HOW A SIMPLE BENCH-SCALE TEST GREATLY IMPROVED THE PRIMARY TREATMENT PERFORMANCE OF FINE MESH SIEVES

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ABSTRACT

In Norway fine mesh sieves are frequently used for primary treatment or as the only treatment before wastewater is discharged to coastal waters. The reasons for this are the intensive product development of fine mesh sieves taking place in Norway, and the significantly reduced investment costs and space requirements compared to other primary treatment processes. Historically the design of these sieves was not very sophisticated. The goal of this R & D was to develop a fairly simple test procedure that can be used to characterize wastewater, establish design criteria for fine mesh sieves and predict removal efficiencies for full-scale plants under different operating conditions. The bench-scale test procedure was verified at several full-scale municipal wastewater treatment plants that used different types of fine mesh sieves (rotating belt, rotating disc, rotating drum, stationary), by comparing the bench-scale test results to the full-scale results. To achieve high removal efficiencies it was crucial to operate the sieves with a filter mat. Rotating belt sieves performed best in the full-scale tests. Properly operated the rotating belt sieves consistently removed more than 50 % SS and 20 % BOD₅, as required by the European Union for primary treatment. Fine mesh sieves with pumped influent should have frequency controlled pumps to avoid on/off operation. At plants with several sieves in parallel, all sieves should be running even at low water flows. This will enable operation with thick filter mats and high removal efficiencies. Simple screw presses dewatered the sludge from the sieves to typically 25 – 30 % total solids. Using fine mesh sieves with < 500 microns openings was found to normally be the most economical process for primary treatment.

KEYWORDS

Bench-scale test, filter mat, fine mesh sieves, primary treatment, wastewater characterization.

INTRODUCTION

In Norway fine mesh sieves are frequently used for primary treatment or as the only treatment before wastewater is discharged to coastal waters. The reasons for this are the intensive product development of fine mesh sieves taking place in Norway, and the significantly reduced investment costs and space requirements compared to other primary treatment processes. Historically the design of these sieves was not very sophisticated. The hydraulic capacity was decided based on a given suspended solids (SS) concentration for the wastewater and the mesh size of the sieve cloth. Mesh sizes were more or less randomly selected in the 350 to 850 microns range. Removal efficiencies at full-scale plants ranged from acceptable to very poor,
and even for sieves with identical mesh sizes there were large differences in performance. Some cities experienced that sieves with large openings actually performed much better than sieves with significantly smaller openings. The initial response was to blame this on faulty sampling or analysis, but when this was ruled out they had to look for another explanation.

At Aquateam we believed a logical explanation could be found for these odd results, if we had a good characterization of the wastewater and a good understanding of how the different fine mesh sieves were constructed and operated. The goal of our research was to develop a fairly simple test procedure that could be used to characterize the wastewater, establish design criteria for fine mesh sieves and predict removal efficiencies for full-scale plants under different operating conditions.

Due to the European Union (EU) requirements for wastewater treatment, the Norwegian State Pollution Control Agency (SFT) took an interest in whether or not it was possible to design and operate fine mesh sieves in such a way that they would fulfill the European Union requirements for primary treatment. Partial funding for Aquateam’s work to develop a bench-scale test for predicting fine mesh sieve performance was therefore obtained from an SFT sponsored R&D program on evaluation and testing of different technologies for primary treatment.

The European Union primary treatment requirements are at least 20 % removal of organic matter (measured as BOD₅) and 50 % removal of suspended solids (SS). For treatment plants with 12 control samples per year at least 10 samples must fulfill the requirements. For treatment plants with 24 control samples per year at least 21 samples must fulfill the requirements. This is a lot stricter than looking at average removal efficiencies and the R&D program showed that an average SS-removal of about 65 % was necessary for enough samples to pass the 50 % removal requirement.

BENCH-SCALE TEST APPARATUS AND PROCEDURE

Good characterization of the wastewater is very important in order to predict what removal efficiencies and hydraulic capacities that can be expected for a given sieve. As a tool for such a characterization a simple bench-scale test apparatus was developed (Rusten, 2004). Two different procedures, one simple and the other more complicated, were tested (Rusten and Lundar, 2004a). They gave identical results and therefore the simple test procedure was later used for all the verification testing at full-scale plants. Only the simple test procedure, referred to as the “grab sample test”, will be described in detail. However, one set of results from the more complicated test procedure, referred to as the “composite sample test”, will be presented for comparison.

Test apparatus

A simplified sketch of the test apparatus is shown in Figure 1. The basic idea was to have a holder for pieces of the sieve cloth to be tested, with a reservoir on top that made it possible to measure how much wastewater that went through the sieve cloth and how fast this wastewater went through the sieve cloth. The reservoir had to be transparent to be able to follow the water level. It had to be easy to change the sieve cloth, and the connection between the top and bottom
of the apparatus had to make sure that there were no leaks where water could leave the reservoir without going through the sieve cloth. A screw coupling was used to keep the top and the bottom together during testing. Instead of using an o-ring to seal the connection, each test piece of sieve cloth had a silicone seal around the circumference. The transparent PVC tube for the water reservoir had an outer diameter of 110 mm and a wall thickness of 5.3 mm.

**Figure 1 – Simplified sketch of bench-scale apparatus for characterization and testing of wastewater with regard to treatment by fine mesh sieves.**

Any mesh size sieve cloth can be used, but for our experiments test pieces with mesh sizes of 550 microns, 350 microns, 250 microns, 150 microns and 55 microns were selected. Circular test pieces were cut to fit inside the test apparatus and the circumferences of all the test pieces were sealed with silicone.

Photos of the test equipment in use are shown in Figure 2, together with photos of a 350 microns sieve cloth prior to testing and after development of a filter mat. It can be seen that a fairly uniform filter mat covered the entire surface area inside the silicone seal. When the top unit is
screwed on, the silicone seal at the circumference of the sieve cloth will form a water tight connection.

Figure 2 – Photos of bench-scale test apparatus in use (top) and a 350 microns sieve cloth prior to testing and after development of a filter mat (bottom).
Test procedure

Wastewater to be tested was collected in batches large enough to run all the planned tests. Normally 50 to 80 liters of wastewater was collected. The wastewater for each batch was placed in a large tank, where it could be vigorously stirred prior to taking wastewater out of the tank for analysis or to put through the test apparatus.

Samples of the wastewater filtered through the sieve cloths were taken of the first liter of wastewater filtered, when the sieve cloth was clean. Then more wastewater was added until a build-up of particles on the sieve cloth had formed a filter mat. Tests with a filter mat simulated operation of a fine mesh sieve with a significant pressure drop over the sieve cloth and a low hydraulic load.

The transparent PVC tube of the apparatus had marks at 200 mm and 300 mm above the surface of the sieve cloth. After the first liter of wastewater was filtered through the sieve cloth, the valve at the bottom of the apparatus was closed and more wastewater was added. Then the valve was partially opened, allowing the water level in the PVC tube to drop at a rate of 3 to 4 cm/s. When a proper filter mat had formed on the sieve cloth, the valve was opened all the way and filtered wastewater was collected while the water level dropped from the 300 mm mark to the 200 mm mark. The time it took for the water level to drop from 300 mm to 200 mm was also recorded. For most test runs this procedure was done repeatedly after more wastewater had been added and a thicker filter mat had developed, resulting in a longer period of time for the water level to drop from the 300 mm to the 200 mm mark. This was the simplest test procedure, referred to as the “grab sample test”.

For the more complicated “composite sample test” all the wastewater going through the sieve cloth was collected in a number of containers. At every step of the test where a sample was required, a flow proportional composite sample was made from the contents of these containers. The time it took for the water level to drop from the 300 mm mark to the 200 mm mark, with a completely open valve, had to be recorded for all the wastewater going through the sieve cloth. This drop in water level happened real fast until a filter mat was developed and accurate time recording was crucial.

All water samples were analyzed for total COD (TCOD), filtered COD (FCOD) and suspended solids (SS). Dr. Lange technology (Dr. Lange, 2000) was used for COD analysis. Glass fiber filters (Whatman GF/C) were used for filtration and to measure SS.

BENCH-SCALE TEST RESULTS

Altogether bench-scale tests were carried out with wastewater from 11 different municipal wastewater treatment plants (WWTP) in Norway. Initial testing was performed with wastewater from three plants in the south-east part of Norway and the compositions of the different batches of wastewater are shown in Table 1. The fraction of filtered COD (FCOD/TCOD-ratio) ranged from 0.18 to 0.49, and the SS concentration ranged from 138 to 807 mg/L.
Table 1 - Composition of the municipal wastewater used for the initial bench-scale testing.

<table>
<thead>
<tr>
<th>Plant/Batch</th>
<th>Time of day</th>
<th>Concentrations, mg/L</th>
<th>FCOD/TCOD-ratio</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SS</td>
<td>FCOD</td>
<td>TCOD</td>
</tr>
<tr>
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<td>9:30a</td>
<td>148</td>
<td>65</td>
<td>267</td>
</tr>
<tr>
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<td>414</td>
<td>221</td>
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<tr>
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<td>11:00a</td>
<td>807</td>
<td>159</td>
<td>897</td>
</tr>
<tr>
<td>TAU 2</td>
<td>1:15p</td>
<td>138</td>
<td>97</td>
<td>198</td>
</tr>
<tr>
<td>TAU 3</td>
<td>2:40p</td>
<td>153</td>
<td>104</td>
<td>236</td>
</tr>
<tr>
<td>GRA 1</td>
<td>12:45p</td>
<td>300</td>
<td>122</td>
<td>502</td>
</tr>
</tbody>
</table>

1 NFR = Nordre Follo WWTP; TAU = TAU WWTP; GRA = Gardermoen WWTP

Without filter mat on the sieve cloth

For the first liter of sample going through a clean sieve cloth, there will be no or only an insignificant filter mat. Thus only particles larger than the openings in the sieve cloth will be removed, and these initial samples will provide a good picture of the size distribution of particles in the influent wastewater.

Based on the first liter of sample from sieve cloths with mesh sizes of 350, 250, 150 and 55 microns, Figure 3 shows the SS concentrations (a), the percent SS removal (b), the TCOD concentrations (c) and the percent TCOD removal (d) for wastewater from the three plants listed in Table 1. “No cloth” is the same as the influent sample. There were great differences between the different tests, with regard to both concentrations and particle size distributions.

Generally speaking, most of the particulate material was either smaller than 55 microns or larger than 350 microns. The exception was the batch of fairly dilute wastewater designated TAU 2, where less than 4 % of the particles were larger than 350 microns. The SS-concentration curves were surprisingly flat from the 350 microns to the 55 microns mesh sizes. The amount of particles in the range from 55 microns to 350 microns varied from 12 % to 22 %, with an average of 17 %. For the tested wastewaters this shows that it is limited how much the removal efficiency can be improved by choosing a sieve with smaller openings. Unless the wastewater contains a large amount of particles bigger than 350 microns, more than 50 % removal of SS can not be achieved by using a sieve cloth without a filter mat. With a 250 microns mesh size only one batch of wastewater (GRA 1) achieved more than 50 % removal of SS. Even with a mesh size of 55 microns, the wastewater from the TAU WWTP was nowhere close to achieve the EU required 50 % removal of SS.
Figure 3 – Concentrations and removal efficiencies for SS (a, b) and total COD (c, d) after going through sieve cloths with given openings. Measured with clean sieve cloths without filter mats, using wastewater from three plants in south-east Norway.

There were also great differences between the different batches of wastewater with regard to TCOD concentrations and TCOD removal efficiencies. The EU requirement of 20 % removal of BOD₅ is roughly speaking equivalent to 25 % removal of COD. Figure 3 (b, d) shows that it was easier to achieve 25 % TCOD removal than 50 % SS removal. Two of the wastewater batches (NFR 1, and GRA 1) achieved 33 to 35 % TCOD removal with a 250 microns sieve cloth. These wastewater batches had low FCOD/TCOD-ratios of 0.24. The batch with a lot of septage (TAU 1) had a very low FCOD/TCOD-ratio, but the fraction of particles larger than 250 microns was too small to achieve good removal of COD.

With filter mat on the sieve cloth

Comparing “grab sample test” and “composite sample test”. Simulating fine mesh sieves operated with a filter mat on the sieve cloth, the “grab sample test” and the “composite sample test” were compared using wastewater from the Nordre Follo WWTP (batch NFR 2). The results are shown in Figure 4 as a function of the sieve rate. For the “grab sample test” the sieve rate is the rate through the test apparatus at the time of taking the grab sample, while for the “composite sample test” the sieve rate is the average rate for all the wastewater that had passed through the
sieve cloth up to the time the last split sample was taken. The sieve rates are given as m$^3$ of wastewater per m$^2$ of sieve cloth area per hour (m$^3$/m$^2$/h).

**Figure 4 – Effluent concentrations (a) and removal efficiencies (b) for SS, shown as a function of the sieve rates.** Results are for wastewater from the Nordre Follo WWTP (batch NFR 2), using two different bench-scale test procedures.
The two different test procedures gave similar results, and it was decided to use the significantly simpler “grab sample test” as the standard bench-scale test procedure for all future tests. The tests also revealed that with filter mats on the sieves the removal efficiencies were completely independent of the sieve openings and only dependent on the hydraulic flow rate through the sieve cloth. The hydraulic flow was a function of the filter mat developed on the sieve cloth, and a thick filter mat would result in a low flow rate. For the wastewater in Figure 4, SS removal of 75 % was achieved at the very low sieve rates of 3.5 – 4.0 m³/m²/h. The removal efficiencies decreased at increasing sieve rates, and fell below 50 % removal of SS at sieve rates above 30 m³/m²/h. The two data points at the far right were run with a very thin or no filter mat at a sieve rate of 490 m³/m²/h and the removal of SS was 32 %.

**Examples of “grab sample test” results.** Some “grab sample tests” with filter mats on the sieve cloths are shown in Figure 5. Figure 5 a is from the Nordre Follo WWTP (batch NFR 1). Sieve cloths with different mesh sizes gave very similar results. Based on Figure 5 a any mesh size from 55 to 350 microns may be used to achieve 60 % removal of SS at a sieve rate of about 100 m³/m²/h. In order to increase the removal of SS to 70 %, the graph indicates that the sieve rate must be reduced to 25 m³/m²/h. Corresponding removal efficiencies for COD were about 40 % at the 100 m³/m²/h sieve rate and 50 % at the 25 m³/m²/h sieve rate. Without a filter mat the removal of SS over a 350 microns sieve cloth was only 38 %, as previously shown in Figure 3 b.

Results from tests at the Tiendeholmen WWTP are shown in Figure 5 b. This batch of fairly concentrated wastewater was extremely well suited for primary treatment by fine mesh sieves. A large fraction of particles were bigger than 350 microns, making it easy to establish a filter mat on the sieve cloth. The FCOD/TCOD-ratio was about 0.30. Even at a sieve rate of 224 m³/m²/h the removal of SS was 69 % with a 350 microns sieve cloth. The corresponding removal of COD was 37 %.

**Knowledge gained from bench-scale testing**

The bench-scale tests showed that required primary treatment removal efficiencies could be achieved with all tested wastewaters (from 11 different treatment plants), if the proper mesh size was used and a sufficiently thick filter mat was allowed to develop. However, use of sieves would not always be economical due to the low hydraulic loads necessary to achieve sufficiently high removal efficiencies with some of the wastewaters. Sieves that could not be operated with a significant filter mat would likely fail to meet primary treatment requirements, even with mesh sizes in the 50 to 100 microns range.

To be considered suitable for primary treatment with fine mesh sieves the screening tests indicated that at least 20 % of the SS in the wastewater should consist of particles larger than 350 microns and the ratio between FCOD and TCOD should be below 0.4. Once a filter mat was formed on the sieves, there were practically no differences in the performances of sieve cloths with different mesh sizes, with regard to both % SS removal and filtration rate. This will normally favor the use of larger mesh sizes, like the 350 microns sieve cloth. However, if the wastewater has a very small amount of larger particles there may not be enough particles present to form a filter mat, and a smaller mesh size would be recommended to initiate the formation of the necessary filter mat.
Figure 5 – Removal of SS versus sieve rate for a batch of wastewater from the Nordre Follo WWTP (a) and from the Tiendeholmen WWTP (b). For the Tiendeholmen WWTP the result from the full-scale plant, at the time the batch of wastewater for the bench-scale tests was collected, is also shown.

With a given wastewater the removal of SS was mainly a function of the hydraulic flow through the sieve cloth, referred to as sieve rate, which again was a function of the development of a filter mat on the sieve. When the sieve rate increased, the removal efficiency decreased.
FULL-SCALE PRIMARY TREATMENT RESULTS FOR FINE MESH SIEVES

Fine mesh sieve plants

A number of fine mesh sieves are on the market and were tested in the R&D program (Ødegaard, 2005). They included stationary sieves, rotating drum sieves, rotating disc sieves and rotating belt sieves. Full-scale tests were carried out at 9 treatment plants with predominantly municipal wastewater. Six of these plants used rotating belt sieves (from two different manufacturers), two plants used rotating disc sieves and one plant had both a stationary sieve and a rotating drum sieve. Mesh sizes ranged from 80 to 850 microns.

Results

Full-scale testing demonstrated the importance of gentle handling of the particles to prevent them from breaking and then going through the sieve openings. It was also important to have a system that efficiently removed sludge and grease from the sieve cloth. Periodic hot water rinse or compressed air cleaning of the sieve cloth was found necessary to maintain the hydraulic capacity of rotating belt sieves.

Full-scale testing also verified the need for a filter mat. Only rotating belt sieves had the ability to control filter mat development at the full-scale plants in our tests. Of all the sieves tested on predominantly municipal wastewater, only rotating belt sieves fulfilled the EU primary treatment requirements.

Sieves operated without filter mats. Operating without a filter mat, even the rotating drum sieve with openings of only 80 microns (Figure 6 a) was unable to consistently remove 50 % of the SS (Berg, 2004). The bench-scale tests at this plant, however, showed the wastewater to be well suited for fine mesh sieve treatment (Rusten and Lundar, 2004b) and very high removal efficiencies were measured with a filter mat on the sieve cloths. The full-scale results were exactly the same as achieved with a clean sieve cloth in the bench-scale tests, and confirmed that the plant was operating without a filter mat.

The Kvernevik WWTP in Bergen has rotating disc sieves with 400 microns openings (Figure 6 b). Bench-scale tests at this plant showed the wastewater to be feasible for fine mesh sieve treatment and very high removal efficiencies were found with a filter mat on the sieve cloths. However, full-scale removal efficiencies were very low. From 24 days of flow-proportional sampling the average removal efficiencies were only 28 % for SS and 17 % for BOD₅ (Akervold, 2004). The main reason for this was continuous washing of the sieve, preventing the establishment of a filter mat. Another potential reason is that separated sludge particles can be stuck between two discs and may be ground into smaller particles that eventually go through the sieve cloth and end up in the effluent. The full-scale removal efficiencies on the day of bench-scale testing were similar to the removal efficiencies achieved with a clean sieve cloth in the bench-scale test.
Figure 6 – Hydrotech (1605-1H) rotating drum sieve with 80 microns openings (a), and Anebra (model 415) rotating disc sieve with 400 microns openings (b).

Sieves operated with filter mats. For sieves operated with filter mats, very good agreement was found between screening tests and full-scale tests. An example of this is shown in Figure 5 b, where the full-scale result for the Tiendeholmen WWTP is shown together with the screening test results. Figure 7 shows a photo of the rotating belt sieves at the Tiendeholmen WWTP.

Figure 7 – Tiendeholmen WWTP with three rotating belt sieves (Salsnes Filter SF 6000) and 350 microns mesh size.
The Salsnes Filter rotating belt sieves performed extremely well at the Breivika WWTP in Tromsø (Berg, 2004). The results, summarized in Figure 8, show that every single sample fulfilled the EU primary treatment requirements for removal of SS and BOD₅. Average influent concentrations for 19 samples were 331 mg SS/L and 176 mg BOD₅/L, while average effluent concentrations were 34 mg SS/L and 36 mg BOD₅/L. This corresponds to average removal efficiencies of 90 % for SS and 80 % for BOD₅. The excellent results can be explained by operating the sieves with a very thick filter mat (Figure 9) and at a sieve rate of only 25 m³/m²/h.

**Figure 8 – Results from primary treatment at the Breivika WWTP using three rotating belt sieves (Salsnes Filter SF 4000) with 350 microns mesh size (data from Ødegaard, 2005).**
At higher sieve rates the removal efficiencies will normally be lower. An example of good performance at a high sieve rate is the Guldholmstranda WWTP, where short term tests showed 78 % removal of SS at 116 m³/m²/h on a Salsnes Filter SF 2000 rotating belt sieve using a mesh size of 350 microns. For wastewater with a favorable particle composition very high sieve rates may be used. In cases where high removal efficiencies are not important and sieves can be operated without a filter mat, hydraulic capacities will depend on wastewater composition and sieve cloth properties and may be as high as 300 m³/m²/h.

In full agreement with the bench-scale tests, a general observation from the full-scale plants was that the highest possible removal efficiencies were achieved if the plants were operated in such a way that they treated the least amount of water over the longest possible time. This means that fine mesh sieves with pumped influent should have frequency controlled pumps to avoid on/off operation. At plants with several sieves in parallel, all sieves should be running even at low water flows. This will enable operation with thick filter mats and high removal efficiencies. Previous operating procedure at most plants had been to run only one sieve at maximum belt speed until the influent flow exceeded the maximum hydraulic capacity, before starting a standby sieve. This led to poor results due to the lack of a filter mat.

**Sludge dewatering**

All the different sieves had simple screw presses for sludge dewatering, either integrated or as separate units. Dewatered primary sludge had total solids (TS) concentrations from 17 to 35 %, with an average of 27 %. There was no significant difference between the different types of
sieves. The volatile solids fraction was very high in all the sludge samples and averaged 91% (Paulsrud, 2005).

OPERATIONAL EXPERIENCES

Drum filters and disc filters failed to achieve EU primary treatment at all locations, even with sieve openings as small as 80 microns, probably due to lack of filter mats.

Rotating belt sieves from Soby did not achieve EU primary treatment at the two locations tested (Akervold, 2004; Berg, 2004; Vogelsang, 2004), primarily because of no filter mat establishment due to high belt speeds. At the test site in Bergen the Soby sieve experienced some mechanical problems with warped and torn filter belt. Inadequate belt cleaning and reduced hydraulic capacity was also observed and this was believed to be due to the absence of hot water rinse and/or air-knife cleaning of the belt (Akervold, 2004; Vogelsang, 2004).

The Salsnes Filter rotating belt sieves easily fulfilled the EU primary treatment requirements when treating predominantly municipal wastewater. These sieves have variable belt speed from zero and up, which made it easy to operate the sieves with a controlled filter mat. The Salsnes Filter rotating belt sieves also have patented air-knife cleaning of the belt, and tracks to keep the belt properly positioned at all times.

COST COMPARISON

A cost comparison of primary treatment, including sludge dewatering, was carried out for rotating belt sieves and clarifiers. The cost comparison was for a dry weather flow of 200 m³/h and an influent concentration of 250 mg SS/L. The maximum wet weather flow was 400 m³/h. The clarifier overflow rate was 1.2 m/h at dry weather flow and 2.4 m/h at maximum flow, as per Norwegian design guidelines (SFT, 1983). The sieve rate was 100 m³/m²/h at dry weather flow and 200 m³/m²/h at maximum flow. The cost of land was set at zero and the clarifiers were not covered. A 7% annual interest rate and 15 years depreciation was used to calculate annual capital costs.

For the above conditions savings will be substantial when using rotating belt sieves for primary treatment. Both investment costs and total annual costs (annual capital costs plus operation & maintenance costs) for the rotating belt sieves were about 50% of the costs for the primary clarifiers.

CONCLUSIONS

Rotating belt sieves will achieve the required EU removal efficiencies for primary treatment if they are properly built and equipped, properly designed, and operated with a filter mat. Fine mesh sieves with pumped influent should have frequency controlled pumps to avoid on/off operation. At plants with several sieves in parallel, all sieves should be running even at low water flows. This will enable operation with thick filter mats and high removal efficiencies.
Design sieve rates should be established by bench-scale tests as described in this paper and will range from 20 m$^3$/m$^2$/h to about 300 m$^3$/m$^2$/h, depending on wastewater characteristics and required removal efficiencies. To meet the EU primary treatment requirements sieve rates will normally be below 200 m$^3$/m$^2$/h.

A sieve opening in the range of 250-500 microns will normally be the proper choice for typical municipal wastewater, but this should be determined after bench-scale tests. Once a filter mat is formed on the sieve, there is practically no difference in the performance of sieve cloths within this size range, with regard to both % SS removal and filtration rate.

To be considered suitable for primary treatment with fine mesh sieves the bench-scale tests indicated that at least 20 % of the SS in the wastewater should consist of particles larger than the openings in the sieve cloth. With fewer large particles it is more difficult to establish a proper filter mat. However, cationic polymer in combination with rotating belt sieves successfully treated wastewater that was originally classified as unfavorable for fine mesh sieves.

Fine mesh sieves outfitted with simple screw presses can typically dewater primary sludge to about 25-30 % total solids.

For a defined treatment plant a cost comparison of primary treatment, including sludge dewatering, was carried out for rotating belt sieves and clarifiers. Both investment costs and total annual costs (annual capital costs plus operation & maintenance costs) for the rotating belt sieves were about 50 % of the costs for the primary clarifiers.

For successful design, installation and operation of primary treatment plants the R&D program confirmed that it is crucial that consultants, vendors and operators have a good knowledge base and a complete understanding of the processes involved.

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