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Sheaf Filter Reduces Pre-Treatment Stages at Nilit Textile Factory

Background: A pilot of a 4 Sheaf filter was conducted at the Nilit textile factory. The factory is located at Migdal Ha'emek and manufactures nylon yarns sold in 70 countries. The pilot was performed in two phases: in the first phase the filter was positioned at the end of a long desalination pre-treatment train and parallel to an existing cartridge filter. In the second phase the filter was placed in parallel to 2 pre-treatment filters working sequentially: a) sand and b) cartridge. Moving the filter backwards in the treatment train allowed for testing of the effectiveness of the sheaf against different technologies.

Challenge: The Nilit factory requires high quality feed water for a continuous nylon production process. Currently, a long pre-treatment desalination train is employed in the factory, which includes seven filtration technologies prior to reverse osmosis (RO) membranes, requiring regular maintenance and energy expenses.

Solution: The aim is to shorten the long treatment train and use the sheaf filter as the sole pre-treatment for RO. The pilot began in August 2016 with phase A, conducted for 3 months, during which the filter was positioned at the end of the RO pre-treatments parallel to the existing cartridge filter. In phase B, conducted for 2 months, the sheaf filter was positioned in parallel to 2 sequential RO pre-treatment technologies: a) sand and b) cartridge.

Results: The filter operated at an average flow rate of 23 L/min and at a pressure of 0.36 bar, as shown in Figure 1. The ΔP had a low standard error of the mean indicating stability and consistency in the sheaf performance. The sheaf filter used less than 0.33% of the water cycle and was washed only once every 24 hours, indicating a high efficiency backwash cycle and low frequency demand.

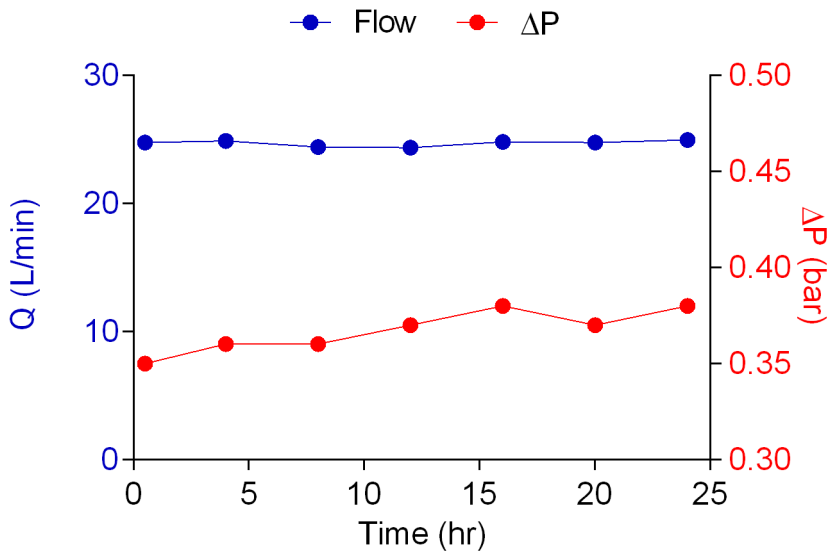

Figure 1. Profile of flow rate (•) and pressure (•) for the Sheaf filter during the pilot at the Nilit plant. Average of phase A and B for a 24 hour cycle.

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The water quality, displayed in Figure 2, demonstrates the particle count (#/ml) before and after filtration for each of the technologies tested indicating that that the sheaf filter operates as effectively at particle removal as the sand and cartridge. The Sheaf produced very similar turbidity (<0.2 NTU) and SDI (<3 %·min^{-1}) as the cartridges and sand, separately and combined.

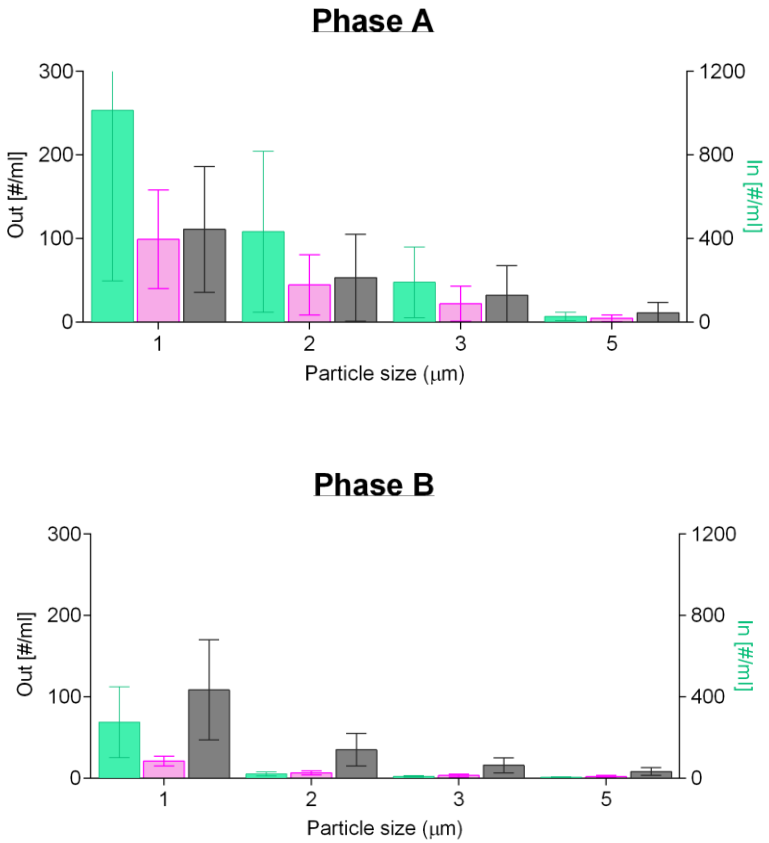

Figure 2. Particle count results for (•) feed and permeate (•) sheaf and (•) reference (ref). Upper panel: phase A where ref=cartridge; Lower panel: phase B where ref= sand + cartridge.

Conclusions: The results here strongly indicate that the sheaf filter treatment is as efficient a technology as the sand and cartridge combined, the two pre-treatment stages tested here in the Nilit pilot. Moreover, the results show that under identical conditions to this pilot the sheaf filter can replace, with a very high probability, both sand and cartridge, meaning the sheaf filter has the ability to replace two filtration stages with one. The sheaf filter also represents a sustainable alternative to the disposable cartridges, which is a popular pre-treatment technology in desalination.

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