



Danfoss RO Solutions Newsletter

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Danfoss RO Solutions Newsletter

by Helle Obeling

Danfoss RO Solutions Newsletter is meant as a means for an extended communication between you and us. It is important to view the newsletter this way: Anything you find interesting, relevant and important concerning RO applications will also be of value to others. So please use Danfoss RO Solutions Newsletter as an additional channel to keep a dialog across the various countries and cultures and send us some material for this newsletter.

We need each other to get better every day!

Exhibitions

by Anders Kjærgaard

AquaTech 2006

The 21st edition of Aquatech Amsterdam will take place in Amsterdam RAI from Tuesday 26 to Friday 29 September, 2006.

AquaTech is the world's leading trade exhibition for process, drinking and waste water.

Also this year, Danfoss RO Solutions will be present during the exhibition. On show will be the new big pump series and staff will be available to discuss our full range of systems for reverse osmosis and for energy recovery.

We are looking forward to meeting you at our stand, 03.311 in Hal 3.



IWA World Water Congress 2006

The 5th IWA World Water Congress will take place in Beijing from Sunday 10 to Thursday 14 September, 2006

Over 4,000 people are expected to participate in the Congress and exhibition over five days. Leading researchers and practitioners will present the latest innovations in water management at the Congress.

Danfoss RO Solutions will participate as exhibitors and introduce all our products including the new big pump series.

We are looking forward to meeting you at our stand, 337.



Innovative desalination process

By Anders Kjærgaard

The Energy Recovery solution from Danfoss RO Solutions is based on an Axial Piston Pump (APP) and an Axial Piston Motor (APM) directly connected to the electric motor to obtain the highest efficiency and simplicity. At one end of a double shaft electric motor, the APP pump is mounted, and at the other end the APM hydraulic motor is mounted without any gearbox or belt drive. Energy recovery is obtained when high-pressure brine from the membranes is fed to the APM converting the energy in the pressurised brine into mechanical energy to be re-used by the electric motor.

- The APM consists of a rotor connected to a shaft and a number of pistons running in the rotor. The high-pressure brine stream is directed against the pistons to generate a rotary torque.
- The APM delivers recovered brine energy to the RO system as mechanical power, as the rotor shaft is coupled to the HP pump motor shaft. Thereby the required motor size and thus the energy consumption are reduced.

- The recovery rate is adjustable by installing a brine valve or by regulating the speed of the electric motor.

Both the APP and APM are positive displacement devices and neither pressure nor temperature or salinity will influence the recovery rate.

The solution from Danfoss has been tested since 2004, and market data show reduction in energy consumption down to typically 4-5 kWh per m³ drinking water. Traditionally, small SWRO plants use as much as 9-12 kWh per m³ drinking water.

Distribution costs of clean drinking water always have to be compared with this often higher energy consumption per m³ when producing drinking water in small decentralised plants. With the new cost-effective solution from Danfoss, small, efficient and easy-to-operate SWRO plants can now be a cost-effective way of providing water in remote areas.

Filtration

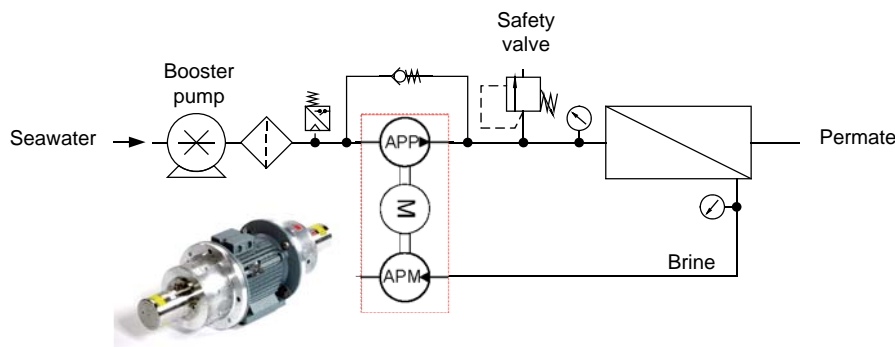
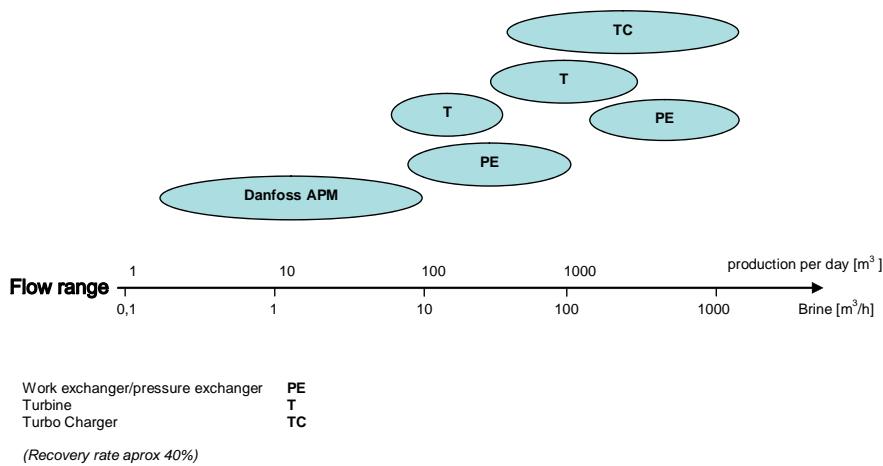
By Helle Obeling

The majority of pump- and membrane-related failures can be attributed to high levels of solid contamination in the fluid. High levels of solid contamination are usually the result of inadequate prefiltration. Effective filtration in membrane systems prevents breakdowns and increases the life expectancy of important and expensive components. The high cost of component repairs and system downtime can be kept to a minimum only through a preventive maintenance program that includes using and maintaining the proper system filtration. While price and delivery are important considerations, filter element performance should be the major deciding factor.

The constantly increasing demands on pump and membrane components means that today's systems must be equipped with filters that have a high rate of particle removal efficiency at the required micron rating. The correct number and type of filters required must be taken into account early in the system design phase. Likewise, the ability to change the filter on the run - often requiring the use of a duplex arrangement - is an important preinstallation consideration. The good design intentions of the application design engineers are often overridden by the sometimes more powerful dictates of price and competition. System suppliers and purchasers often change the filter strategy by changing the filter size, micron rating and the number of filters. This is an easy way to lower the overall system price. The equipment user may then have to add filtration to achieve the required system performance after the system is purchased, installed and operating.

The Beta Ratio (β) of a filter element is a measure of its dirt-holding capacity and its particulate removal efficiency.

A single multi-pass test is divided into many smaller time segments. During each of these counting periods, the number of particles of a specific size - size x - and greater upstream of the filter is totaled and the number of size x and greater particles downstream of the filter is totaled. The number of particles found upstream of the filter divided by the number of particles found downstream of the filter equals the beta value of the element at the given particle size during that counting period.



Efficiency

Filter element efficiency for a particular micron rating is determined by the Beta Ratio for that micron rating. The efficiency is calculated as Beta Ratio minus one divided by the Beta Ratio then multiplied by 100.

For example, an element with a Beta Ratio of 5000 for a particular micron rating has the following efficiency:

$$\frac{(5000-1)}{5000} \times 100$$

equal to

99.98% efficient

The following table shows the Beta Ratio, corresponding efficiency and the number of particles that will pass to the downstream side of the element for each 100,000 particles seen at the upstream side of the element.

β -value of filter	Filter efficiency	Number of particles downstream for each 100,000 particles upstream
2	50.00%	50,000
4	75.00%	25,000
10	90.00%	10,000
20	95.00%	5,000
40	97.50%	2,500
100	99.00%	1,000
200	99.50%	500
500	99.80%	200
1,000	99.90%	100
2,000	99.95%	50
5,000	99.98%	20
10,000	99.99%	10

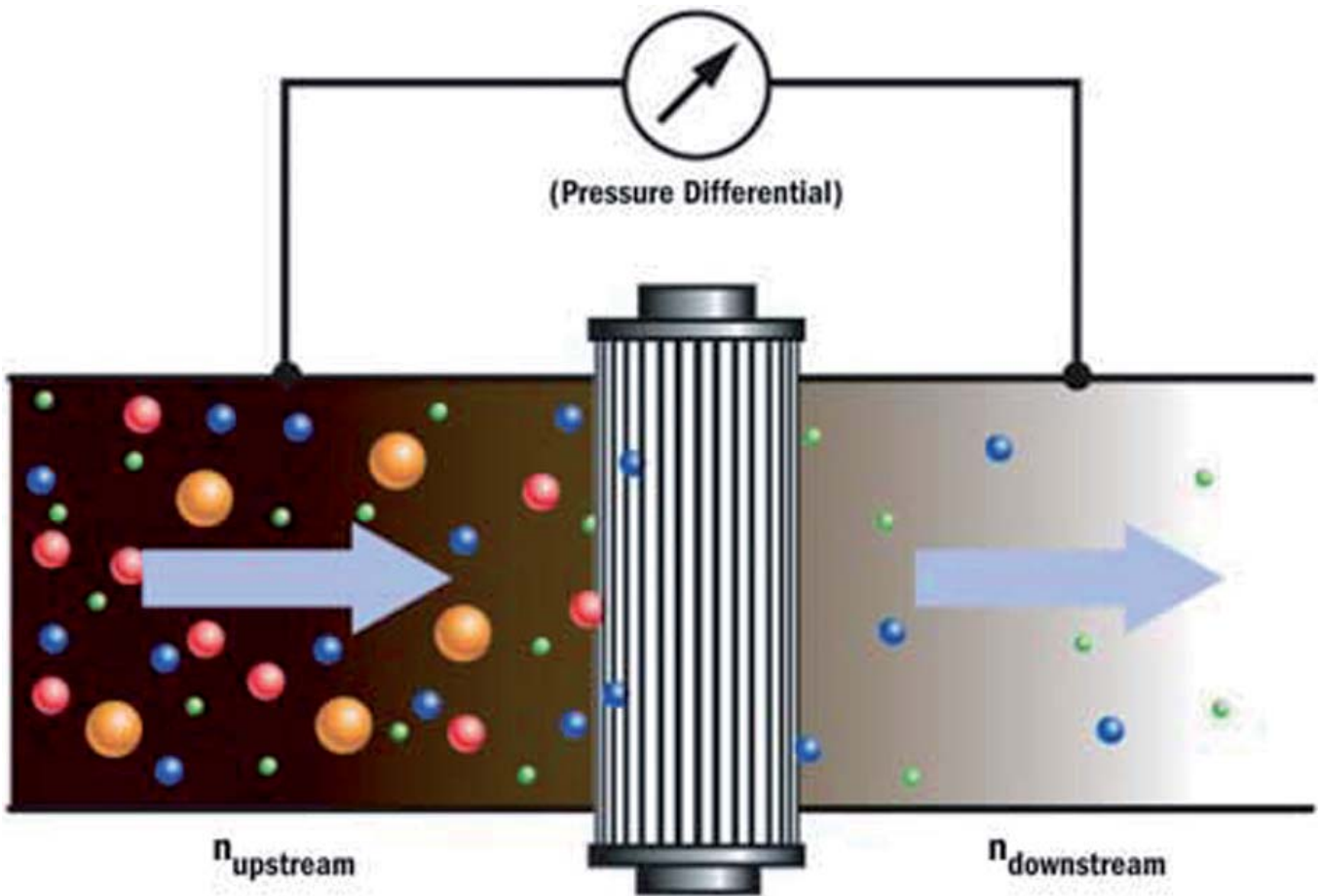


Figure 1: Beta value

$$\beta_x = \frac{n_{Upstream} \geq X \mu m}{n_{Downstream} \geq X \mu m}$$

Danfoss RO Solutions

Danfoss RO Solutions consists of a group of dedicated Danfoss employees who develop, produce, and market products and services within membrane technology. The group focuses on RO applications and has knowledge of all Danfoss' products that profitably can be used in the market mentioned. The group's vision is to be a rewarding partner, in every respect, for customers, universities and individuals who deal with separation technologies and related markets.

Contact details of people in charge of our different departments:

Management:



Anders Valbjørn
Director
Phone: +45 7488 4325
Mobile: +45 2966 7370
Fax: +45 7445 3831
E-mail: Anders@danfoss.com

Sales:



Anders Grum Kjærgaard
Sales Manager
Phone: +45 7488 7320
Mobile: +45 5133 7320
Fax: +45 7445 3831
E-mail: kjaergaard@danfoss.com

Research and development:



Palle Olsen
R&D Manager
Phone: +45 7488 4202
Mobile: +45 2966 7366
Fax: +45 7445 3831
E-mail: Palle_Olsen@Danfoss.com

Applications and systems:



Jan Linnig
Application Engineer
Phone: +45 7488 4936
Mobile: +45 2016 0139
Fax: +45 7445 3831
E-mail: JAL@Danfoss.dk

Marketing:



Helle Obeling
Marketing Consultant
Phone: +45 7488 7007
Fax: +45 7445 3831
E-mail: obeling@danfoss.com

Logistics and commercial:



Marianne Cronbach
Logistics/Commercial
Phone: +45 7488 4169
Mobile: +45 2967 1971
Fax: +45 7488 3177
E-mail: MCR@Danfoss.com

For technical and/or commercial requests, please also use:

E-mail: waterpumps@danfoss.com

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Danfoss A/S

DK-6430 Nordborg
Denmark
Tel.: +45 7488 4325
Telefax: +45 7445 3831
E-mail: waterpumps@danfoss.com