Technology Opportunity
Improved Efficiency Multiple Effect (Low Temperature) Distillation Method

With Applications in
- Desalination
- Chemical Processes
using geothermal or waste heat sources

Background
The University of Western Australia (UWA) is collaborating with the Western Australian Geothermal Centre of Excellence (WAGCOE) and the National Centre of Excellence in Desalination (NCED) to develop novel technologies for exploiting low-grade geothermal and waste heat (75..100°C) which lead to the technology being presented here.
**The Technology**

Multiple-Effect Distillation (MED) is a well established method for desalination of seawater. Thermal methods for seawater desalination generally consume more energy than the reverse osmosis method, however, when used with geothermal or waste heat sources, thermal methods have an advantage.

When using genuine waste heat sources, it is of advantage to extract maximum energy from the heat source by cascading a secondary MED system:

**Fig 1:** A traditional multi-effect desalination system with 4 effects.

**Fig 2:** First generation cascaded two-stage MED design
To maximise the extraction of additional energy with minimal impact on hardware cost, the secondary MED system can be replaced by a single element “steam booster” as follows:

![Second generation MED design with steam boosting](image)

**State of Development**

The novel MED system has been thoroughly modelled, and the following table lists the performance of the technology compared to a standard 6-effect MED plant driven by geothermal energy. The model has been validated with data from commercially available (current technology) systems.

<table>
<thead>
<tr>
<th></th>
<th>Geothermal water flow rate (L/s)</th>
<th>Hot water temperature (°C)</th>
<th>Discharge hot water temperature (°C)</th>
<th>Sea water temperature (°C)</th>
<th>Freshwater yield (m³/day)</th>
<th>Improvement (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard MED</td>
<td>100</td>
<td>90°C</td>
<td>68°C</td>
<td>32</td>
<td>1532</td>
<td>N/A</td>
</tr>
<tr>
<td>Improved MED technology</td>
<td>100</td>
<td>90°C</td>
<td>60°C</td>
<td>32</td>
<td>1994</td>
<td>30%</td>
</tr>
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A prototype of the first generation cascaded two-stage MED system is currently under constructions at the facilities of the National Centre of Excellence in Desalination.
Benefits of the Technology

- Improve freshwater yield of MED plant by some 30% with only a minor increase in cost compared to currently available commercial systems.
- Alternatively, reduced hot water supply flow rate for a given freshwater output rate.
- Reduced plant cost per output capacity.

For geothermal applications:
- Reduced pumping costs for production and injection wells (for a given output capacity).
- Increased peak output capacity.
- Reduced depth of the injection well (i.e. reduction in drilling costs).
- Reduced risk of thermal breakthrough due to increased vertical separation between production and injection well.

Commercial Opportunity

UWA and NCED are seeking an industry partner willing to join forces with UWA and NCED to bring the technology to market. Applications identified in Western Australia and in the South East Asian region are as follows:

- Using surplus waste heat in chemical process plants to generate fresh water from dilute process liquors or lower quality water streams.
- Seawater desalination using waste heat in power stations and petroleum refineries.
- Seawater desalination using geothermal energy from sedimentary basins.

The Research Team

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References


Intellectual Property protection

Patent protection has been applied for.

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