

# RECP Best Practice Catalogue

*Adding a second stage to the existing RO system  
Developed within the framework of MED TEST II  
July 2018*



UNITED NATIONS  
INDUSTRIAL DEVELOPMENT ORGANIZATION



The SwitchMed Programme is  
funded by the European Union

# Best Practice - Adding a second stage to the existing RO system

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<b>SECTOR:</b>	<b>Food &amp; Beverage</b>
<b>SUBSECTOR:</b>	Bakery and farinaceous products
<b>PRODUCTS</b>	Bread, cakes, kaak, pastries, potato chips
<b>CATEGORY</b>	Process control or modification
<b>APPLICABILITY</b>	Utilities

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<b>COMPANY NAME</b>	NOT DISCLOSED
<b>COMPANY SIZE</b>	SME



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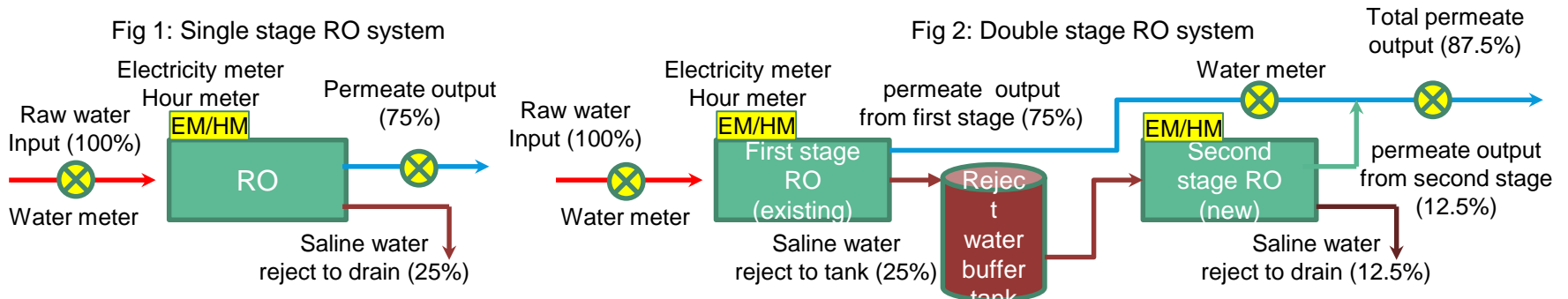
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## Description of the problem (Base scenario):

The raw water available to the plant has high hardness which is not suitable for production, a Reverse Osmosis (RO) system is used to obtain treated water (permeate). This system is a single stage type (See fig 1 below), the reject water (fraction of the water with high salinity that exits the RO) does not undergo a further stage of treatment. The output from the system consists of 75% permeate and 25% reject water which is wasted to drain. Reject water amounted to 20% of overall water use in this plant.

## Description of the solution

The proposal was to add a second stage to the existing RO system where the reject water is the input to the second stage (see fig.2 below). More than half of the reject water could be recovered as permeate thus saving large quantities of water. Of course there will be more electricity consumption and maintenance costs but the net result is a benefit in both financial and environmental terms.



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<b>Economic Benefits</b>	<p>Base case RO water reject: 18,000 m<sup>3</sup>/yr</p> <p>Market price of water: 2.5 EUR/m<sup>3</sup></p> <p>Base case water reject cost at market prices: 18,000*2.5 = 45,000 EUR/year</p> <p>Expected RO water reject after intervention: 9,000 m<sup>3</sup>/yr</p> <p>Expected water reject cost at market prices after improvement: 9,000*2.5 = 22,500 EUR/year</p> <p>Expected savings at market prices from reduced water reject: 22,500 EUR/year</p> <p>Expected increase in electricity consumption after improvement: 12,500 Kwhre/year</p> <p>Electricity cost at plant: 0.14 EUR/Kwhre</p> <p>Expected maintenance cost of second stage RO unit: 1,250 EUR/year</p> <p>Expected increase in electricity and maintenance costs: 12,500*0.14 + 1,250 = 3,000 EUR/year</p> <p>Expected Net savings for improvement: 22,500 - 3,000 = 19,500 EUR/year</p>
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<b>Environmental Benefits</b>	<p>Expected water savings: 9,000 m<sup>3</sup>/yr (50% reduction in reject water)</p> <p>Reject water from RO will drop to around 11% of overall plant water consumption instead of the base case 20%.</p>
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<b>Environmental negative impacts</b>	<p>Specific CO<sub>2</sub> emissions electricity grid: 1 kgCO<sub>2</sub>/Kwhre</p> <p>CO<sub>2</sub> emissions due to increased electricity use: 12,500*1 = 12,500 kgCO<sub>2</sub>/year</p>
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<b>Other benefits</b>	Reduced load on drainage network
<b>Health and safety impact</b>	Not applicable

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## Capital investments & financial indicators

Cost of intervention: 14,000 EUR  
Return on investment (simple payback): 0.7 years

## Suppliers

### Other aspects

- The market cost of water is considered and not the official utility cost which is much less.
- The cost of intervention shown above includes the cost of the information system to implement a Performance Monitoring and Verification Plan for that intervention
- Accurate values were obtained thanks to the information system installed by the company at the start of the project at the request of the MED TEST II team. The following measuring devices were installed related to this intervention;
  - water meter at each of the supply and permeate lines of the two existing single stage RO units (working in parallel).
  - Electricity meters and hour counters for the two existing RO units.

Readings were taken on a daily basis.

- Above calculations are based on production period between September 2016 and August 2017.

## Implementation

measure has been implemented in July 2018