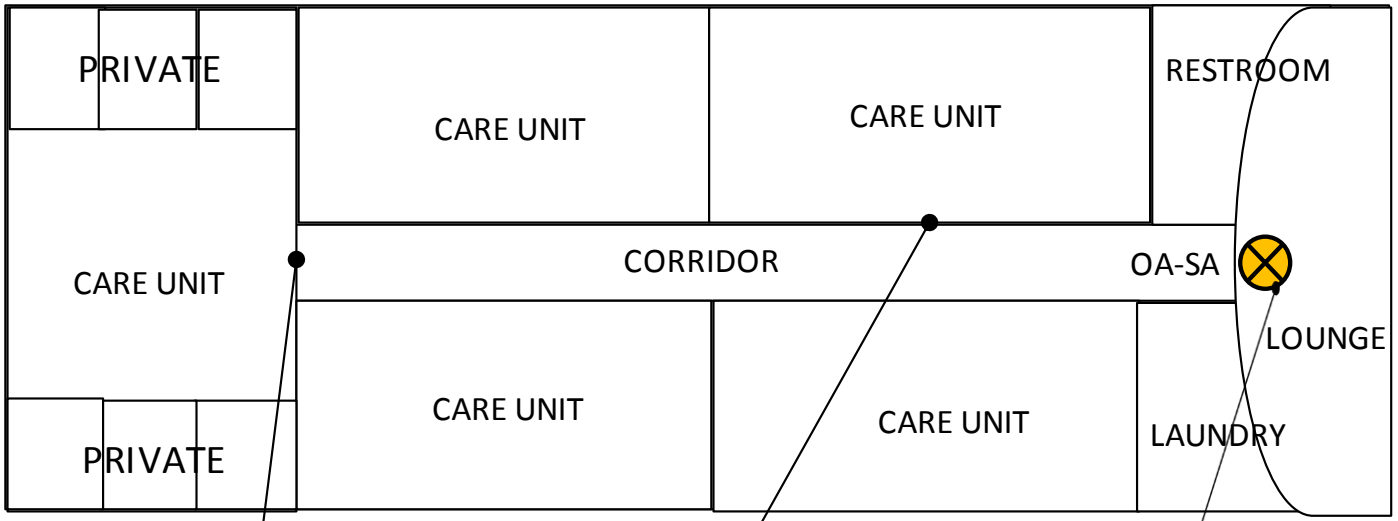
Three room ambiences

- Heat transfer
- Equable ventilation
  Deodorant effect
- Humidity control

7.

What we should know clearly is the processor we have developed uses pressurized ventilation, not negative ventilation. Three key features of the processor are shown on the right hand side, namely, effective heat transfer, equable ventilation, which also means remarkable deodorizing effect (which is very much appreciated in medical facilities and nursing homes), and it also provide intelligent humidity control. This is no ordinary humidity control.

INSIDE THE NURSING HOME



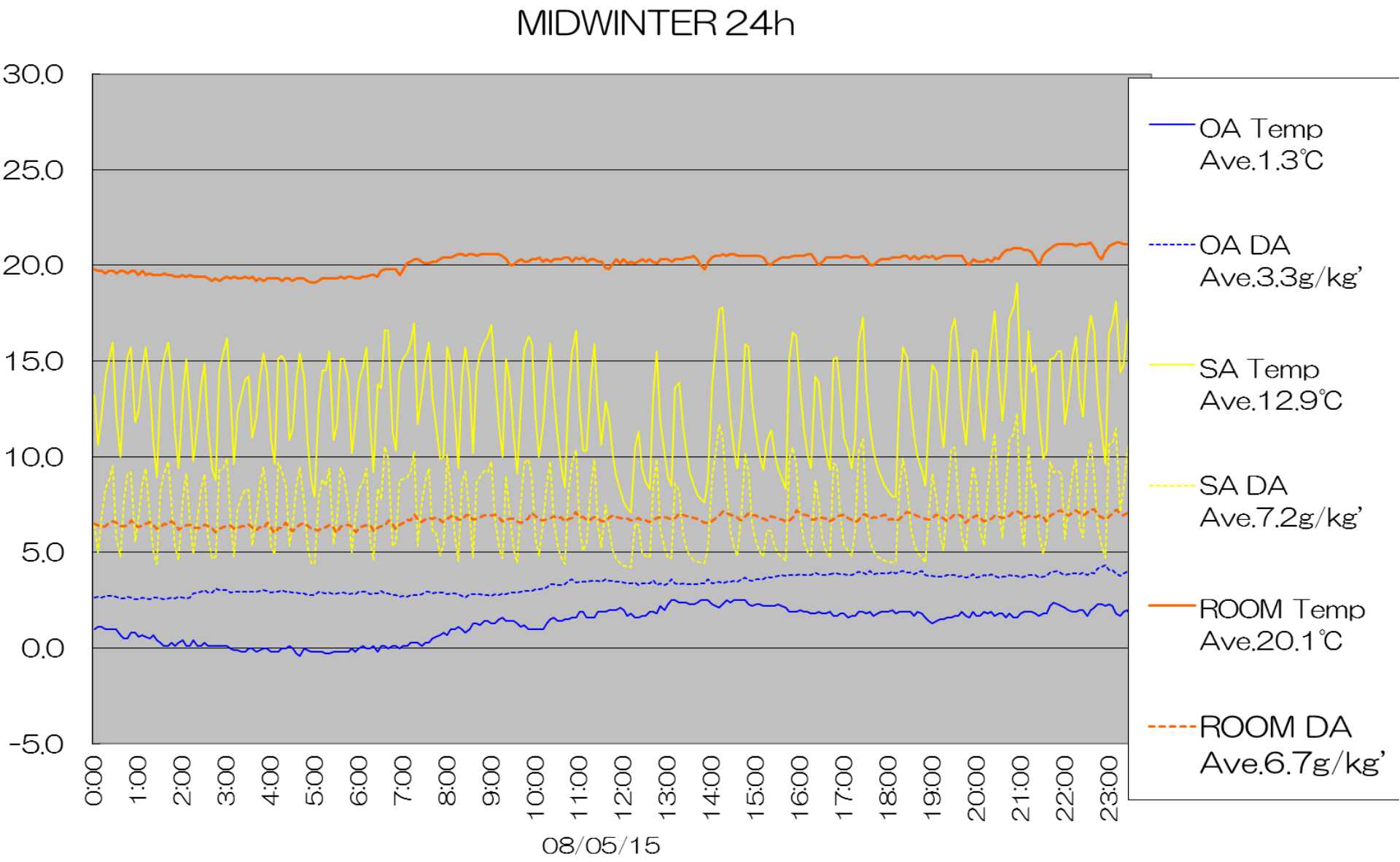
8.

This slide shows a typical floor plan of a nursing home.

Please note that there is only one SA louver on the right hand side of this floor plan. Our processor is capable of very effective ventilation as shown in these three pictures. The curtains you can see in the pictures on the bottom are not moving, but are almost stationary because of the SA pressure.

The air is effectively pressured and deodorized because of the air pressure generated by our processor.

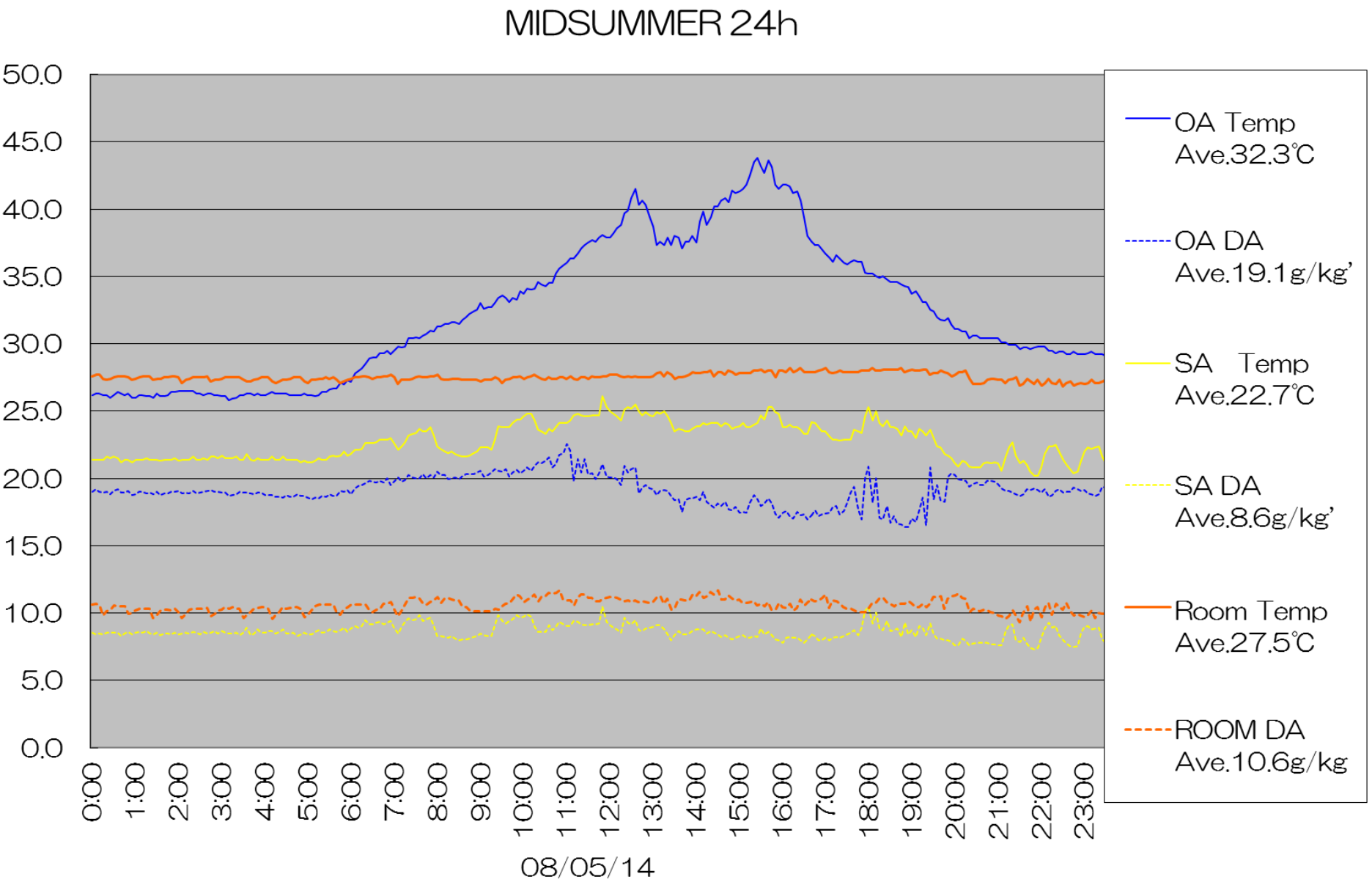
TYPICAL CONDITIONS IN WINTER



9.

The following two slides show graphs of the OA, SA and Return-air temperature and the absolute humidity for midwinter and midsummer respectively. Please pay attention to the solid orange line indicating the room temperature. In midwinter, it's pretty stable at around 20 degrees Celsius around the clock.

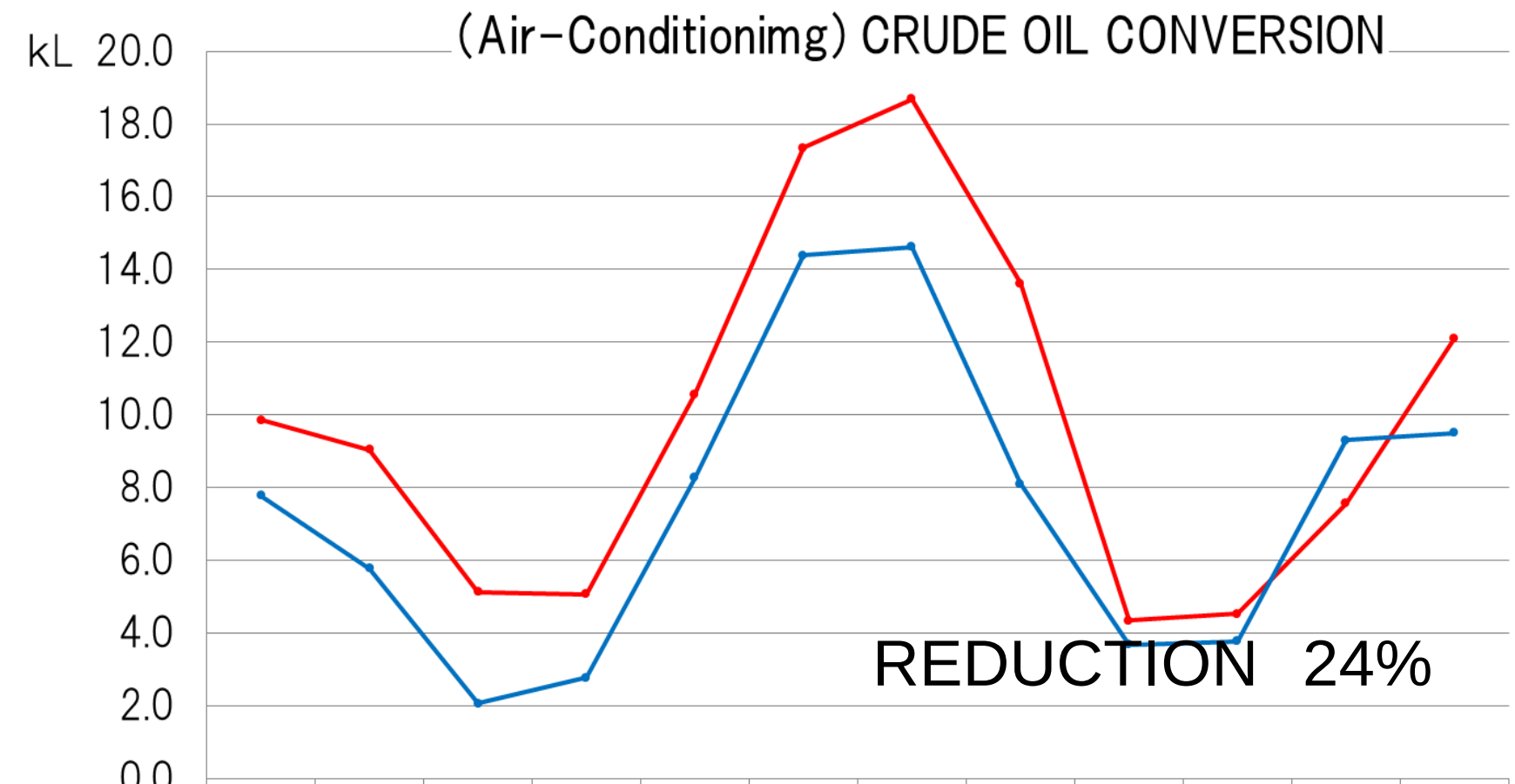
TYPICAL CONDITIONS IN SUMMER



10.

The stability of latent load enables the stability of sensible load.

TOTAL AIR-CONDITIONING ENERGY CONSUMPTION



	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
BEFORE	9.9	9.0	5.1	5.1	10.6	17.3	18.7	13.6	4.3	4.5	7.6	12.1
AFTER	7.8	5.8	2.1	2.8	8.3	14.4	14.6	8.1	3.7	3.8	9.3	9.5

11.

The main purpose of the liquid desiccant processor is to help improve the IAQ, however, its by-product is high energy efficiency of 20 to 70%, depending on the amount of ventilation.

PREVENT INFECTIONS OUTBREAK

APPROXIMATELY 5,000 PEOPLE WHO STAYED AT 50 HOSPITALS AND NURSING HOMES FROM 2006 TO 2015

Only few announced the outbreak of the group infection of the flu and the norovirus

IAQ EFFECTIVENESS FOR MANAGEMENT
AVERAGE UTILIZATION RATE 95.8%⇒99%
$1,000/PERSON

12.

Since the first installation of the liquid desiccant processor, we have seen only very few cases of major outbreak of virus infection in the medical facilities where the processors have been installed. The processor removes bacteria by means of the chloride-induced attack to process the air instead of filtering the air. We should note that the source of infection is very often not airborne, but rather, the viruses are brought in directly by the carrier of the viruses. Today, it is well known that the influenza virus is vulnerable to humidity, but there are high-resistant varieties of fungi and viruses. It is difficult to determine precisely how much the processor contributes to suppress the virus infection. We cannot single out the processor to account for very low mass infection rate. One of our hypotheses is that the IAQ might be able to help improve human resistance to virus infection. IAQ could improve health of those who stay and work at medical facilities. However, it is necessary to conduct epidemiological studies.

Now, let's turn our eyes to the cost, which is, needless to say, the greatest concern of all to the management.

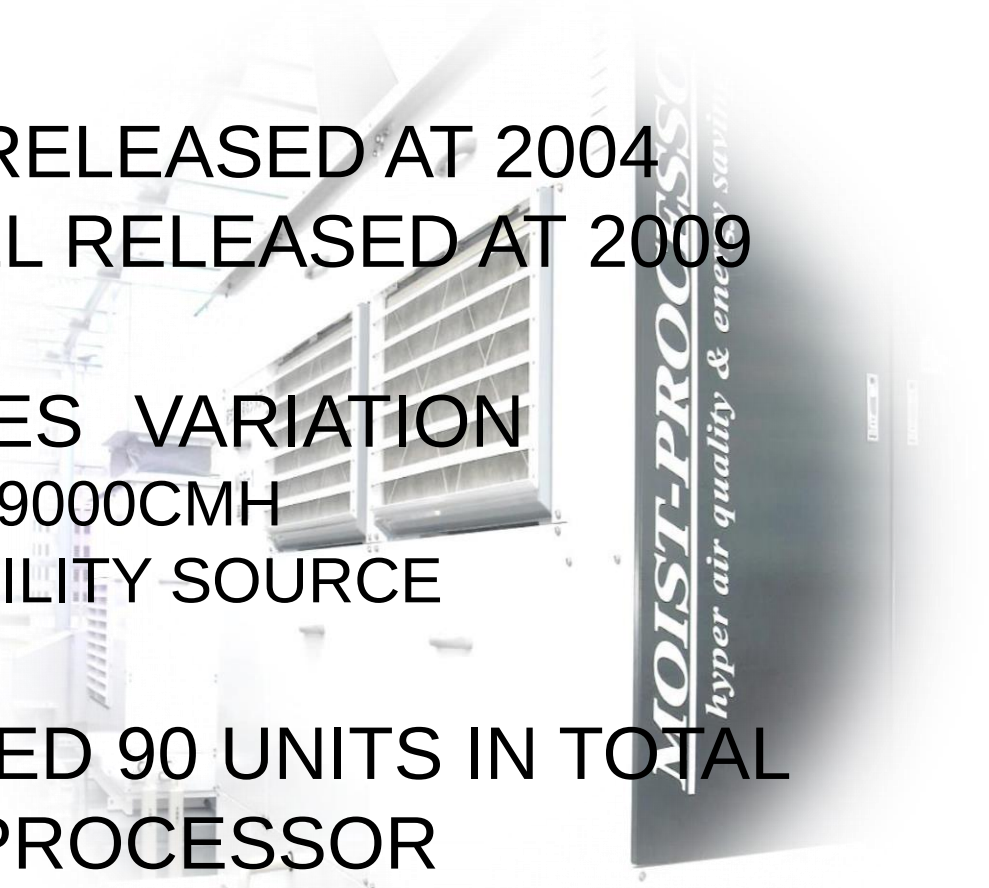
ABOUT DYNA-AIR Co,.LTD

FOUNDED IN 2004

PROTOTYPE RELEASED AT 2004
CURRENT MODEL RELEASED AT 2009

FIVE TYPES VARIATION
300-9000CMH
MULTI-UTILITY SOURCE

TO DATE INSTALLED 90 UNITS IN TOTAL
AS OA-PROCESSOR



DynaAir

MOIST-PROCESSOR
hyper air quality & energy saving

13.
Thus far, we have resolved a number of technical problems such as the issues of performance and durability.

However, we have not been able to solve the issue of the initial costs.　Without mass-production, cost reduction is not feasible.

There are several manufacturers in this arena outside of Japan. Some of you may recall/ now-gone DRY-KOR, which had a very short life, but was one of the initiators in this field.

The segment is still too small for a bit of competition to occur.
I truly want to see the liquid desiccant technology a lot more prevalent in the world as it has a great potential to improve the IAQ=Indoor Air Quarity and reduce the burden on the environment, hopefully more people start to see how this technology can be beneficial while I'm still alive.

Thank you!