

UNEP DTIE OzonAction Programme

T.R.
Ministry of Environment
and Forestry



Multilateral Fund
for the Implementation of the Montreal Protocol



**JOINT MEETING OF THE REGIONAL OZONE NETWORKS
FOR EUROPE & CENTRAL ASIA (ECA) AND SOUTH ASIA (SA), ISTANBUL,
TURKEY, 26-30 APRIL 2010**

Presented by Jan Boone

OZONE- AND CLIMATE FRIENDLY PRODUCTS

**USING ZERO ODP AND LOW-GWP REFRIGERANTS
IN PARTICULAR NATURAL REFRIGERANTS**

TECHNICAL SPECIFICATIONS

INVESTMENT AND OPERATING COSTS

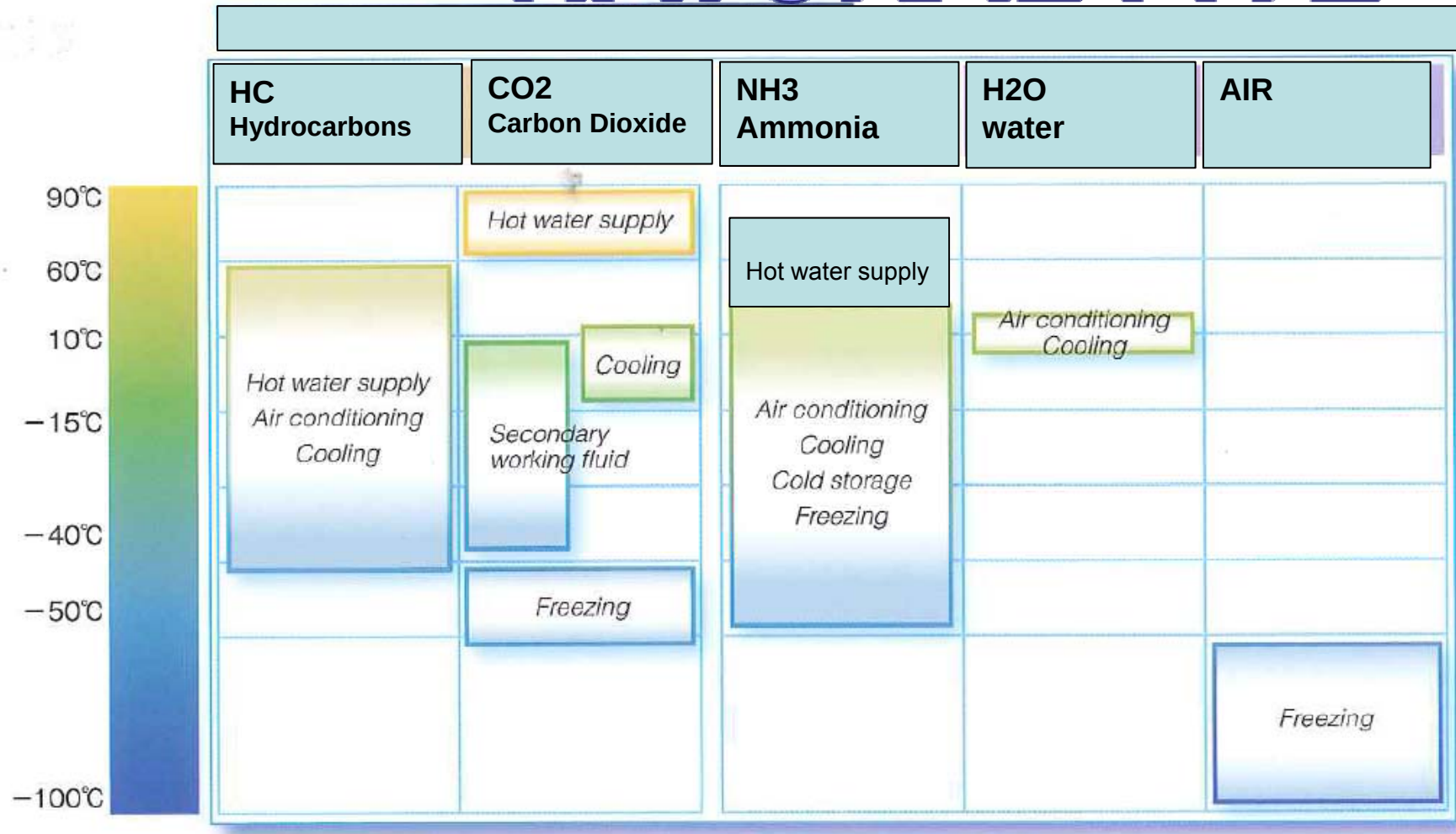
ENERGY EFFICIENCY

MARKET AVAILABILITY

FOCUS

MYCOM

NATURAL FIVE



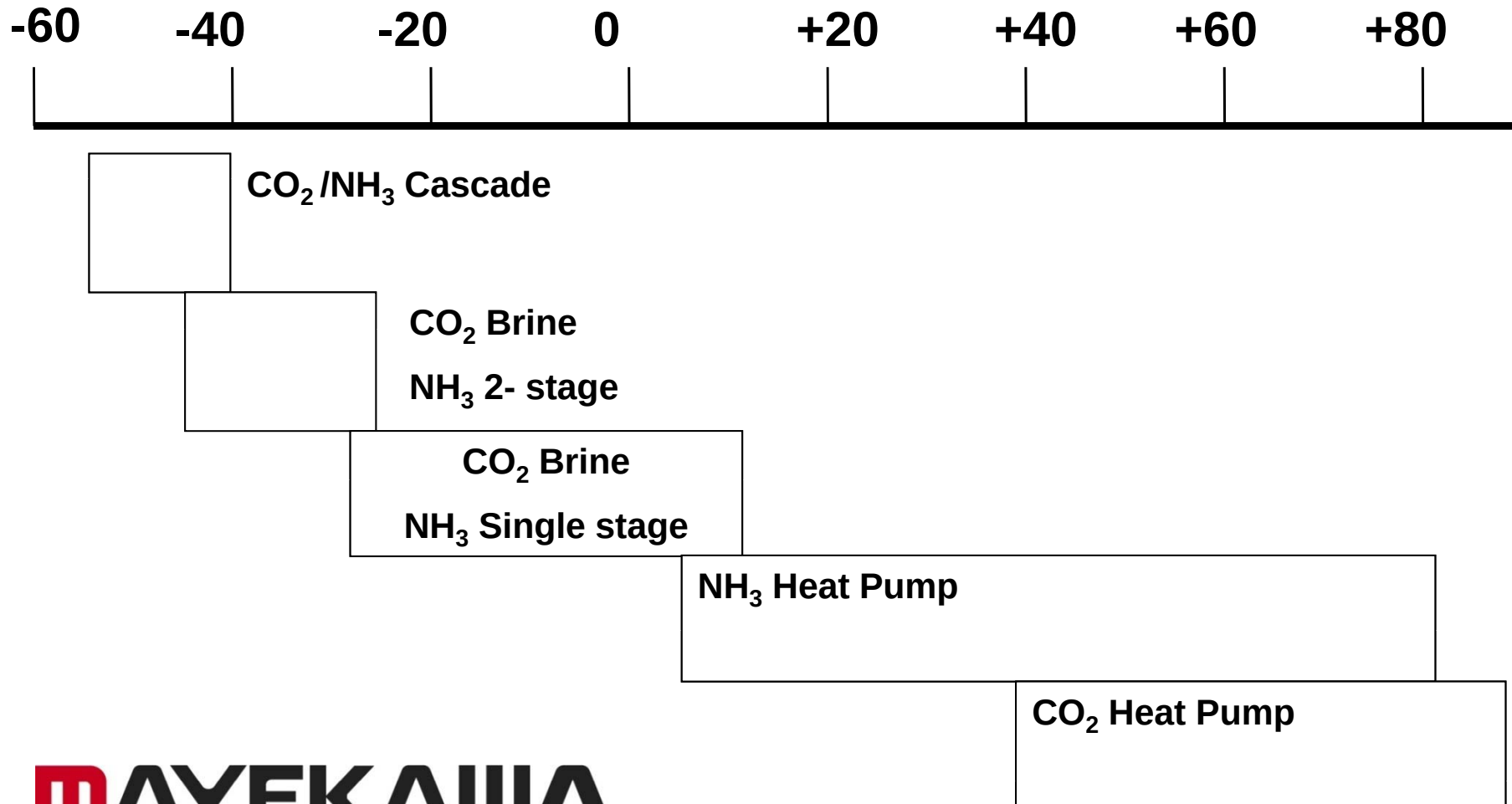
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System Application

Applicable Temperature Ranges [degC]



TECHNICAL SPECIFICATIONS

Our products / high pressure compressor

Reciprocating compressor

N6HK

Pressure : 40bar

50bar (available February 2010)

Speed : 900~1600rpm at 40bar

900~1450rpm at 50bar

Swept volume; 120~193m³/h 100%Load



N6HK

Screw compressor

Pressure: 50bar

Speed : 2950rpm, 3550rpm

Swept volume 2950 / 3550 rpm

N160GHS: 434 / 522 m³/h

N250GHS; 1552 / 1867 m³/h

N320GHS; 3212 / 3865 m³/h

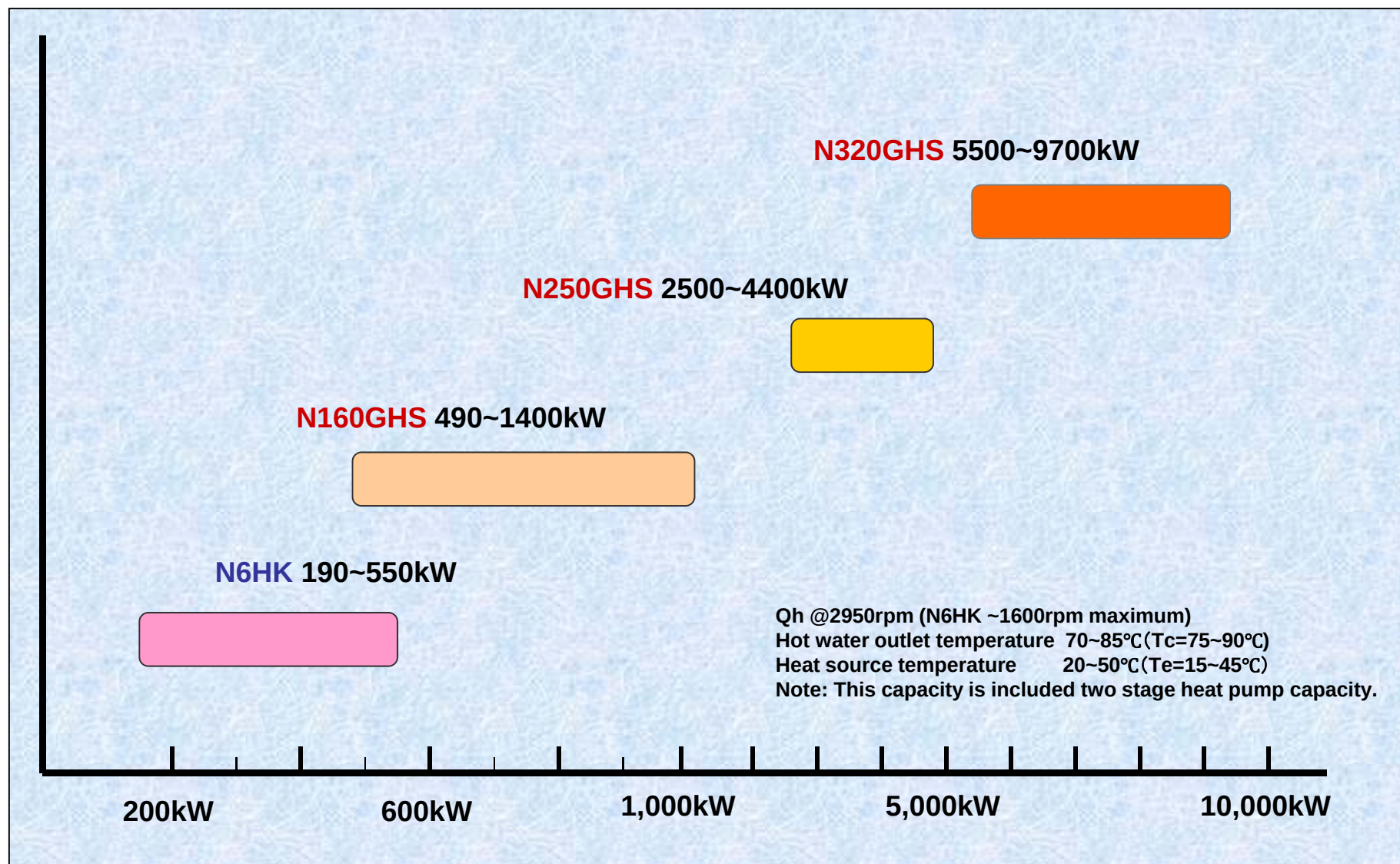


GH series

Note : N160GHS applied with frequency driven motor.
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Capacity table

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Data sheet

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N6HK

970rpm

Hot water temperature	Te(1)	5°C	10°C	15°C	20°C	25°C	30°C	35°C	40°C	45°C
	Heat source temperature (2)	15°C	20°C	25°C	30°C	35°C	40°C	45°C	50°C	55°C
65°C	Heat capacity(kW)	108.6	136.0	166.7	200.7	238.0	278.9	323.2	371.5	423.3
	Power consumption(kW)	35.3	38.5	41.4	43.9	45.7	46.8	47	46.3	44.4
	COP	3.08	3.54	4.03	4.58	5.21	5.96	6.88	8.03	9.54
70°C	Heat capacity(kW)		128.7	158.9	192.5	229.5	269.7	313.6	361.0	412.1
	Power consumption(kW)		40.1	43.6	46.7	49.3	51.1	52.1	52.1	51.1
	COP		3.21	3.65	4.13	4.66	5.28	6.02	6.93	8.07

1450rpm

Hot water temperature	Te(1)	5°C	10°C	15°C	20°C	25°C	30°C	35°C	40°C	45°C
	Heat source temperature (2)	15°C	20°C	25°C	30°C	35°C	40°C	45°C	50°C	55°C
65°C	Heat capacity(kW)		207.1	252.3	302.6	357.8	418.5	484.5	556.2	633.3
	Power consumption(kW)		61.9	66.1	69.6	72.2	73.8	74.1	73.1	70.4
	COP		3.35	3.82	4.35	4.96	5.68	6.54	7.61	9.00
70°C	Heat capacity(kW)			241.2	290.8	345.4	405.2	470.2	540.7	616.5
	Power consumption(kW)			69.6	74.1	77.7	80.4	81.8	81.9	80.4
	COP			3.47	3.93	4.45	5.04	5.75	6.61	7.67

1600rpm

Hot water temperature	Te(1)	5°C	10°C	15°C	20°C	25°C	30°C	35°C	40°C	45°C
	Heat source temperature (2)	15°C	20°C	25°C	30°C	35°C	40°C	45°C	50°C	55°C
65°C	Heat capacity(kW)		229.4	279.2	334.4	395.0	461.8	534.4	613.1	698.1
	Power consumption(kW)		70.1	74.7	78.5	81.3	83.1	83.5	82.3	79.5
	COP		3.28	3.74	4.26	4.86	5.56	6.40	7.45	8.79
70°C	Heat capacity(kW)				321.5	381.5	447.2	518.7	596.2	679.5
	Power consumption(kW)				83.5	87.5	90.4	92	92.1	90.4
	COP				3.86	4.36	4.95	5.64	6.48	7.52

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Data sheet

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N160GHS

Hot water temperature	Te(1)	10°C	15°C	20°C	25°C	30°C	35°C	40°C	45°C
	Heat source temperature (2)	20°C	25°C	30°C	35°C	40°C	45°C	50°C	55°C
70°C	Heat capacity(kW)	555	647	745	858	979	1112	1253	1414
	Power consumption(kW)	231	244	250	255	256	253	245	233
	COP	2,40	2,65	2,98	3,36	3,82	4,40	5,11	6,07
75°C	Heat capacity(kW)	531	619	715	823	943	1068	1207	1361
	Power consumption(kW)	249	263	275	280	286	285	280	271
	COP	2,13	2,35	2,6	2,94	3,3	3,75	4,31	5,02
80°C	Heat capacity(kW)	508	591	686	789	901	1024	1159	1305
	Power consumption(kW)	268	283	301	308	314	318	317	311
	COP	1,90	2,09	2,28	2,56	2,87	3,22	3,66	4,20
85°C	Heat capacity(kW)	486	565	654	756	864	981	1113	1254
	Power consumption(kW)	282	300	315	331	338	343	345	342
	COP	1,72	1,88	2,08	2,28	2,56	2,86	3,23	3,67

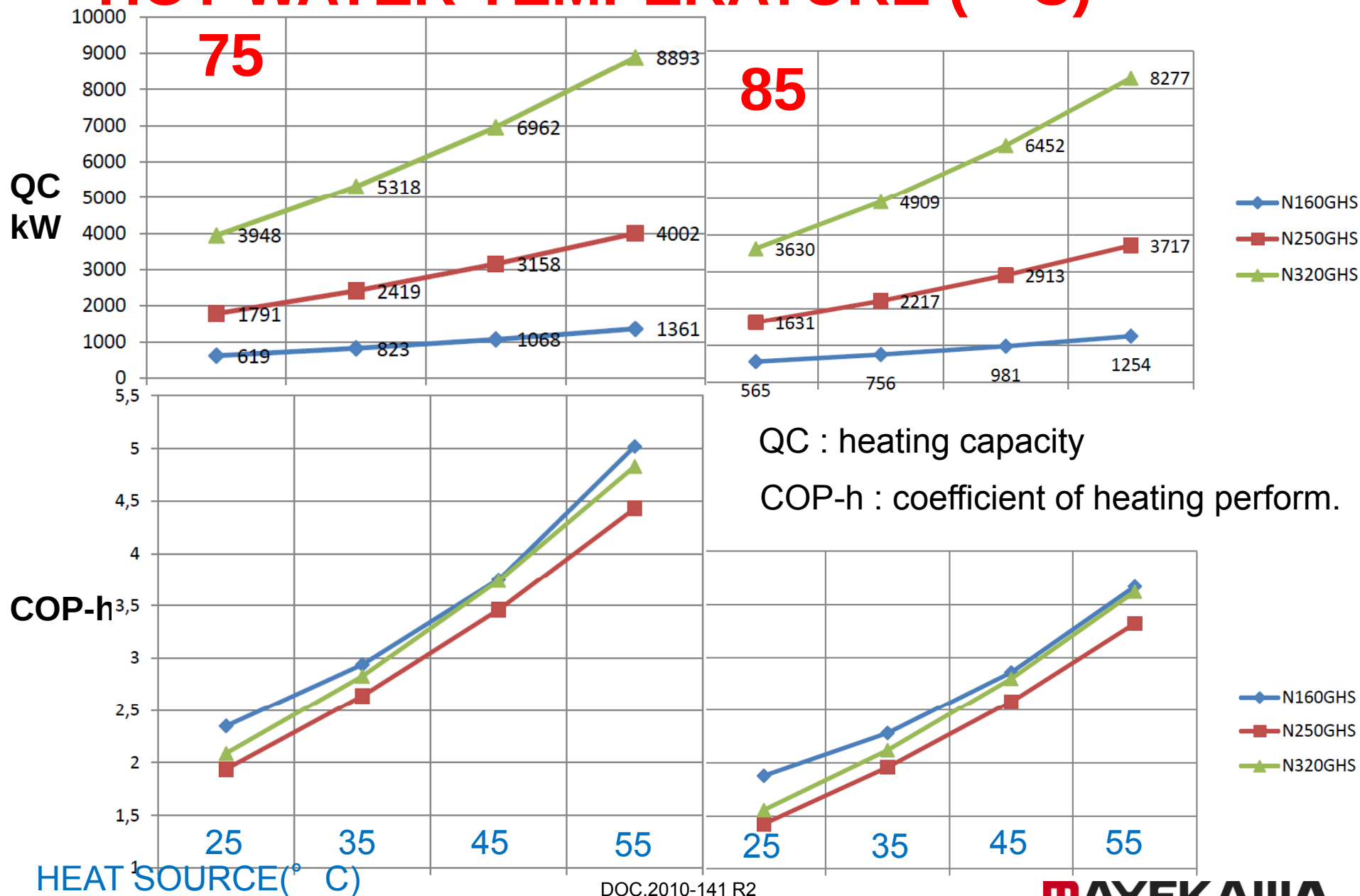
N250GHS

		Hot water out 85°C				Hot water out 80°C				Hot water out 75°C			
Te	[°C]	15	25	35	45	15	25	35	45	15	25	35	45
Heat capacity	[kW]	1,631	2,217	2,913	3,717	1,712	2,320	3,039	3,865	1,791	2,419	3,158	4,002
Power consumption	[BkW]	1,137	1,133	1,127	1,120	1,026	1,021	1,015	1,007	923	918	912	903
COPh	[-]	1.43	1.96	2.58	3.32	1.67	2.27	2.99	3.84	1.94	2.64	3.46	4.43

N320GHS

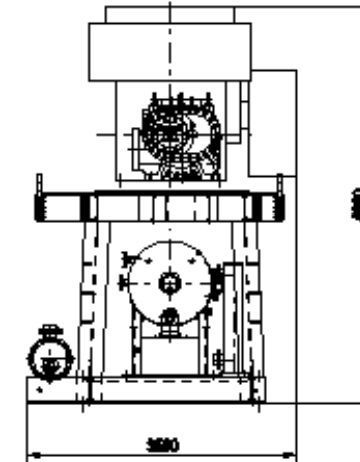
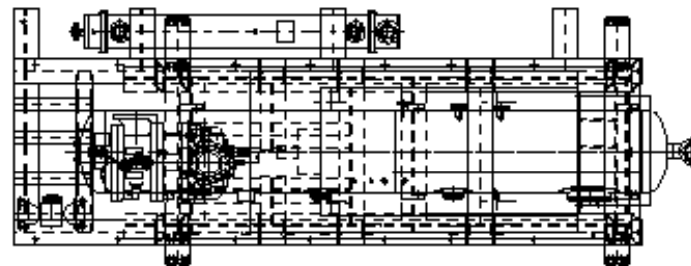
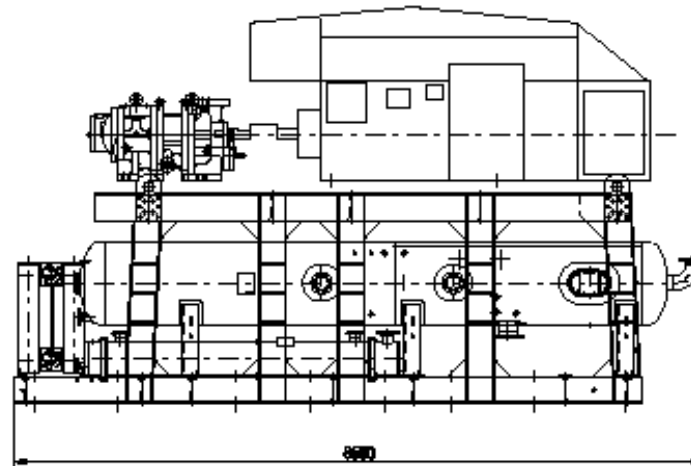
		Hot water out 85°C				Hot water out 80°C				Hot water out 75°C			
Te	[°C]	15	25	35	45	15	25	35	45	15	25	35	45
Heat capacity	[kW]	3,630	4,909	6,452	8,277	3,792	5,117	6,714	8,596	3,948	5,318	6,962	8,893
Power consumption	[BkW]	2,325	2,315	2,303	2,286	2,098	2,087	2,074	2,055	1,888	1,877	1,862	1,842
COPh	[-]	1.56	2.12	2.8	3.62	1.81	2.45	3.24	4.18	2.09	2.83	3.74	4.83

HOT WATER TEMPERATURE (° C) MYCOM



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Order by: F.ELI (LBR)		Date (dd/mm):		Title UNIT LAYOUT GH3205	
Ord by: TPA		Date (dd/mm):			
Made part code: n/a				Projectname: 8007	
	Order 1/100	Size A3	Sheet 1	of 1	Job No [58] ME-25151
	Prepared by: n/a				

N160GHS

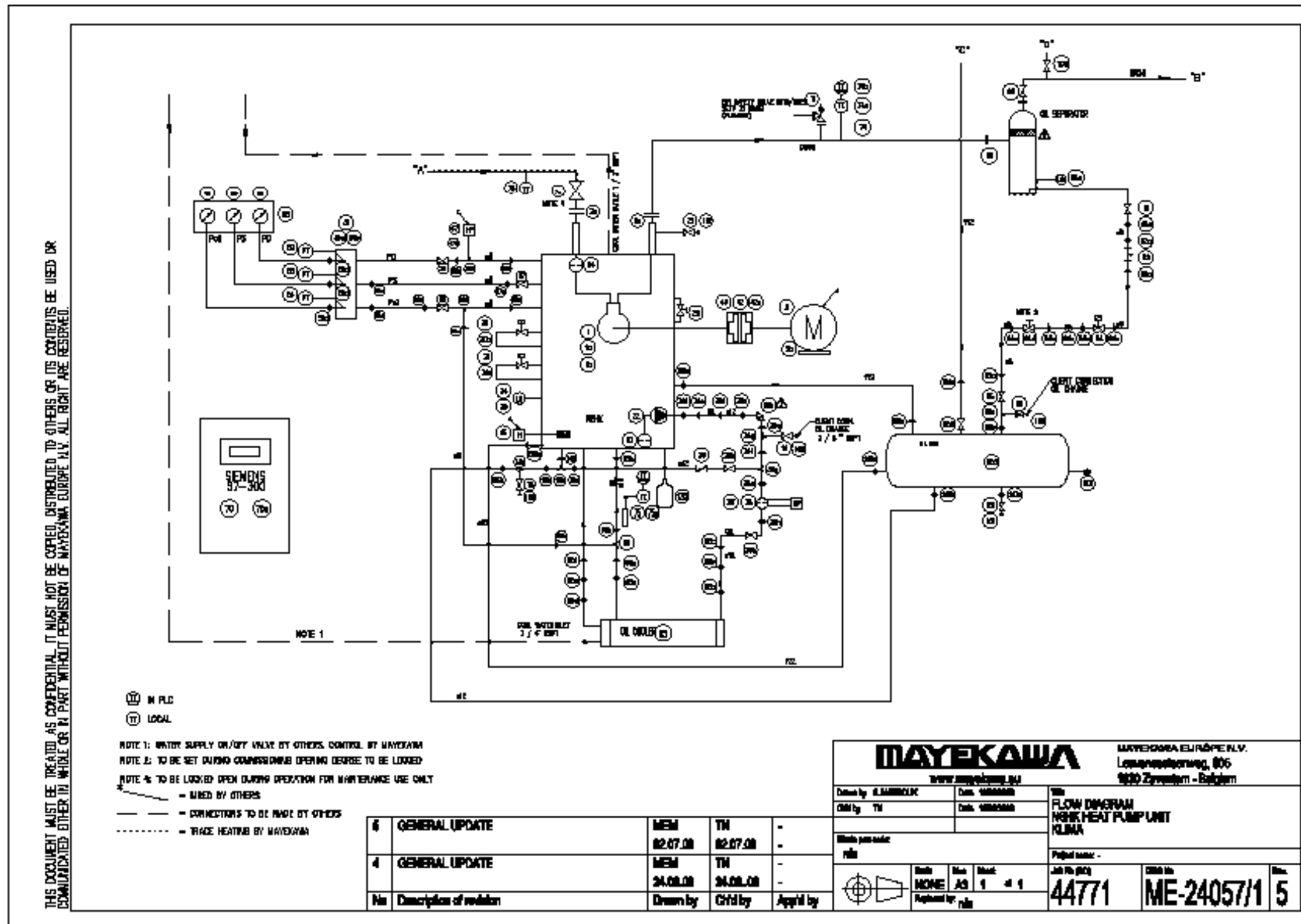


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FIELD CASES

1. WATER SOURCED HEAT PUMP
to produce 60° C hot water for district heating

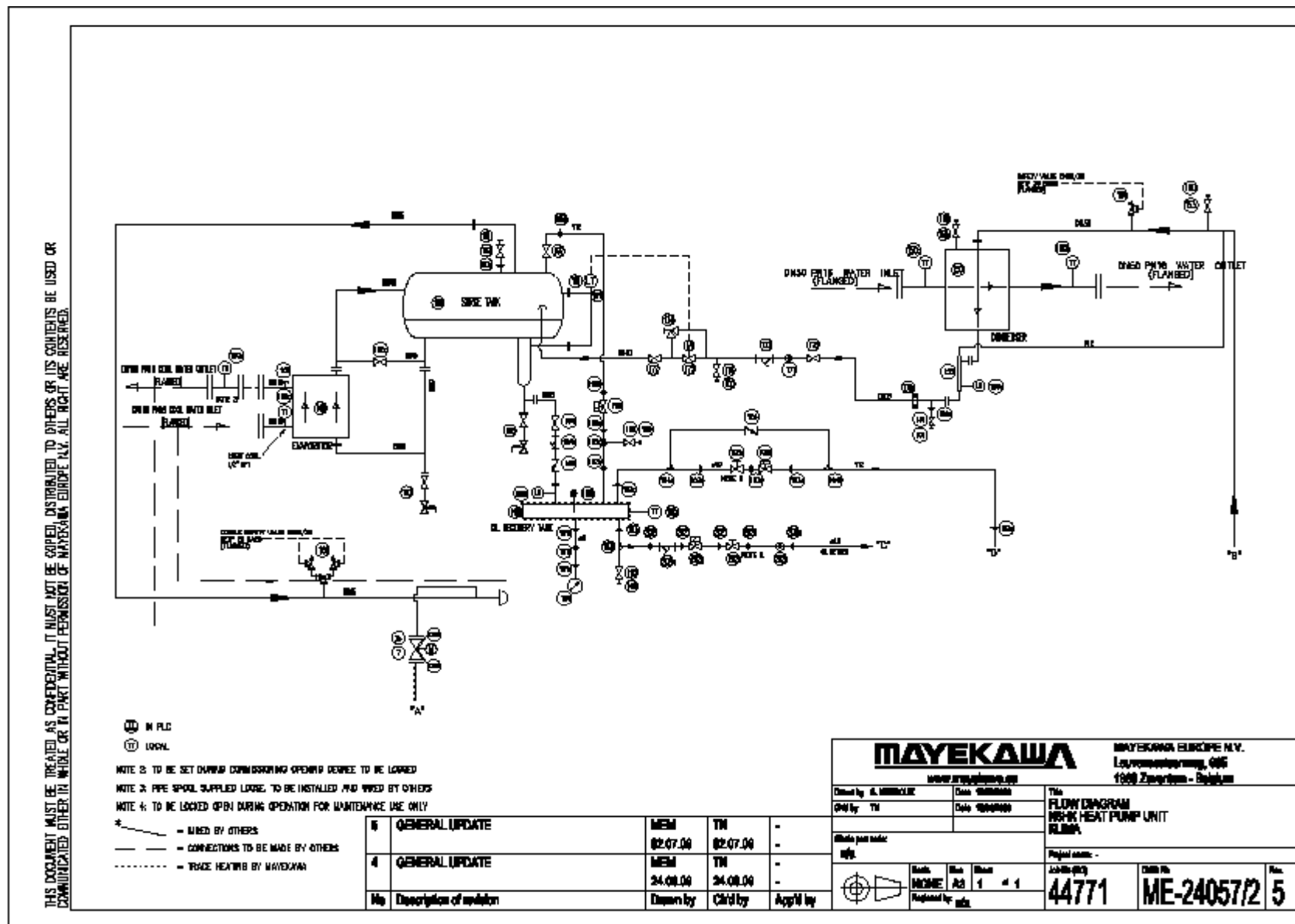
P&ID compressor part



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P&ID heat exchanger part

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Complete package heat pump unit



Specifications;

Heat capacity: 480kW(maximum)

Compressor speed: 900~1600rpm (frequency inverter drive)

Absorbed power: 39~75kW

Heating COP=6.4

Hot water conditions

Temperature: 40→60°C

Flow rate: 20.6m³/h

Use application: Process water in the factory

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Heat source: Hot spring

Temperature: 40→35°C

Flow rate: 69.8m³/h

Installation on the site for district heating plant



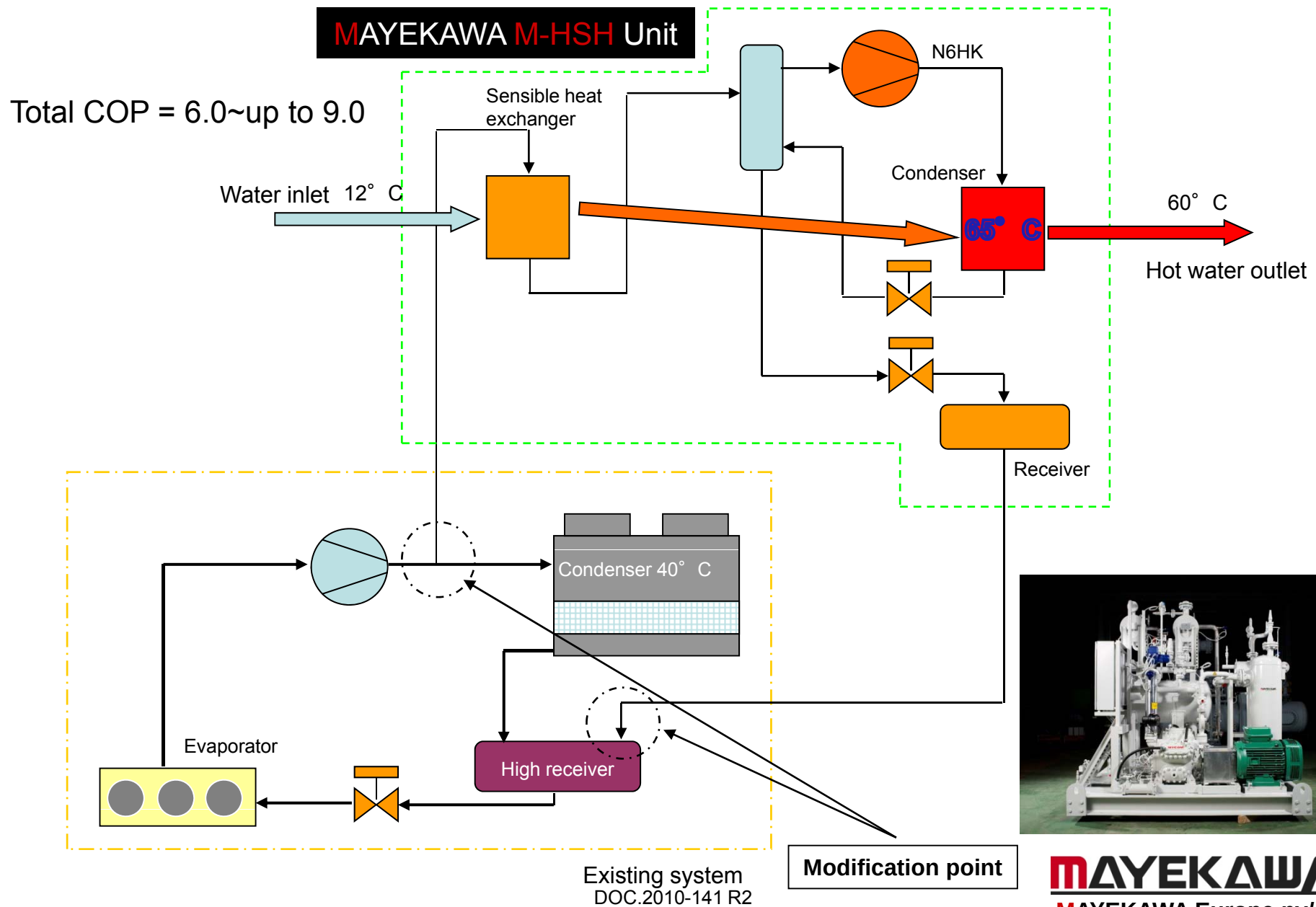
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2. OVERCOMPRESSION HEAT PUMP

to produce 60° C hot water for meat factory process

High stage heat pump unit

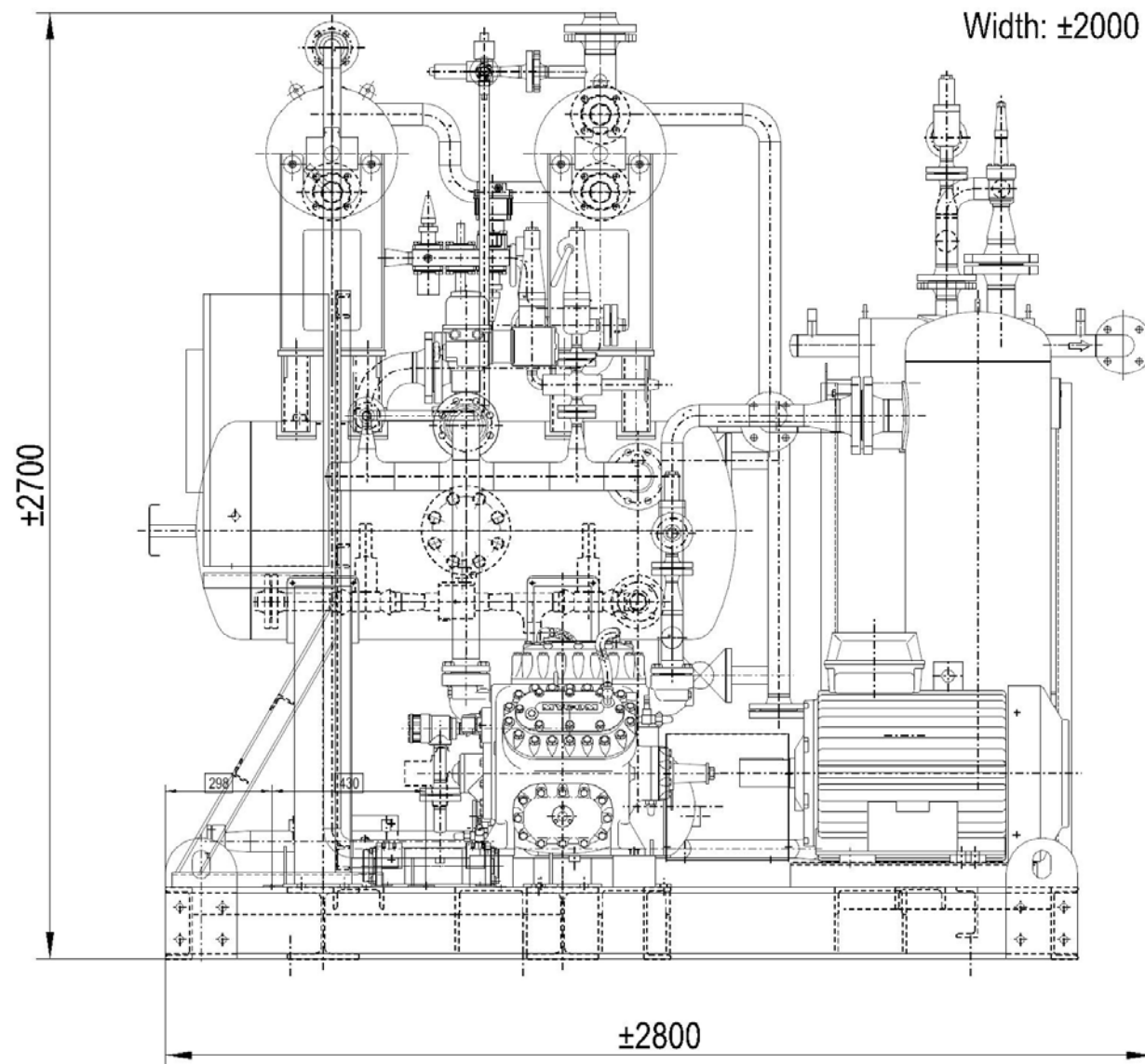
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Two stage heat pump unit

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High stage heat pump unit (Meat production)

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Thermal stratification tank



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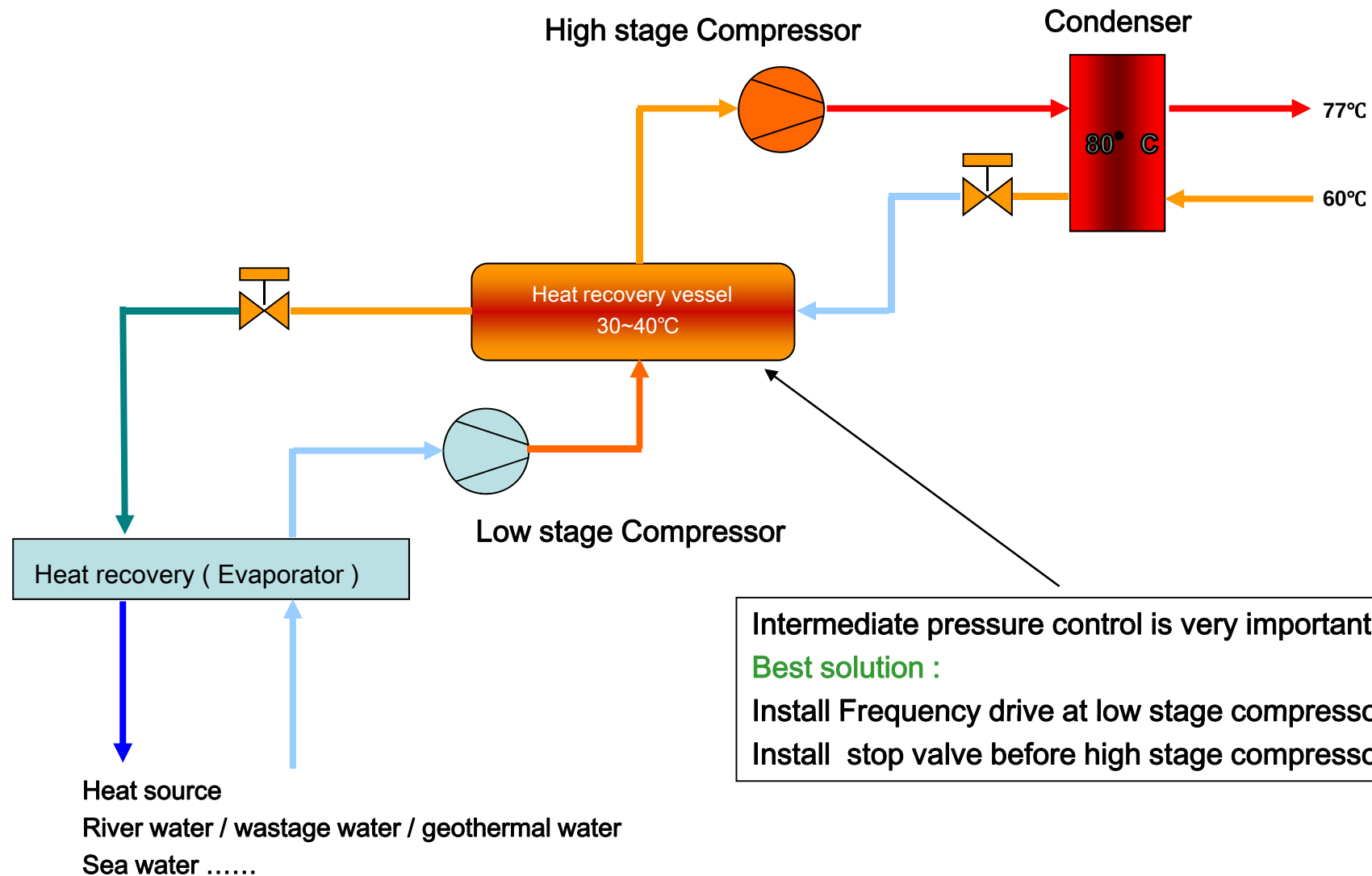
COSTS		STEAM	HP SUMMER	HP WINTER
Heating capacity	kW/day	5581	5581	5581
Steam load (latent heat 0.6395kW/kg)	Kg/day	8727		
Heating capacity/hr	kW		406	305
Running time/day	hr		13.7	18.3
Operating days	days	300	115	250
Yearly heating capacity	mWh	1.674	640	1.396
Energy per year		2.618 (ton) (steam)	65.698 (kW, 41.7kW/hr)	191.235 (kW, 41.8kW/hr)
Energy cost	€	91.342 (34.89€/ton)	4.599 (0.07 €/kWh)	13.386 (0.07 €/kWh)
Installation cost (excl.watersystem)	€			186.000
Yearly running cost saving	€			73.357
Payback time	years			Approx.2.6

3. OVERCOMPRESSION HEAT PUMP

to produce 77° C hot water for district heating

Two stage heat pump unit

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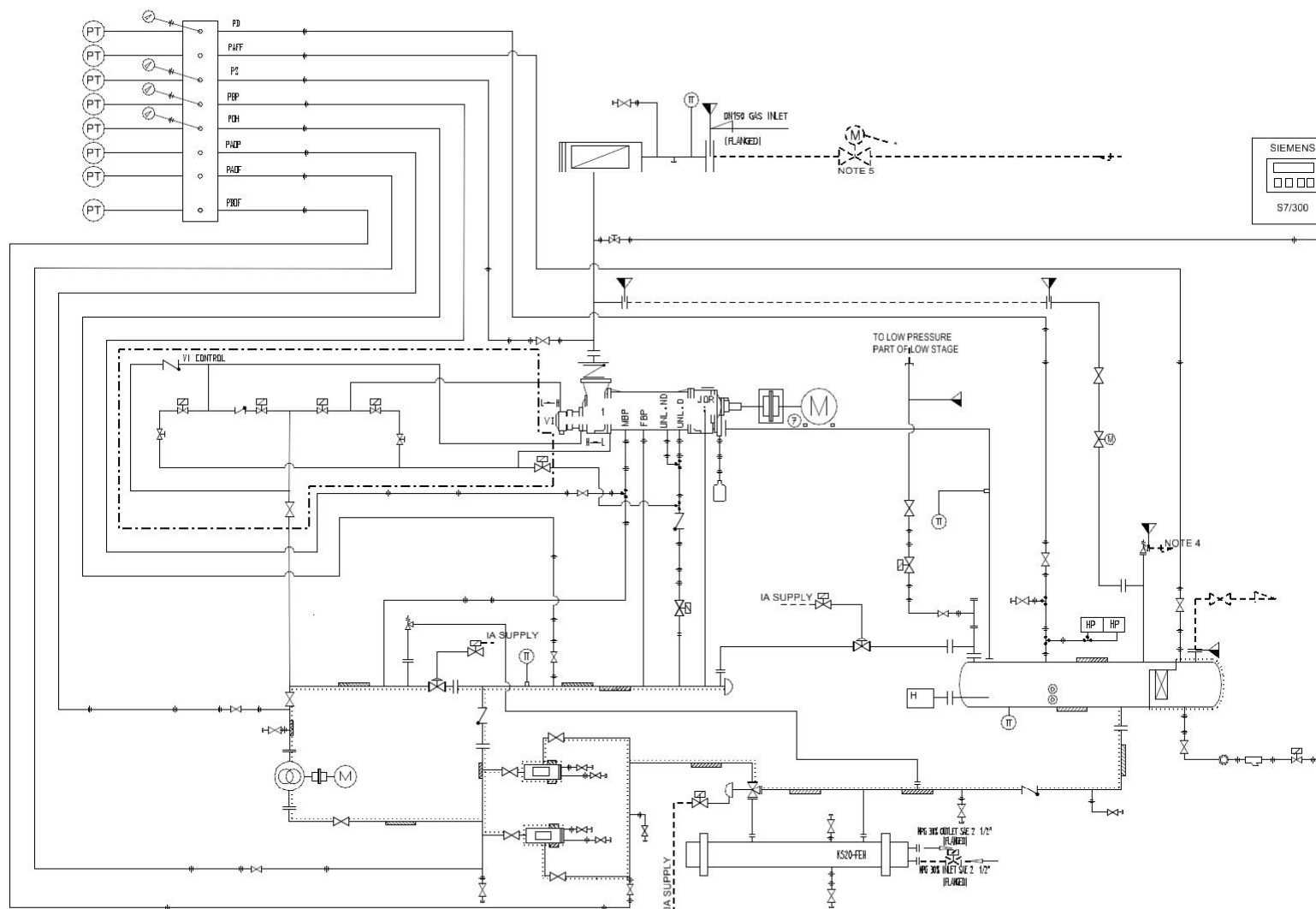


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Two stage heat pump unit

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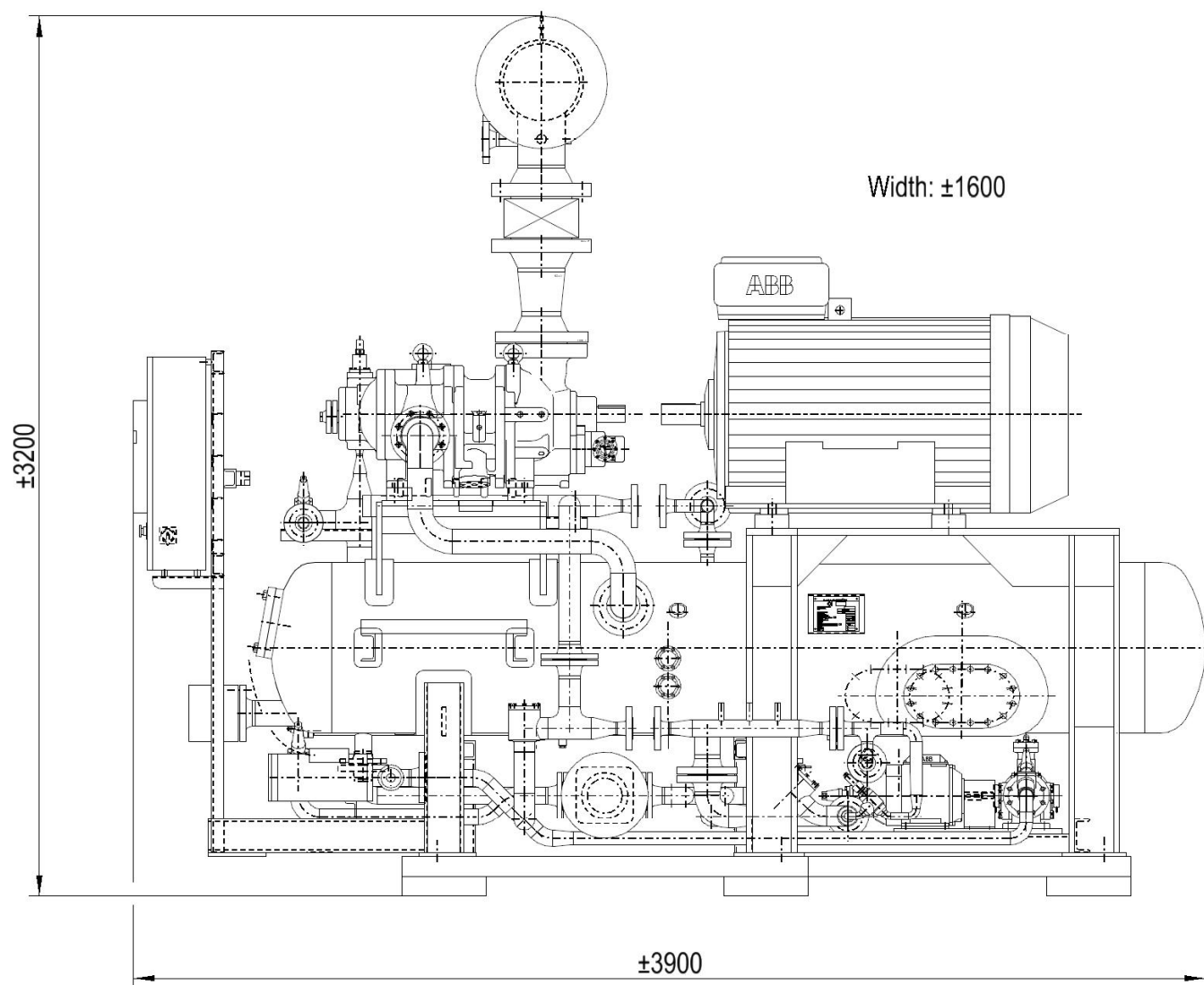


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Two stage heat pump unit

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MYCOM SO45000-3 N160GHSD

case		A	B	C	D	E	F
TC	°C	80	80	80	80	80	80
TE	°C	40	40	35	35	30	30
RPM	Rpm	3550	1800	3550	1800	3550	1800
PS	MPaA	1.55	1.55	1.35	1.35	1.17	1.17
PD	MPaA	4.06	4.06	4.06	4.06	4.06	4.06
RT	kW	1104	472	950	407	820	361
BKW	kW	263	135	266	136	266	136
QC	kW	1367	607	1216	543	1086	497
COP-h		5.2	4.5	4.6	4.0	4.1	3.7

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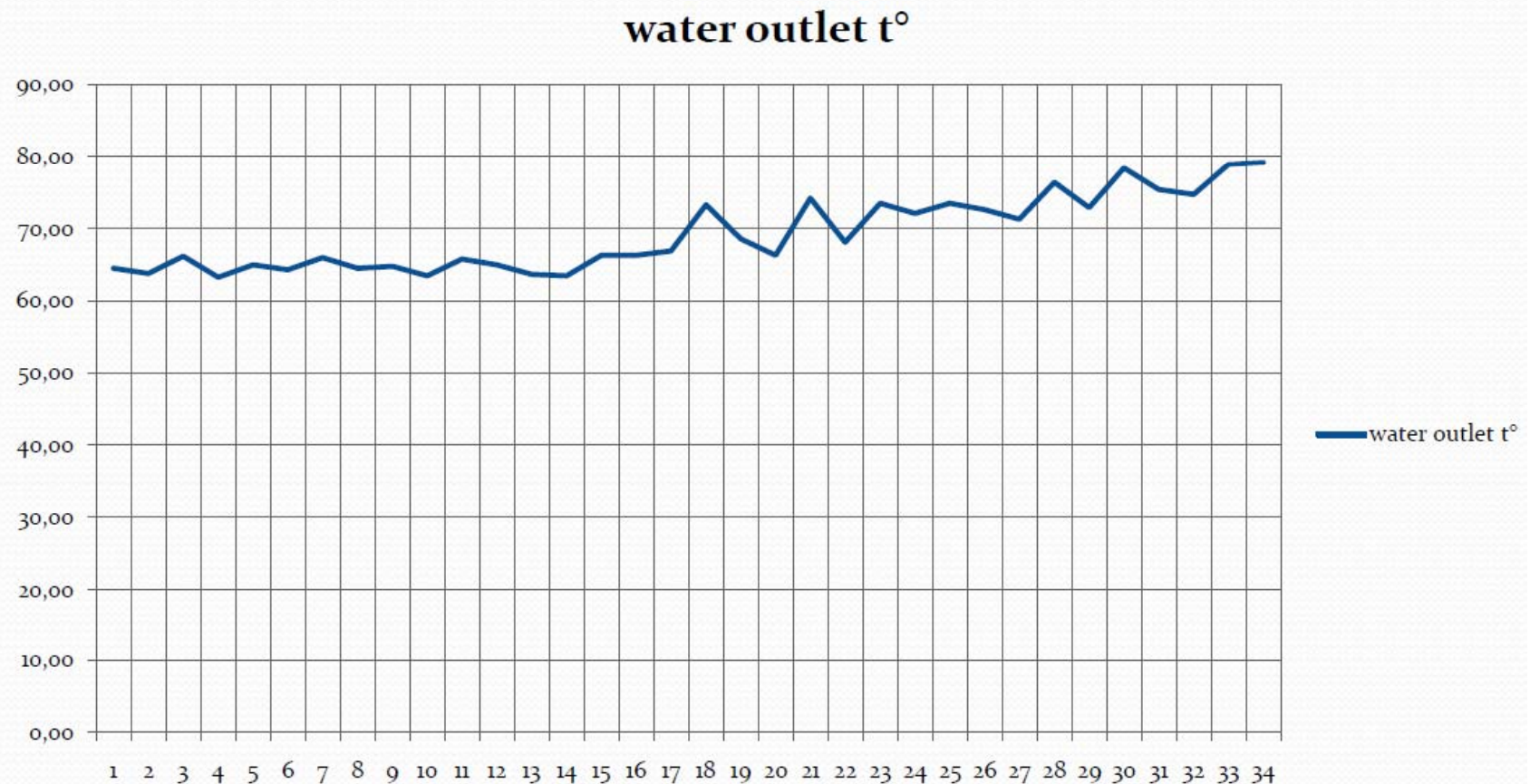
Norway / Kongsberg / 2 x N160GHS two stage Heat pump system 2.400kW



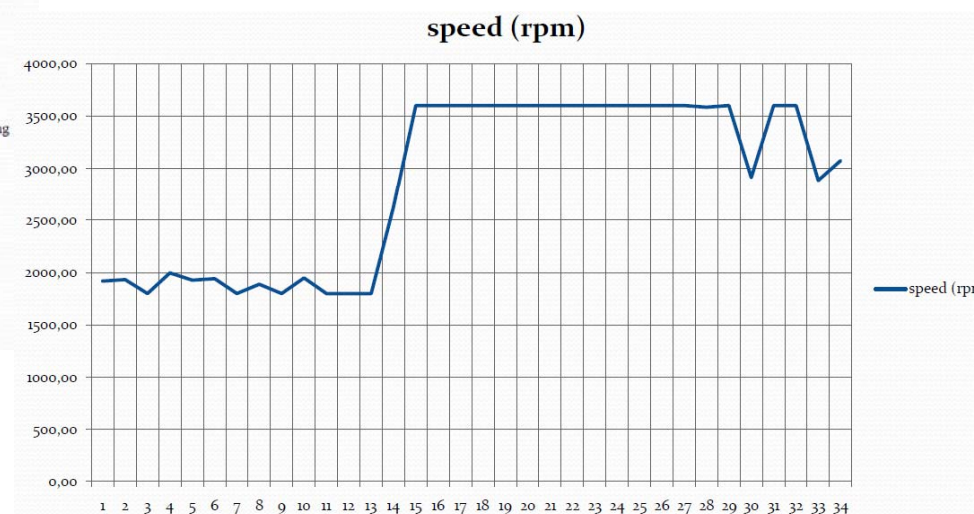
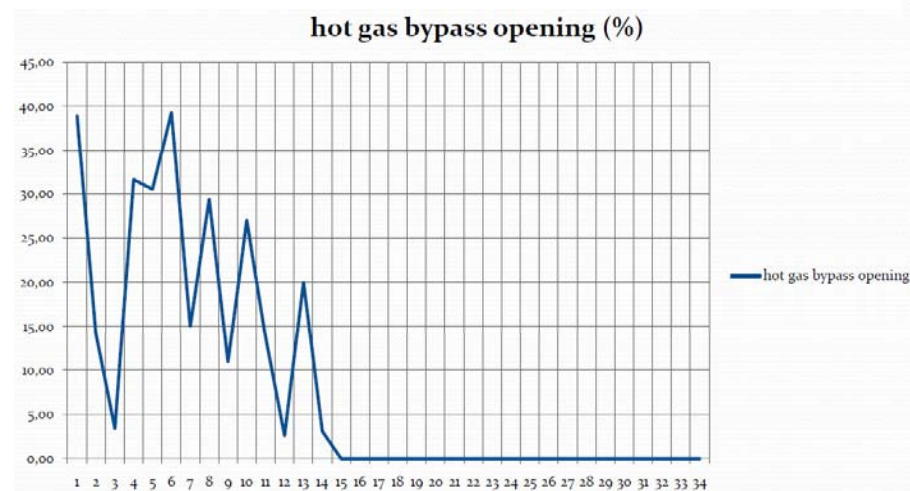
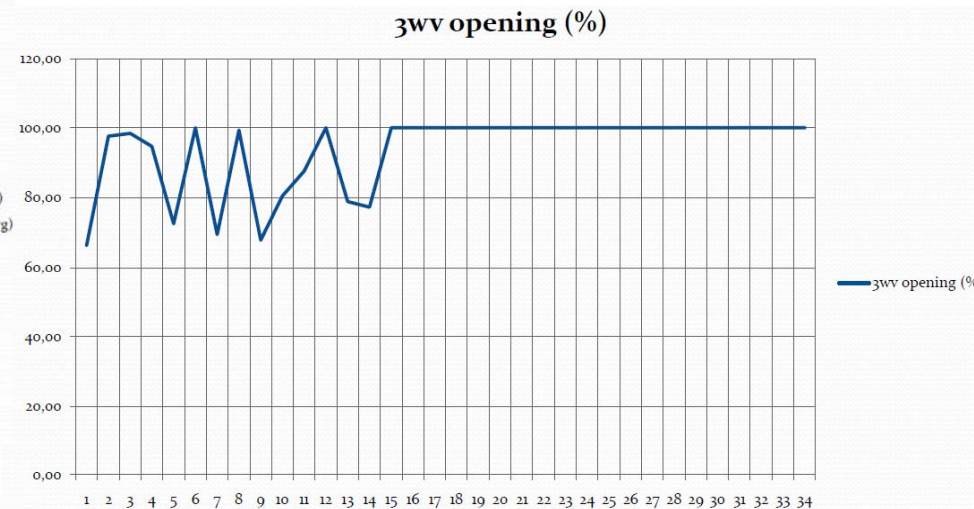
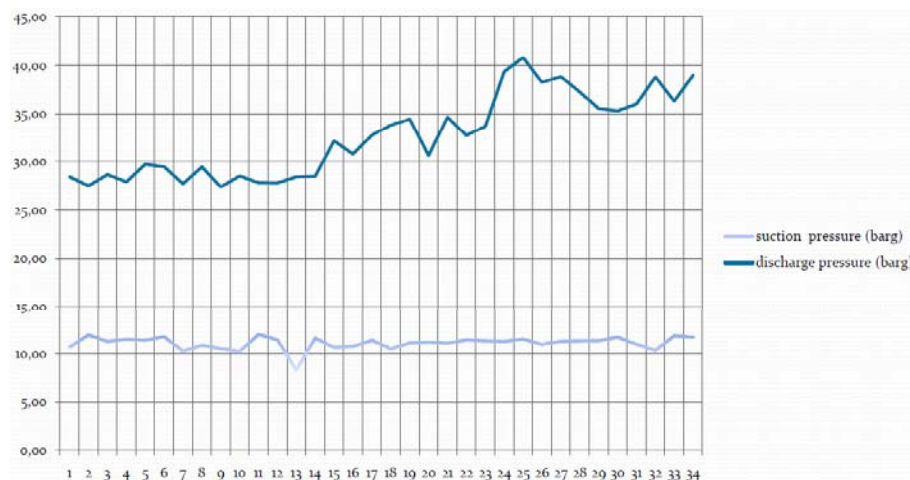
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LOGGINGDATA

date 22-1-10 time span 8.55->11.11hr

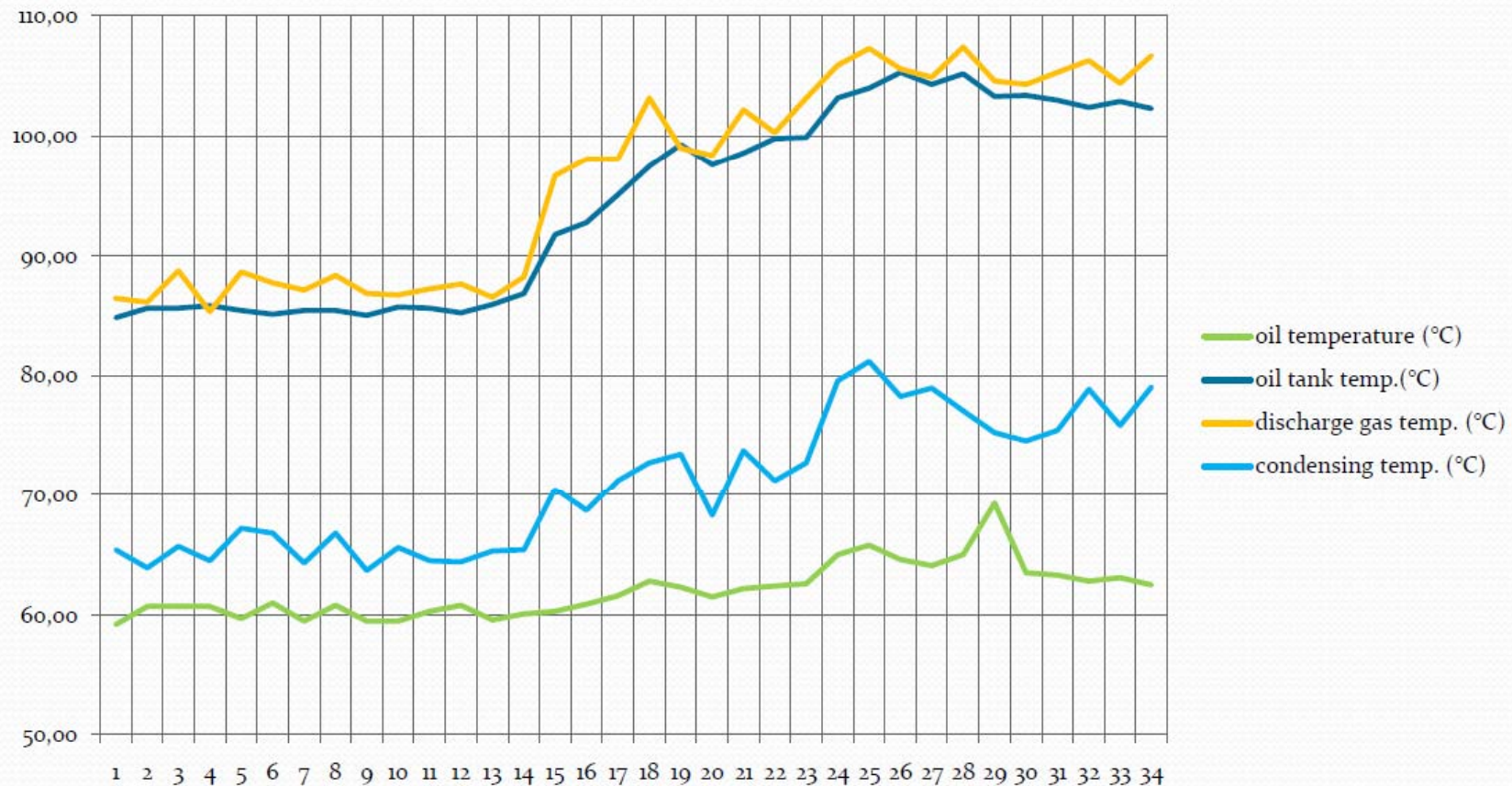


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LOGGINGDATA

date 22-1-10 time span 8.55->11.11hr



COSTS		GAS BOILER	HEAT PUMP
plant heating capacity	kW	2513	2513
Load ratio (average)	%	70	70
Efficiency	%	85	
Required energy heating capacity	kW	2069	975
Operating hours	hrs	5000	5000
Yearly capacity	mWh	10.345	8.795
Energy per year		1.034.500 (liter) (gasoil 10kWh/liter)	4.875.000 (kWh) (975kW/hr/4 compr.)
Energy cost	€	982.775 (0.95€/liter)	524.550 (0.1076€/kWh)
Installation cost(compr-motor set excl.h.exch)	€		1.000.000
Yearly running cost saving	€		458.225

MARKET AVAILABILITY

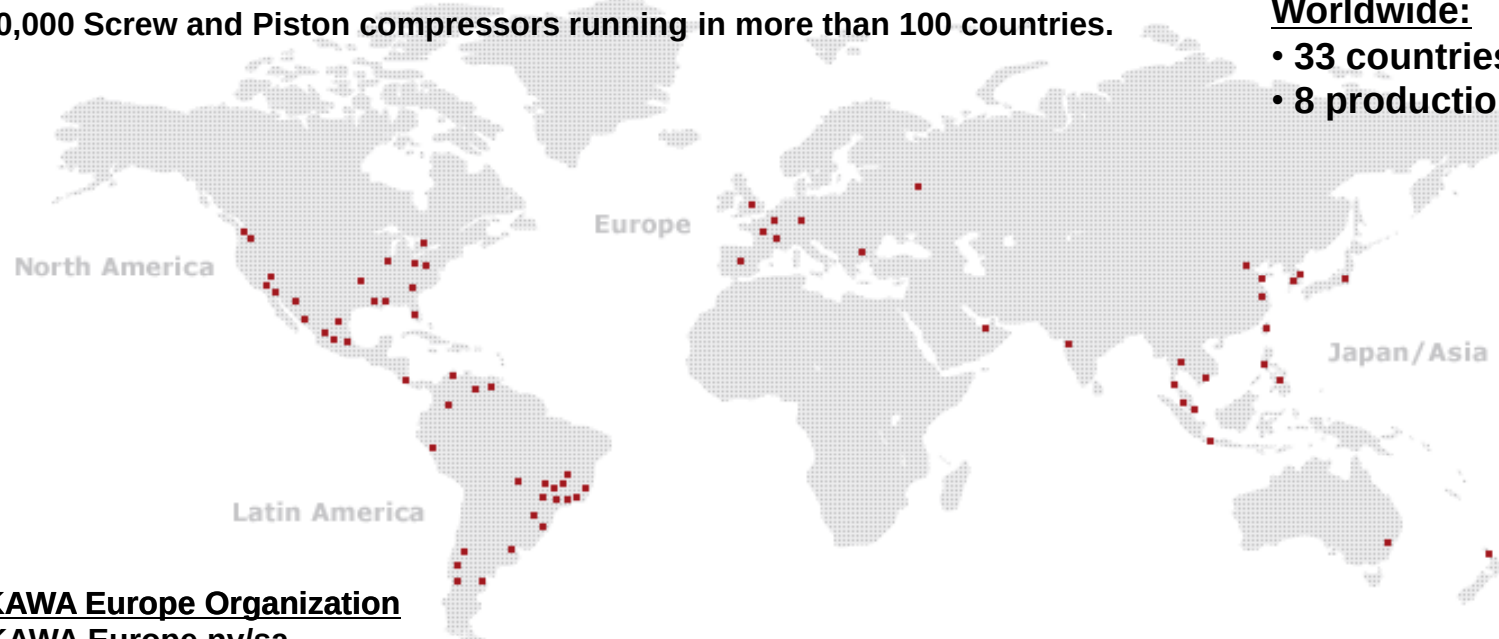
MAYEKAWA Global Network

Over 70,000 Screw and Piston compressors running in more than 100 countries.

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Worldwide:

- 33 countries / 119 offices
- 8 production plants



MAYEKAWA Europe Organization

MAYEKAWA Europe nv/sa

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