

Storks come from Poland.

Stork (in Polish "Bocian") is an innovatory device for purifying water elaborated in Gdynia, Poland. This device was constructed using the latest membrane technologies. Its purpose is to clean contaminated water in an efficient, easy and cheap to use manner.

Stork takes in the river, lake, canal or tap water. Poor quality of water does not affect the device. In the multi-stage process it cleanses water to the ultra-pure state. Many mineral water suppliers can only dream of such clean water. The rest – condensed water – is used for purifying Stork device, and then it is returned to the tank. To prevent the use of replaceable filter cartridges, the water flow into a self-cleaning system is used. This process is called cross-filtering.

Incoming dirty water is purified from substances suspended in a special self-cleaning Huzar® filter registered as a DOE company's patent. Then it is fed to the vast Ultrafiltration Membrane, which is purified in cycles of reverse rinsing to finally reach the Reverse Osmosis membrane. At this stage, salt and other substances dissolved in water are fed to the drain. Electrical conductivity meters let you control the quality of rejected and obtained water.

DOE company has just fitted a Stork device on the "Kopernik" passenger and car ferry (in Świnoujście) cruising the Baltic Sea. The water fed into the vessel's tanks in Sweden is very hard. Its conductivity exceeds 800 $\mu\text{S}/\text{cm}$ (TDS more than 600 ppm). This causes problems which are well-known from adverts of washing machines descalers offered by many companies.

Instead of adding additional chemicals for water treatment, the ferry's owner – a Polish company Euroafrica has decided to invest in a desalination device.

The device operates almost silently, collecting drinking water from drinking water tank on the ferry. Using membranes and pumps the Stork device separates inlet water into 3 streams:

1. The first stream is water containing 0.02 micron suspensions – separated by a UF membrane. The UF membrane has a huge, 75 m^2 filtration surface. This water regularly returns to the tank located on the ship. The returning water contains sand, bacteria (some, in trace amounts, are allowed in drinking water) and other suspended matter. The thorough treatment of water, prior to the next treatment level, and regular washing of the membrane (automatic reverse rinsing) will save the crew plenty of work and money on the filter cartridges in the initial water treatment before it reaches RO membranes. The Stork device does not require replacement of filter cartridges.

2. The second stream is the product – ultra-pure water that we want. It contains only 1% of its initial hardness. It contains no suspended substances.

3. The third stream – several times larger than the product – is concentrated rejected waste. It is directed back into the tank, from which the inlet water was collected. The water in the tank is slightly concentrated. Every few days the water in the ship's tanks is supplemented and the density of water again returns to its initial value.

The water in the ship's tank (collected in the port) is approved and safe to drink – like streams from the Stork device, which are healthy (approved), but separated – soft water (product) and harder water (rejected waste). All components of the Stork device are hygienically certified, made of stainless steel or polymers. In the process of water stream separation, no additional chemical substance is used.

As a result, “Kopernik”, while consuming little energy to power the pumps (up to 30 kWh per day) produces 5 tonnes of ultra-pure water with utilisation of membranes. The obtained water’s conductivity is 7 $\mu\text{S}/\text{cm}$ (approx. 3 mg ions per litre). These values may be even smaller – using different membranes we can achieve a value of 1 $\mu\text{S}/\text{cm}$.

Similarly, using a more energy-efficient membrane (pay less for electricity), we will obtain higher conductivity values, and the water’s purity will be as perfect.

Such clean water is used for: technological processes, for washing the machinery, (including electric devices), stainless steel cargo bays, wash laundry and clean the dishes or even cook meals, and drink it, although such water is poor in minerals, below the limits set out for drinking water. However, this water can easily be enriched with minerals passing through a dolomite deposit.

self-cleaning feature of the Stork device is also worth mentioning, as it allows for low operating costs.

Water flowing through the device washes away all dirt and hardness contained in the inlet water. The device has no replaceable filters.

An American membrane manufacturer advises to clean the membranes chemically from time to time, to maintain their maximum performance. Membrane durability is as high as 10 years.

Membrane technologies – UF (Ultrafiltration) and RO (Reverse Osmosis) were elaborated over 50 years ago.

Now, membrane technology has nested in Poland – just like real storks have been nesting here for centuries.

Text: Leonard Kasprzak, Marta Małek, Adam Kasprzak photos and filming, for more info and videos visit www.doe.pl