

Energy Efficiency in WWT

Choice and operation af blowers

Ove Fjordmand Country Manager,
Sulzer Pumps Denmark A/S, Odense

Vejle, 18 May 2017

How would you like to evaluate the solutions

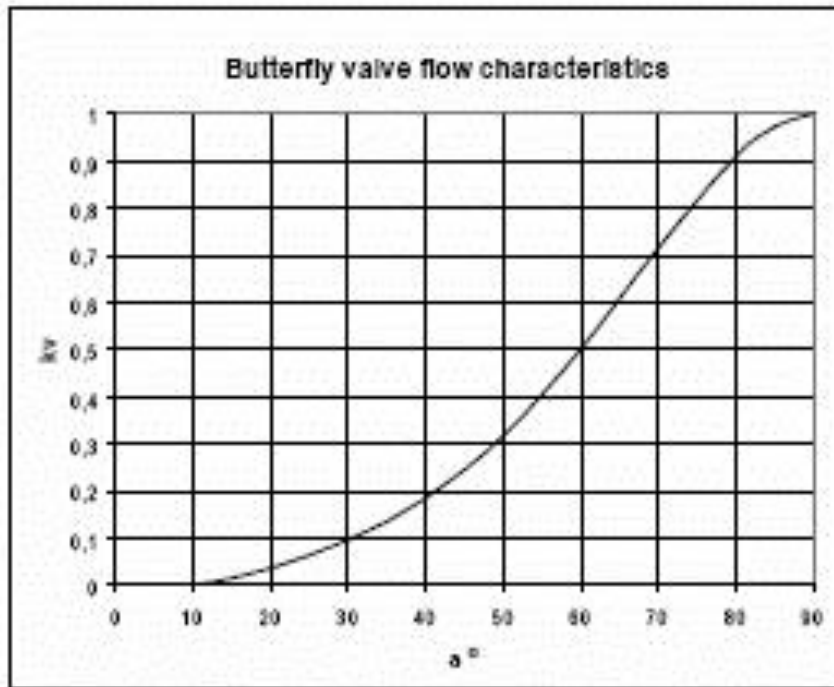
Investment or LCC

- Expected life time of the treatment plant
- What is the investment budget
- How big is your energy consumption
- What are your maintenance costs
- How many employees are there at the WWTP

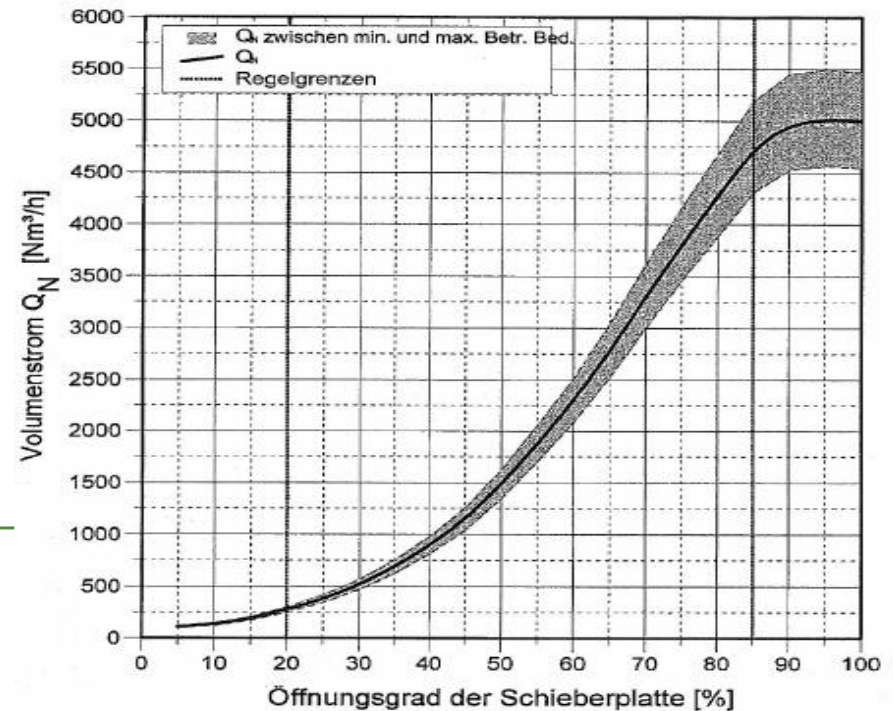
• 1000,1800

Clarification of your needs/requirements

- What is your pressure?
- Water depth
- Pressure loss in pipes
- Pressure loss in control valves
- Pressure loss in the disk diffusers



Flow characteristics for butterfly valves



Clarification of your needs/requirements

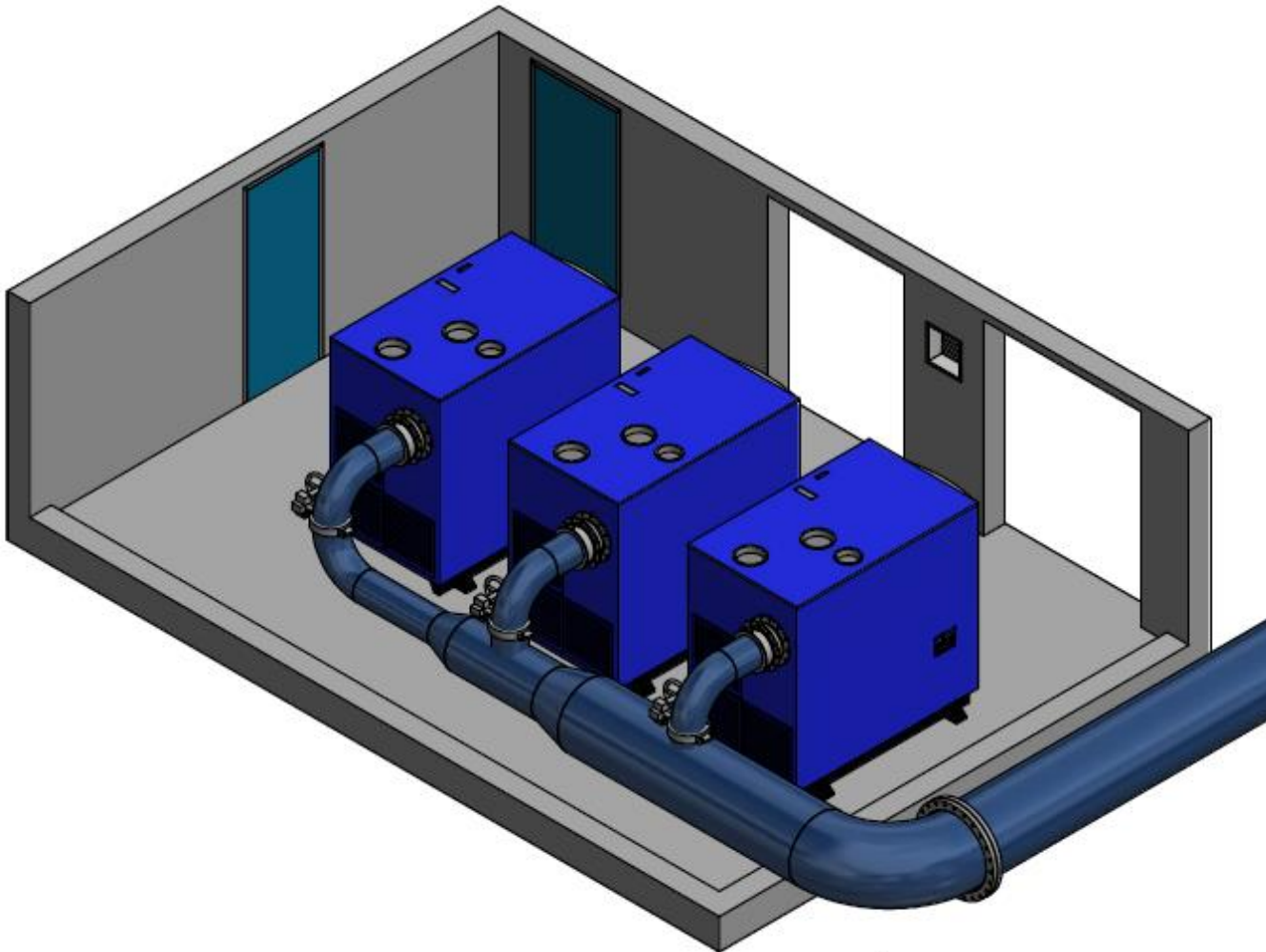


5000 Nm³, 0°C, 50 Kpa

3,5

Clarification of your needs/requirements

- Is there a building that can be used?



Clarification of your needs/requirements

- Is there a building that can be used?



Clarification of your needs/requirements

- Is there a building that can be used?
- Or must you build a new building
- Should a new building be built? Where can we build it



Clarification of your needs/requirements

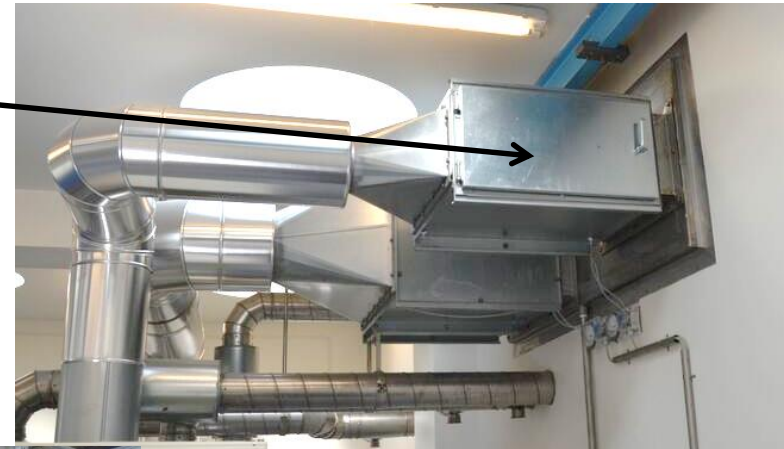
- Which noise level is acceptable inside the building ?
- Which type of noise can easily be reduced, high or low frequency noise ?
- Which noise level is acceptable outside the Building ?
- What noise requirement is there for pipe noise outside the building?



- In the room 62 db
- outside building 36 db

Clarification of your needs/requirements

- Air from the room or from the outside?
- The difference from 10°C to 20°C at 5000 Nm³, 0°C, 50 Kpa 3,4 kw
- What can be done to reduce room temperature



Clarification of your needs/requirements

- Can you use the waste energy for example to room heating ?



Clarification of your needs/requirements

Your air needs

- It is not enough to know the maximum need
- One should know the need from minimum to maximum with the number of hours in each operating point.
- You should know the need for air in each tank.
- What is the difference between the periods in which you have a big need and the periods where you have a low need
- If you do not have the required data, we need to analyze the data you have

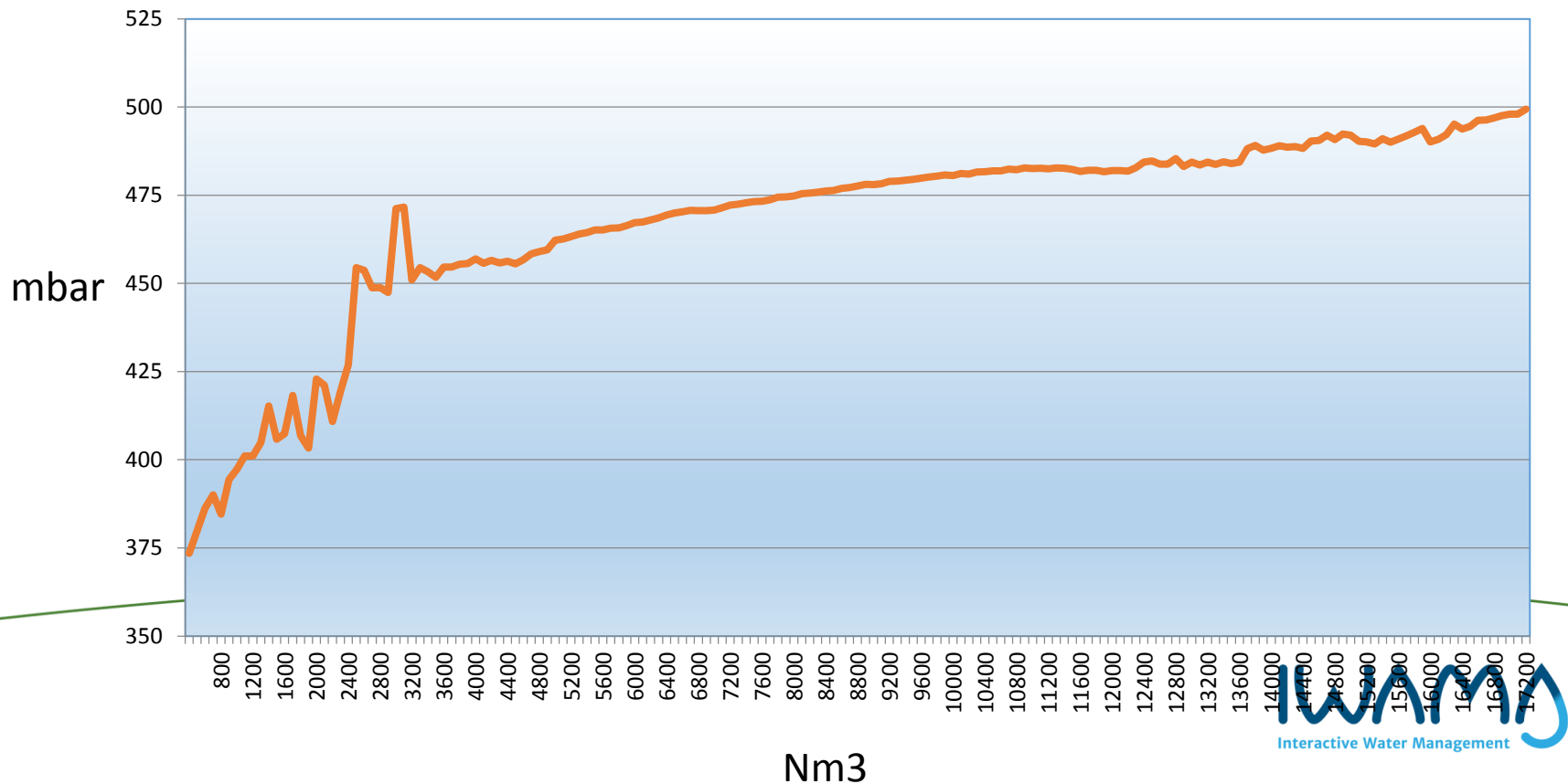
Time pressure Kw (Amp) Nm3 Cal Nm3

	antal	A	Amper	kwh måler	Energiforbrug kwh	Hz	Luftmængder m3	Bar	Mbar
2016-08-01 00:00:00.000	1	0	0	655884,5		0,00	0	0,005992	6
2016-08-01 00:01:00.000	1	0	0	655884,522 7	0,0227	0,00	0	0,005933	6
2016-08-01 00:02:00.000	1	0	0	655884,545 5	0,0227	0,00	0	0,00592	6
2016-08-01 00:03:00.000	1	0	0	655884,568 2	0,0227	0,00	0	0,005949	6
2016-08-01 00:04:00.000	1	0	0	655884,590 9	0,0227	0,00	0	0,006024	6

Clarification of your needs/requirements

Your air needs

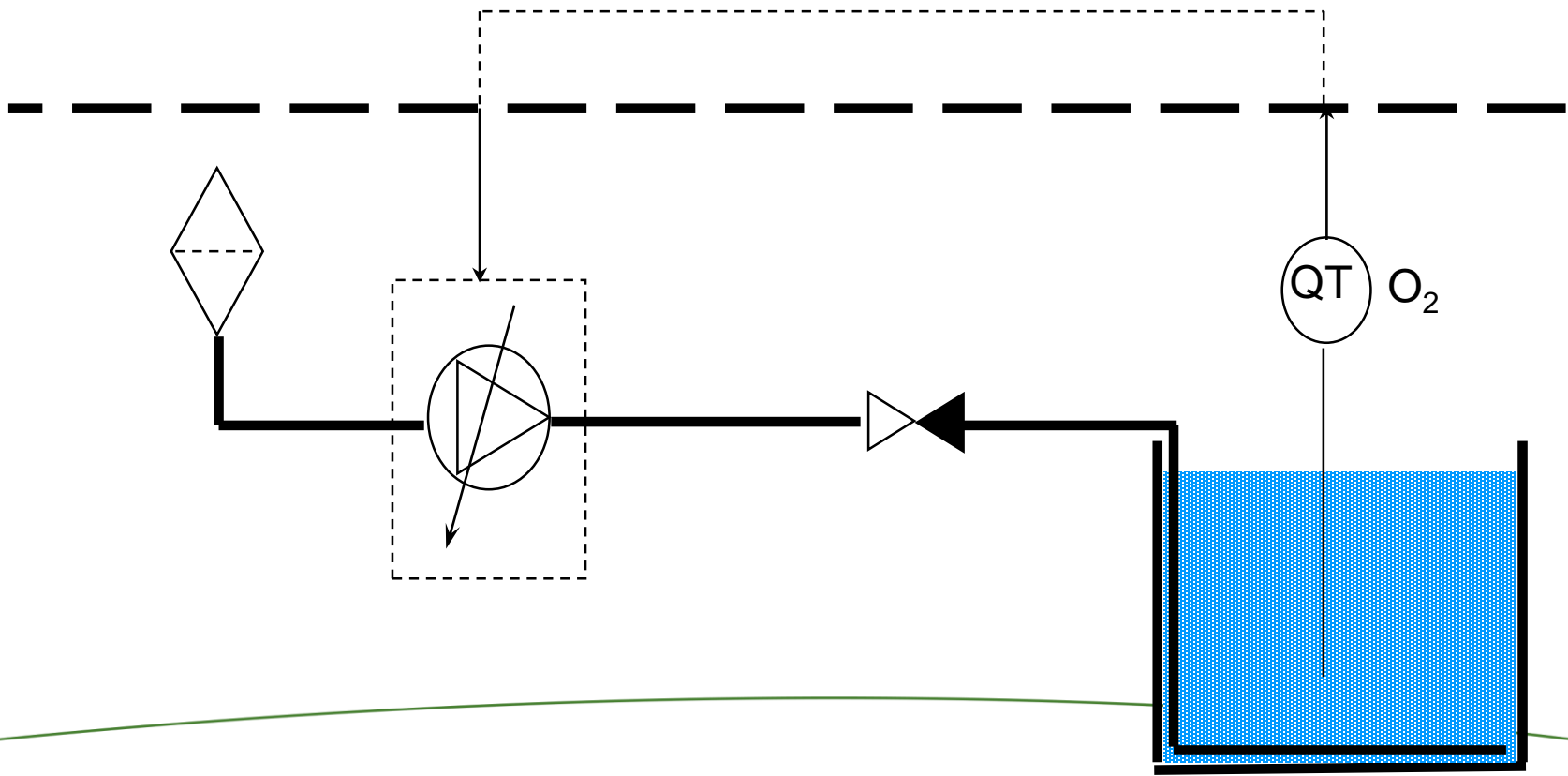
- It is usually easy to analyze the pressure. It may look like this



Clarification of your needs/requirements

Your air needs

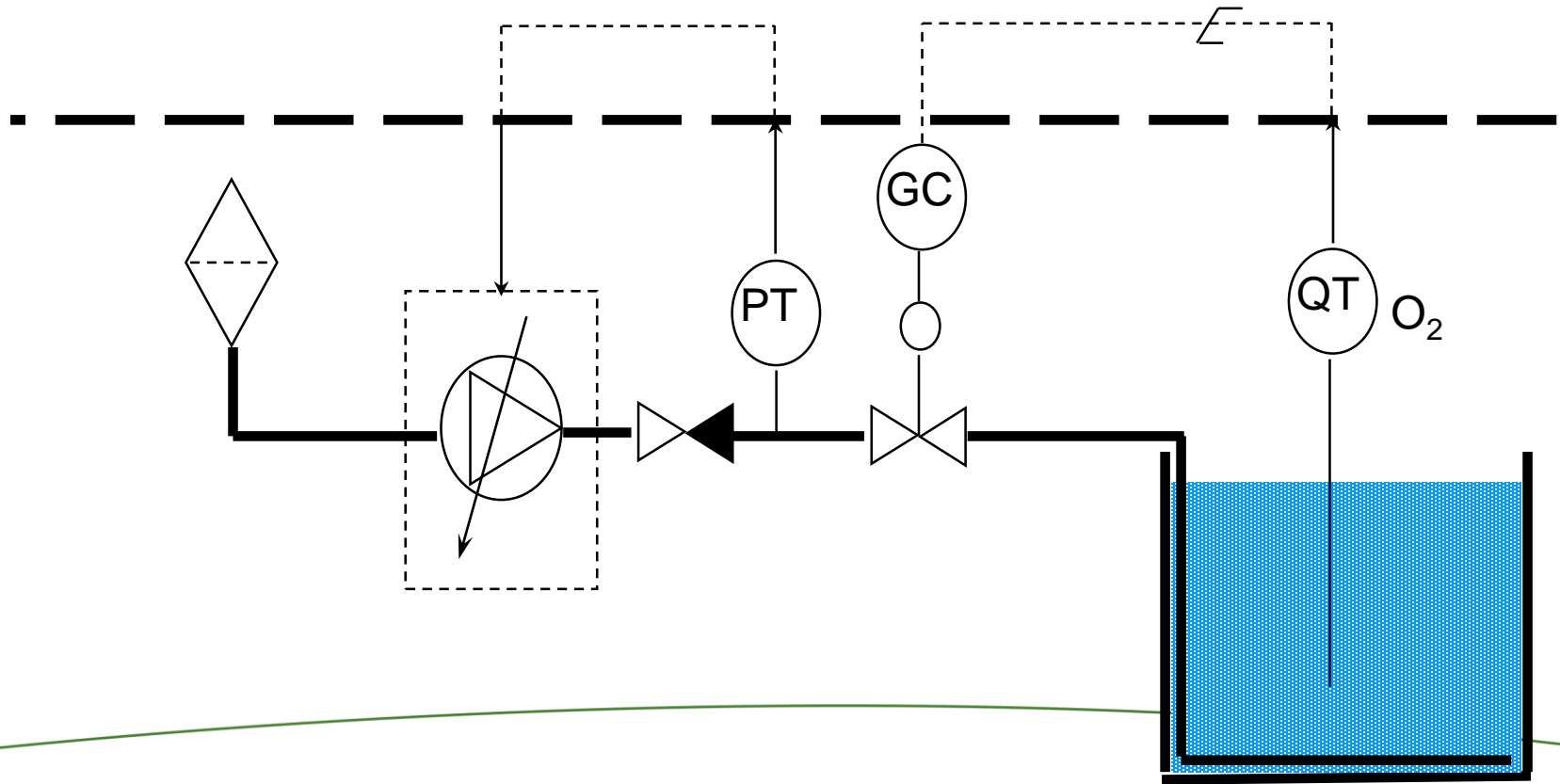
Plant control automation



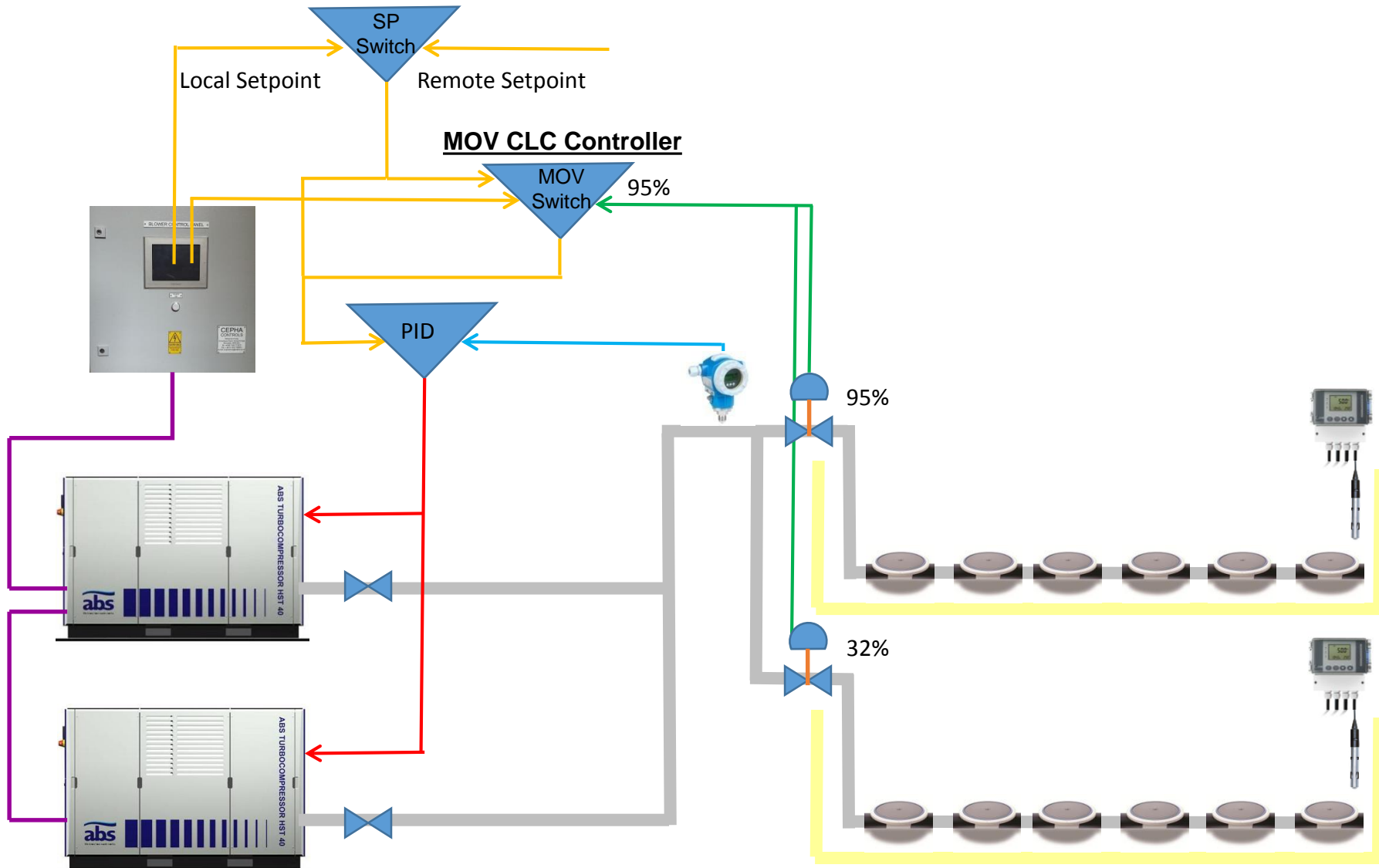
Clarification of your needs/requirements

Your air needs

Plant control automation



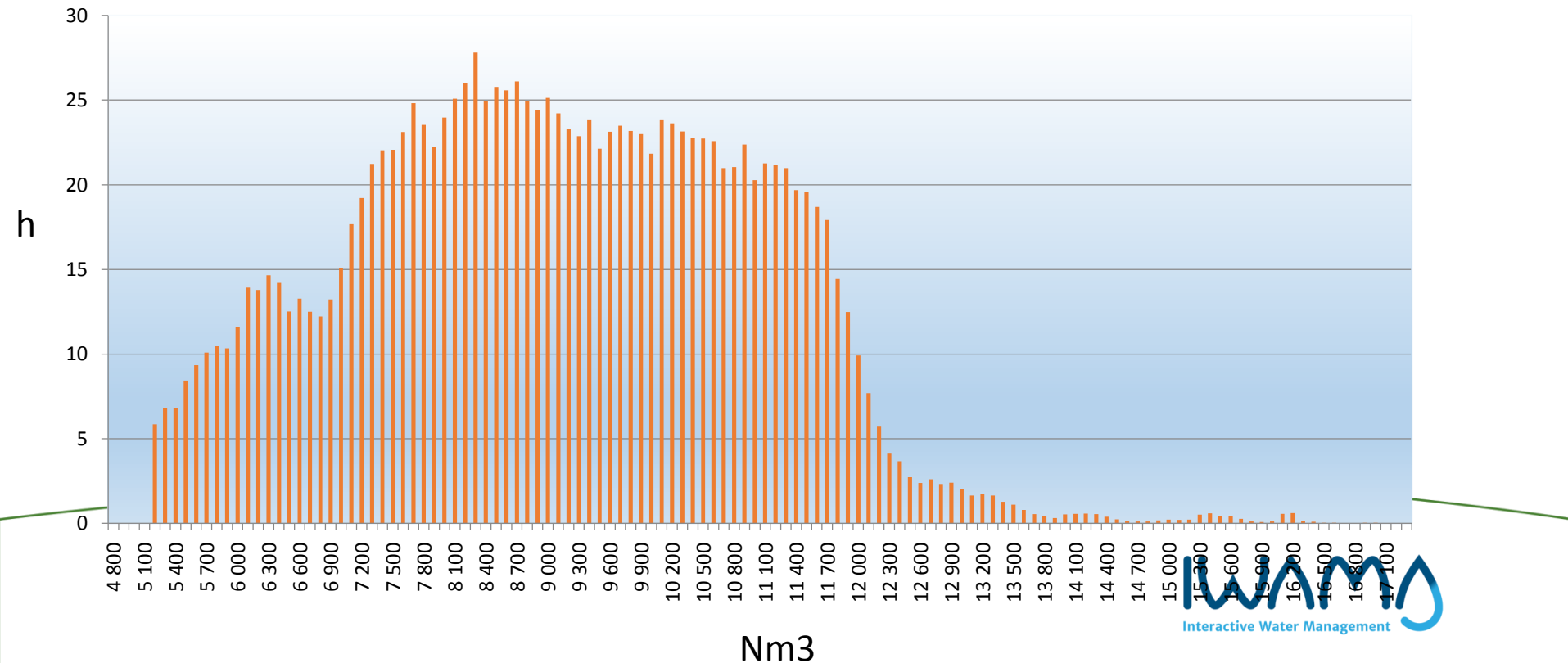
Most-Open-Valve (MOV)



Clarification of your needs/requirements

Your air needs

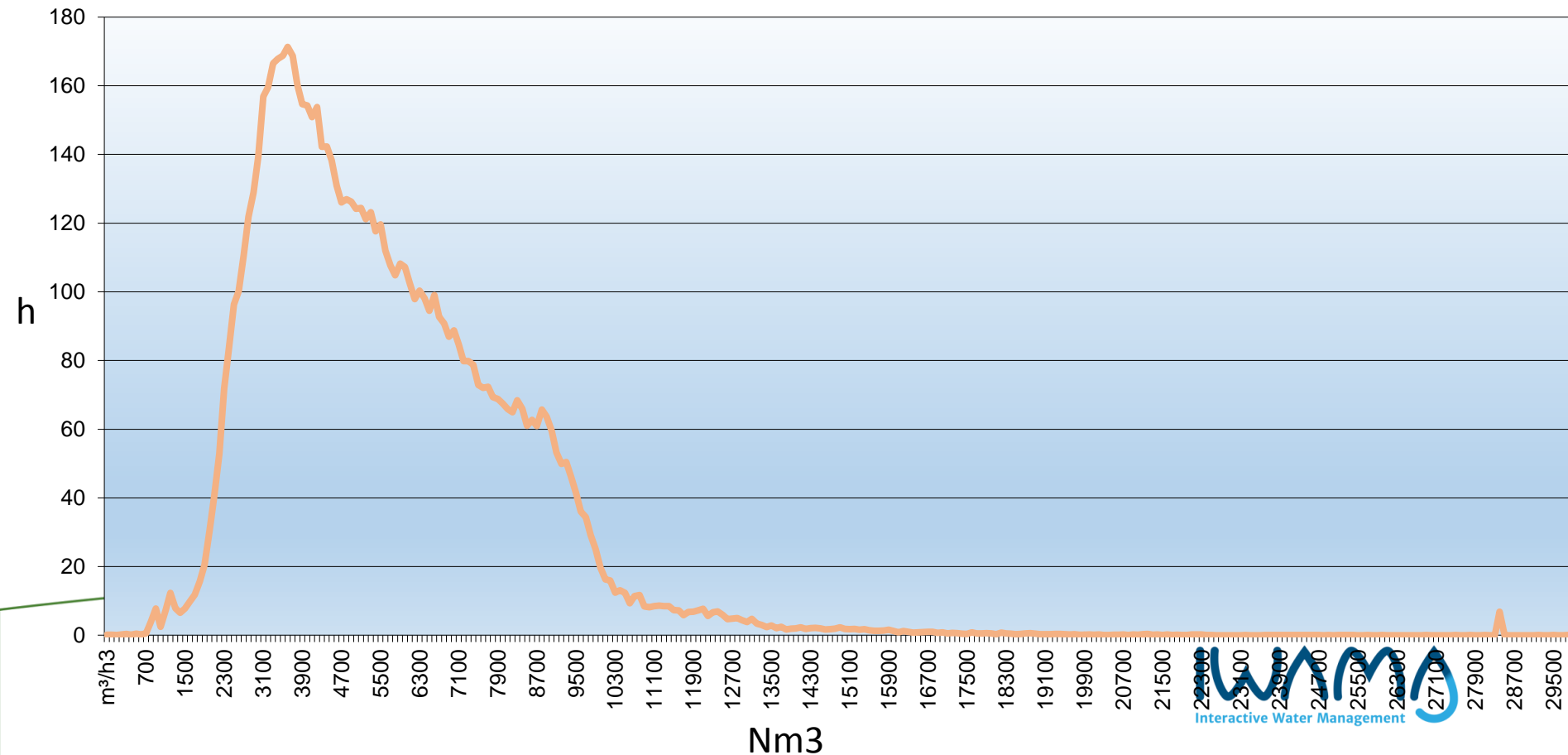
- Air consumption can be very different. It may look like this



Clarification of your needs/requirements

Your air needs

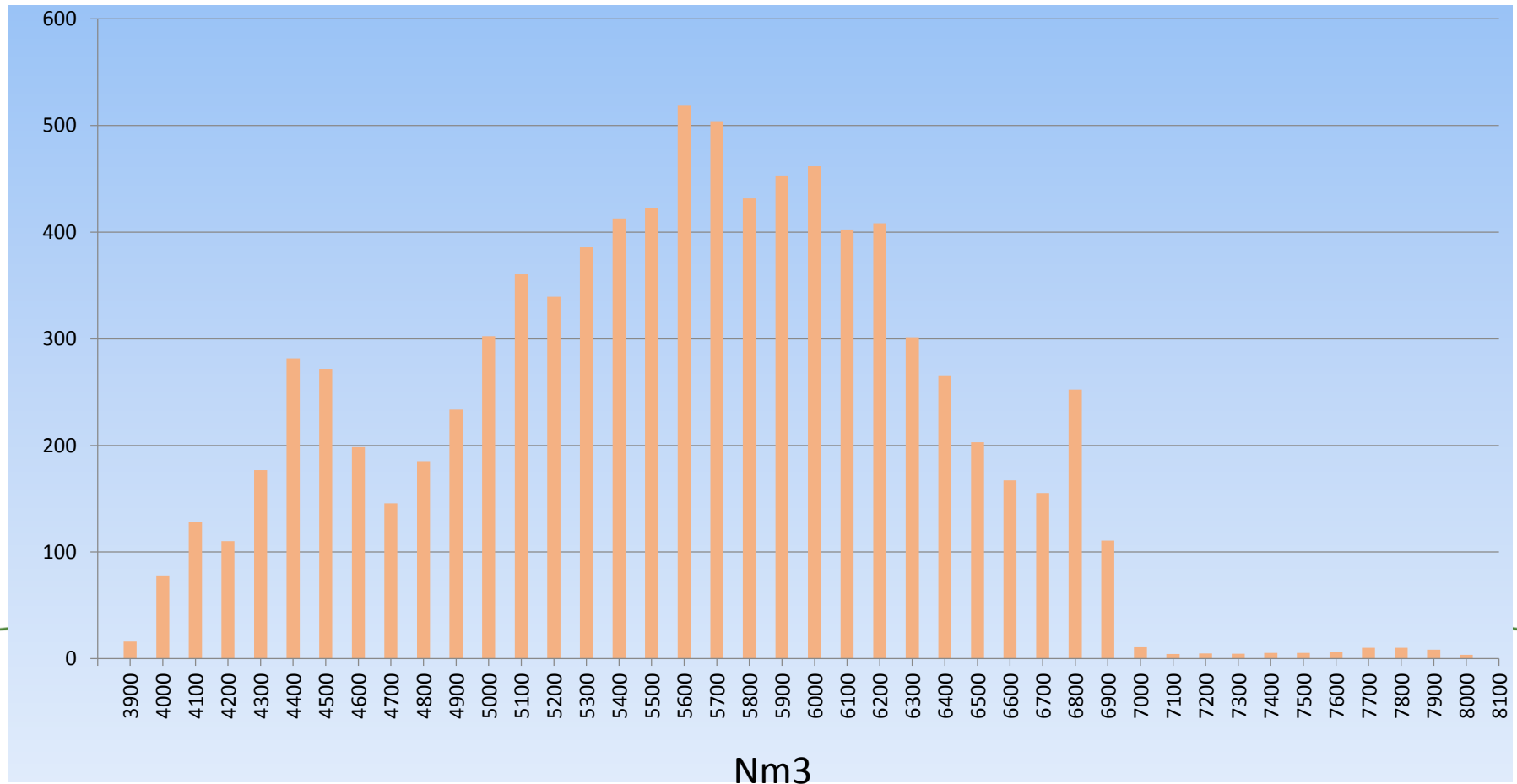
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Clarification of your needs/requirements

Your air needs

- [Air](#) consumption can be very different. It may look like this



Clarification of your needs/requirements

Your air needs

- Now we know the pressure and air consumption throughout the operation area
- You must see in the future what the need for development is

					Investment				
	Energy consumption	Energy savings	Savings in%	Savings on maintenance costs	HST	subsidies	Installation	Sum	Payback time
	DKK.	DKK.		DKK.		DKK.	DKK.	DKK.	
Current solution	5.082.724				kr.	0,48			0,69
One to one replacement	4.538.992	543.732	10,70%	60.000	3.590.000	260.992	250.000	3.579.008	8,22

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Solution with one systems									
2 stk. HST20-4500, 2 stk HST20-6000;HST40-400-1-H	4.090.412	992.312	19,52%	60.000	3.590.000	476.310	250.000	3.363.690	4,52
HST20-4500, HST20-6000, HST40-400-1-H	3.965.960	1.116.764	21,97%	70.000	2.370.000	536.047	230.000	2.063.953	2,46
2 Stk. HST20-6000, HST40-400-1-H	3.910.712	1.172.012	23,06%	60.000	2.450.000	562.566	230.000	2.117.434	2,44
HST20-6000, 2 stk HST40	3.869.209	1.213.515	23,88%	70.000	2.950.000	582.487	230.000	2.597.513	2,86
HST20-4500, 2 stk. ST40-400-1-H	3.870.137	1.212.587	23,86%	70.000	2.870.000	582.042	230.000	2.517.958	2,78

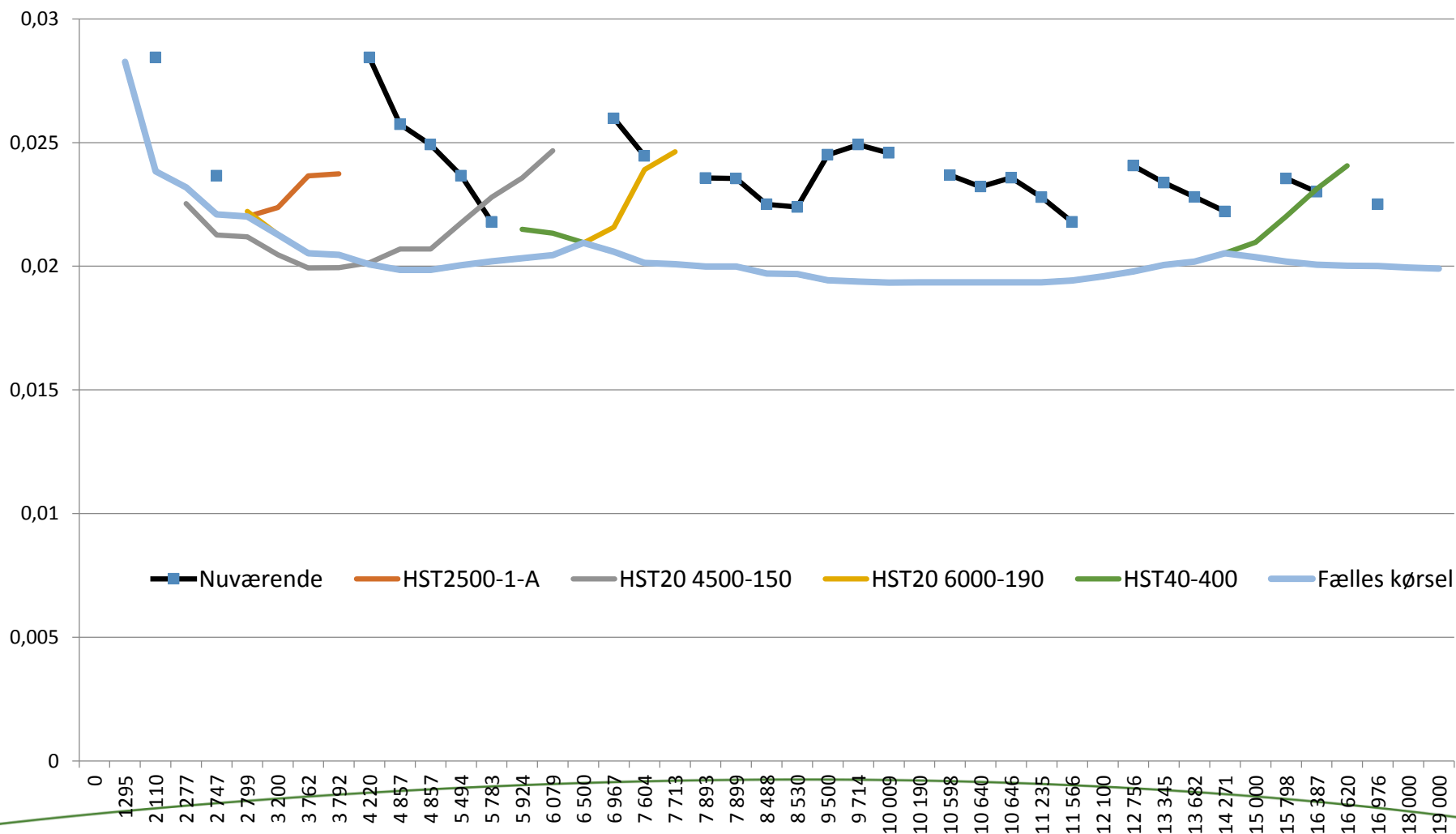
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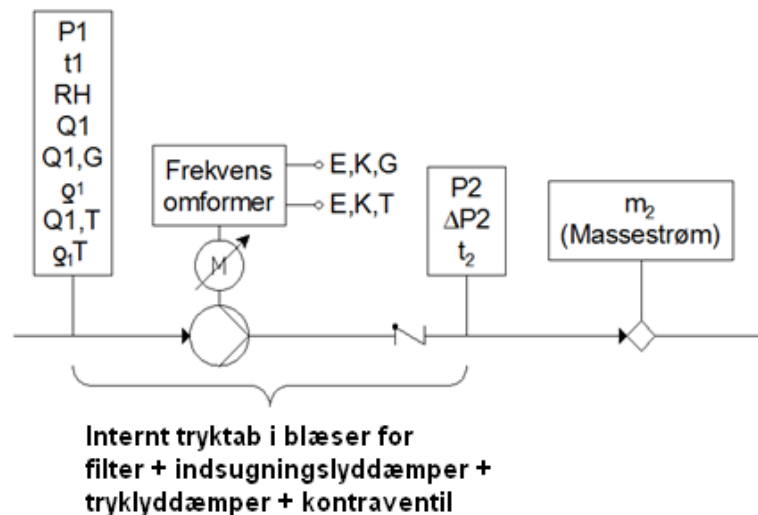
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Solution with two systems									
3 stk. HST20-6000,HST40-400-1-H	3.647.600	1.435.125	28,24%	60.000	3.100.000	688.860	250.000	2.365.140	2,39
HST20-4500, 2 stk HST20-6000,HST40-400-1-H	3.646.720	1.436.004	28,25%	60.000	3.020.000	689.282	250.000	2.315.718	2,34
HST20-4500, stk HST20-6000,2 Stk HST40-400-1-H	3.634.669	1.448.055	28,49%	60.000	3.520.000	695.066	250.000	2.694.934	2,7

Description of control



Before signing the contract

- Check that the calculations are made at the same temperature, air pressure and humidity (Check the discharge temperature from the compressor)
- Check energy consumption is given as total consumption kw
- Check that the air volume is given as free air delivered
- Energy consumption should also be expressed as the maximum energy consumption that may come. That is, the supplier must include the uncertainties that are in the norms, machine uncertainty, etc. for their energy consumption.



Before signing the contract

- Energy consumption There should be a penalty if the compressor uses more energy than promised (expensive).
- You should make a service agreement with an agreed price for service for a number of years.
- You should require a maximum noise level in the compressor room. A penalty if the noise level is high (is expensive).
- You should require a control description of the compressors
- Factory Test

Clarification of your needs/requirements

To get the best solution. Demand is

- Analysis of your data
- Strict requirements for suppliers
- The most expensive solution well can be the most economically advantageous
- A solution with several identical compressors is very rarely the best solution

questions



Ove Fjordmand
Country Manager

Sulzer Pumps Denmark A/S
Mobil +4551539067
E-mail. ove.fjordmand@sulzer.com



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