

Start up Low Charge Ammonia DX

Food storage in Brisbane Australia



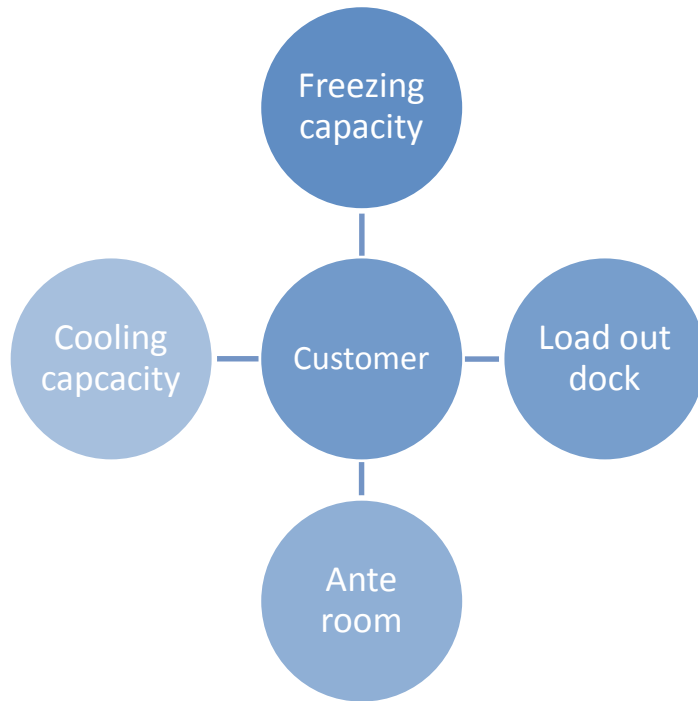
By Martin Koudal Fisker
Technical development & service engineer

Agenda

- The customer and site
- Installation of sensors and control function
- The system (plant construction)
- Results
- Another system and its installation
- Benefits by using the dx
- Optimize the HBX controller

The customers cooling requirements

Food storage in Brisbane Australia



Quality Food Services has a reputation of being a first class supplier of products and services offering now more than 5000 lines making Quality Food Services a viable player in the food service market. (1)



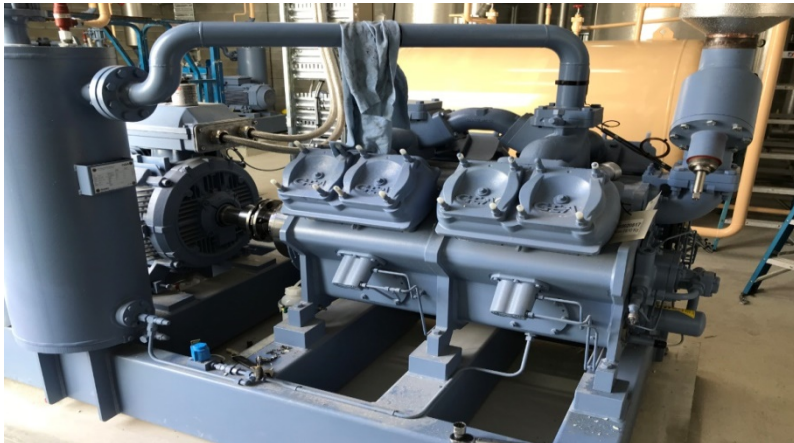
Pictures from the installation



Load out deck



Freezer



GEA Compressor



The nearby airport → Low charge system



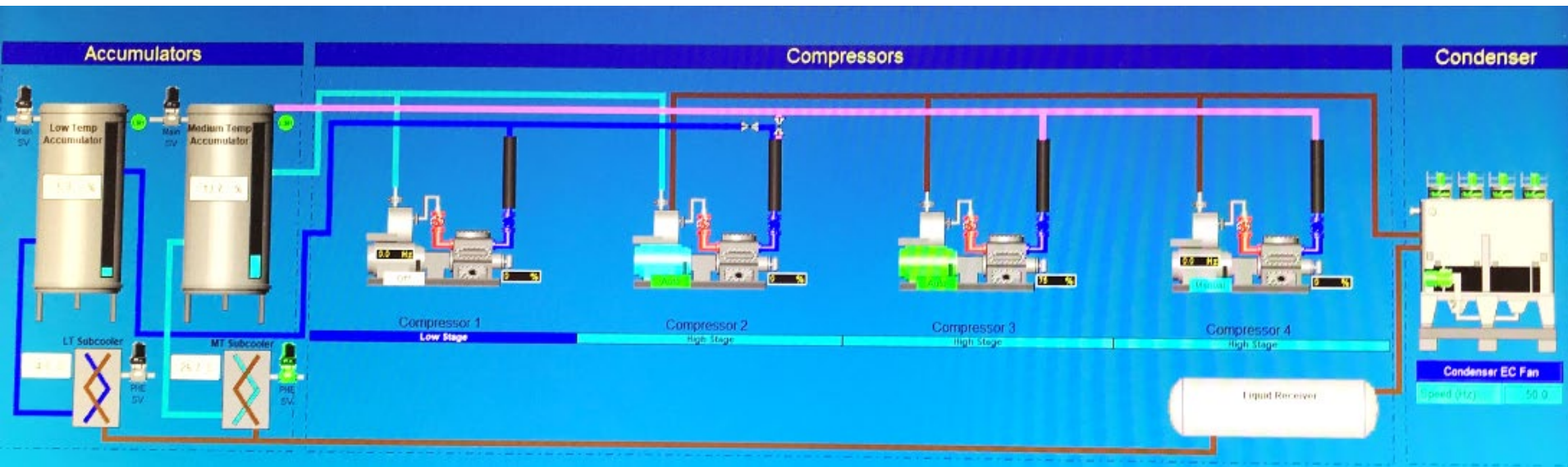
Evaporators



The HBX sensors are mounted in the outlet of the LT evaporators.

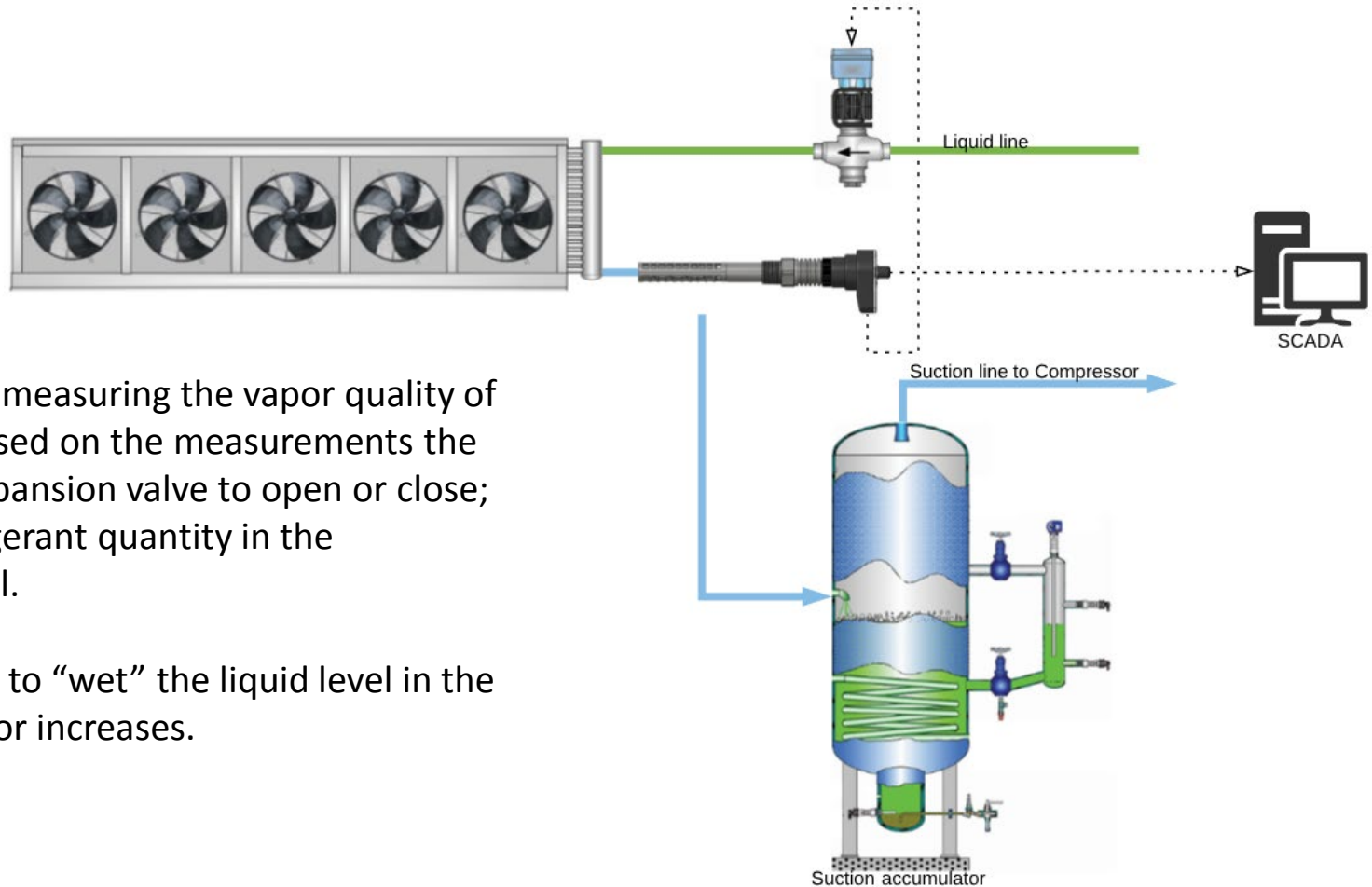


The system



Picture from the costumers SCADA system

Simple explanation of the system

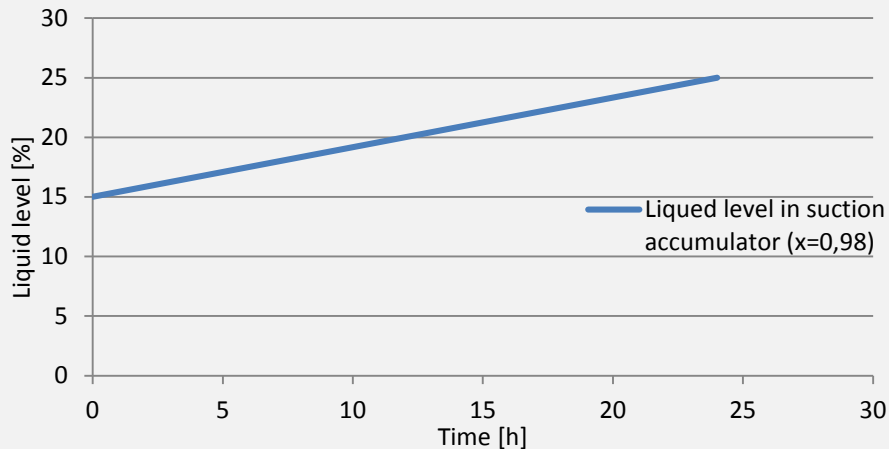


The HBX sensor is measuring the vapor quality of the refrigerant. Based on the measurements the sensor tells the expansion valve to open or close; which makes refrigerant quantity in the evaporator optimal.

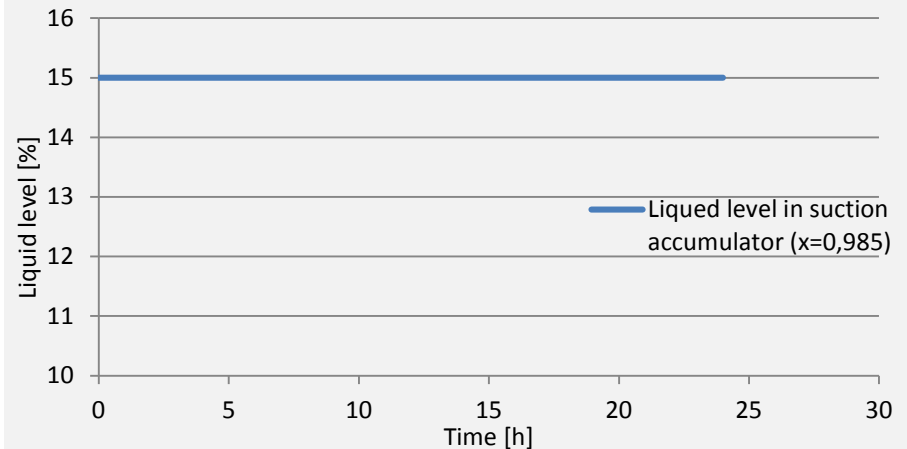
If the refrigerant is to “wet” the liquid level in the suction accumulator increases.

The correct x-value?

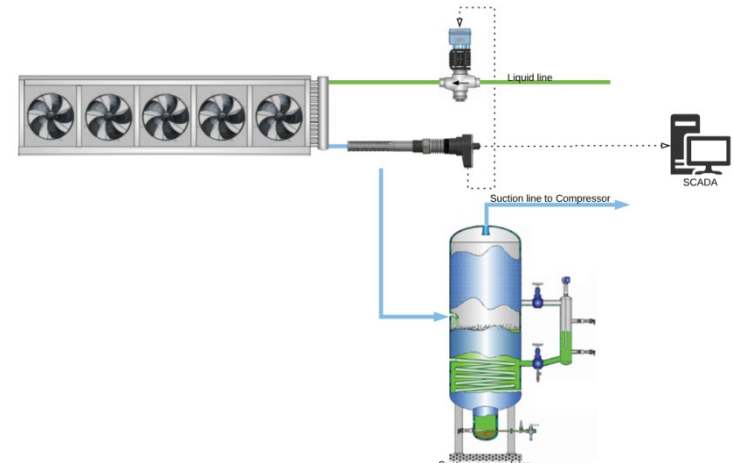
Liquid level in suction accumulator



Liquid level in suction accumulator



By choosing the x-value to 0,980 the liquid level increases by 10 percent over night. After a few adjustments the x-value was set to 0,985, making the liquid level constant.



The correct x-value?

HB HBX Tool - Gas quality sensor

Basic settings

Advanced settings

Calibration

Communication settings:

Disable comm

Read configuration is successfully

Show sensor settings

Sensor SW version: ---

HBX basic settings:

Control/Sensor mode:

Control

Degree of dryness "X":

0.985

P-band in %:

30

I-Factor in sec:

200

Filter time const. in sec.:

2

Run in signal:

ON

Zero cal. function:

ON

Alarm setting in "X":

0.8

Alarm Delay in sec.:

2

mA input function:

Remote setp...

Select refrigerant type:

NH3

Admin settings:

Compensation pos. value:

50

Compensation neg. value:

12

Setting output range:

4-20mA

Temperature cal. value:

Set temp. cal.

Offset Calibrate:

Set offset cal.

Setting of Control Output:

Analog 4-20...

HB Products

Configuration Instruction:

1) Configure sensor:
If 'Read configuration is successfully'
Select 'Show current configuration' to
check current set values.
Change relevant parameters and
'Save to sensor' or 'Reset sensor'

Check out HBX Promotional video:

Promotional Video

Set the configuration:

Save to sensor

Reset data to default:

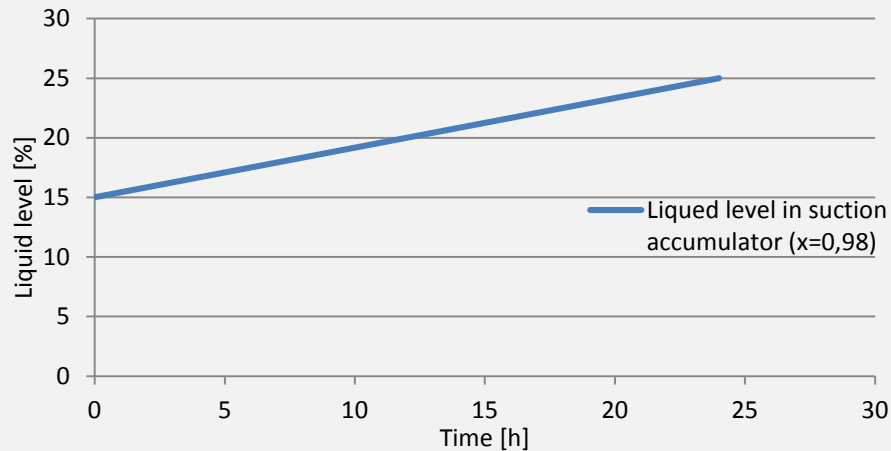
Reset sensor

Select all data

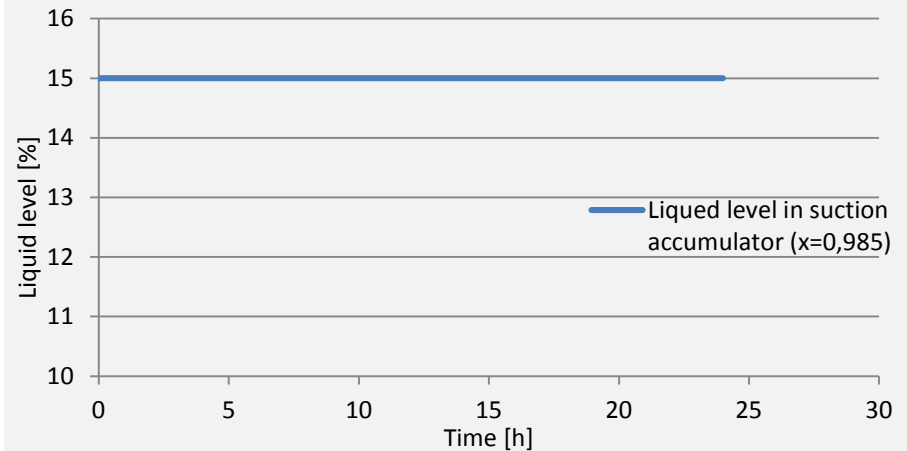
Setting file loaded:

The correct x-value?

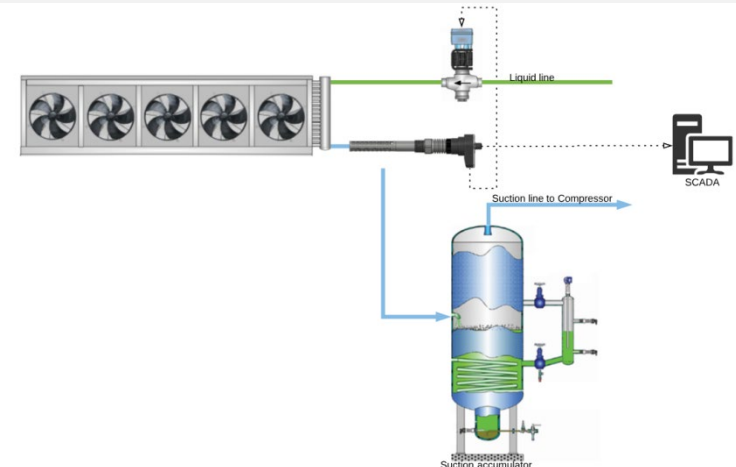
Liquid level in suction accumulator



Liquid level in suction accumulator



By choosing the x-value to 0,980 the liquid level increases by 10 percent over night. After a few adjustments the x-value was set to 0,985, making the liquid level constant.



Evaporators



Play

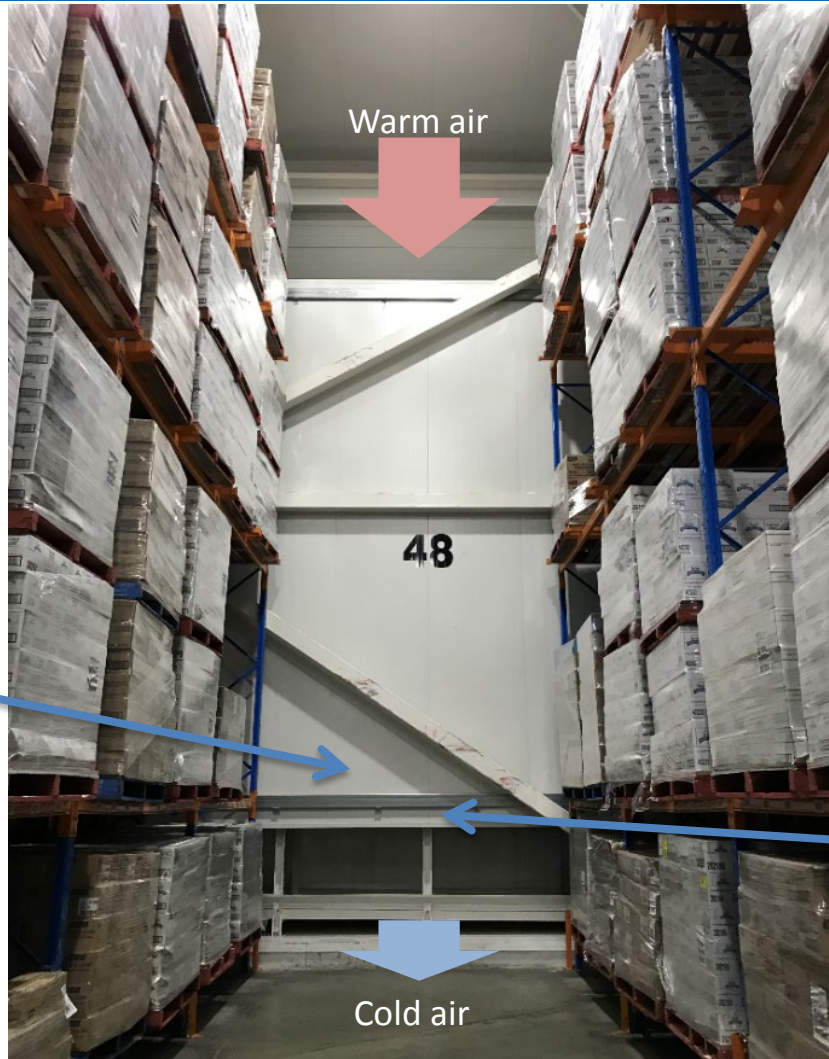
Same case somewhere else

Food storage in Brisbane Australia



Evaporators

Evaporator



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Evaporators



Evaporator

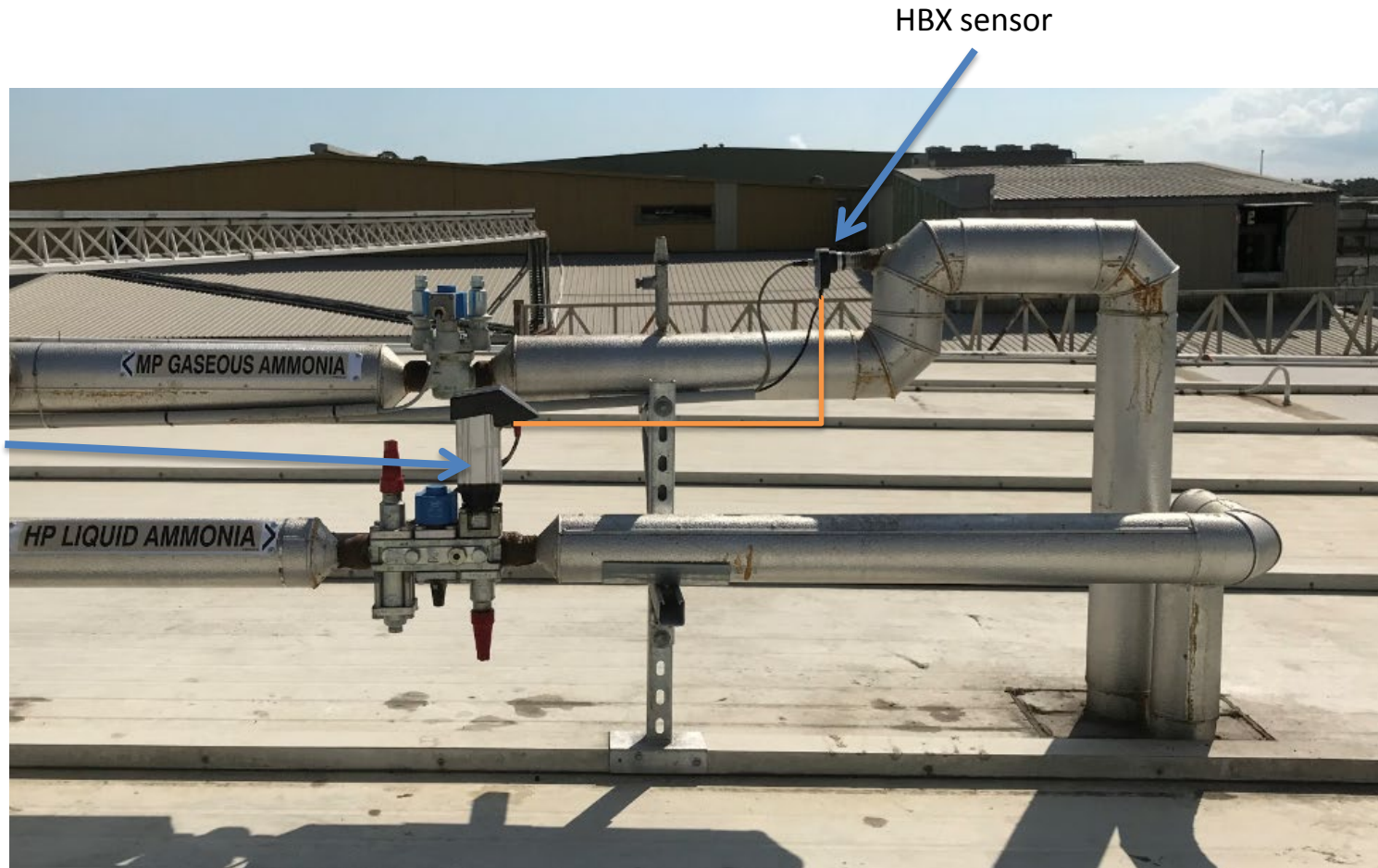
Piping for evaporator



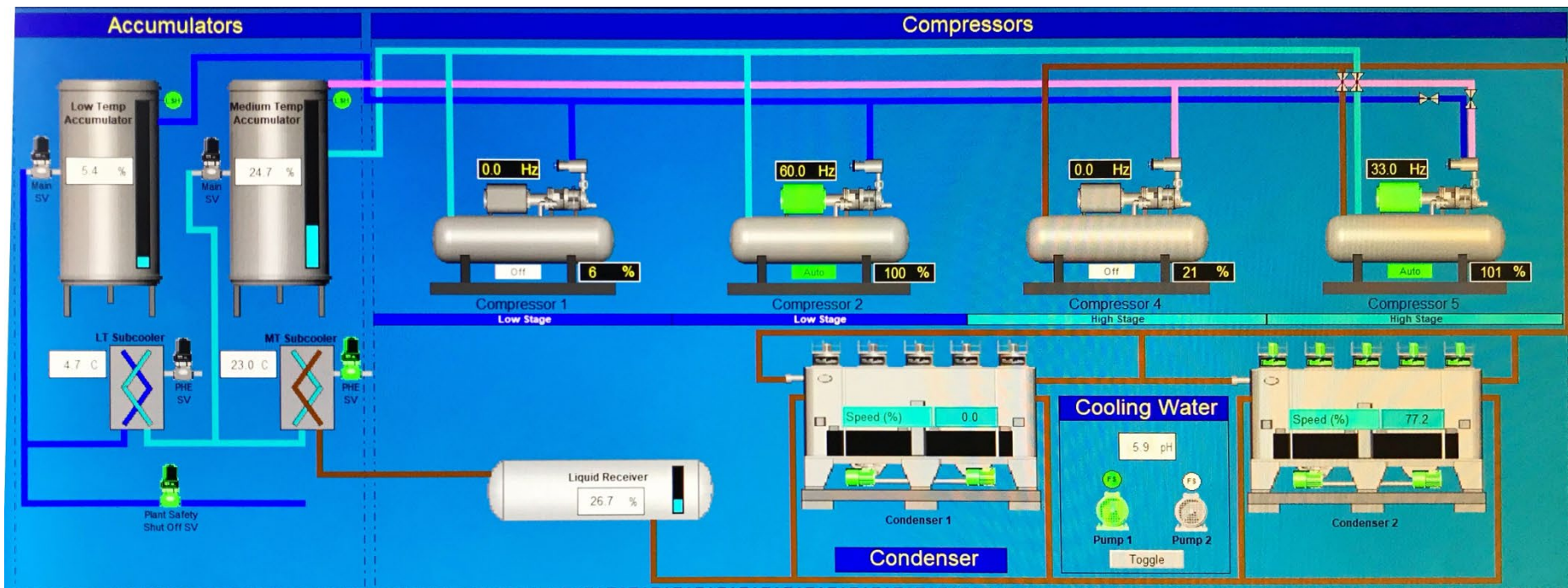
Old and new evaporators



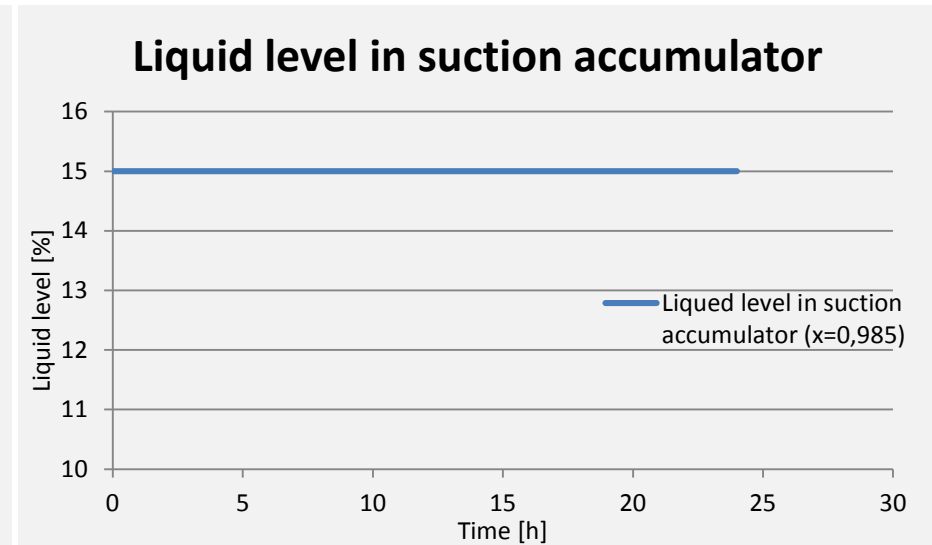
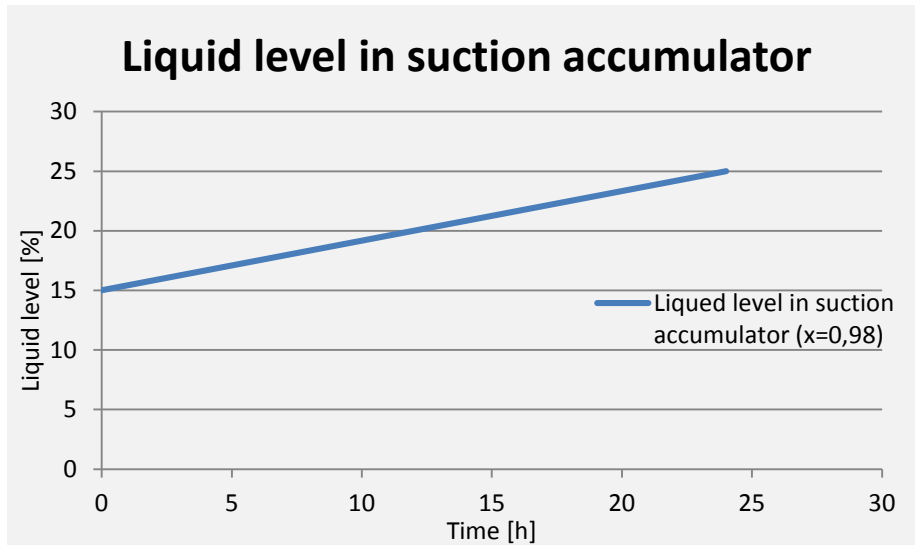
Piping for evaporator on roof



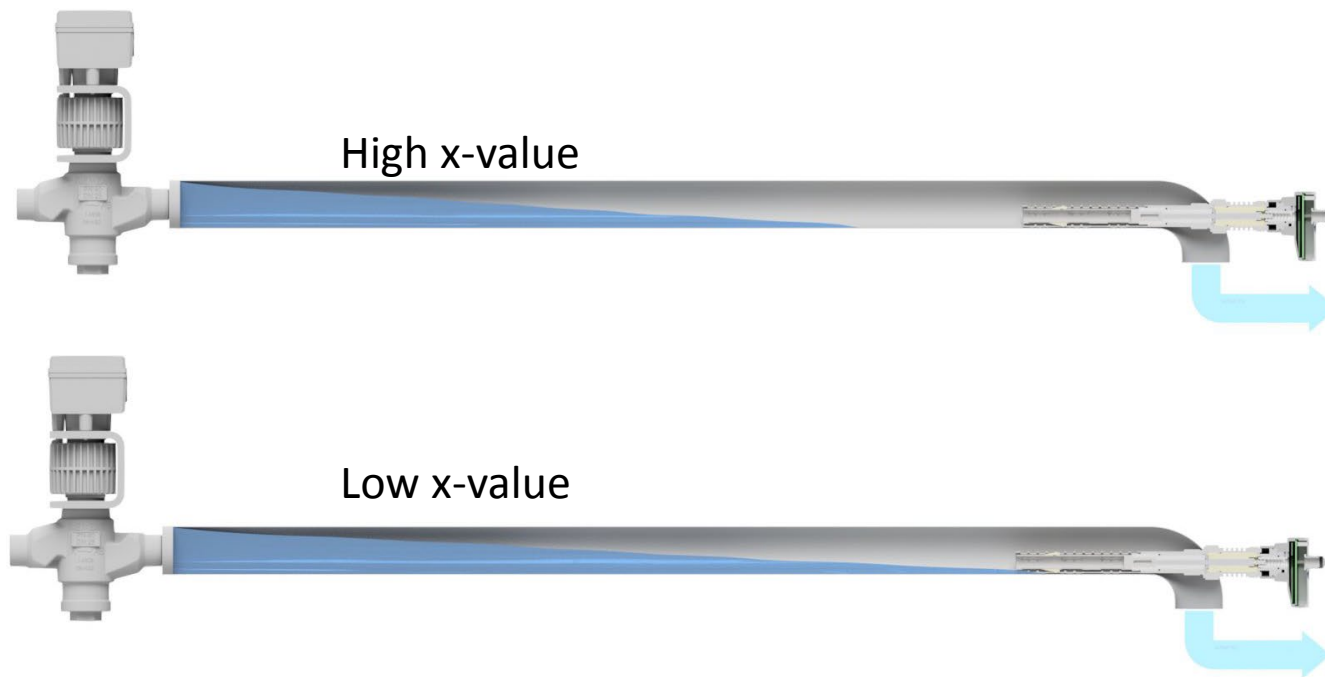
The system



The correct x-value?



Summary



Benefit by filling the evaporator

Charge reduction calculation

DX charge reduction by component on NH3 systems:

- Evaporators
- Liquid line
- Suction line

A suction accumulator remains necessary for protection of the compressor against liquid flood-back when the system operates with negative superheat.

The figures are based on 700 kW @ -29°C stainless steel air cooler system. NH3 4:1 pumped vs NH3 Charge reduction DX.

Component	Pumped			DX			Charge reduction [lbs]
	Size	Volume [cu ft]	Charge [lbs]	Size	Volume [cu ft]	Charge [lbs]	
Evaporators	7/8" tube x 8 row	50	1500	7/8" tube x 8 row	50	50	1450
Liquid Line	2 1/2" x 300'	10.3	443	1 1/4" x 300'	2.58	111	332
Suction Line	8" x 300'	106	51	6" x 300'	60	4.1	46.9
Recirculator Vessel	12" x 5' Liquid Leg	5	170	N/A	0	0	170
Totals			2164				1999

[Source: Colmac Coil]

"When used with the Advanced Direct Expansion (ADX) system from Colmac Coil Manufacturing , the new HBDX sensor improves ammonia evaporator performance even at freezer temperatures."

Bruce I. Nelson, P.E. | President

www.colmaccoil.com

Benefit: Smaller suction pipe



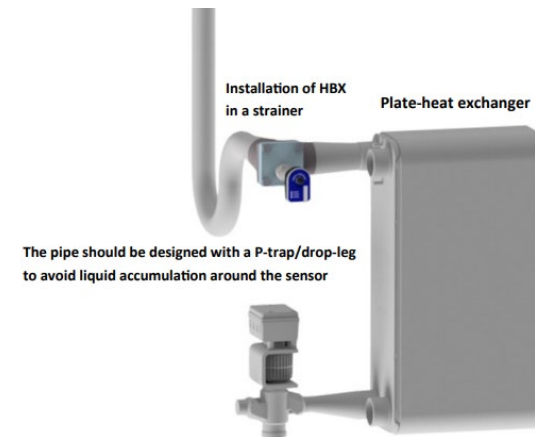
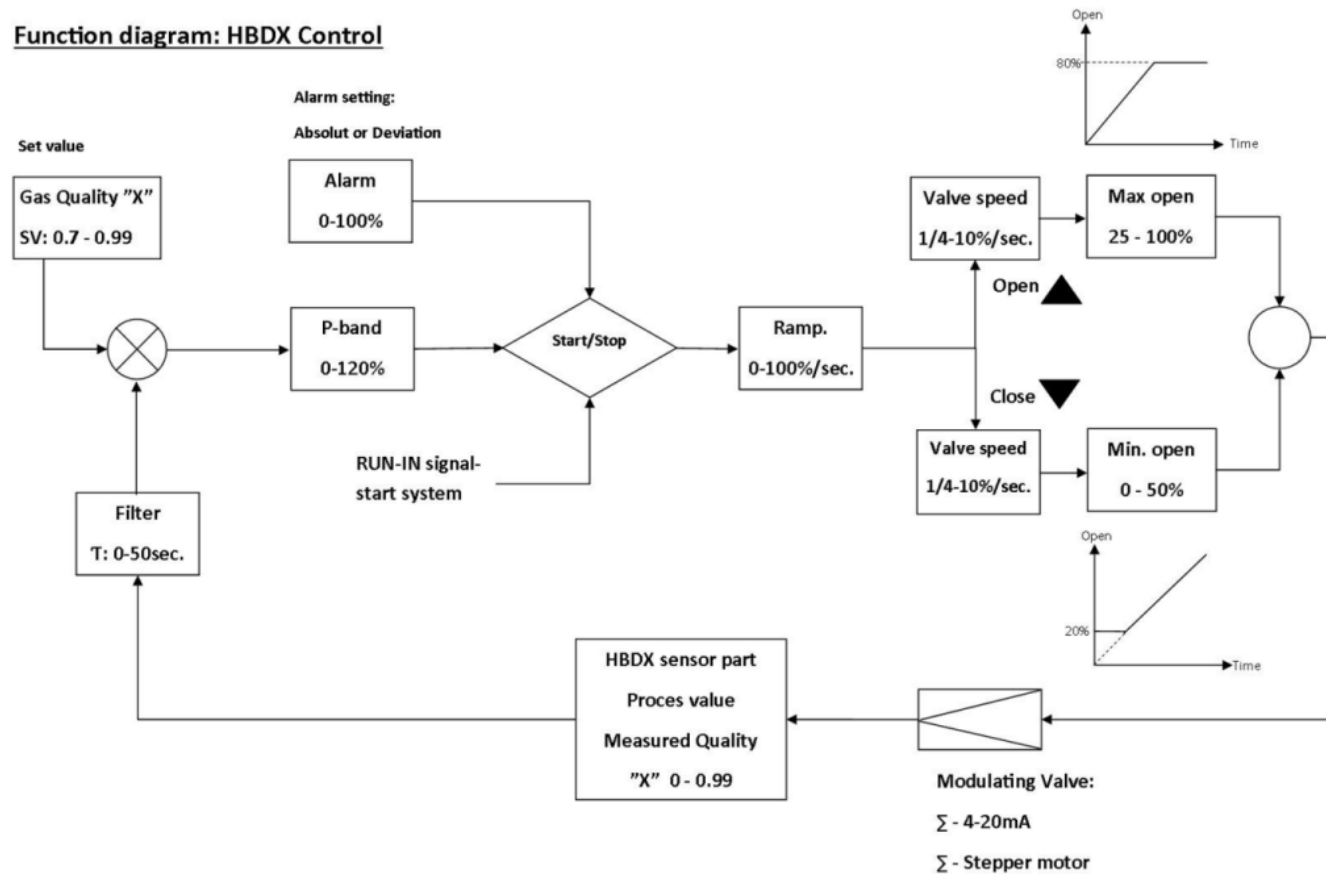
Benefit: Smaller evaporators



Beside the setpoint: Optimize the controller

Optimal settings for HBX controller

Function diagram: HBDX Control

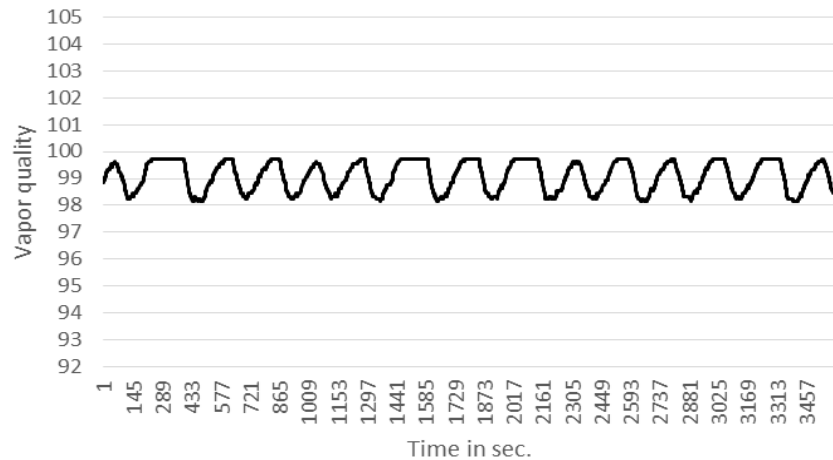




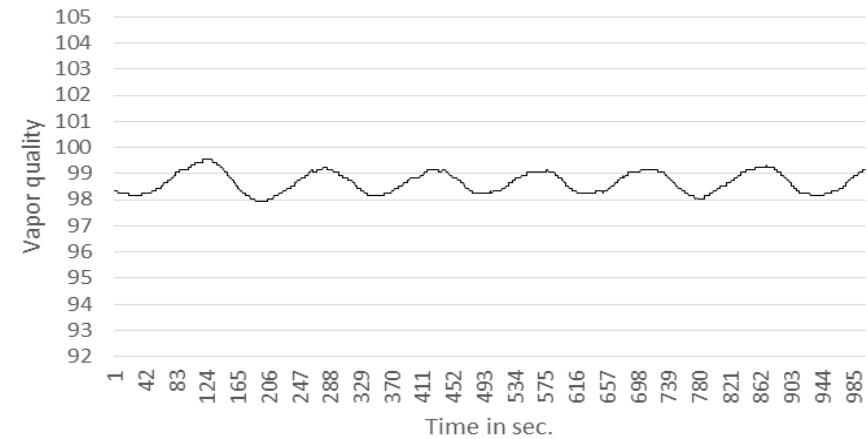
Other values in the HB conf. tool

Optimal settings for HBX controller

X-value HBX



X-Value HBX



P-band: 60
Filter: 10 sec.
Speed: 0.2 %/sec.



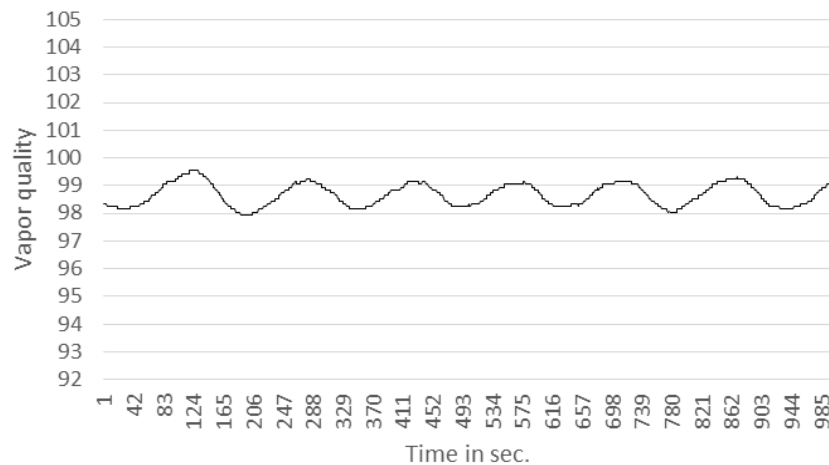
P-band: 20
Filter: 20 sec.
Speed: 0.3 %/sec.



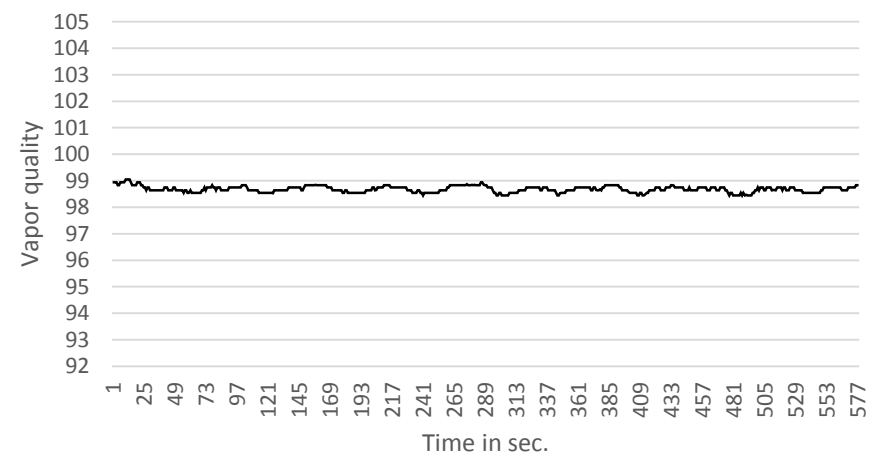
Other values in the HB conf. tool

Optimal settings for HBX controller

X-Value HBX



X-Value HBX



P-band: 20
Filter: 20 sec.
Speed: 0.3 %/sec.

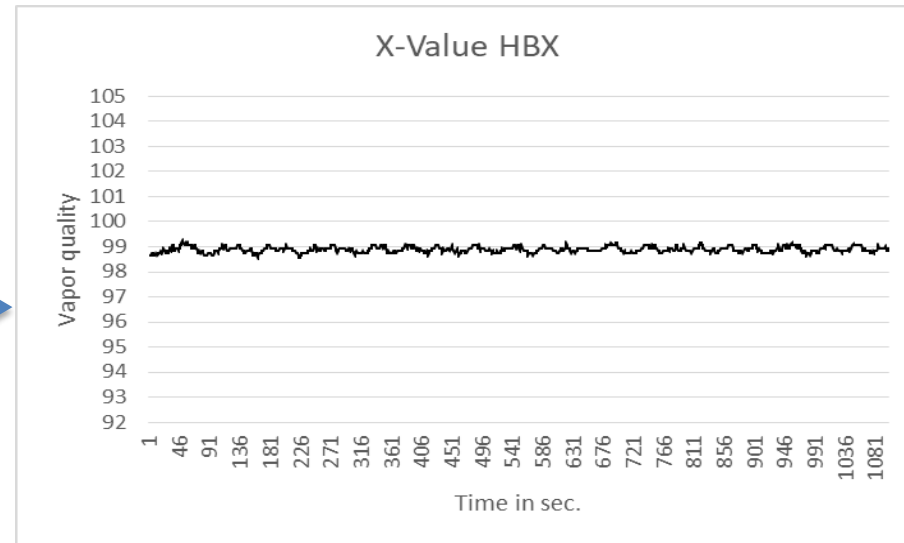
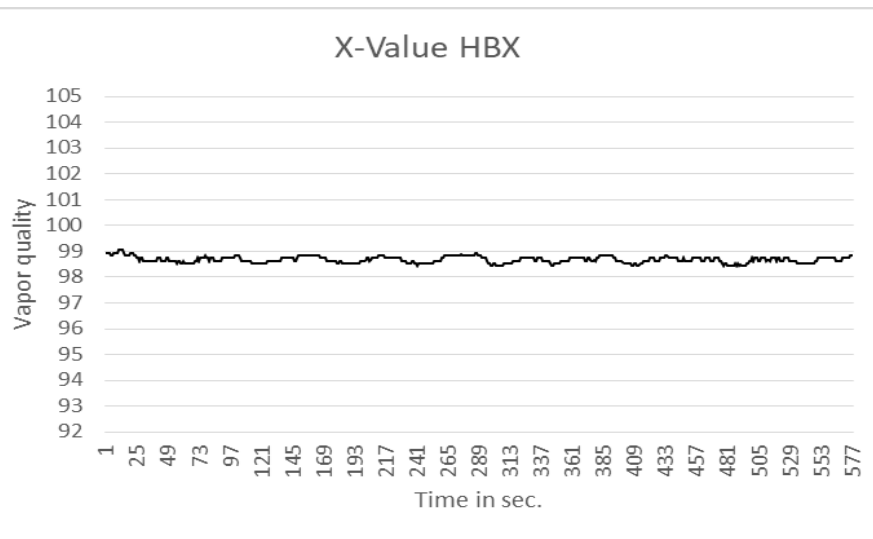


P-band: 20
Filter: 5 sec.
Speed: 0.3 %/sec.



Other values in the HB conf. tool

Optimal settings for HBX controller



P-band: 20
Filter: 5 sec.
Speed: 0.3 %/sec.

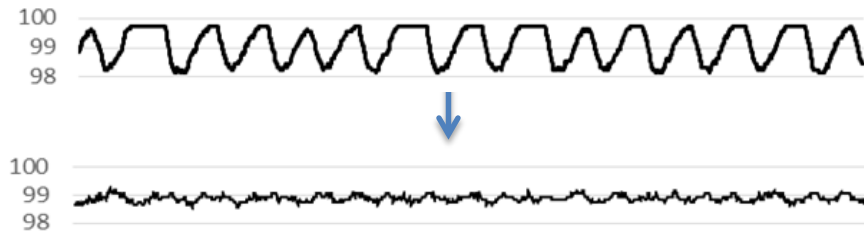
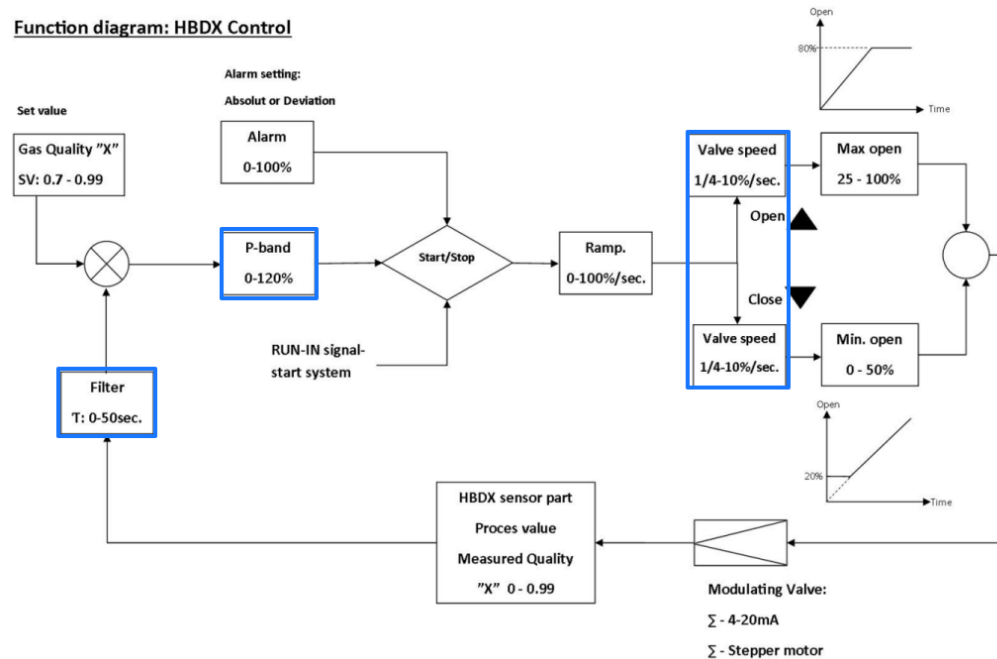


P-band: 10
Filter: 3 sec.
Speed: 0.3 %/sec.

Summary

Optimal settings for HBX controller

Function diagram: HBDX Control



Only by changing:
P-band, filter and speed

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**Thanks for
listening**