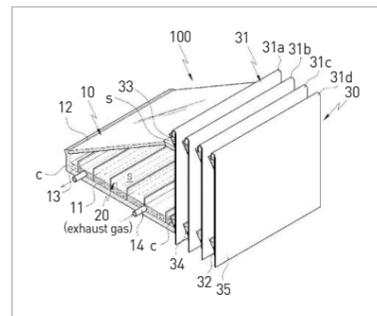


# Small Capacity Multiple-effect Seawater Desalination Apparatus Using Solar Heat and Multiple Heat Sources

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⇒ Seawater desalination apparatus that uses solar energy and various waste heat to desalinate seawater and increases the solar energy collecting effect using multiple reflectors

## Client / Market

- Areas with water shortage in islands, the Middle East, South-East Asia, Africa,
- KOICA project-linked business, solar salt manufacturer, seawater concentration recycling business

## Necessity of this Technology

- Reverse osmosis method, the general method for seawater desalination, requires large electric power consumption and has difficulty in maintenance and repair.
- Among distillation methods, large capacity multiple-effect distillation requires expensive initial establishment cost and maintenance fee as well as complex maintenance technology, which is not appropriate to be applied in areas having difficulty with energy supply like island areas and underdeveloped areas.
- Existing seawater desalination equipment using solar heat takes the solar still type or uses commercial solar thermal collector and heat exchanger, which accompanies indirect heat collection and heat exchange, resulting in low performance and efficiency.
- Therefore, it calls for an eco-friendly seawater desalination apparatus that does not require a lot of energy yet has better fresh water generating ability than existing desalination method using solar heat.

## Technical Differentiation

- This invention can desalinate seawater using solar heat and various waste heat that it can generate fresh water when solar radiation condition is poor.
- Solar energy going through the multiple-effect distiller and the condensation heat in the basin part are combined to be used as the source of evaporation heat in the multiple-effect distiller. Latent heat condensed in the multiple-effect distiller is reused as the heat source in the next effects so that fresh water production and heat efficiency are improved.
- Therefore, compared to existing seawater desalination using commercial solar thermal collector, it can increase the fresh water production by 50 to 430% from the same area. The design does not require decompression so that maintenance is easy.
- It can be used as an eco-friendly small capacity desalination facility in islands, coastal areas, and remote areas that lack electrical or water supply facilities due to regional/economic conditions or a distributed small-scale desalination facility in regions with economic feasibility considering the water transfer cost and high oil prices.
- This hybrid solar desalination apparatus can use solar heat and waste heat independently or simultaneously as the source of evaporation heat, and it integrated

## DESIRED PARTNERSHIP

Technology Transfer

Licensing

Joint Research

Other



## TECHNOLOGY READINESS LEVEL [TRL]

Research, basic explanation | Project concept or idea development | Technology idea verification | Prototype development | Trial product production/evaluation in similar environment | Pilot field demonstration | Development and optimization of commercial model | Commercial product demonstration | Mass production and initial market launch



the fresh water production ability of solar still with verified durability and the multiple-effect technology that can boost the efficiency.

- Therefore, the fresh water production ability was maximized and the maintainability is high to be utilized in underdeveloped areas with poor technical/economic conditions.
- The installation cost is low as it does not require heat exchanger, commercial solar thermal collector, and heat storage tank but the performance of the apparatus is 18 L/m<sup>2</sup> · d, which is a world-class level.

## Excellence of Technology

- This invention can desalinate seawater using solar heat and various waste heat that it can generate fresh water when solar radiation condition is poor.
- Solar energy going through the multiple-effect distiller and the condensation heat in the basin part are combined to be used as the source of evaporation heat in the multiple-effect distiller. Latent heat condensed in the multiple-effect distiller is reused as the heat source in the next effects so that fresh water production and heat efficiency are improved.
- Therefore, compared to existing seawater desalination using commercial solar thermal collector, it can increase the fresh water production by 50 to 430% from the same area. The design does not require decompression so that maintenance is easy.
- It can be used as an eco-friendly small capacity desalination facility in islands, coastal areas, and remote areas that lack electrical or water supply facilities due to regional/economic conditions or a distributed small-scale desalination facility in regions with economic feasibility considering the water transfer cost and high oil prices.
- This hybrid solar desalination apparatus can use solar heat and waste heat independently or simultaneously as the source of evaporation heat, and it integrated the fresh water production ability of solar still with verified durability and the multiple-effect technology that can boost the efficiency.
- Therefore, the fresh water production ability was maximized and the maintainability is high to be utilized in underdeveloped areas with poor technical/economic conditions.
- The installation cost is low as it does not require heat exchanger, commercial solar thermal collector, and heat storage tank but the performance of the apparatus is 18 L/m<sup>2</sup> · d, which is a world-class level.

## Current Intellectual Property Right Status

### PATENT

- Multiple-effect Atmospheric Pressure Desalination Apparatus Using Solar Heat and Multiple Source of Heat (US14/408376) and 18 registered patents, 11 patent applications

### KNOW-HOW

- Design/production technology for seawater desalination using solar heat
- Performance estimation technology for seawater desalination using solar heat