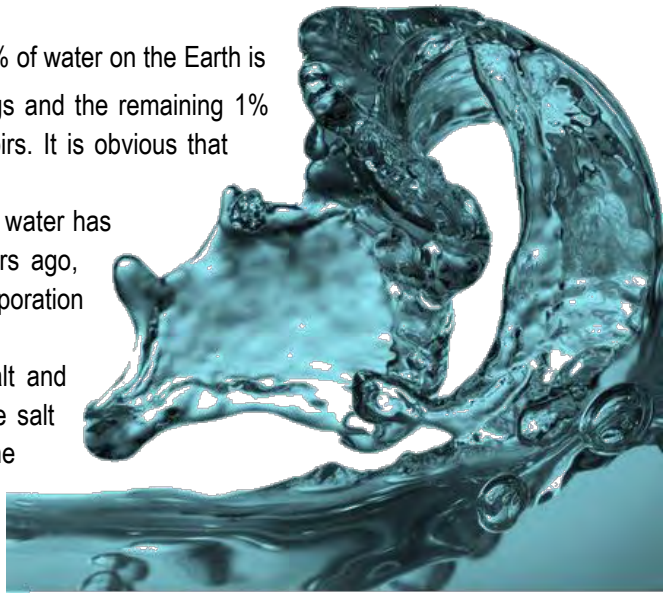


Looking at the nature, it can be observed that about 97% of water on the Earth is cumulated in the oceans; 2% is in arctic oceans and icebergs and the remaining 1% consists of sea water, lakes, rivers and underground reservoirs. It is obvious that only a negligible portion of this remaining water is consumable.

Man's effort to convert impure/salty water to desalinated water has been extended throughout his long history. About 2400 years ago, Aristotle announced the possibility of this conversion by evaporation and distillation.

This water is capable of dissolving various kinds of salt and mineral, amount of which varies in different regions, thus the salt amount of water differs depending on the place due to the quantity and kind of salt and minerals in the soil. According to the World Health Organization, the standard amount of dissolved solids in potable water is 500 PPM, in which the chloride ion must not exceed 250 PPM. However, in some arid regions, water with 3000-5000 PPM of impurity is currently used as potable water.

200 years ago, developments in marine industry led to construction of simple versions of evaporation desalination units. The primitive commercial desalination units were constructed about 100 years ago. After the discovery of oil in the Middle East in the 1930's, a few small desalination units were installed in that region.

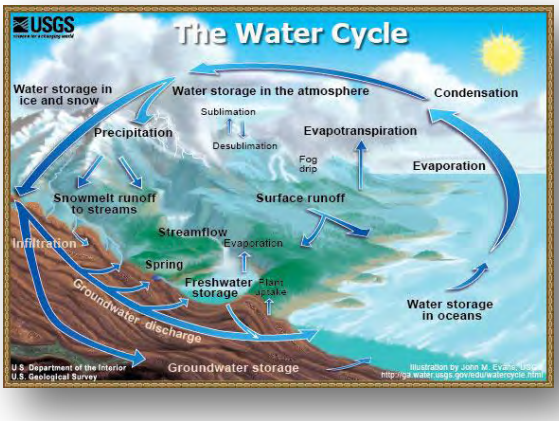
The oil industry developments in Persian Gulf increased the world growth of desalination industry in the 1940's. In these years the majority of desalination plants were fabricated by countries which did not require desalinated water in their own countries. In the 1950's the world's largest desalination plant of that time, with capacity of 2200 m3/day came into service.

The world's total desalinated water product in those days is estimated to be about 10,000 m3/day.

In 1960 the total capacity of desalination plants in the world reached 38000 m3/day. In 1970 it came up to 1,000,000 m3/day and in 1980 this amount exceeded 7,300,000m3/day. This increase was due to the rapid growth of industrial demand, which led to the universal expansion of desalination industry and caused the rush of money from consumer countries towards developed countries that produced desalination plants.

In 1960, a desalination unit using reverse Osmosis process method

A suitable method for desalination of brackish waters such as wells and rivers-was developed. In recent years many efforts have been made to utilize RO desalination process for desalination of sea water, which has not achieved results better than evaporation methods and the use of waste heat from optimality, and water quality point of view.



In 1980, about 75% of desalinated water was produced by evaporation methods, 20% by Reverse Osmosis, 4.7% by electrodializing method and 0.3% by other methods.

Nowadays desalinated water is more expensive than oil, and therefore the growth of desalination technology should be considered as a strategic industry. Having the MED type design and manufacturing Know-how, **FAN NIROO Co.** is delighted to solve the drinking and industrial water problems.

Fan Niroo
Desalination & Water Solutions

NF/RO Membrane Systems

Membrane desalination technologies have been known to be an efficient method in water purification industry for many years and are developing at a significant pace. The technology improvement in reducing energy consumption and solving the biofouling problem has been substantial. The NF/RO systems produce various types of water in a wide range of capacity and raw water quality. This is a unique advantage of NF/RO systems. The most common brackish and seawater desalination technology today is NF/RO systems.

NF/RO Membrane System Applications

- Potable water production from brackish and seawater,
- Industrial water for boilers, cooling towers, electronic parts production, laboratory, etc.
- Producing the water required for oil and petrochemical, mining, and chemical industries,
- Ultrapure water for pharmaceutical industries,
- Agricultural water production and wastewater reuse,
- Pretreatment for EDI and ion exchange systems,
- Acids and metals recovery.

NF/RO Membrane System Features

- Full removal of hardness,
- Ion removal over 99%
- Full removal of bacteria, viruses, etc.,
- Lower finished costs,
- Fewer footprints.

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UF/MBR Membrane Systems

Ultrafiltration (UF) systems are among the first achievements of mankind in the fast growing trend of membrane technologies and discovery of their various applications in different industries. The UF systems remove all pollutants, bacteria, viruses, suspended solids, etc. without any effect on dissolved matter. These systems are a known solution to many of the intractable problems confronting different industries as they recycle even valuable effluents back to processes.

Developments in the UF systems and the introduction of the immersed UF system have radically transformed the wastewater treatment industry. Immersed UF system accompanied by aeration namely membrane bio-reactor (MBR) presented itself as a new phenomenon in wastewater treatment industry.

UF/MBR Membrane System Applications

- Alternative to clarifiers, media filters, and traditional wastewater treatment,
- Pretreatment for NF/RO systems,
- Pretreatment of ion exchange systems,
- Biological treatment of wastewater,
- Applications in food industries and slaughterhouses,
- Wastewater treatment in paint, pulp and paper, textile, etc. industries.

UF/MBR Membrane System Features

- Modular design for easy expansion,
- Low operating pressure and high efficiency,
- Consistent product quality and quantity with an SDI of less than 1 for NF/RO systems,
- Membrane and pressure vessel reduction and long membrane life in NF/RO systems,
- BOD, TOC, Turbidity, TSS, nitrate, phosphate and biological pollutants removal,
- Reducing NF/RO systems operating pressure leading to a decrease in energy consumption,
- Easy design and problem solving and automatic commissioning and cleaning,
- High contact level, fewer footprints and construction, and a more effective treatment,
- Reduction in required manpower levels,
- Longer membrane life against different destructive water and wastewater.

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Desalination & Water Solutions

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AVIN PALAYESH NIROO CO.

Electro-deionization Systems

Mutation in ion exchange systems was once a far-fetched concept; however, scientific and industrial developments have introduced electro-deionization (EDI) systems as a substitute for ion exchange systems. EDI systems have cornered a segment of ion exchange systems market and are expanding their presence in it. In addition to the consistency and ultrahigh quality of product in EDI systems, environmental compatibility is another important factor that has contributed to the success of the EDI systems.

Electro-deionization Applications

- Ultrapure water for boilers as well as pharmaceutical, micro-electronics, and similar industries.

Electro-deionization Features

- Suitable and advanced substitute for traditional ion exchange systems
- Purification of water to less than 0.1 ppm
- Ions removal based on electric charge difference between cathode and anode with less energy consumption
- Continuous water deionization
- Lower costs due to elimination of chemicals in regeneration
- Fewer footprints and more environmental compatibility
- Reactive Silica and TOC removal