Energy Efficiency in WWT

Choice and operation of 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
Choice and operation of blowers

Clarification of your needs/requirements

5000 Nm³, 0°C, 50 Kpa
Choice and operation of blowers

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?
Choice and operation of blowers

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?
Choice and operation of blowers

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
Choice and operation of blowers

Clarification of your needs/requirements

- Air from the room or from the outside?
- The difference from 10°C to 20°C at 5000 Nm$^3$, 0°C, 50 Kpa
- What can be done to reduce room temperature
Choice and operation of blowers

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

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<th>Pressure</th>
<th>Kw</th>
<th>(Amp)</th>
<th>Nm3</th>
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</table>
Choice and operation of blowers

Clarification of your needs/requirements

Your air needs

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

Plant control automation

Clarification of your needs/requirements
Choice and operation of blowers

Clarification of your needs/requirements

Your air needs

Plant control automation

[Diagram showing various components and labels such as GT, PT, QT, O₂]
Choice and operation of blowers

**Most-Open-Valve (MOV)**

- **SP Switch**
- **Local Setpoint**
- **Remote Setpoint**
- **MOV CLC Controller**
- **PID**
- **MOV Switch**
- **95%**

- **95%**
- **32%**

Choice and operation of blowers.
Clarification of your needs/requirements

Your air needs

- Air consumption can be very different. It may look like this.
Choice and operation of blowers

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

- Air consumption can be very different. It may look like this.
Choice and operation of blowers

**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

<table>
<thead>
<tr>
<th></th>
<th>Energy consumption</th>
<th>Energy savings</th>
<th>Savings in%</th>
<th>Savings on maintenance costs</th>
<th>HST</th>
<th>subsidies</th>
<th>Installation</th>
<th>Sum</th>
<th>Payback time</th>
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<td>10,70%</td>
<td>60.000</td>
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<td>260.992</td>
<td>250.000</td>
<td>3.579.008</td>
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Solution with one systems

- 2 stk. HST20-4500, 2 stk HST20-6000; HST40-400-1-H 3.870.137 1.212.587 23,86% 70.000 2.870.000 582.042 230.000 2.517.958 2,78
- HST20-4500, HST20-6000, HST40-400-1-H 3.869.209 1.213.515 23,88% 70.000 2.950.000 582.487 230.000 2.597.513 2,86
- 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 3.905.960 1.116.764 21,97% 70.000 2.370.000 536.047 230.000 2.063.953 2,46
- HST20-4500, 2 stk. ST40-400-1-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. HST20-4500, 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
**Choice and operation of blowers**

**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

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**Solution with one systems**

- 2 stk. HST20-4500, 2 stk HST20-6000;HST40-400-1-H
  - Energy consumption: 4.090.412
  - Energy savings: 992.312
  - Savings in%: 19,52%
  - Savings on maintenance costs: 60.000
  - HST: 3.590.000
  - subsidies: 476.310
  - Installation: 250.000
  - Sum: 3.363.690
  - Payback time: 4,52

- HST20-4500, HST20-6000, HST40-400-1-H
  - Energy consumption: 3.965.960
  - Energy savings: 1.116.764
  - Savings in%: 21,97%
  - Savings on maintenance costs: 70.000
  - HST: 2.370.000
  - subsidies: 536.047
  - Installation: 230.000
  - Sum: 2.063.953
  - Payback time: 2,46

- 2 Stk. HST20-6000, HST40-400-1-H
  - Energy consumption: 3.910.712
  - Energy savings: 1.172.012
  - Savings in%: 23,06%
  - Savings on maintenance costs: 60.000
  - HST: 2.450.000
  - subsidies: 562.566
  - Installation: 230.000
  - Sum: 2.117.434
  - Payback time: 2,44

- HST20-6000, 2 stk HST40
  - Energy consumption: 3.869.209
  - Energy savings: 1.213.515
  - Savings in%: 23,88%
  - Savings on maintenance costs: 70.000
  - HST: 2.950.000
  - subsidies: 582.487
  - Installation: 230.000
  - Sum: 2.063.953
  - Payback time: 2,44

**Solution with two systems**

- 3 stk. HST20-6000,HST40-400-1-H
  - Energy consumption: 3.647.600
  - Energy savings: 1.435.125
  - Savings in%: 28,24%
  - Savings on maintenance costs: 60.000
  - HST: 3.100.000
  - subsidies: 688.860
  - Installation: 250.000
  - Sum: 2.365.140
  - Payback time: 2,39

- HST20-4500, 2 stk HST20-6000,HST40-400-1-H
  - Energy consumption: 3.646.720
  - Energy savings: 1.436.004
  - Savings in%: 28,25%
  - Savings on maintenance costs: 60.000
  - HST: 3.020.000
  - subsidies: 689.282
  - Installation: 250.000
  - Sum: 2.315.718
  - Payback time: 2,34

- HST20-4500, stk HST20-6000,2 Stk HST40-400-1-H
  - Energy consumption: 3.634.669
  - Energy savings: 1.448.055
  - Savings in%: 28,49%
  - Savings on maintenance costs: 60.000
  - HST: 3.520.000
  - subsidies: 695.066
  - Installation: 250.000
  - Sum: 2.694.934
  - Payback time: 2,7
Description of control

Choice and operation of blowers

Nuværende HST2500-1-A

HST20 4500-150

HST20 6000-190

HST40-400

Fælles kørsel

Interactive Water Management
Choice and operation of blowers

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
Choice and operation of blowers

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
Choice and operation of blowers

**questions**
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