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DEVELOPMENT OF AIR REFRIGERATION SYSTEM “Pascal Air”

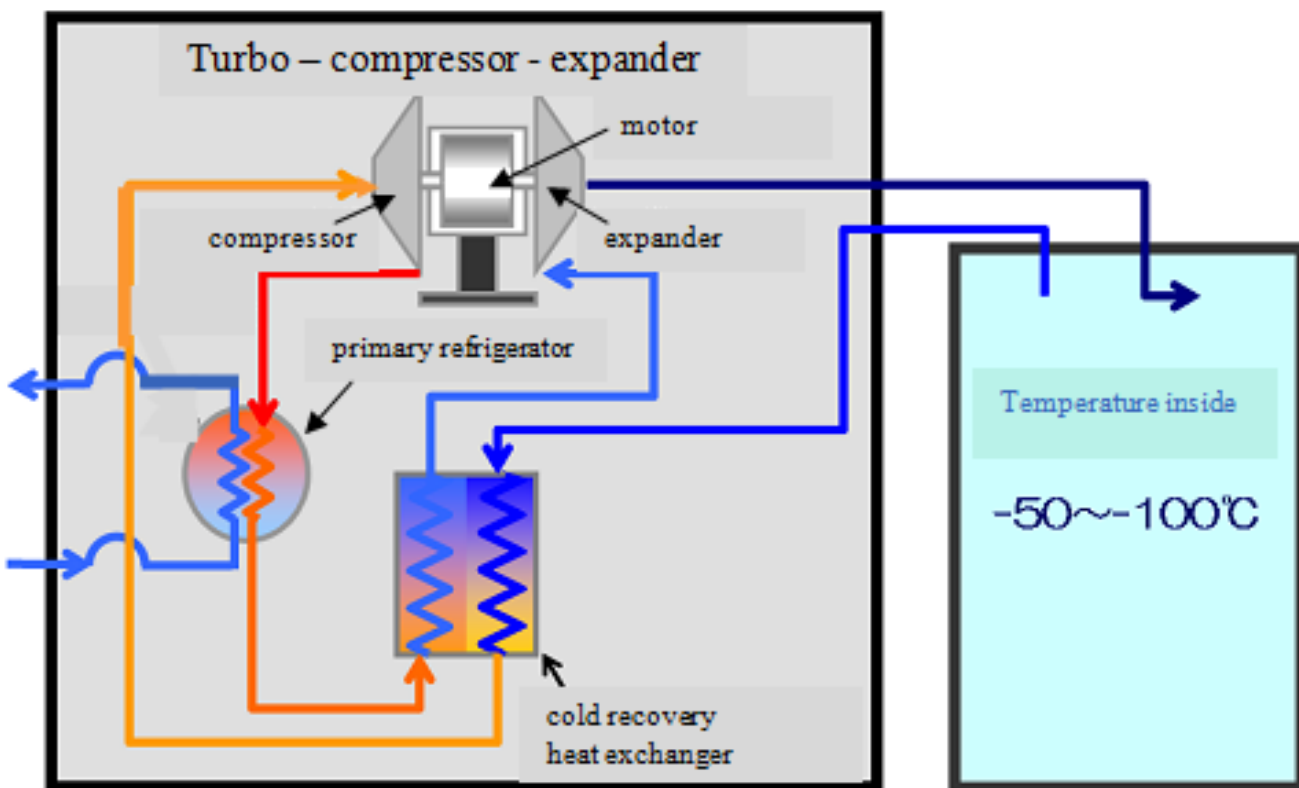
Introduction

a refrigeration system “Pascal Air”, was developed using the ultimate natural refrigerant “air”, targeting the field of ultra-low temperature.

Brief description

The system “Pascal Air” is composed of three parts:

- an expander-integrated compressor (compression and expansion),
- a primary cooler (heat dissipation),
- a heat-recovery heat exchanger (heat recovery).



Air – refrigeration system “Pascal Air”

Low temperature system

“Pascal Air” flow diagram

Results



Installation of Pascal Air



Existing ultra-low temperature refrigerator



“Pascal Air” ultra-low temperature refrigerator

Installation date	December 2008	Unit
refrigerator temperature	-60	° C
total capacity	150	kW
nr of machines per room	3	
nr of rooms	2	
nr 1 nr 2	6667	hours
nr 3	5996	hours
nr 4	6069	hours
nr 5	6597	hours
nr 6	6173	hours
	7410	hours
suction pressure (35° C)	0,98	bara
discharge pressure (93° C)	1,74	bara
rotation speed (invertor)	12.000 - 18.000	rpm
	30	kW
capacity	72	kW
power consumption	-80	° C
air outlet temperature	-60	° C
refrigerator temperature	air 40	kW
gain expander		

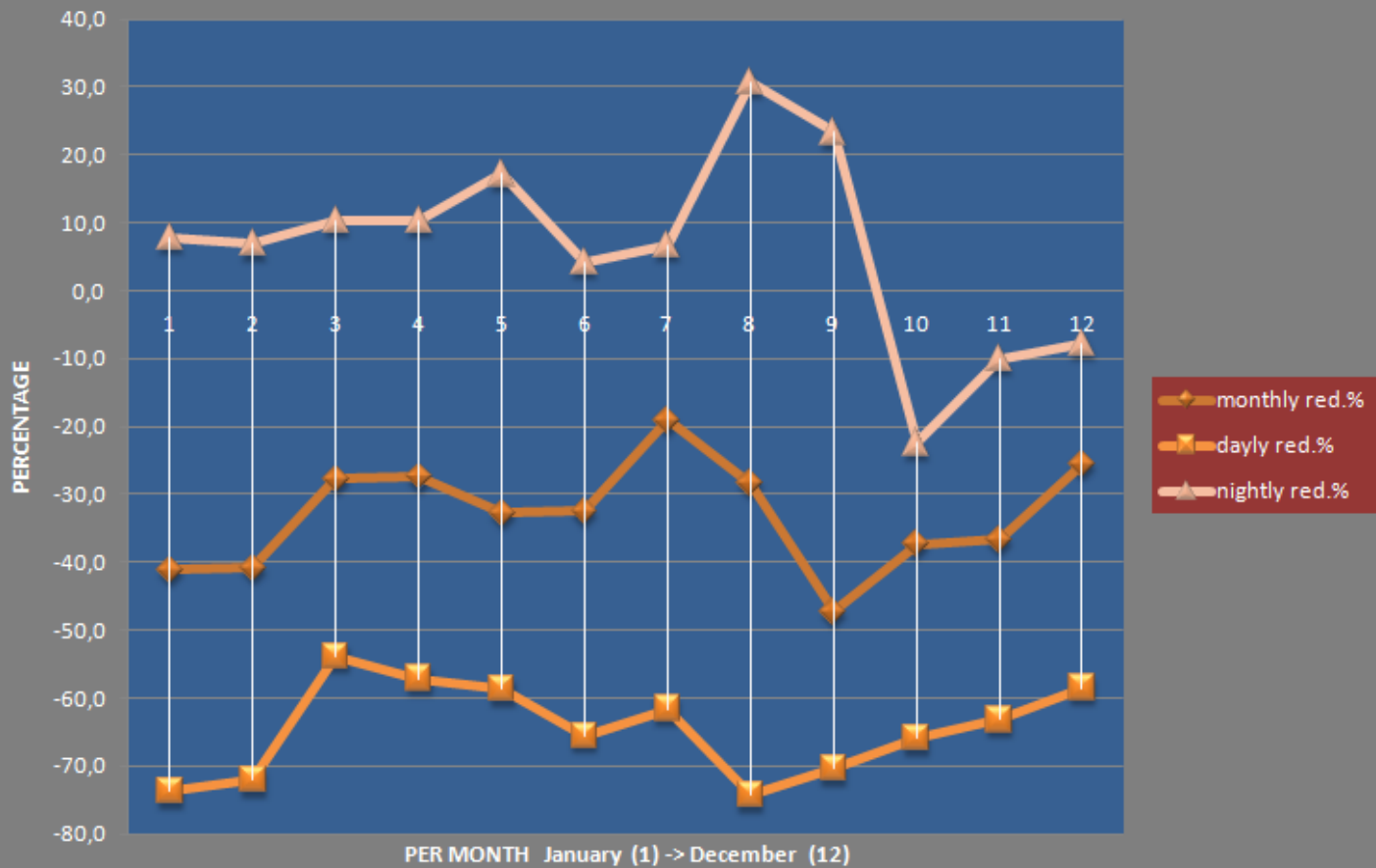
The first test of a prototype was conducted in an existing ultra-low temperature refrigerator (nominal capacity 1795 tons, -50°C, Yaizu City, Shizuoka Prefecture).

For 4 months, from July to the end of October 2008, when the heat load is usually at its highest, continuous operation was performed

Plant specifications of “Pascal Air” - system

Conclusions

ENERGY CONSUMPTION REDUCTION



Data "Pascal – Air " – system

The total annual energy consumption is 33,1% lower, representing 64,2% reduction on day-regime and 6,1% increase on night regime compared to the conventional system.

The difference of 20°C between temperature inside the warehouse and air blown into the warehouse makes air circulation stay at 1/10 compared to an air cooler .

The characteristics of this open system, by using the air inside the warehouse as refrigerant, are still developing.