

## **Borås Treatment Plant, the Gässlösaverket, rebuilt for reduction of nitrogen and to meet future requirements. Landia A/S has supplied the mixers**

**Borås Treatment Plant, the Gässlösaverket, is situated at the river Viskan which is also the recipient. The plant is the largest single discharge to the Viskan, and since the water does not pass any lakes on its way to the sea, the reduction of nitrogen is small. Due to requirements with regard to the reduction of nitrogen discharge set out by the Swedish environmental authorities, the Borås municipality decided in 1991 to set aside money for rebuilding of the treatment plant**

The rebuilding took place in 4 phases. Phase 4 included a rebuilding of the existing activated sludge part. This part consists of three parallel lines, six aeration basins with a total volume of 10,600 m<sup>3</sup>.



Each of the three lines consists of two equally sized basins and a basin with a volume of approx. 15 % of the total volume. During alternating operation the wastewater is led to the two major basins. They are connected to one another by an opening at one of the ends. The outlet from the two major basins to the small basin takes place by means of automatically controlled overfall gates.

Bottom aerators controlled by oxygen meters placed in each basin are installed for the addition of air.

The operation includes different phases in order to create aerobic and anoxic conditions resp., in the aeration basins.

During the anoxic phase the medium is kept mixed by means of mixers.

### **Mixer installation, the Gässlösaverket**

The activated sludge part at the Gässlösaverket in Borås consists of six aeration basins with the dimensions as shown on fig. 21202-10

Each basin has a volume of approx. 1,700 m<sup>3</sup>. Mixers are installed in all aeration basins. In the basins DN1 – DN4 three pcs of Landia POP-I 3,0 kW-180 rpm mixers are installed in each basin, i.e. 12 mixers for 4 basins.

In the remaining two basins, DN5 and DN6, 11 and 10 pcs of 1.5 kW mixers of a different brand are installed, i.e. 21 mixers for 2 basins.

### **Dimensioning**

Landia's dimensioning of mixers for the Gässlösaverket is based on many years of experience from national and international treatment plants.

All projects in which Landia is involved are handled by our project department where the dimensioning for a specific project is discussed among the project engineers. The project engineer who is responsible for the specific project determines the correct type of installation equipment based on tank drawings from the tank design engineer. We pay much attention to the fact that the equipment must be of a high quality and produced in materials specified by the customer. Furthermore, the equipment must fit completely when delivered and it should be easy to mount. We believe that one person only should be able to maintain the units.

### **The project Gässlösaverket, Borås Municipality**

Landia was given the task of sizing the mixers for the activated sludge part at the Gässlösaverket.

Having a length of 64.4 meter and a width of 4.4 meter the basins were not at all ideal as far as hydraulic is concerned. However, Landia met the challenge and found that the correct mixer sizing was three pcs of POP-I 3.0 kW-150 rpm per basin.

The 12 mixers were delivered and installed during the summer of 1997.



### Control

A part of Landia's after sales service is the continued contact to the customer. This was also the case with the Gässlösaverket. The feedback which we received was that the process worked as planned. No problems with sedimentation, inadequate mixing nor air aspiration in the anaerobic phases.

With the accept of works manager Mr Jöran Eriksson at the Gässlösaverket we had the opportunity of

carrying out a comparative test of both the energy consumption and the mixing in the tanks.

Measurements were made for the three Landia POP-I 3.0 kW-150 rpm units in basin DN 1 and 8 of the direct driven 1.5 kW mixers in basin DN 5 and DN6.

The mixing is controlled by means of dry matter measurements in basin DN 1 and DN 5.

### Measurement of power consumption, basin DN 1, 3 pcs of Landia POP-I 3.0 kW

Mixer, pos. no.	Consumed power P1 kW	Power consumption A	Cos φ	Voltage Volt
DN 1.01	3.804	7.31	0.78	396
DN 1.02	3.873	7.74	0.74	395
DN 1.03	3.549	7.20	0.73	395
<b>Average</b>	3.742	7.42	0.75	395

### Measurement of power consumption basin DN 5, 4 pcs of 1.5 kW , different brand. 11 mixers in total in this basin.

Mixer, pos. No.	Consumed power P1 kW	Power consumption A	Cosφ	Voltage Volt
DN 5.02	1.24	3.91	0.46	399
DN 5.03	1.34	4.15	0.47	398
DN 5.04	1.07	3.54	0.44	401
DN 5.05	1.03	3.36	0.44	399
<b>Average</b>	1.17	3.74	0.45	399

### Measurement of power consumption basin DN 6, 4 pcs of 1.5 kW, different brand. 10 mixers in total in this basin.

Mixer, pos. No.	Consumed power P1 kW	Power consumption A	Cos φ	Voltage Volt
DN 6.01	1.25	3.56	0.51	399
DN 6.02	1.41	4.02	0.51	398
DN 6.03	1.38	3.64	0.55	400
DN 6.05	1.12	3.40	0.48	402
<b>Average</b>	1.29	3.66	0.51	400

### Comparison of energy consumption

In basin DN1 3 pcs of Landia POP-I 3.0 kW-150 rpm mixers are installed. As a total they consume 11.2 kW from the mains, resulting in an installed power of 6.4 W/m<sup>3</sup> at a volume of 1,760 m<sup>3</sup>.

In basin DN 5 11 pcs of 1.5 kW mixers of a different brand are installed. As a total they consume 12.9 kW resulting in an installed power of på 7.3 W/m<sup>3</sup>.

Finally, in basin DN 6 10 pcs of 1.5 kW mixers of a different brand are installed. They also consume a total of 12.9 kW resulting in an installed power of 7.3 W/m<sup>3</sup>.

### Dry matter measurements in basin DN 1, 3 pcs of Landia POP-I 3.0 kW

	Measuring point T1	Measuring point T2	Measuring point T3
<b>Bottom</b>	345	330	320
<b>Top</b>	345	325	330
<b>Average</b>	345	327.5	325

### Dry matter measurements in basin DN 5, 11 pcs of 1.5 kW different brand

	Measuring point T4	Measuring point T5	Measuring point T6
<b>Bottom</b>	340	350	345
<b>Top</b>	325	345	370
<b>Average</b>	332.5	347.5	357.5

### Comparison of dry matter measurements

Basin DN 1, 3 pcs of Landia POP-I 3.0 kW-150 rpm.

The average of the 6 measurements showed a relative SS-content of 332.5 ml/l.

Highest value: 345 ml/l in point T1 (same value at bottom and top).

Lowest value: 320 ml/l in point T3 at the bottom.

This results in a deviation of 3.8% at both the highest and the lowest value. As the acceptable deviation from the average is +/- 10 %, you must say that the job has been solved satisfactorily.

Basin DN 5, 11 pcs of 1.5 kW direct driven mixers of a different brand.

The average of the measurements was 345.8 ml/l.

Highest value: 370 ml/l in point T6, top, corresponding to a deviation of + 7,0 %.

Lowest value: 325 ml/l in point T4, top, corresponding to a deviation of - 6,0 %.

In this basin the job has also been solved satisfactorily.



### Conclusion of control at the Gässlösaverket

As far as energy consumption and homogenization of the medium are concerned the measurements at the

Gässlösaverket showed only marginal differences in the basins where the measurements were carried out. The real difference is the number of mixers. Landia has installed 3 mixers in each basin, against 10 and 11 mixers resp. of a different brand in the remaining two basins.

Naturally, it is always preferable to install as few mixers as possible for a given job. Please see the following advantages:

- lower purchase price
- reduced mounting costs
- less expensive contract work for the electrical installations due to less cabling, reduced costs to electrical boards and SCADA system, if necessary.
- reduced costs for wear parts
- reduced stock of spare parts
- less man hours for maintenance
- often a reduced energy consumption

The control at the Gässlösaverket clearly shows the advantages which can be obtained by selecting slow-speed instead of high-speed mixers.

