Fonte Pura-Princeston ~ seawater treatment

INNOVATIVE SEAWATER DESALINATION TECHNOLOGY

TECHNOLOGY PARTNER

The technology company PRINCESTON s.r.o. has its technical and manufacturing base in the Czech Republic.

Our main line of business is technology focused on solving environmental problems, primarily issues of lack of wholesome drinking water. To solve this problem, we have developed an innovative new-generation technology for obtaining drinking water from seawater, otherwise salinized/mineralized water (lakes, wells, etc.) or water contaminated with certain inorganic substances. Our priority is manufacturing of drinking water in nature-friendly ways.

The technique is unique primarily due to its high efficiency, up to 20% higher compared to competing technologies based on similar principles. In addition, it is capable of reusing waste heat as an energy source, thus making the drinking water produced fundamentally cheaper without generating any CO_2, so not contributing to global warming, because it conversely absorbs waste heat for the purposes of drinking water production. Finally, the technology also permits autonomous functioning, i.e., deployment in areas with no additional infrastructure, and it can work, for example, only using solar power, for instance in desert areas.

TECHNOLOGY DESCRIPTION

EMSF is an innovative technology for production of very clean drinking water using vacuum distillation. Explanation of EMSF = Environmental Multi-Stage Flash.

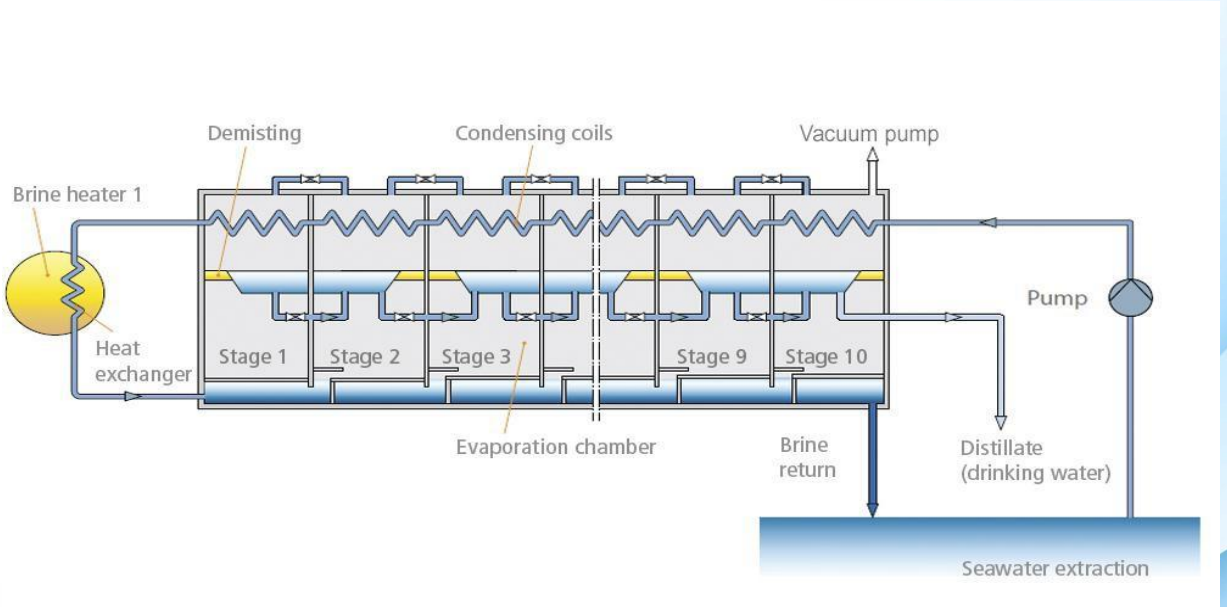
At the same time, there is an EMED technology available, with similar advantages. Explanation of EMED = Environmental Multi-Effect Distillation.

EMSF and EMED technology:

- Permits production of high-quality “baby drinking water” with a measurable value up to 1 ppm (parts per million). That is one millionth of dissolved solids, whereas using a traditional method such as reverse osmosis (RO) makes it difficult to comply with an output value of 300 ppm (and that only using brand new filters and well configured equipment).

- Reduces pressure inside the equipment, leading to a significant reduction in water boiling point, which reduces energy consumption and thus also costs of water production.

Figure 1 - Simplified technology diagram



POSSIBLE ENERGY SOURCES FOR EMSF

- EMSF is capable of using energy for the desalination process from both conventional sources (thermal, nuclear, hydropower plants) and alternative sources (solar, wind power plants, etc.).

- However, the greatest advantage is the ability to use waste heat, which makes it possible to produce high-quality drinking water at almost zero operating costs.

- The technical design permits use of waste heat from many types of technical equipment, such as diesel generators, machine halls, engines, exhaust pipelines, incinerators, flares, power plant cooling systems, and more. That permits the cheapest water production without producing any additional CO_2.

Figure 2 - Energy sources

ADVANTAGES OF EMSF MODULAR SYSTEM AND TECHNICAL PARAMETERS

- The equipment is designed as a modular system with a standard capacity ranging from 5 to 100 m^3 of drinking water a day. To increase capacity, these modules can be connected in parallel without limitation.
- Requires almost no maintenance except scheduled shutdowns for simple cleaning of the equipment. The equipment operating time is 360 days a year.
- The technology can be equipped with remote monitoring with periodic transmission of servicing data – servicing history and failure reports.
- Requires no complex construction preparations; can also be delivered as an in-built model installed in a container.
- Requires no qualified staff for operating and servicing.
- Brings immediate monetary savings thanks to using waste heat.
- Brings additional monetary savings because it requires no replenishing or replacement of consumable operating media or materials.

Figure 3 – EMSF size comparison

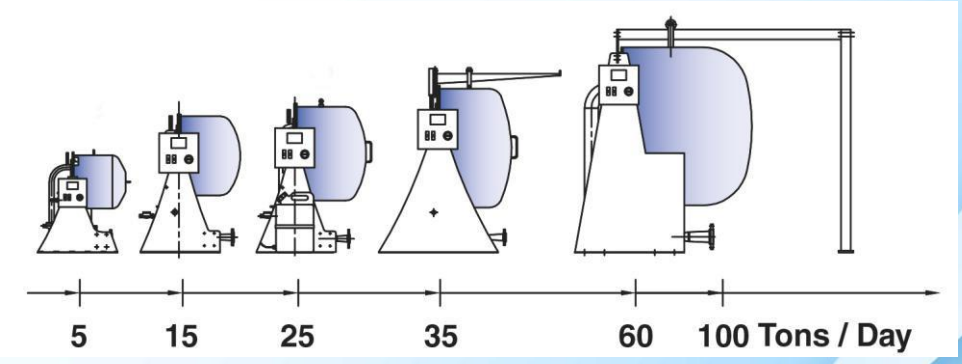


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Figure 4 – Table of technical parameters, basic model series

Type	Capacity		Heat consumption	Power consumption	Sea water temperature	Sea water flow	Dimensions			Weight
	litres/ hour	m3/day					Length	Width	Height	
Princeston 005	210	**5**	160 kW	7.5 kW	85 °C	12 m³ / hr	160 cm	130 cm	150 cm	650 kg
Princeston 010	420	**10**	270 kW	7.5 kW	85 °C	20 m³ / hr	210 cm	160 cm	150 cm	730 kg
Princeston 015	630	**15**	410 kW	17.5 kW	85 °C	31 m³ / hr	220 cm	160 cm	150 cm	900 kg
Princeston 020	830	**20**	550 kW	22 kW	85 °C	40 m³ / hr	230 cm	160 cm	180 cm	950 kg
Princeston 025	1040	**25**	690 kW	22 kW	85 °C	51 m³ / hr	230 cm	160 cm	180 cm	950 kg
Princeston 035	1460	**35**	960 kW	22 kW	85 °C	72 m³ / hr	300 cm	250 cm	200 cm	1200 kg
Princeston 060	2500	**60**	1650 kW	34 kW	85 °C	123 m³ / hr	350 cm	250 cm	240 cm	3600 kg
Princeston 080	3300	**80**	2210 kW	34 kW	85 °C	161m³ / hr	400 cm	250 cm	270 cm	3900 kg
Princeston 100	4150	**100**	2760 kW	55 kW	85 °C	206 m³ / hr	400 cm	250 cm	270 cm	3900 kg

APPLICATIONS AND REFERENCES

EMSF finds applications:

- in production of quality drinking water, also for irrigation in agriculture, orcharding, forestry and industry,
- specifically in desert areas for provision of drinking water and irrigation for farms growing vegetables, date palms and so on, also for afforestation of selected areas,
- as a mobile, autonomous source of water after natural disasters, water supply failures, military operations and so on,
- in areas afflicted by diseases and increased mortality caused by consuming contaminated water,
- as a source of water in areas without infrastructure using only solar power or waste heat, for example for: hospitals, schools, villages, manufacturing plants, accommodation facilities, restaurants, farms, and so on,
- in places and facilities on the sea, such as motor boats and yachts, islands without their own store of drinking water, mining rigs, etc.,
- in fisheries for rinsing sea fish before freezing,
- for production of cheap high-quality packaged water for further sale (PET, barrels),
- in combination with other technologies such as depolymerizing for processing waste, mirror solar power plants (CSP), which produces 2/3 of excess thermal energy, and so on.

EMSF can be seen in the Czech Republic, Egypt and Cambodia and in various other places in the mobile version. Besides, PRINCESTON has been collaborating with the Ministry of Science and Technology of Mozambique and its subsidiary Water Research Institute on implementation of a seawater desalination project on Inhaca island.

Figure 5 – EMSF container version with biofuel boilers, PV panels and a control workstation

Figure 6 – Use of excess heat from CSP for producing fresh water for irrigation using EMSF

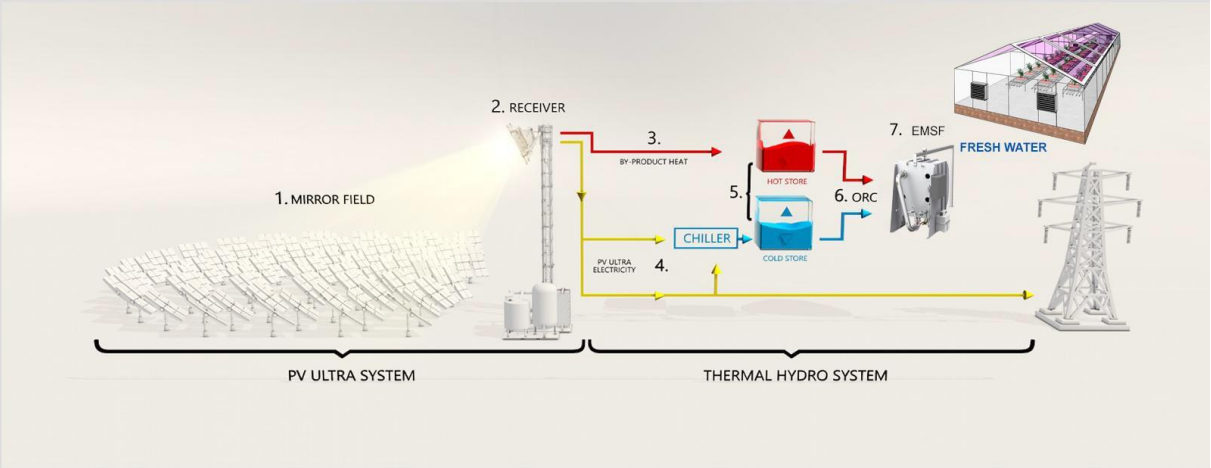
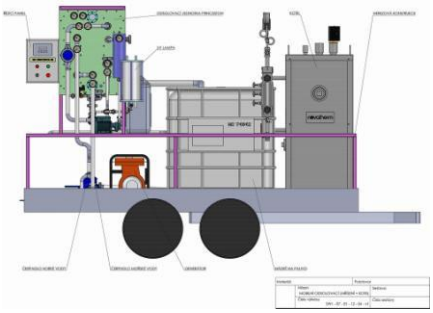


Figure 7 – EMSF mobile unit diagram for the autonomous diesel version



COMPARISON WITH OTHER TECHNOLOGIES, NOTABLY REVERSE OSMOSIS (RO)

- The fundamental difference is the quality of the output drinking water from EMSF, which is >300 times cleaner.
- Significantly lower acquisition price of EMSF (approximately 50%).
- The operating costs are very low if using waste heat for water production (0.12 EUR/1m3/year).
- EMSF requires no qualified operators.
- EMSF uses no filter membranesthat would have to be regenerated and replaced periodically; the replacement makes up to 30% of the total price of RO for each periodic replacement.
- EMSF requires no chemicals (acids) for rinsing that would have to be disposed of after use.
- EMSF requires no special operating environment for equipment installation.
- Water from RO is absolutely inappropriate for irrigation in the long term due to higher proportion of salts in irrigation water, leading to a cumulative effect and thus irreversible destruction of soil.

Figure 8 – Soil salinized by inappropriate irrigation techniques:

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EXPECTED COSTS

The prices of EMSF in the basic model series range from 38.000 EUR to 167.000 EUR depending on equipment size and capacity. Equipment can also be made to order.

Comparing the acquisition prices with competing manufacturers, which use the vacuum distillation technique, the EMSF technology is approximately 50% cheaper. Qualitatively, EMSF equipment efficiency is approximately 20% higher.

Comparing the acquisition prices with RO manufacturers, the EMSF prices are also about 50% lower. If EMSF uses energy of waste heat for water production, the EMSF has significantly lower operating costs compared to RO.

Figure 9 – Charts: Comparison of EMSF and RO technologies

IMPLEMENTATION

After consultation with the customer – notably in respect to available energy source – the supply can be implemented either as standard equipment unit of the requested capacity or as tailor-made manufactured unit as per order. In manufacturing per order, the first stage of implementation is detailed project development, followed by equipment manufacturing and delivery. The final installation and commissioning and operation staff training will be provided on side by PRINCESTON expert team.

CONTACT

King Brand Industrial Limited

Rm. 1123, 11/F, Metro Centre II, 21 Lam Hing Street, Kowloon Bay, Kowloon, Hong Kong

Email: info@kingbrand.com.hk

Tel.: 852-22433328

Fax: 852-22433884

References:

Idea: https://www.youtube.com/watch?v=M3t4b0HsofI&ab_channel=Princestoneu

Animation: https://www.youtube.com/watch?v=fz9e5CQfWwI&ab_channel=Princestoneu