Jan Gerritsen

GEA

DiGitalisering in en rondom koelinstallaties

Betrouwbaarheid en duurzaamheid

GEA Heating & Refrigeration Technologies

Jan Gerritsen
14 maart 2024

GEA at a glance

Order intake

5,679

EUR million
Previous year: EUR 5,222 million

Revenue

5,165

EUR million
Previous year: EUR 4,703 million

EBITDA
before restructuring expenses

712

EUR million
Previous year: EUR 625 million

EBITDA margin
before restructuring expenses

13.8

percent of revenue
Previous year: 13.3 percent

Dividend proposal

0.95

EUR per share
Previous year: EUR 0.90

Employees

18,236

Full-time equivalents
Previous year: 18,143

All figures are from fiscal year 2022

GEA is one of the world's largest suppliers of systems and components to the food, beverage and pharmaceutical industries. The international technology group, founded in 1881, focuses on machinery and plants, as well as advanced process technology, components and comprehensive services.

GEA is listed in the German MDAX, the STOXX® Europe 600 Index and is among the companies comprising the DAX 50 ESG, the MSCI Global Sustainability and the Dow Jones Sustainability Europe Indices.

Our applications put consumers in touch with GEA every day

Food
Approx. every third chicken nugget is produced using GEA technology

Food
Approx. every third process line for instant coffee was installed by GEA

Dairy farming & processing
Roughly one quarter of processed milk comes from GEA production systems

Beverage
Approx. every second liter of beer is brewed with the aid of systems and process solutions from GEA

Pharma & healthcare
Roughly every fourth liter of human blood for making plasma-derived products is processed using GEA equipment

Chemical
More than one third of all polymer producers are using GEA drying technology

Environment
Approx. two million tons of pollutants are averted annually thanks to GEA emission control plants

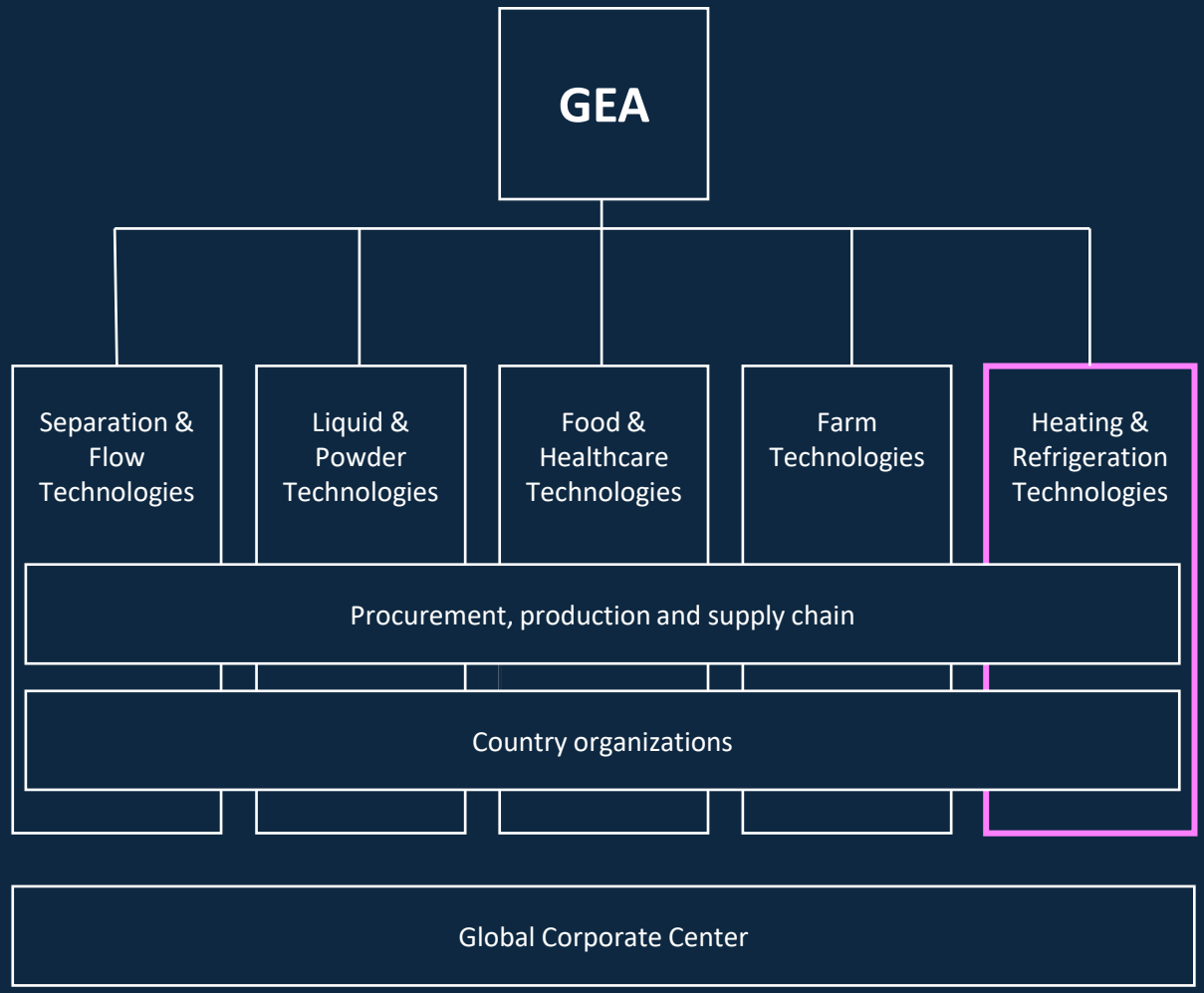
Heating & refrigeration
Each industry we serve utilizes industrial heating & refrigeration technology from GEA

Marine
Roughly every second container ship in the world sails with GEA marine equipment on board

Our organization

GEA is divided into **five divisions**, each with up to six business units. The units are based on comparable technologies and have leading market positions.

The **country organizations** stand ready to serve their respective customers as a central point of contact, offering them local access to an extensive portfolio of products and services.



GEA DAIRYROBOT – Automatische melksystemen

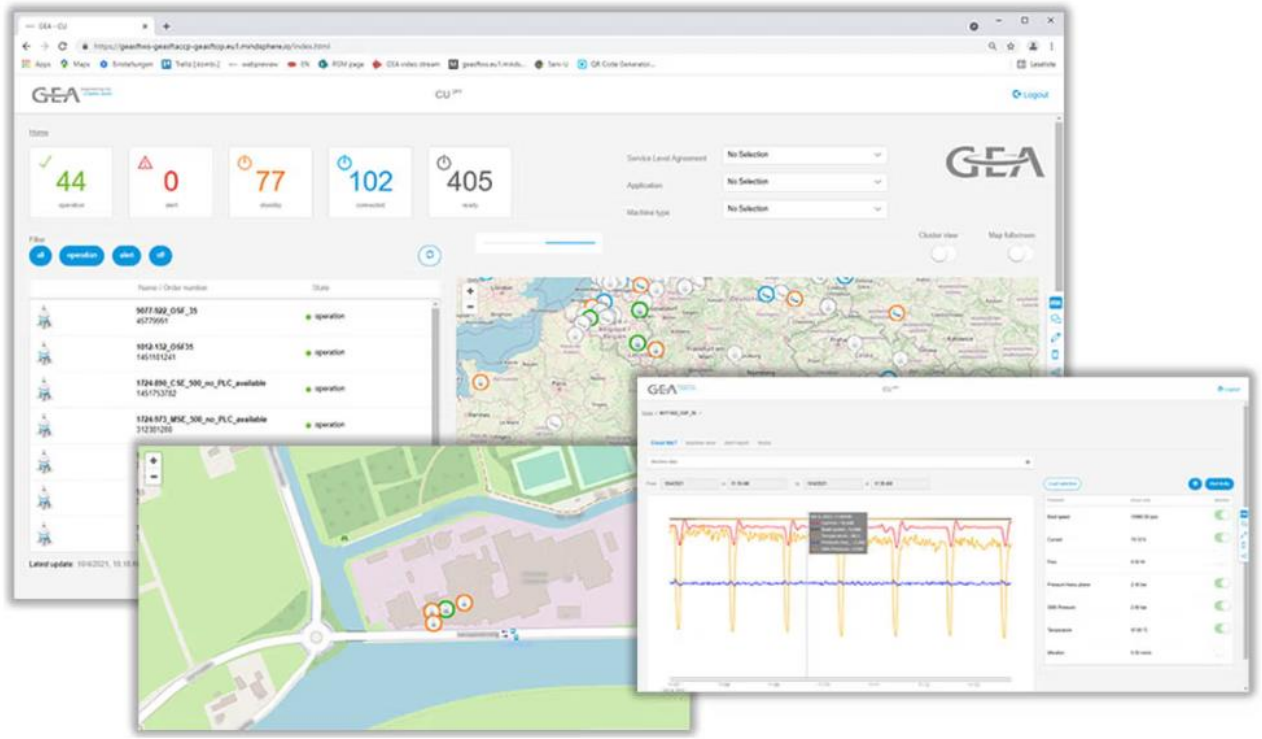
Meer koeien melken in minder tijd

Met GEA FarmView kan je de gemiddelde melkopbrengst, melkstroom of werkbelasting van de melkboxen bewaken en optimaliseren.

GEA Separatoren

Automatische controle van correcte werking van de separator en de productie parameters.

Continue kwaliteitsverbetering door monitoring en optimalisatie



Monitor your centrifuge performance

GEA Digital HUB, offering support to Divisions

IIoT

Developing secure, standardized, and scalable connections from edge to cloud.

Data Science

Developing secure, standardized, and scalable pipelines to serve digital products with data.

Portal/APP Factory

Implementation of a unified customer interface including APPs.

Business Transformation

Enablement of new digital business models and customer centric development of GEA wide APP concepts.

The GEA Cloud® enables our customers to quickly and easily get digital services for their GEA machines. It is the basis for all digital solutions that support our customers in the daily operation of their machines, product lines or individual machines to improve machine availability, productivity and sustainability. Analyze your machine data securely in the GEA Cloud® to unlock new services and increase production. Benefit from anytime, anywhere access. Connect now!

Making products ready for digital services based on

GEA Cloud

10010

0010

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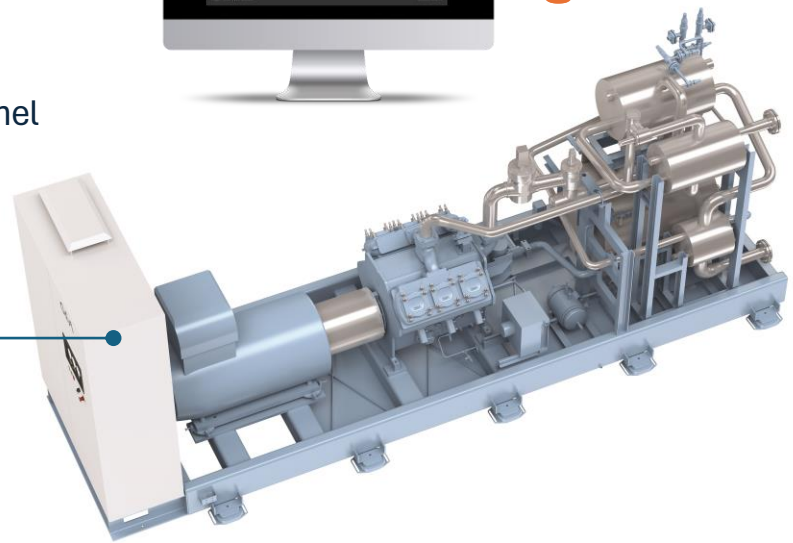
GEA Omni
Control panel

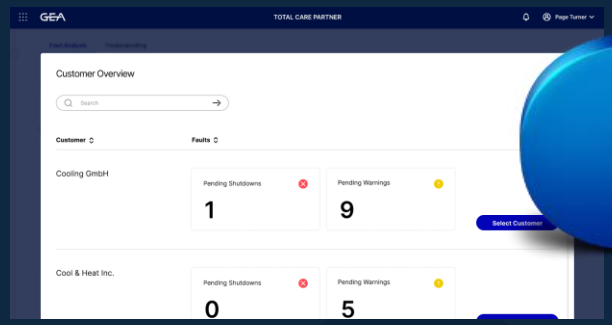


GEA G-Plex

Ways to analyze the data

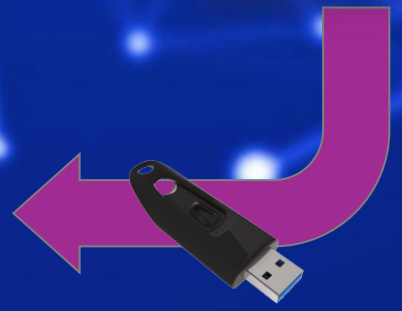
Offline vs. Online

Customer Portal with Blu-Red Care



GEA Cloud®

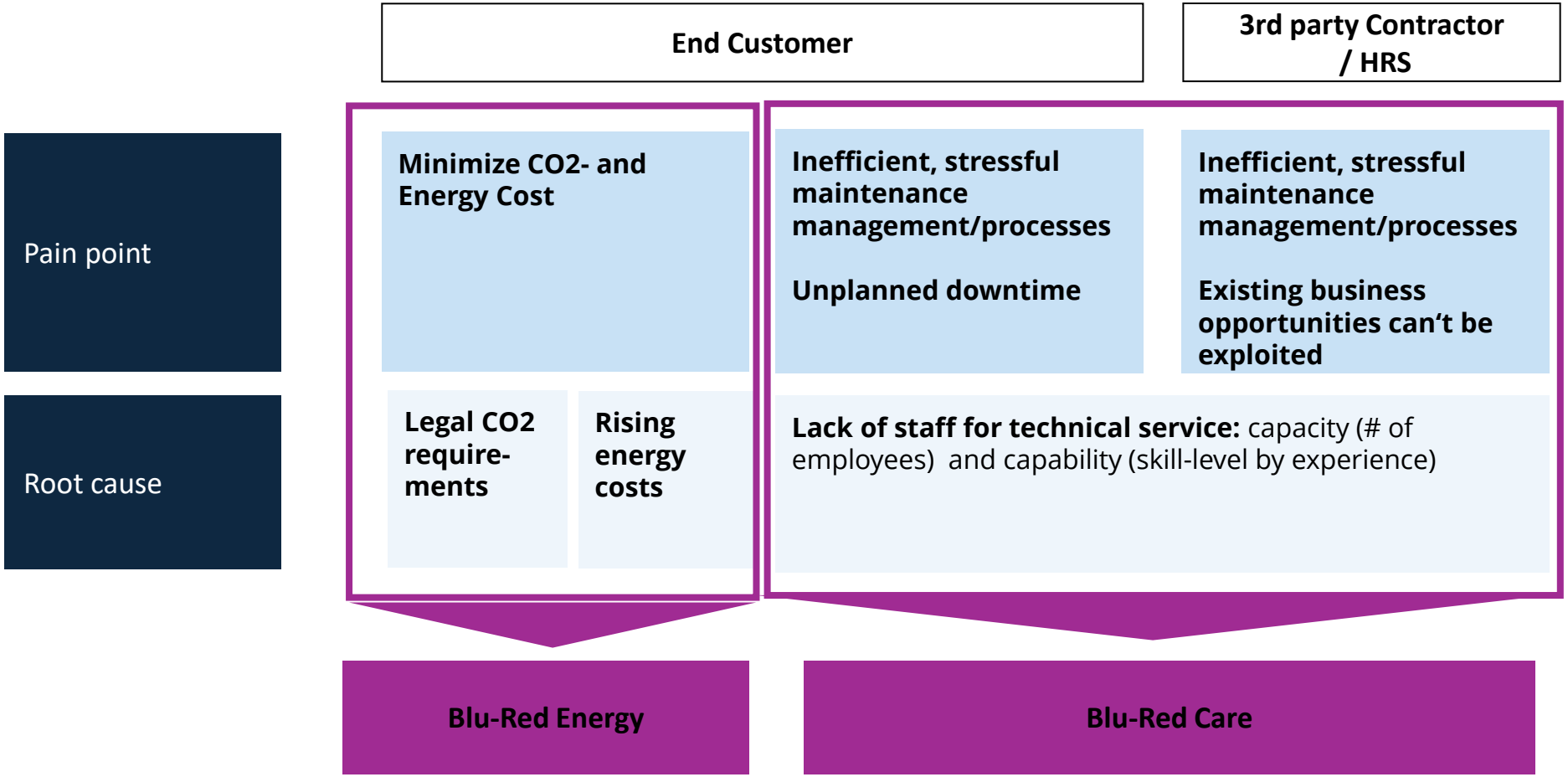
GEA OmniHistorian



GEA IIoT EDGE Gateway – Streamed & Batch Upload

Interviews revealed 3 major pain points for customers

Customer pain points



Optimize the availability & safety

of your equipment & processes

Availability

More uptime of your equipment

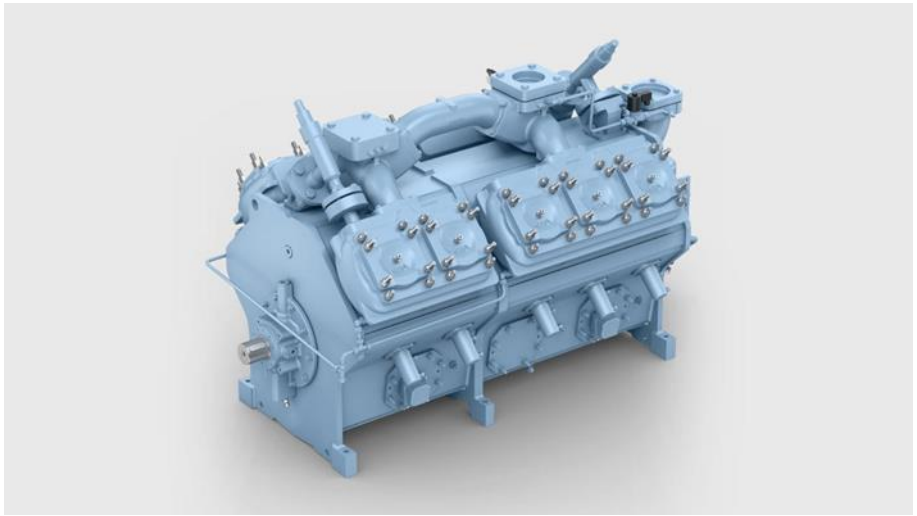
Optimize maintenance despite growing complexity

Safety

Ensure safe operation of your machines

Focus on your core business

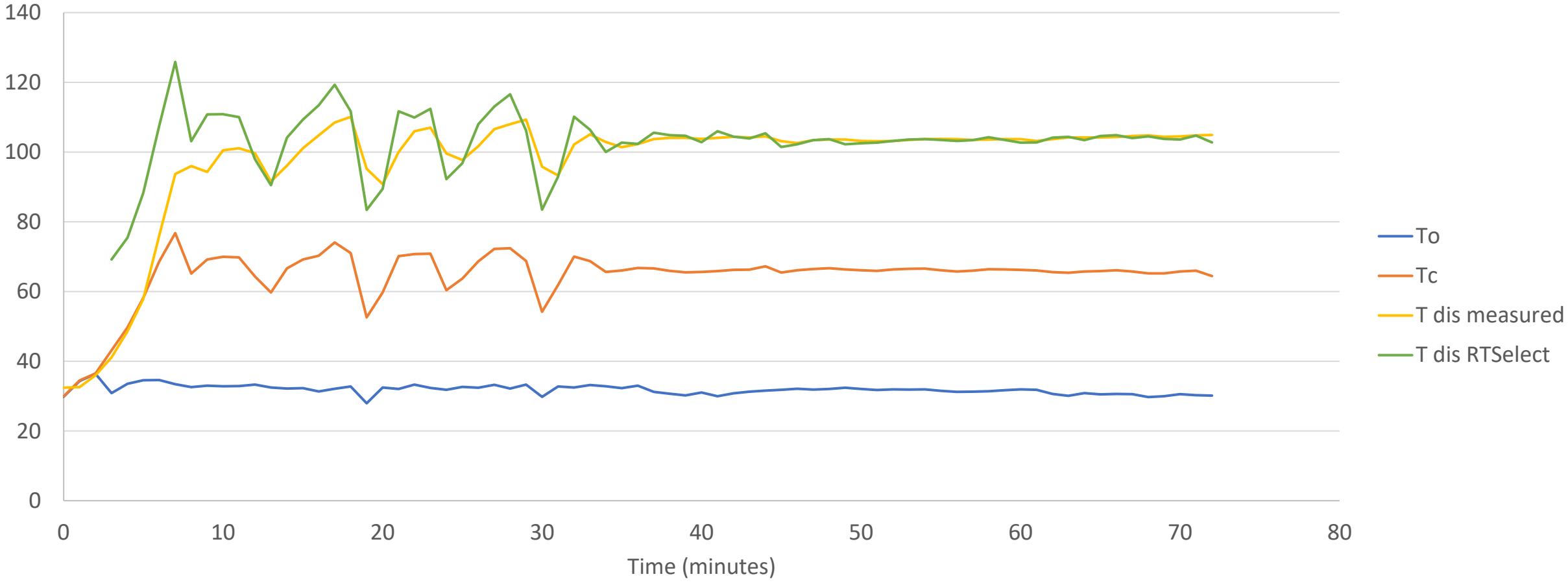
VXHP warmtepomp compressor (tot 95°C water)
RTSelect – Compressor Digital Twin



Speed (RPM)	Part Load (%)	Cylinder Quantity (LP - HP)	Refrigerating / Heating Capacity (kW)	Power (kW)	EER / COP
35.0 / 90.0 °C (ET / CT)					
1500	100	6	1099.6 / 1408.9	309.3	3.55 / 4.55
1450	100	6	1064.2 / 1362.8	298.6	3.56 / 4.56
1400	100	6	1028.7 / 1316.7	288.0	3.57 / 4.57
1350	100	6	993.1 / 1270.5	277.4	3.58 / 4.58
1300	100	6	957.5 / 1224.4	266.9	3.59 / 4.59
1250	100	6	921.7 / 1178.1	256.5	3.59 / 4.59
1200	100	6	885.8 / 1131.9	246.1	3.6 / 4.6
1150	100	6	849.8 / 1085.6	235.8	3.6 / 4.6
1100	100	6	813.8 / 1039.3	225.5	3.61 / 4.61
1050	100	6	777.6 / 992.9	215.3	3.61 / 4.61
1000	100	6	741.4 / 946.4	205.0	3.62 / 4.62
950	100	6	705.1 / 899.9	194.8	3.62 / 4.62
900	100	6	668.7 / 853.3	184.7	3.62 / 4.62
850	100	6	632.2 / 806.7	174.5	3.62 / 4.62
800	100	6	595.6 / 759.9	164.4	3.62 / 4.62
750	100	6	558.9 / 713.1	154.2	3.62 / 4.62
700	100	6	522.1 / 666.2	144.0	3.63 / 4.63
650	100	6	485.3 / 619.1	133.8	3.63 / 4.63
600	100	6	448.4 / 572.0	123.6	3.63 / 4.63
550	100	6	411.4 / 524.8	113.4	3.63 / 4.63
500	100	6	374.4 / 477.5	103.1	3.63 / 4.63
500	83	5	310.8 / 398.3	87.5	3.55 / 4.55
500	67	4	250.9 / 323.8	72.8	3.45 / 4.45
500	50	3	This partload could not be calculated. Please consult factory for details.		
500	33	2	This partload could not be calculated. Please consult factory for details.		

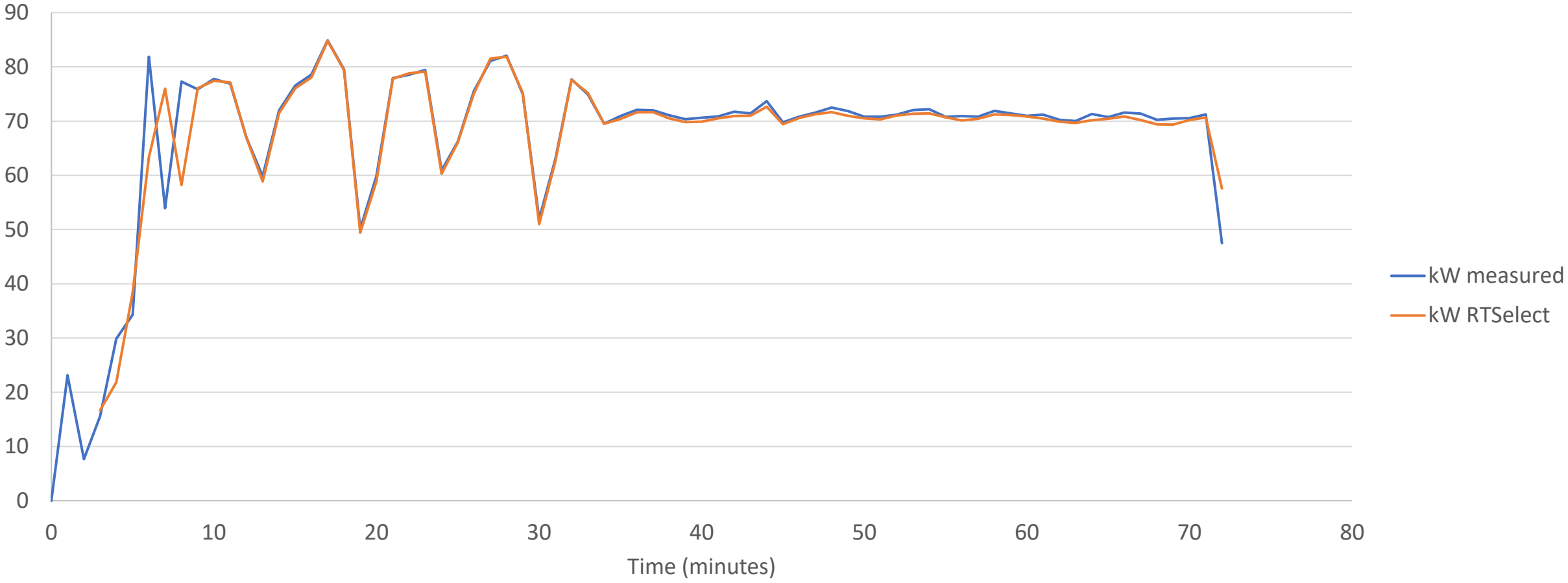
RTSelect als digital twin

Persgastemperatuur



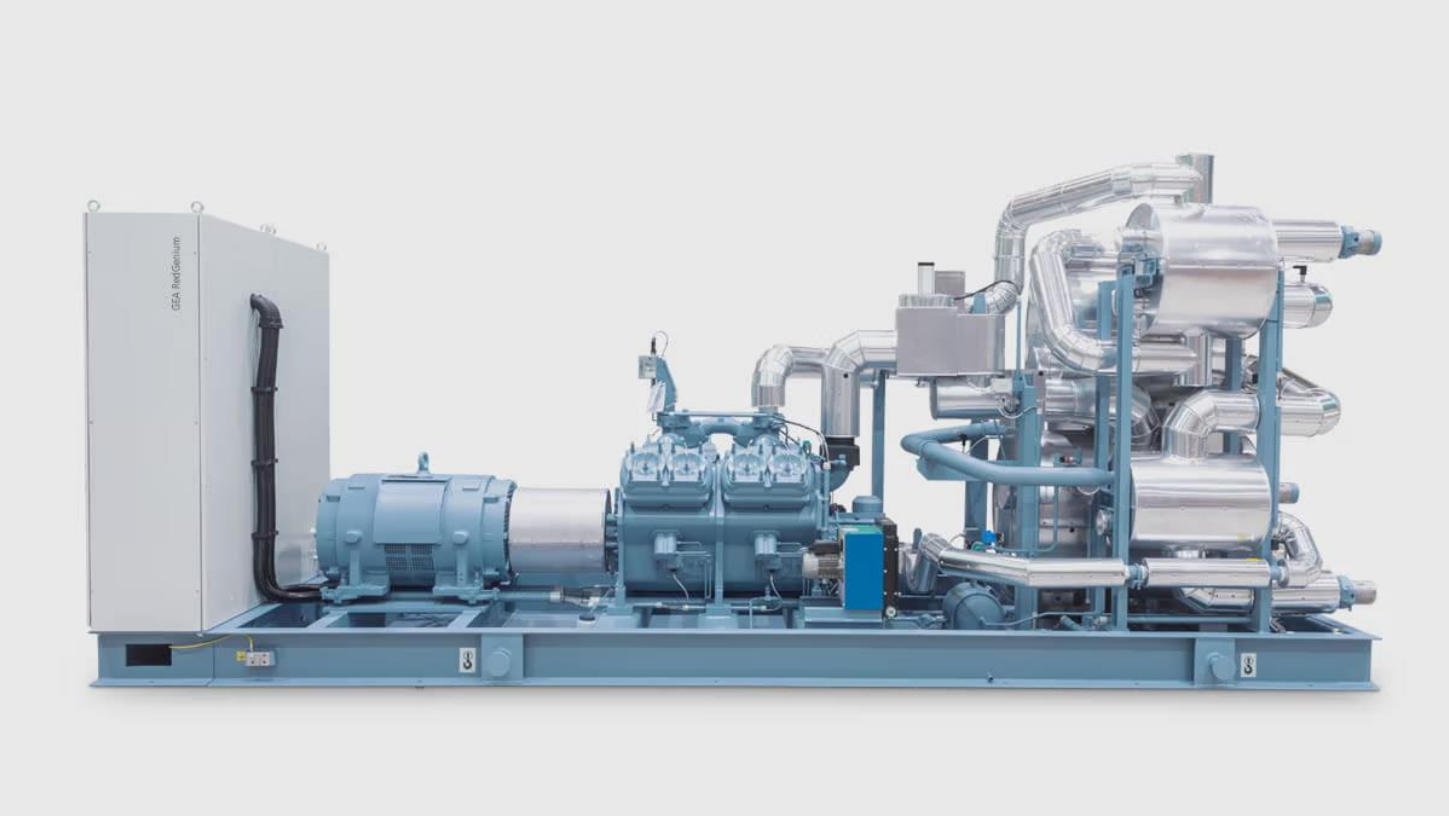
RTSelect als digital twin

Aandrijfvermogen



GEA Red Genium met VXHP compressor

Water verwarmen tot 95°C

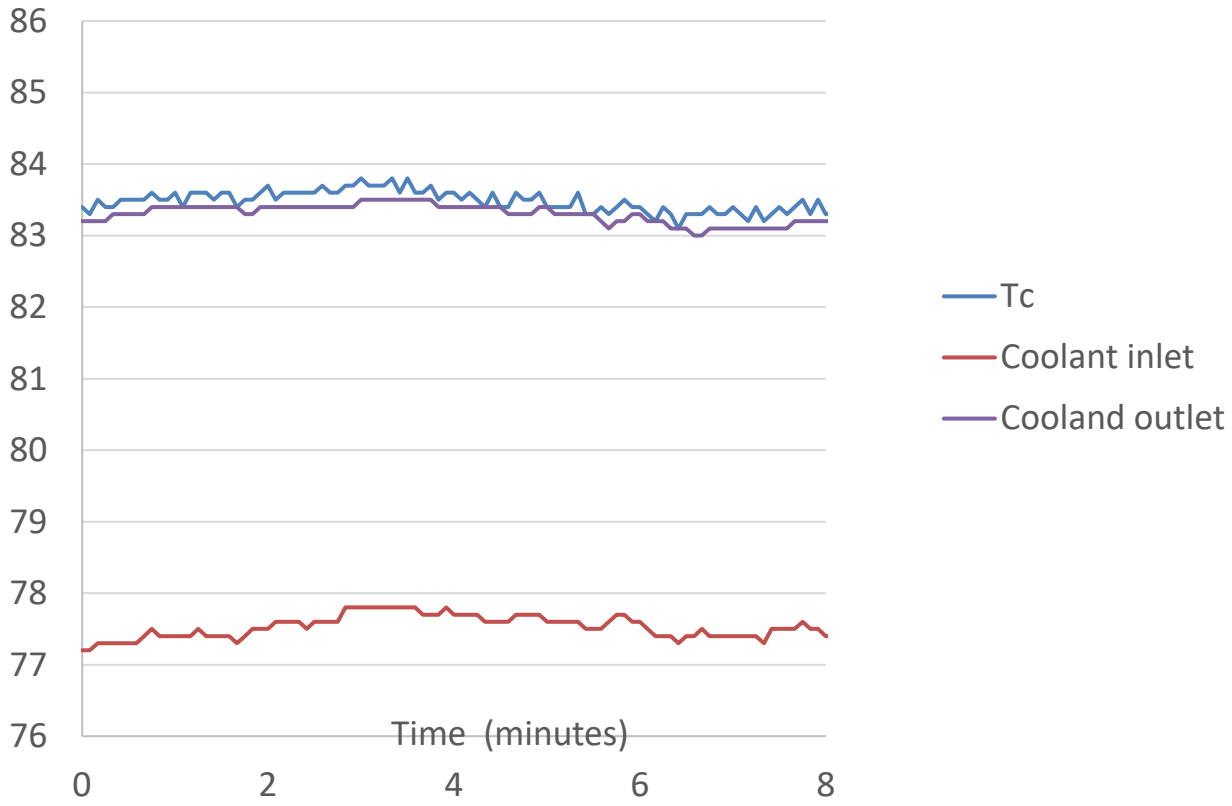


Hoofd componenten:

1. VXHP zuiger compressor
2. Shell & Plate verdamper
3. Combinatie desuperheater / condenser / onderkoeler

RTSelect als digital twin

Prestaties van de warmtewisselaars

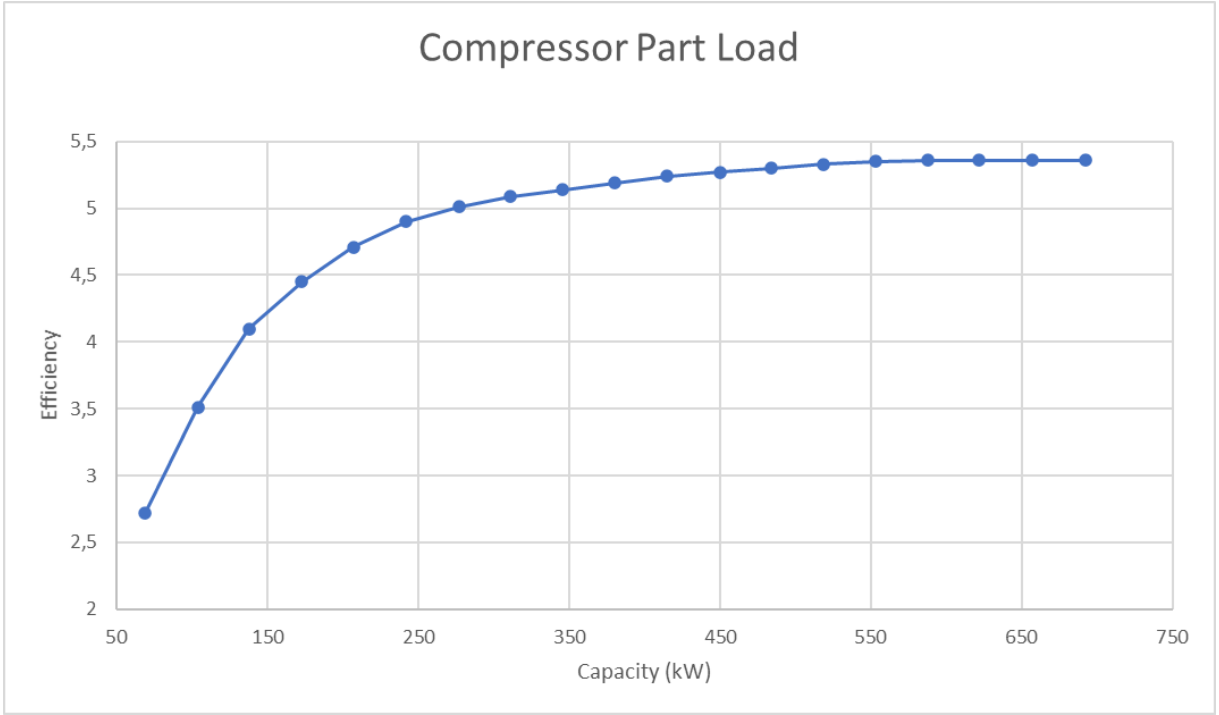


Capacity	Cooling Capacity	Heating Capacity	Pe Line	Pe Shaft	Sec. Refrigerant In	Sec. Refrigerant Out	Cooling Medium In	Cooling Medium Out	Evaporator Temperature	Evaporator Pressure	Condenser Temperature	Condenser Pressure	Superheat	Useful Superheat	Cylinder 1	COP [Shaft]	COP [Line]	EER [Shaft]	EER [Line]
(%)	(kW)	(kW)	(kW)	(kW)	(°C)	(°C)	(°C)	(°C)	(°C)	(bar)	(°C)	(bar)	(K)	(K)	(%)	(COP)	(COP)	(EER)	(EER)
100	953	1200	270	247	38.7	30.0	71.0	83.0	27.5	10.8	82.7	44.0	0.0	0.0	100	4.85	4.45	3.85	3.54
95	905	1137	252	231	38.7	30.4	71.6	83.0	28.0	11.0	82.8	44.0	0.0	0.0	100	4.92	4.51	3.92	3.60
90	857	1073	235	215	38.7	30.9	72.3	83.0	28.5	11.2	82.8	44.1	0.0	0.0	100	4.98	4.57	3.98	3.65
85	810	1011	218	201	38.7	31.3	72.9	83.0	29.0	11.3	82.9	44.1	0.0	0.0	100	5.04	4.63	4.04	3.71
80	762	948	203	186	38.7	31.7	73.5	83.0	29.5	11.5	82.9	44.1	0.0	0.0	100	5.10	4.68	4.10	3.76
75	715	887	187	172	38.7	32.2	74.1	83.0	30.0	11.7	82.9	44.2	0.0	0.0	100	5.16	4.73	4.16	3.81
70	667	825	173	158	38.7	32.6	74.7	83.0	30.6	11.9	83.0	44.2	0.0	0.0	100	5.23	4.78	4.23	3.86
65	620	764	158	144	38.7	33.0	75.4	83.0	31.2	12.1	83.0	44.2	0.0	0.0	100	5.30	4.83	4.30	3.92
60	572	703	144	131	38.7	33.5	76.0	83.0	31.8	12.3	83.0	44.2	0.0	0.0	100	5.37	4.88	4.37	3.97
55	524	642	131	118	38.7	33.9	76.6	83.0	32.3	12.5	83.0	44.2	0.0	0.0	100	5.44	4.92	4.44	4.01
50	476	581	117	106	38.7	34.4	77.2	83.0	32.9	12.7	83.0	44.3	0.0	0.0	100	5.51	4.95	4.51	4.05
45	428	522	105	93	38.7	34.8	77.8	83.0	33.4	12.9	83.1	44.3	0.0	0.0	100	5.58	4.98	4.58	4.09
46	438	531	104	93	38.7	35.8	77.7	83.0	34.4	13.3	83.1	44.3	0.0	0.0	100	5.71	5.10	4.71	4.21
39	368	446	88	78	38.7	36.3	78.5	83.0	35.0	13.5	83.2	44.4	0.0	0.0	83	5.69	5.07	4.69	4.18
31	299	363	73	65	38.7	36.8	79.4	83.0	35.7	13.8	83.3	44.5	0.0	0.0	66	5.60	5.00	4.60	4.11
24	231	283	58	52	38.7	37.3	80.2	83.0	36.3	14.0	83.4	44.6	0.0	0.0	50	5.45	4.86	4.45	3.97
16	155	193	43	38	38.7	37.7	81.1	83.0	36.9	14.3	83.6	44.8	0.0	0.0	33	5.10	4.55	4.10	3.65

Compressor RTSelect
Parallel bedrijf schroefcompressoren

- Deellast gedrag
- ET/CT = -10/+25 ºC
- Model = P

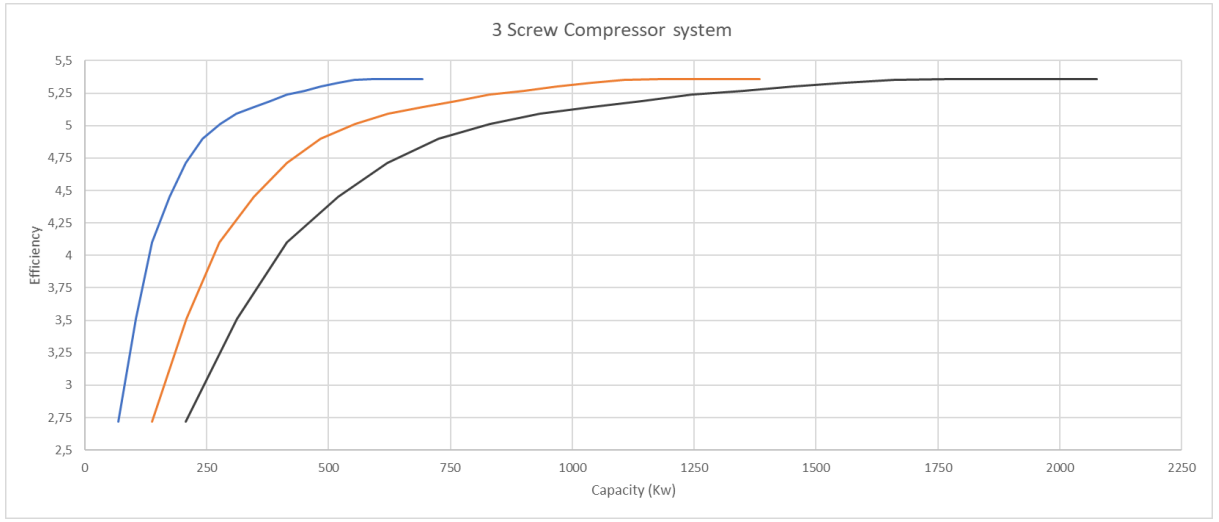
Capacity (%)	Cooling Capacity (kW)	Pe Shaft (kW)	Evaporator Temperature (°C)	Condenser Temperature (°C)	Speed 1 (RPM)	Slide Valve Position (%)	EER [Shaft] (EER)
100	692	129	-10.0	25.0	3600	100	5.36
95	657	122	-10.0	25.0	3415	100	5.37
90	622	116	-10.0	25.0	3230	100	5.38
85	588	110	-10.0	25.0	3055	100	5.36
80	553	104	-10.0	25.0	2880	100	5.34
75	519	97	-10.0	25.0	2710	100	5.33
70	484	91	-10.0	25.0	2540	100	5.32
65	450	85	-10.0	25.0	2375	100	5.28
60	415	79	-10.0	25.0	2210	100	5.24
55	380	73	-10.0	25.0	2040	100	5.20
50	346	67	-10.0	25.0	1870	100	5.16
45	311	61	-10.0	25.0	1700	100	5.11
40	277	55	-10.0	25.0	1530	100	5.04
35	242	49	-10.0	25.0	1500	96	4.90
30	207	44	-10.0	25.0	1500	93	4.71
25	173	39	-10.0	25.0	1500	80	4.45
20	138	34	-10.0	25.0	1500	68	4.10
15	104	30	-10.0	25.0	1500	50	3.51
10	69	25	-10.0	25.0	1500	33	2.72



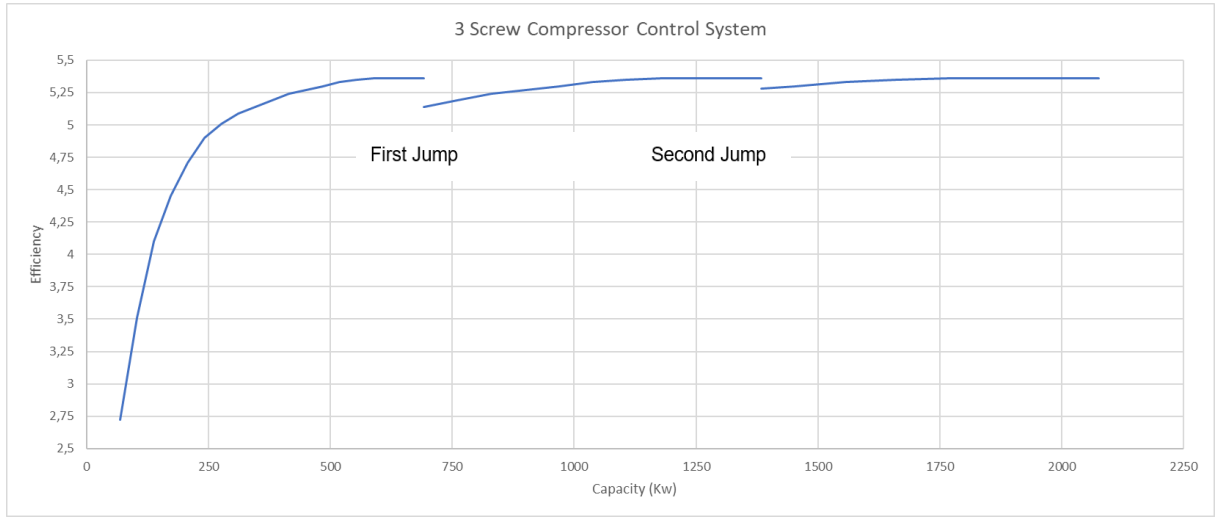
Optimal Control Strategy For 3 Screw Compressors

- The **first jump** of the performance line can be achieved by suddenly dropping the capacity of the first compressor to 50% and engaging the second compressor also at 50%.

- The **second jump** follows the same method however both first and second compressors are dropped to 66,7% of capacity and the third one is engaged at 66,7%



Separate 1 active, 2 active and 3 active compressor performance lines



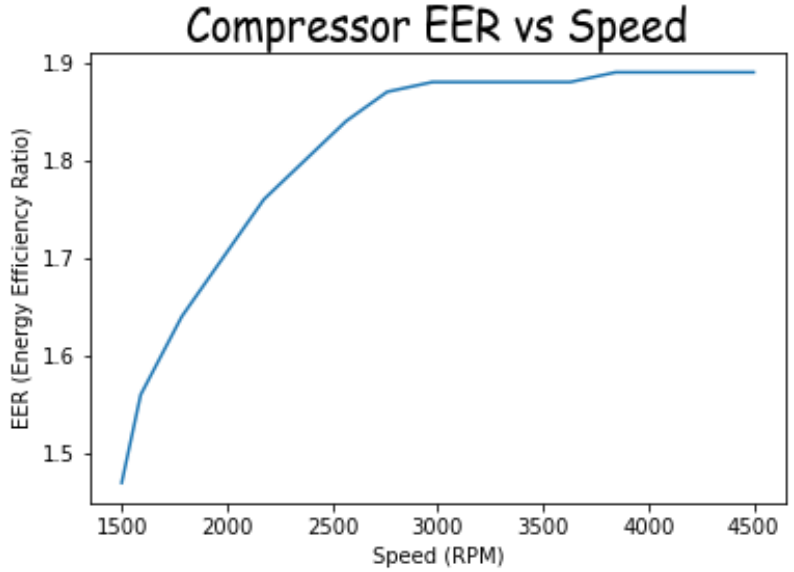
Optimal control performance line for maximizing EER

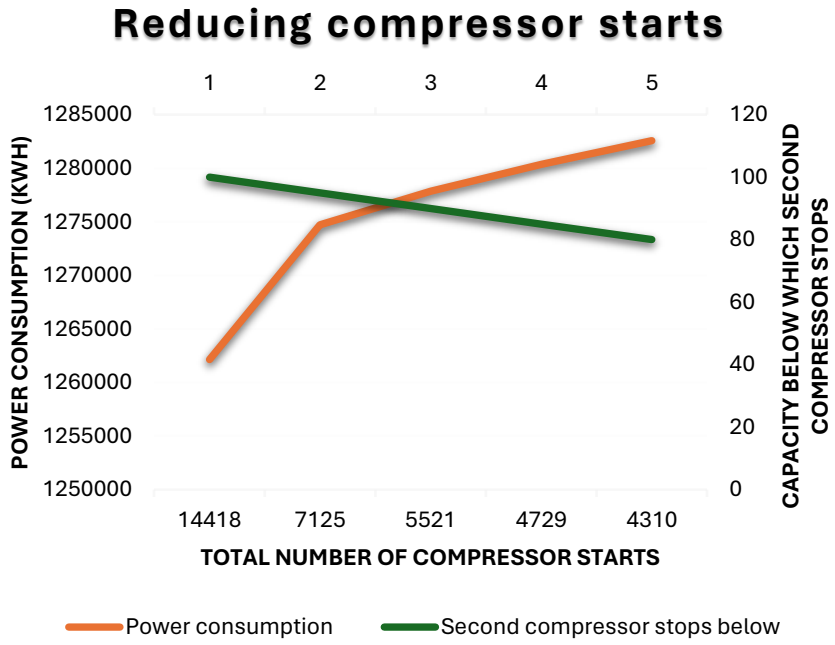
Compressor Optimisation

1. Balancing the cooling load for parallel operation
2. Low energy savings potential
3. But huge potential to save number of starts and stops for compressor

- TU-Student Animesh Sahoo

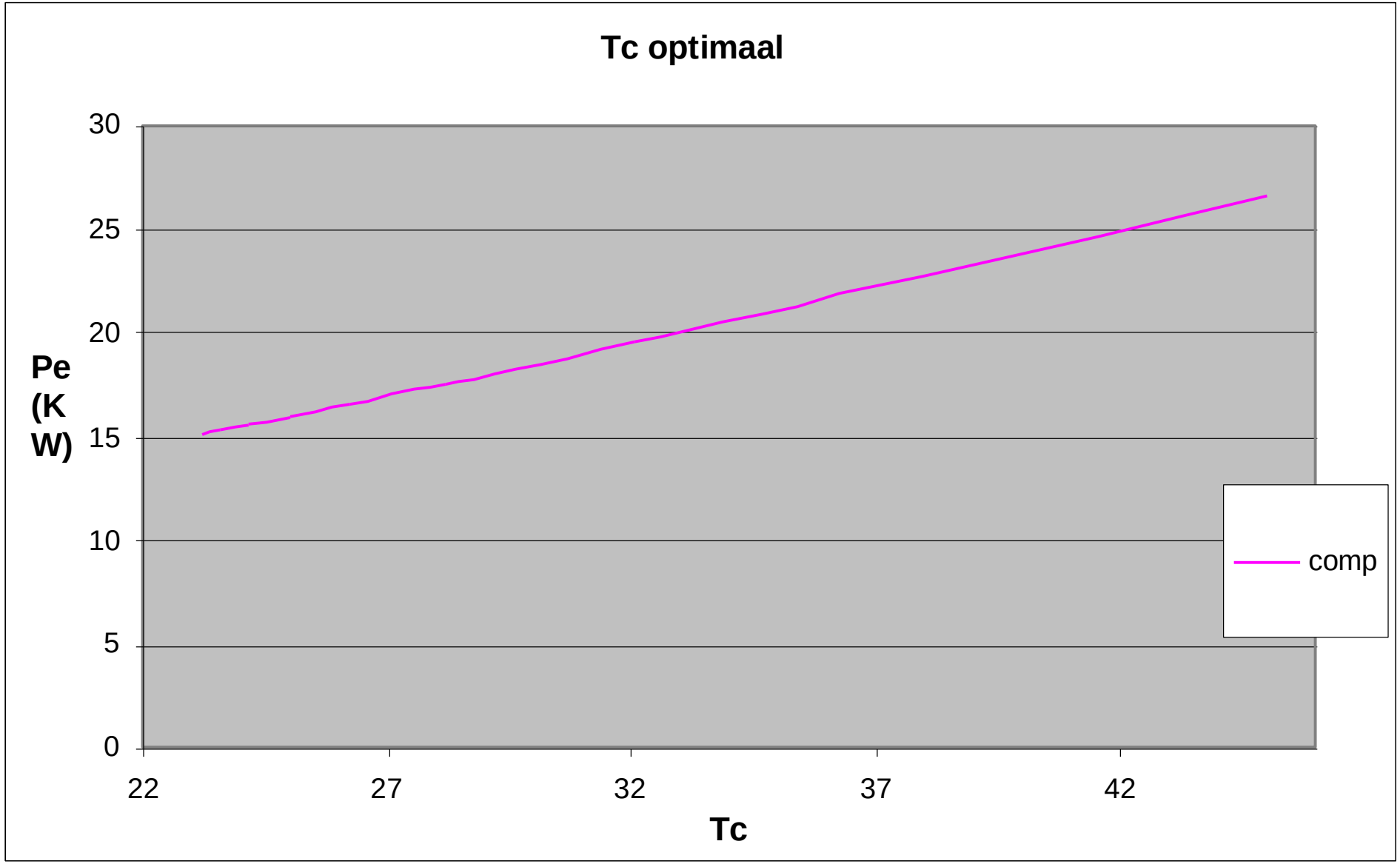
TU Delft

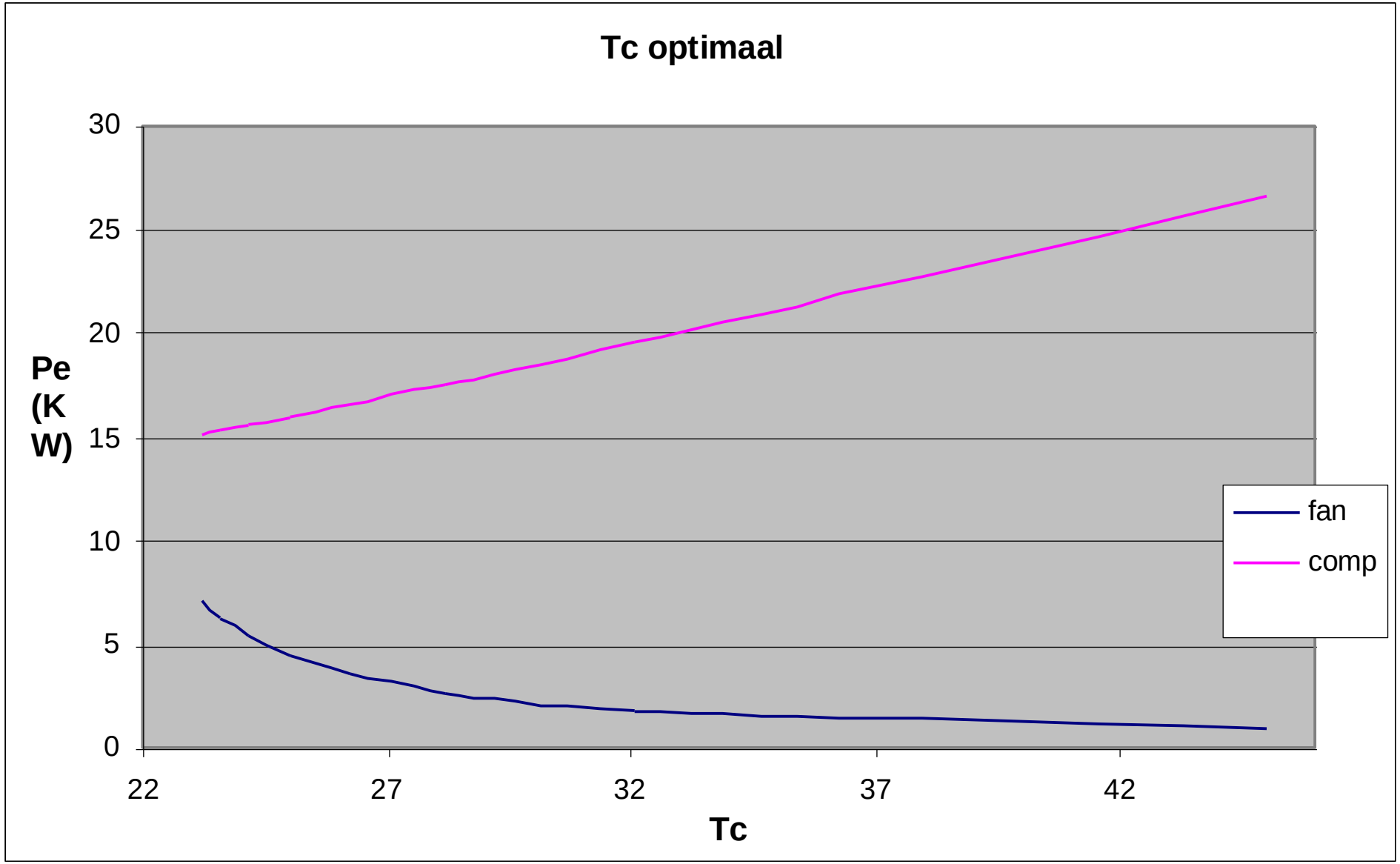




GEA BluQ Chiller + Evaporative condenser

- Compressor (CompaX 700)
- Evaporator (GEA Vatherus 5HH-390)
- Evaporative condenser remote (BAC CXVE 313-1012-15L)


Tc optimaal
30
25
20
15
10
5
0
Pe (KW)
22
27
32
37
42
Tc
comp


Tc optimaal
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15
10
5
0
Pe (K W)
22
27
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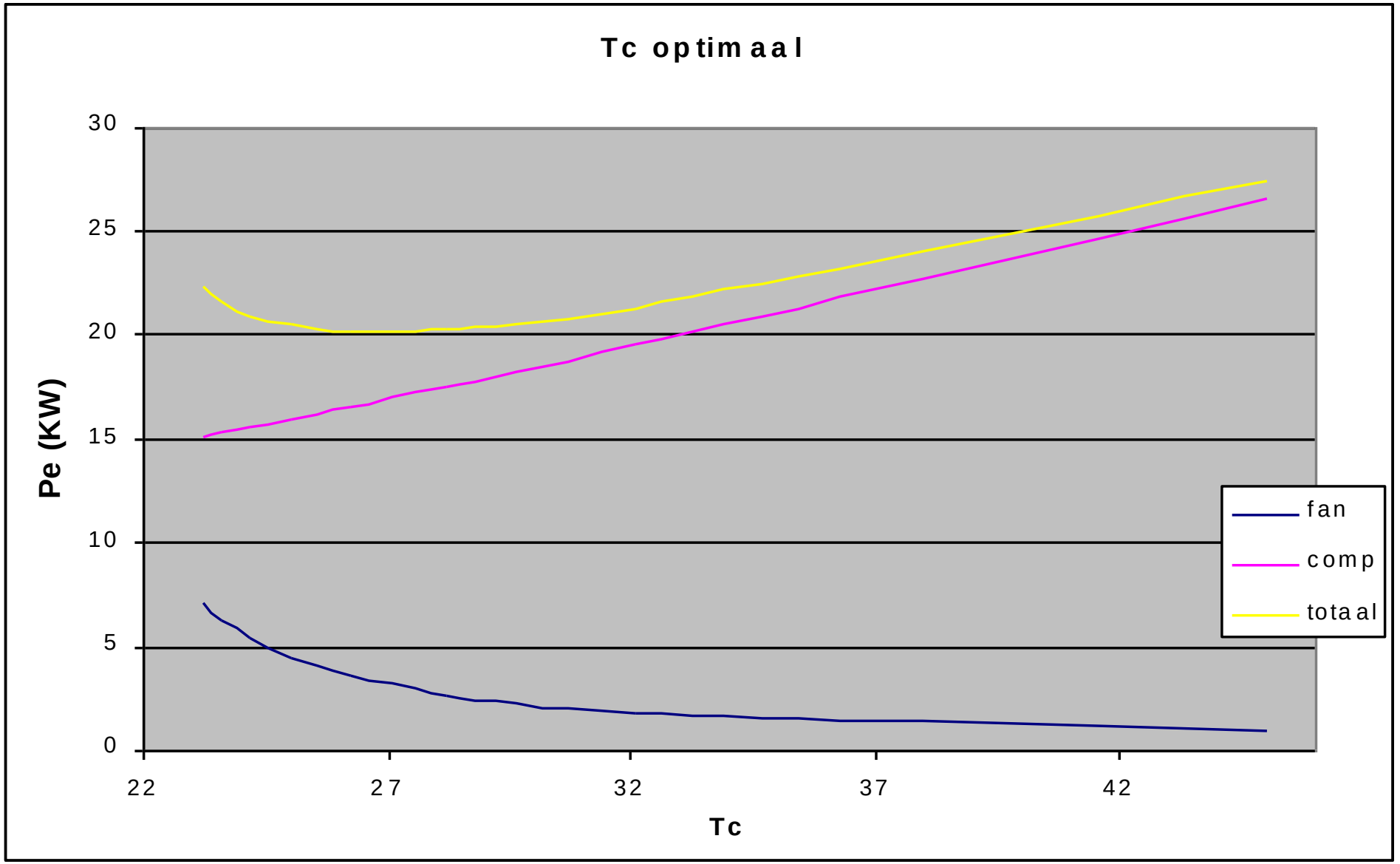
37
42
Tc
fan
comp


Tc optimaal
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Pe (KW)
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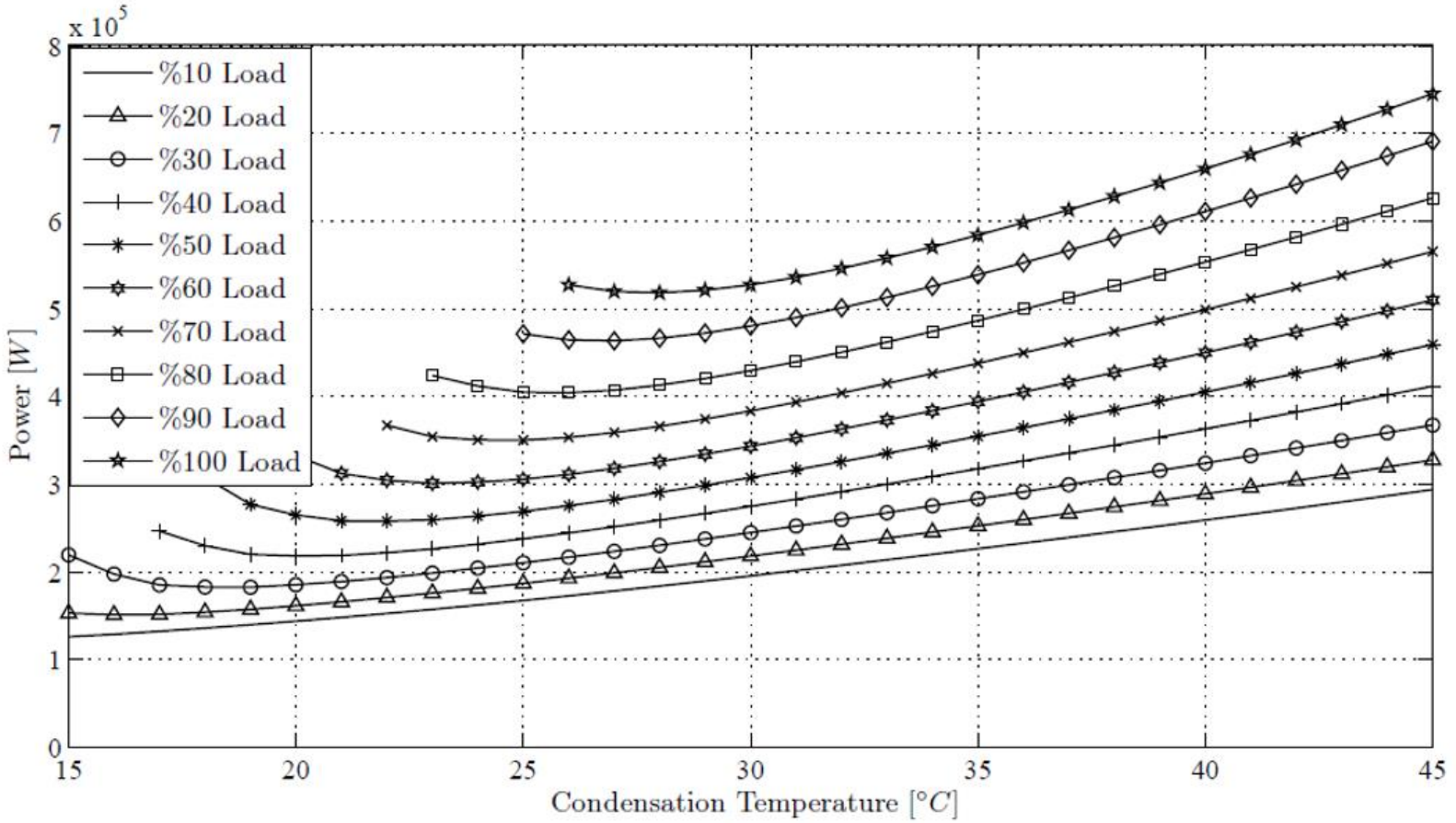
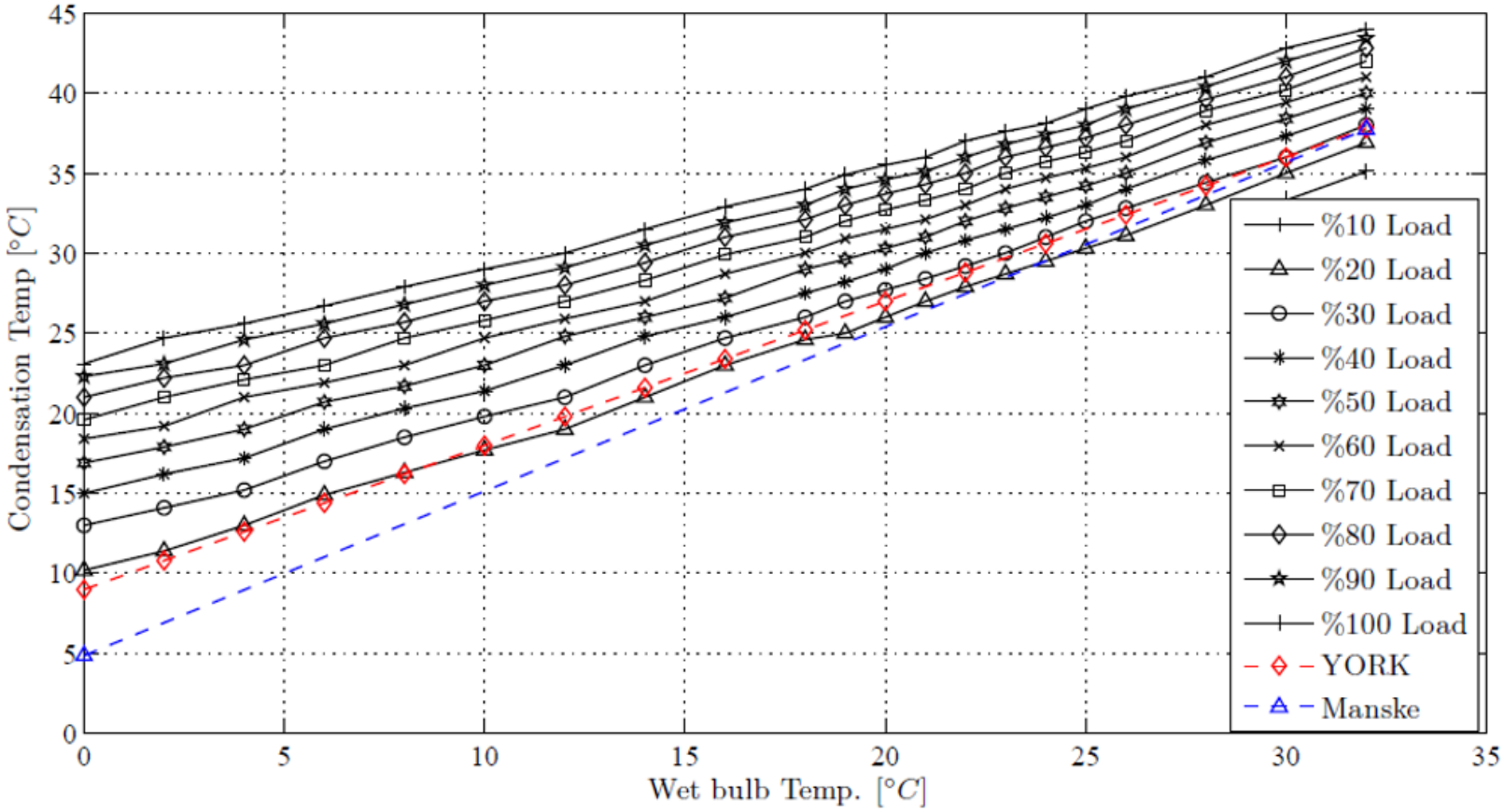
37
42
Tc
fan
comp
totaal

Optimale condensordruk regeling bij meerdere belastingen
Natte bol temperatuur 8°C
TU-student: Sebastian Bahamonde

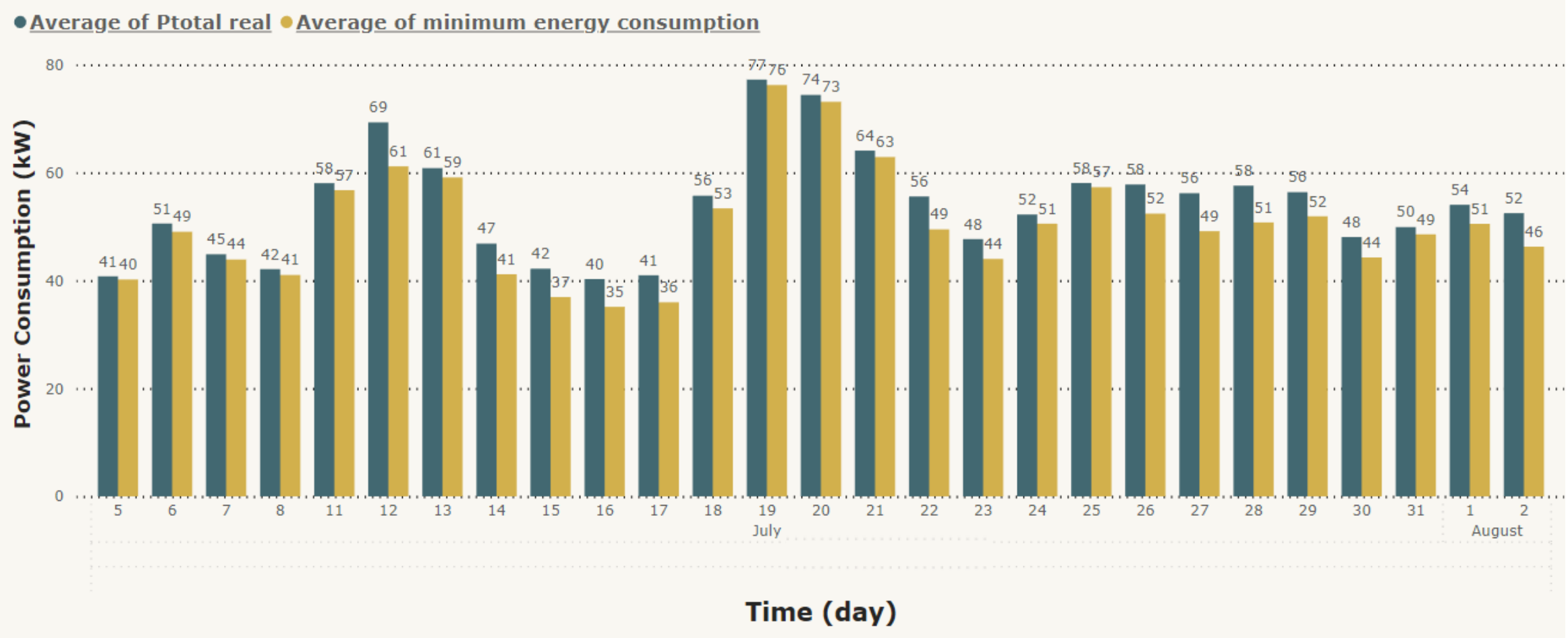


Optimale setpoint condensordruk bij verschillende natte bol temperaturen en verschillende deellast condities



Optimal power consumption (TU-student Dimitrios Ntagkras)

The average power savings can be close to 7% per day.



GEA.com