iJust Software

Technical Note

Scope
High product water quality obtained by balancing the needs of ecology and economy:

- More efficient recovery rates of purified water
- Economic control of cleaning cycles
- Less energy used by Arium® lab water systems with an integrated electrodeionization (EDI) module.

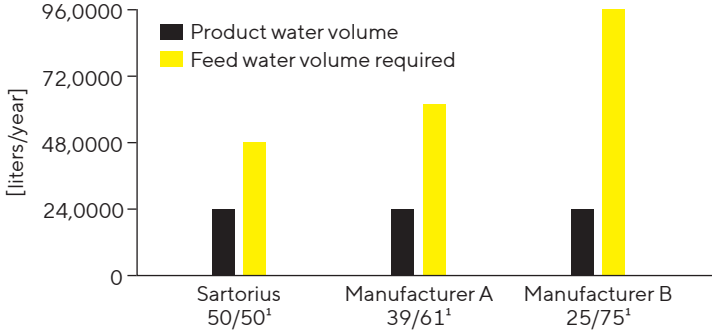
The iJust software installed in all Arium® Advance and Arium® Comfort systems optimizes the performance of reverse osmosis technology. To ensure the best possible performance, inlet water, also known as feed water, needs to be tested usually only once by a Sartorius technician to determine the hardness and CO_2 content. Afterwards, these values are saved in the Arium® system.

In areas where the water changes seasonally, we recommend regular testing and adjusting of the iJust settings to match the feed water chemistry. Based on the values saved, iJust selects the operating parameters that ensure not only high product water quality but also ecological use of your resources. In addition, iJust controls the cleaning cycles in the most economical way, adapting their frequency to the quality of your laboratory's feed water. As a result, 50% fewer cleaning cycles are needed per year. This has a positive impact on the ratio of product water delivered to the feed water volume required for purification.

Moreover, iJust takes the CO_2 content into account, minimizing the energy consumed by Arium® systems with an integrated electrodeionization (EDI) module.

The economic benefits that iJust provides by saving feed water usage are shown in Figure 1.

Figure 1: *Water Usage in Comparison With Other Manufacturers' Systems and Potential Savings With iJust*



¹ Ratio between product water and concentrate water

An Arium® Advance RO system that requires 24,000 liters of feed water annually, or around 100 liters a day, saves between 13,538 liters and 48,000 liters of reverse osmosis water per year, depending on the particular model you use.

The technical terms important for understanding how iJust software works, such as product water recovery, rejection rate and the effects of CO_2 and water hardness, are explained in the following.

Significance of Feed Water Hardness

The hardness of your feed water saved in an Arium® unit defines the ratio of concentrate and product water. The softer the feed water, the less concentrate water will be rejected.

Beyond this, water hardness influences the number of cleaning cycles. The softer the feed water, the less frequently RO modules need to be cleaned. This reduces the time and effort required for care and maintenance.

Product Water Recovery Rate (Yield)

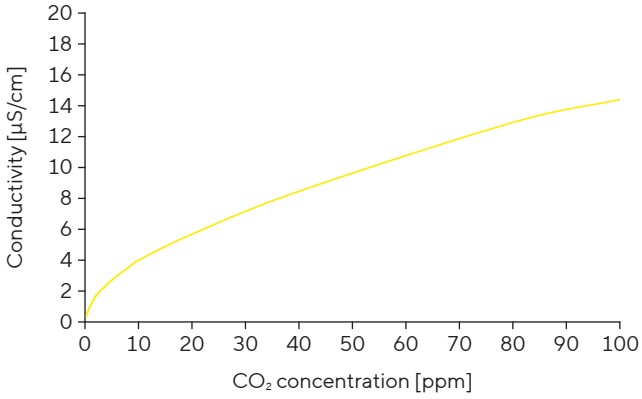
The proportion of the product water delivered to the concentrate water rejected is designated as recovery rate or yield. If iJust is not activated, the recovery rate will consistently remain at 40%; i.e., 40% of the inlet water is fed into the Arium® Bagtank and 60% will be rejected as concentrate. For soft feed water with a low conductivity, the recovery rate is 50%. In the case of hard feed water, the ratio of product water to concentrate water is 25% to 75%.

The Effect of CO_2

The conductivity of water is affected by the CO_2 content, which can regionally differ. CO_2 is not retained by an RO membrane and thus has a considerable impact on the conductivity of product water (see Figure 2).

As iJust uses the conductivity of the feed and product water and the CO_2 content to calculate the salt rejection rate, this actual rate is displayed on Arium®. The formulas described below explain how the salt rejection rate is calculated.

Figure 2: *Correlation Between the CO_2 Content and the Conductivity in Water*



Considering CO_2 has a positive impact on controlling the energy consumed by the EDI module. When an Arium® system is started up, iJust uses the manually saved CO_2 value to quickly regulate the current input to an optimal value. If the CO_2 value is not saved, it will take several hours until the EDI module can operate at an optimal energy level. As a result, the module will consume more energy during this time.

Salt Rejection Rate (Retention Rate)[2]

Besides optimizing the yield of purified water, iJust ensures accurate display of the rejection rate. This term denotes the percentage of salt retained from the feed water and removed from the product water; i.e., the percentage of salt retained by an RO membrane. The effect of iJust on the salt rejection rate is illustrated by the following formulas:

Calculation of the rejection rate without iJust:

$$\frac{LFF - LFR}{LFF} \times 100$$

Calculation of the rejection rate with iJust:

$$\frac{LFF - LFR + CO_2\ \text{correction factor}}{LFF} \times 100$$

LFF = conductivity of feed water
LFR = conductivity of reverse osmosis water

The rejection rate usually lies between 95% and 99%, and also depends on the water temperature. The warmer the feed water, the lower the salt rejection rate.

[2] The term commonly used for describing the performance of a membrane in collecting substances on its surface is retention rate. However, this term is not used within the context of reverse osmosis for removal of salts. Retention by RO membranes is referred to as "rejection," although this word actually means to rebuff, to repel or cast off.

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