

تحسين أداء محطة التناضح العكسي باستخدام تقنية الأغشية الهزازة

Novel Application of VSEP Technology for Recovery Enhancement of RO Plant

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Outline :

- Introduction .
 - Water security.
 - Reverse osmosis.
 - Reject water.
- VSEP technology.
 - Definition .
 - Mechanism.
- Results.
- Achieved benefits.
- Conclusions.
- Acknowledgment .



Introduction :

The water resources in most of the world's countries are threaten due to

- **Rapid increase in population**
 - **Global warming**
 - **Environmental pollution**



Introduction : Cont.

- Arab countries are suffering from the shortage in drinking water including Saudi Arabia.
- The environmental program of UN confirmed that the acute shortage of water is one of the major challenges the world in the new century.
- **50%** of the total production desalinated water in Saudi Arabia produced by saline water conversion corporation (SWCC)

And

50% produced from brackish water.



Introduction : Cont.

● For Riyadh city

In Riyadh city there are **many of** brackish water plants, **most** of them include reverse osmosis plants , from this plants and as per the design capacities a **37,000,000** m³ yearly of water is rejected with an average TDS of 12,000 ppm.





Reverse osmosis process



Introduction : Cont.

Reverse osmosis

- Process of osmosis through semi permeable membranes was first observed in 1748 by Jean Antoine Nollet.
- For the following 200 years, osmosis was only a phenomenon observed in the laboratory.
- In 1949 the University of California at Los Angeles(UCLA) first investigated desalination of seawater using semi permeable membranes.



Introduction : Cont.

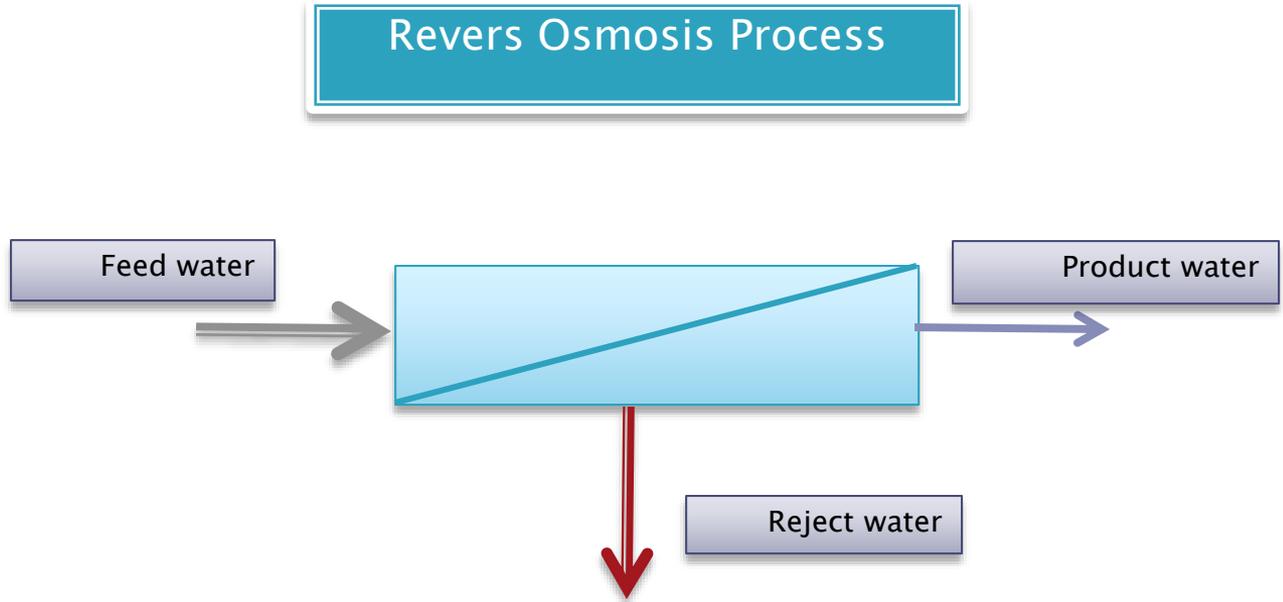
Reverse osmosis

- By the end of 2001, about 15,200 RO desalination plants were in operation or in the planning stages worldwide.
- Reverse osmosis plant recovery ranges between 50% and Maximum of 85% till now.
- The rejected water is about 15% of the feed water With high TDS.



Introduction : Cont.

Reverse osmosis



REJECT WATER



Introduction : Cont.

Reject water

- For the Riyadh city the total reject water at the designed Capacities is more than 30,000,000 m³/ year.
- The average TDS for the reject water equal to 10,000 ppm.

Ion type		Concentration ppm
Calcium as Ca ⁺⁺	كالمسيوم	1265.8
Magnesium as Mg ⁺⁺	مغنيسيوم	358.2
Sodium Na ⁺	صوديوم	1253.1
Chloride Cl ⁻	الكلورايد	1964.2
Sulphate SO ₄ ⁻⁻	الكبريتات	3948.7
Nitrate NO ₃ ⁻	النترات	12.6
Fluoride F ⁻	الفلورايد	2.755
Silicate SiO ₂	السيلاكا	76.5
Bromide Br ⁻	برومايد	9
B	بورون	1.145

water



Is it possible to treat
and recycle this type of
water ?



How ?



REJECT WATER TREATMENT BY VSEP



VSEP TECHNOLOGY

VSEP TECHNOLOGY







"L mode" Assembly



"P mode" Assembly

VSEP TECHNOLOGY



VSEP TECHNOLOGY



VSEP technology:

- It is called Vibratory Shear Enhanced Processing (VSEP).
- It is a technique for producing intense shear waves on a membrane surface.

In this technique:

- The feed material moves between parallel membrane leaf elements.
- Shear cleaning action is created by vibrating the leaf elements in a direction tangent to the faces of the membranes.



"P mode" Assembly

