



Under the Auspice of the Ministry of Environment

MINISTERO DELL'AMBIENTE
E DELLA TUTELA DEL TERRITORIO E DEL MARE



16th EUROPEAN CONFERENCE

THE REFRIGERANT REVOLUTION : A 79% REDUCTION TECHNICAL INNOVATIONS IN REFRIGERATION AND AIR CONDITIONING

organised by
**Centro Studi Galileo and
Associazione dei Tecnici italiani del Freddo**

Mostra Convegno Expocomfort – Milano, Italy

LOW GWP REFRIGERANTS DEVELOPMENT OF NEW SYSTEMS



XVI th EUROPEAN CONFERENCE

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MYCOM NATURAL FIVE

DOC.2014-609 R0

"Natural Five" Refrigerants and Product Solutions

Refrigerant (Natural Five)	NH ₃ R-717	CO ₂ R-744	HC Hydrocarbon	H ₂ O R-718	Air R-728
90°C	Utility hot water Heating	Utility hot water			
60°C			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			Cryogenics		
-60°C					Cryogenics
-100°C					
Notes	<ul style="list-style-type: none"> Conventional system National Projects 	<ul style="list-style-type: none"> HeatCO₂m 	<ul style="list-style-type: none"> Nat'l Proj. Butane + Propane 	<ul style="list-style-type: none"> Nat'l Proj. Adsorption Heat recovery 	<ul style="list-style-type: none"> Nat'l Proj. Air-cycle

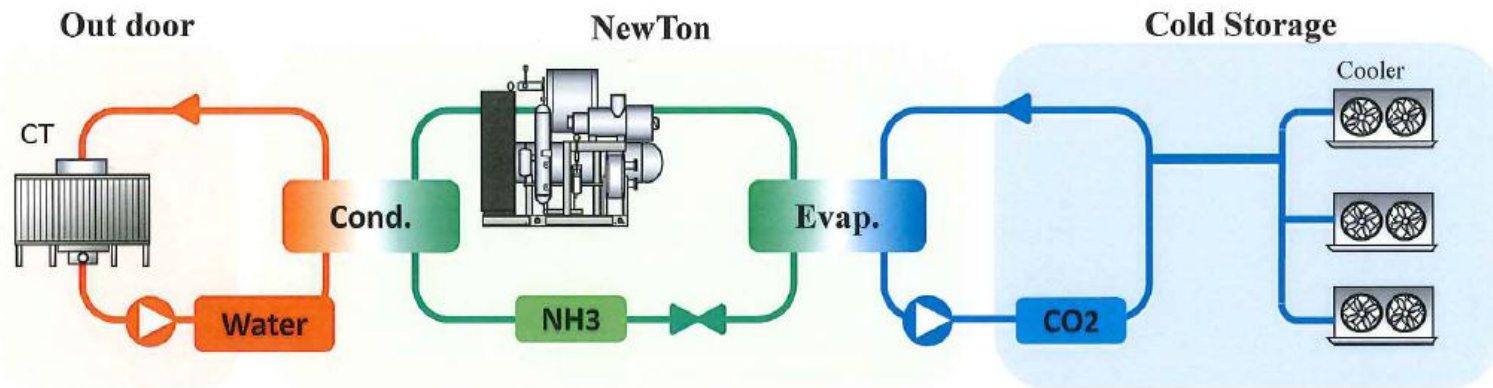
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MYCOM NH₃/CO₂ REFRIGERATION SYSTEM 'NEWTON'

presented by Jan Boone
Author : Mr.Hideo Asano

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Basic Concept of *NewTon*



Water cooled

- Energy saving
- NH3 charge min.
- Free layout
- Easy Maintenance



NH3 Package

- New Screw compressor
- Semi-hermetic IPM motor
- Flooded Evaporator
- Double economizer
- Automatic operation



CO2 brine

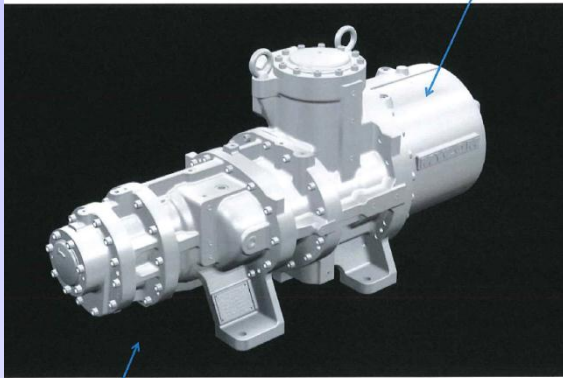
- Safety
- Low pump power
- No trouble by oil
- High heat transfer



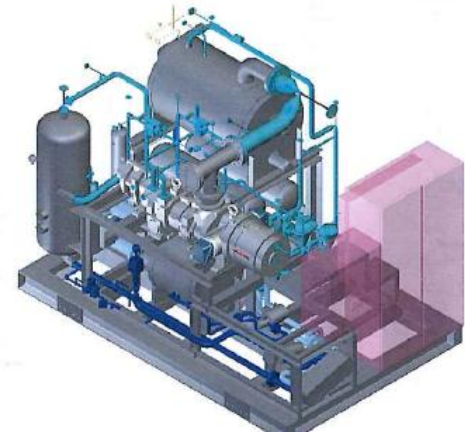
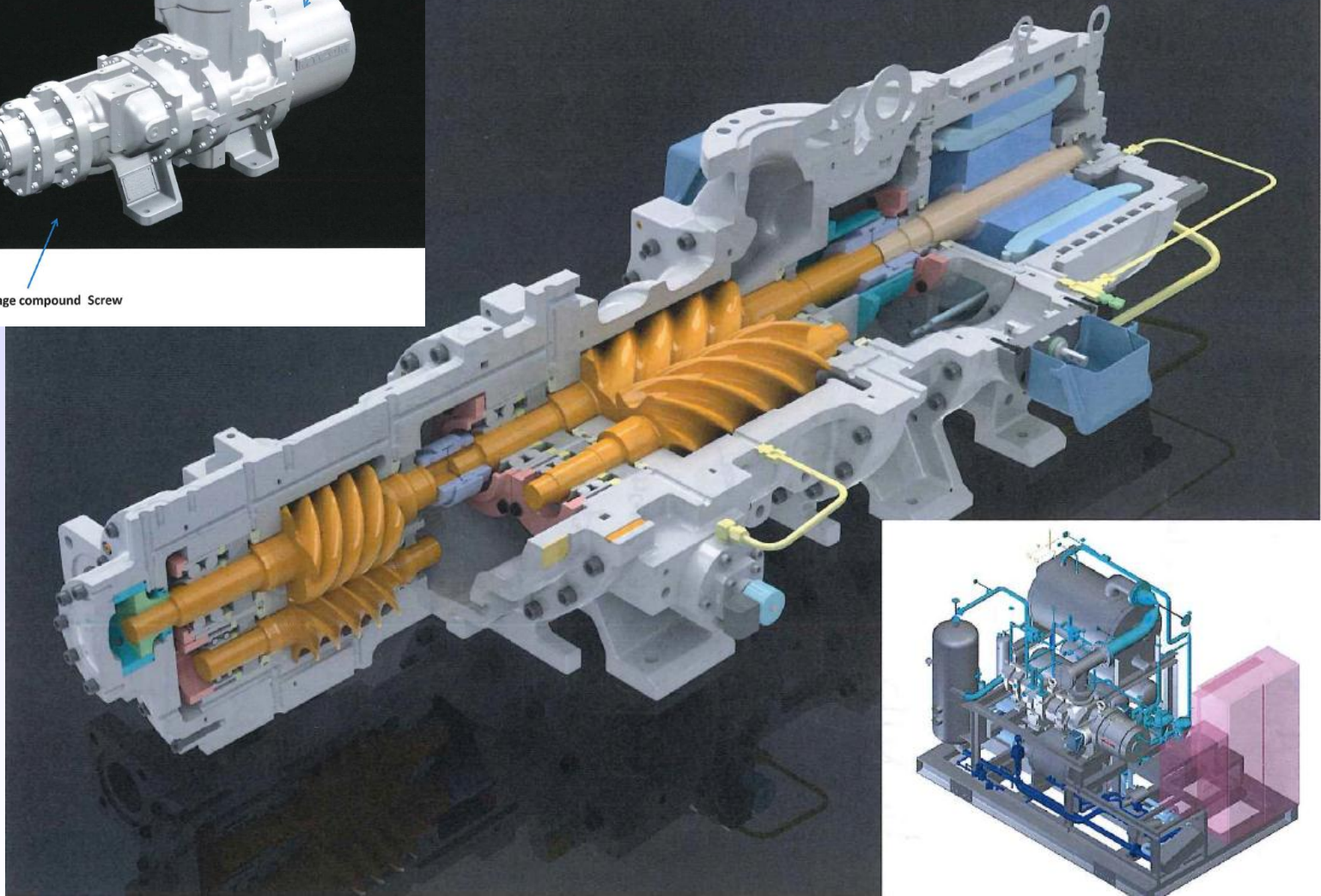
「Safety」 「Energy saving」 「Easy maintenance」

NH3 New Screw Compressor

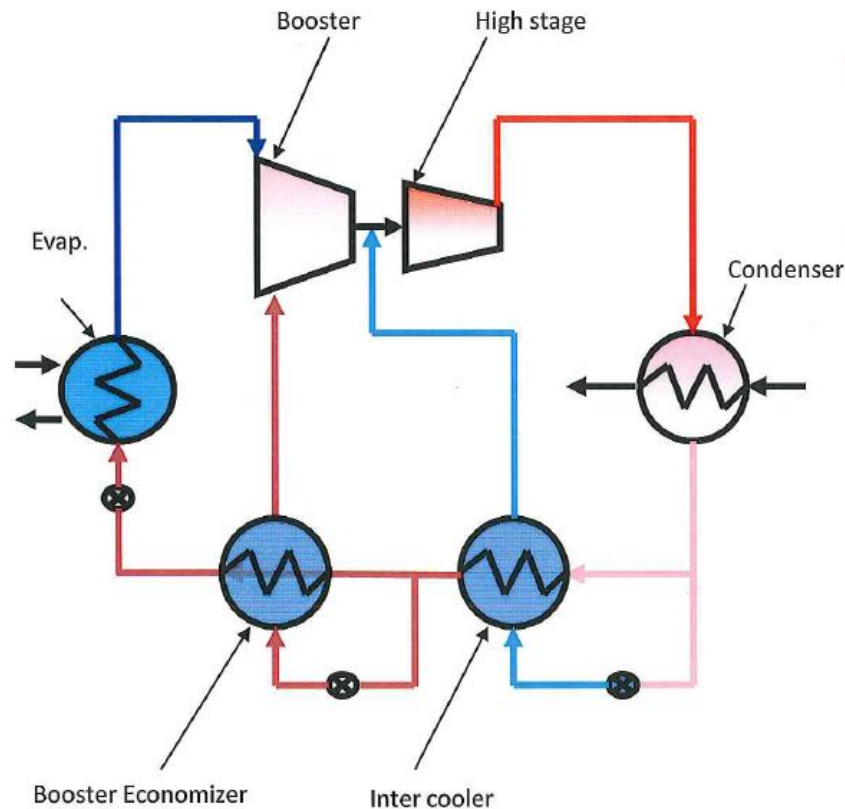
Semi-hermetic IPM Motor



Two stage compound Screw

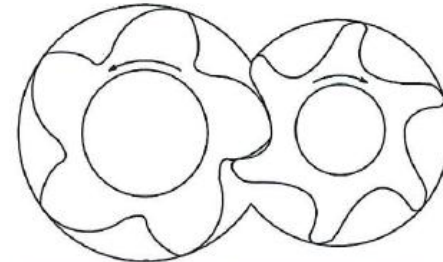


New rotor profile and Double economizer system



Features

- High efficiency: Less gas leakage
- Quiet: Low noise, low vibration
- High reliability: Use of proven bearings



Double Economizer

MYCOM NEWTON PACKAGE



High Efficient & Safe Refrigeration Package

- Improve efficiency with IPM Motor
- An ideal operation with actual load, controlled by an inverter.
- The special refrigeration package, designed for cold storages
- Much less NH3 volume in the system by using a shell & plate heat exchanger
- Prevent NH3 leakage by using bellows valves

Energy Saving by 20%, as compared with a conventional refrigeration system

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FIELD CASE

NH₃/CO₂ COOLING SYSTEM

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LOGISTIC COOLING CENTER

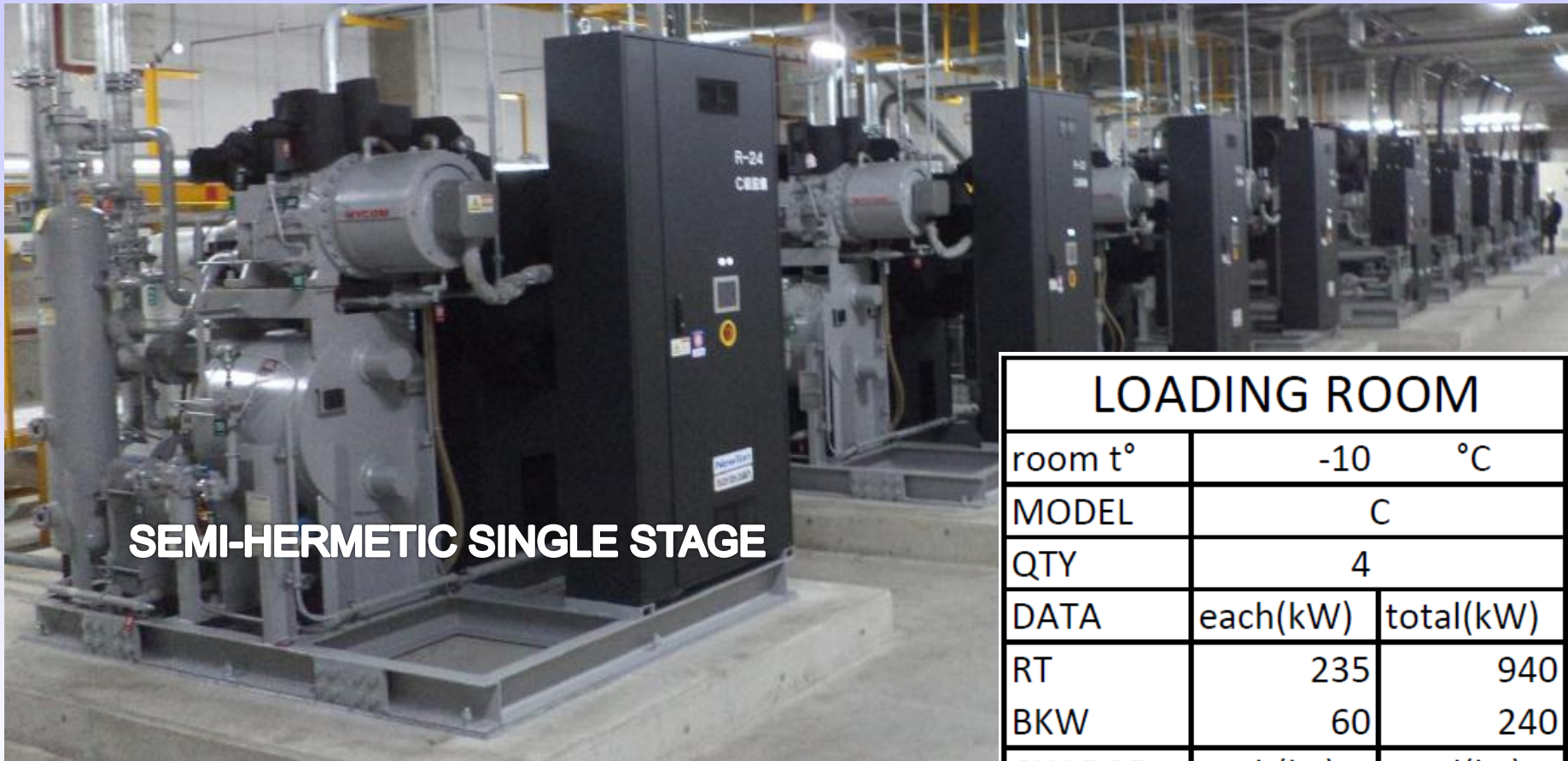
200.000 m³

REQUIREMENT

NEED	200.000m3 cold storage/logistic center	Holding capacity(ton)
-25°C	Cold storage	50.000
+5 to -25°C	Chilled room & cold storage	20.500
-25°C	Chilled room	5.500
0 to +5°C	Loading room	6.900
-42°C	Freezing room	10/d/2 rooms
Refrigerant	medium : NH3 <ul style="list-style-type: none"> - Natural refrigerant (ODP=0 & GWP=0) - Safe as kept inside the refrigeration package unit (roof). no NH3 circulation inside the room Secondary medium : CO2 <ul style="list-style-type: none"> - Natural refrigerant (ODP=0 & GWP=1) - CO2 circulation in cold-/ & processing rooms 	

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INSTALLED NEWTON PACKAGES



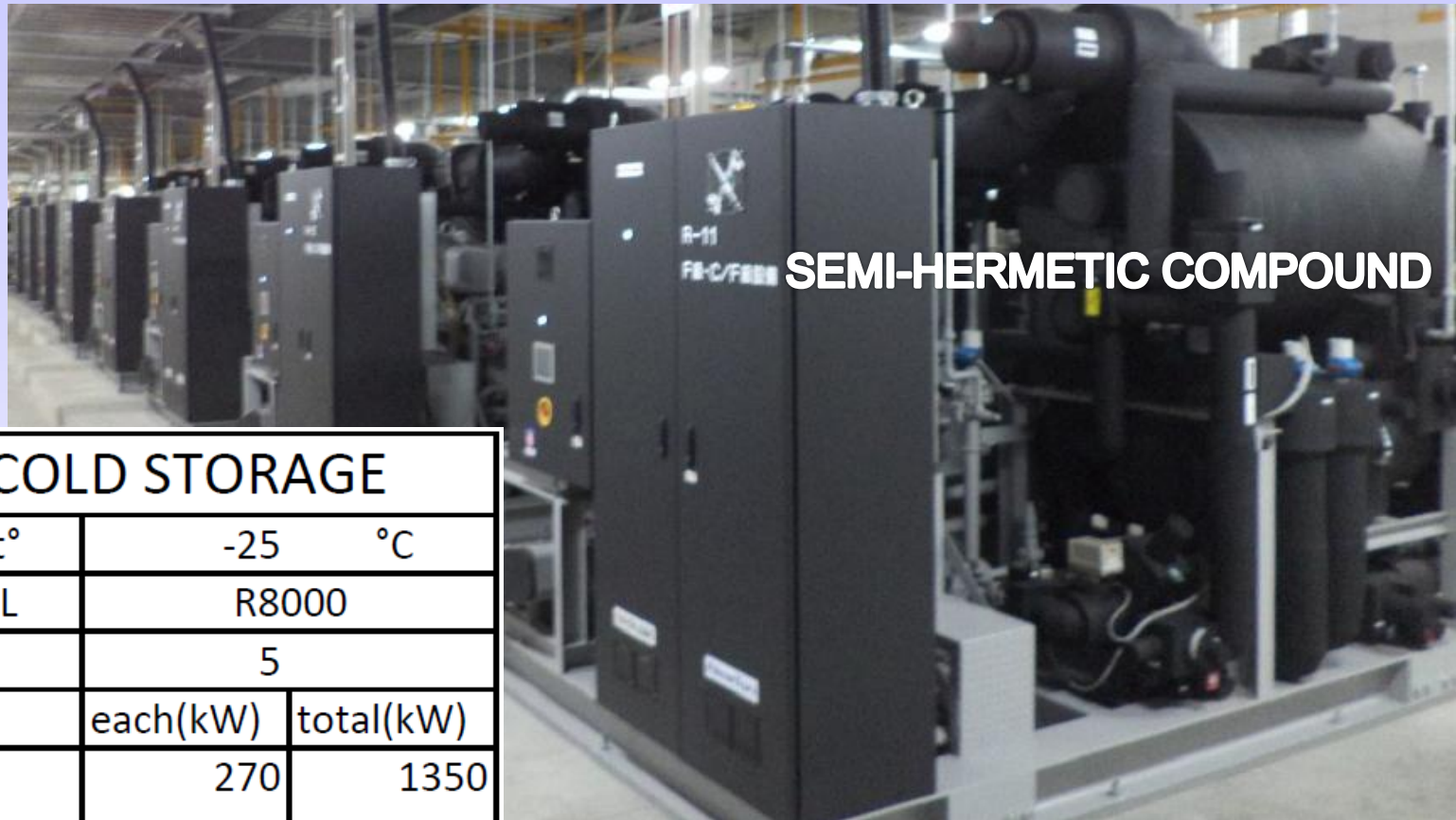
SEMI-HERMETIC SINGLE STAGE

LOADING ROOM

room t°	-10 °C	
MODEL	C	
QTY	4	
DATA	each(kW)	total(kW)
RT	235	940
BKW	60	240
CHARGE	each(kg)	total(kg)
NH3	60	240
CO2		2000

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INSTALLED NEWTON PACKAGES



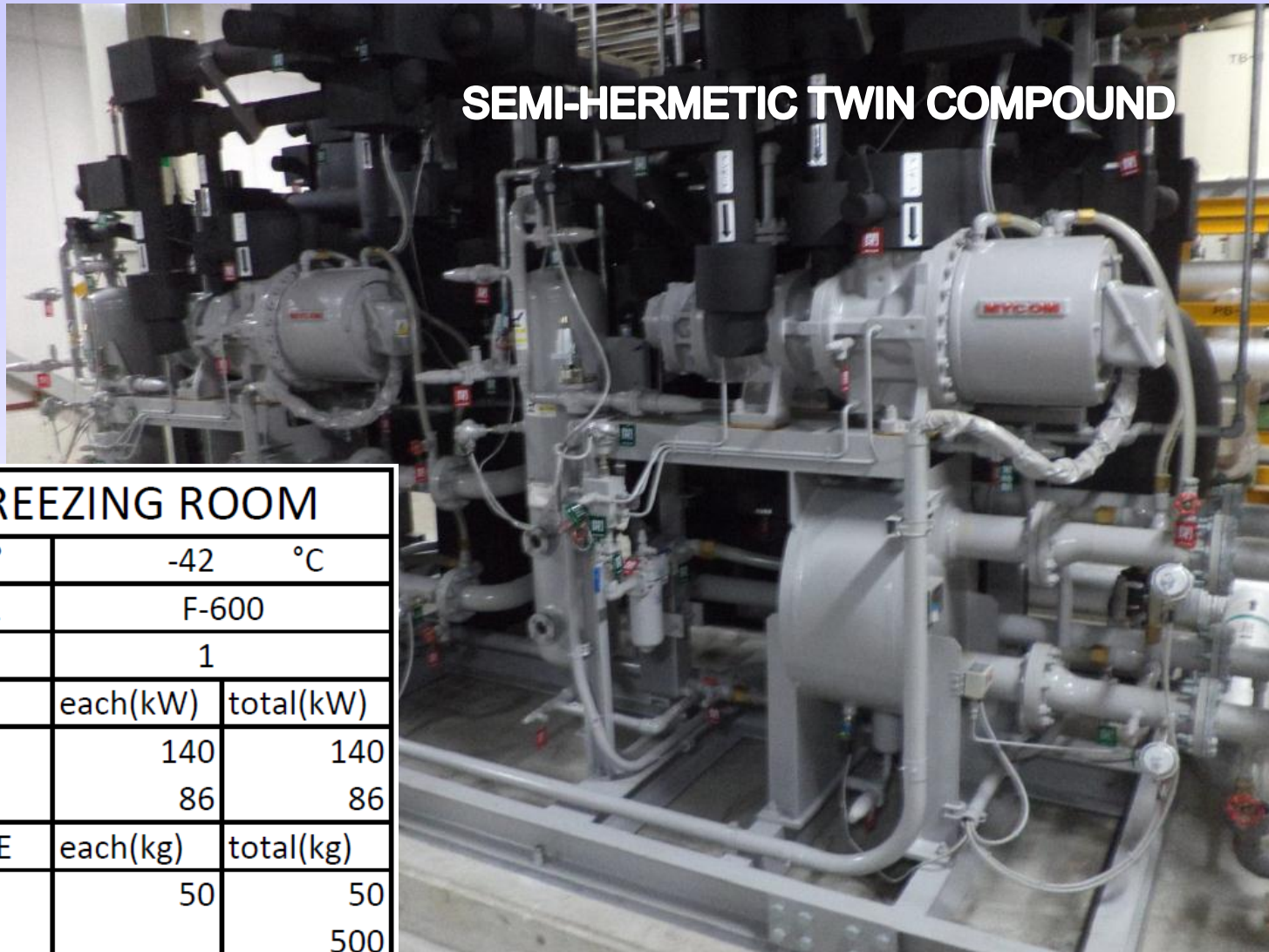
COLD STORAGE		
room t°	-25 °C	
MODEL	R8000	
QTY	5	
DATA	each(kW)	total(kW)
RT	270	1350
BKW	120	600
CHARGE	each(kg)	total(kg)
NH3	70	350
CO2		3600

Approx. 1/15th of NH3 volume <=>conventional NH3 circulation system

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INSTALLED NEWTON PACKAGES

SEMI-HERMETIC TWIN COMPOUND



FREEZING ROOM

room t°	-42 °C	
MODEL	F-600	
QTY	1	
DATA	each(kW)	total(kW)
RT	140	140
BKW	86	86
CHARGE	each(kg)	total(kg)
NH3	50	50
CO2		500

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Overview :

Installed capacity :

- 11 Newton packages
 - Nominal capacities per hour :
 - RT : 2700 kW (-42/-25/-10/0°C)
 - bkw : 986 kWh
 - Specific performance per m3 coldstore : 32kWh/m3

Advantages :

- Natural refrigerants NH3 & CO2
 - Energy saving 25%
 - compressor efficiency
 - double subcooling
 - semi hermetic IPM drive motor
 - minimized condensing pressure
 - 5°C condensor subcooling
 - CO2 brine low pump power

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->Overview :

->Advantages :

- Safety
 - CO2 brine (in cold rooms)
 - NH3 (in compressor package)
 - +neutralizing system/emerg.power gen.
 - +leak & vibration detectors
 - individual NH3 packages
 - minimised NH3 charges (S&P H.EXCH)
 - semihermetic equipment
 - bellows valves

- Operation
 - flooded evaporator
 - high heat transfer
 - automatic operation
 - low noise level
 - low vibration level
 - no trouble by oil
 - easy maintenance

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Survey on COLD STORE INSTALLATIONS :

Main Installations of *NewTon*

User	tons	Newton sets	installed
Nissui Logistics kawasaki	14,000 ton	3	2008
Igarashi reizo Hidaka	15,000 ton	4	2008
Toyo suisan Nagoya	32,000 ton	9	2009
Kowa reizou Nagoya	8,500 ton	4	2009
Coop Tosu	50,000 ton	12	2009
Hosui Atsugi	8,000 ton	2	2010
Yokohama reito Osaka	27,000 ton	8	2011
Matsuoka Kawasaki	80,000 ton	11	2013

500 are running



Nissui Log. / Kawasaki



Igarashi / Hidaka LCC



Kowa reizou / Nagoya



Yokohama reizou / Osaka



COOP / Tosu Log.

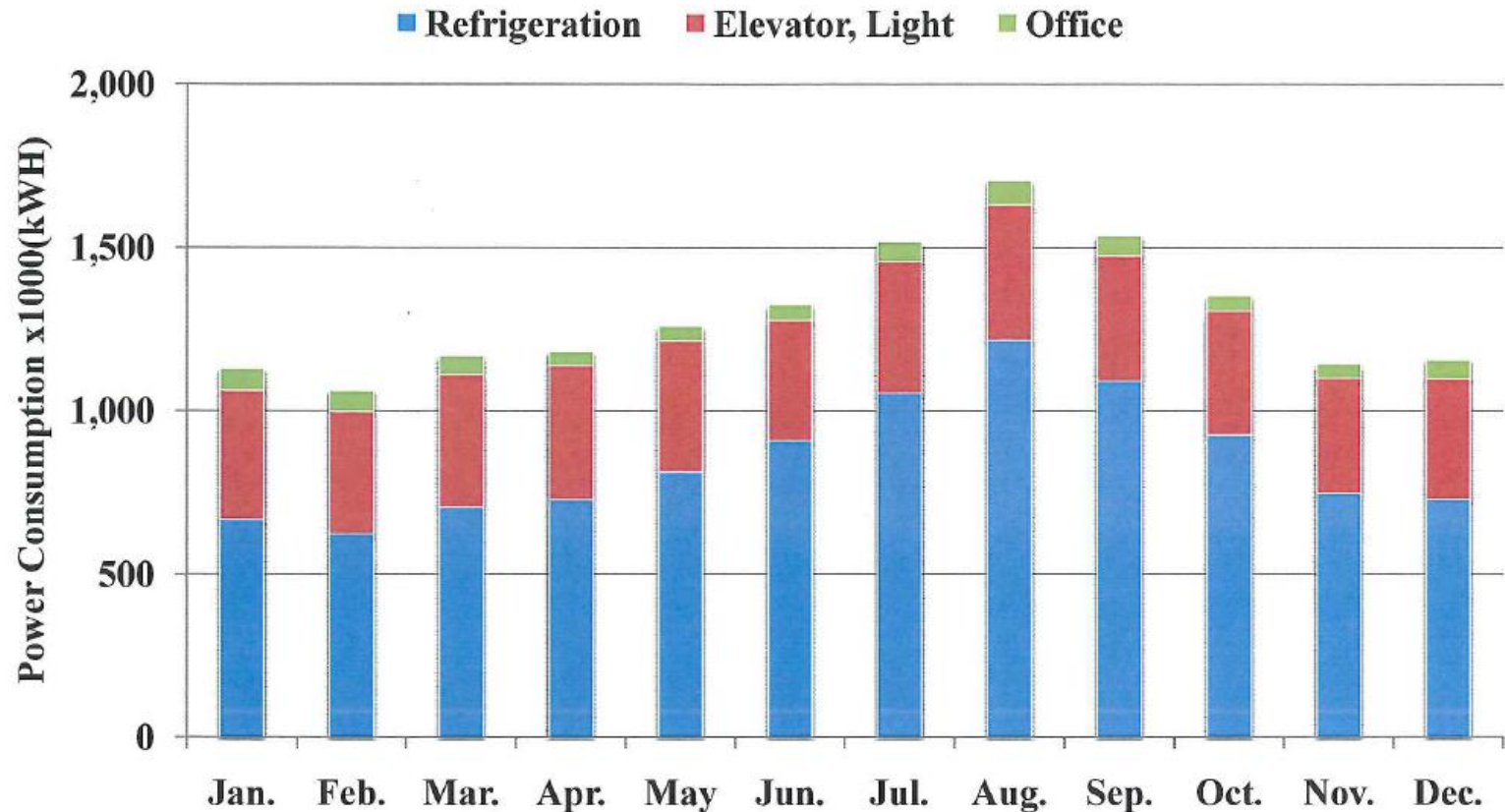


Toyo suisan / Nagoya



Matsuoka / Kawasaki

Electric Power Usage in Cold Storage



Refrigeration:65%, Elevator, Light:30%, Office:5%

Specific Power Consumption in Cold Storage

Definition of “SPC”

$$\text{SPC} = \text{PCy}/V_c$$

where:

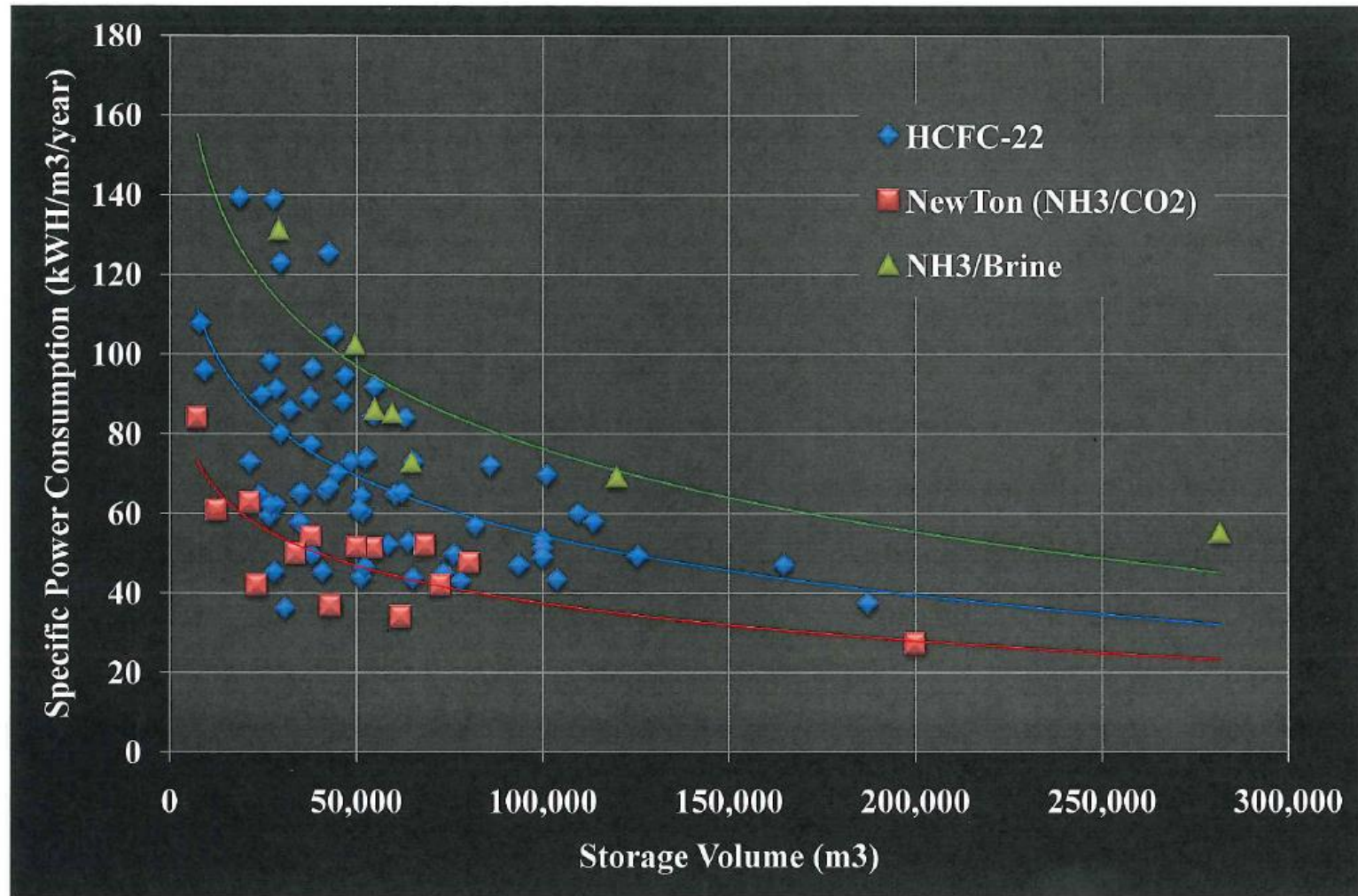
SPC : Specific Power Consumption (kWH/year/m³)

PCy : Annual Power Consumption (kWH/year)

V_c : Cold Storage Volume (m³)

*** PCy is the total power consumption which includes refrigeration system, elevator, light and office.**

Specific Power Consumption in Cold Storage



CONCLUSION :

This survey of NEWTON in Cold Storage installations, using natural refrigerants NH₃ and CO₂, initially developed to reduce the environmental load,

show that :

compared to HCFC-22 power consumption savings with NEWTON are achieved of 25 to 30%.

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MAYEKAWA MYCOM

WORLDWIDE
 • 35 countries / 122 offices
 • 8 production plants



MAYEKAWA Europe Organization

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