

Osmotic power — a new, renewable energy source

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ABSTRACT

The mixing of freshwater and seawater where rivers flows into the salty ocean releases large amounts of energy. This energy can be harvested and made into electricity using pressure retarded osmosis (PRO). This is the concept of osmotic power, a new and yet unexploited source of renewable energy. The idea of exploiting the energy from mixing fresh water and sea water with PRO was first developed by Prof. Sidney Loeb in the early seventies. After some years in the eighties with limited progress in the field, the Norwegian power company Statkraft engaged in technology development in the mid nineties aiming at cost-effective osmotic power production. Today Statkraft is the world leader in development of osmotic power, and have made state of the art achievements during the last few years. The work has been focused on the design and production of a semi-permeable membrane optimized for osmotic power. During these years the power density of the membrane has increased from less than 0,1 W/m² up to today's membranes producing close to 3 W/m². The target of 5 W/m² necessary to produce osmotic power on commercial basis seems within a few years time. The development has consisted of testing existing membranes, and improving these, as well as designing completely new membranes. An insight to this work will be given, and also give some results from the testing of existing and novel membranes operated in PRO. The world's first osmosis driven power plant will be put into operation during 2009 in the southeast of Norway. The main objectives of the prototype are twofold. Firstly, confirming that the designed system can produce power on a reliable 24-h/d production. Secondly the plant will be used for further testing of technology achieved from parallel research activities to substantially increase the efficiency. These activities will mainly be focused on membrane modules, pretreatment of water, pressure exchanger equipment and power generation (turbine and generator). The presentation will give a brief introduction to the prototype system, the expectations for operation and maintenance, and also some outline of the next steps in the development of osmotic power. The paper gives a general overview of the obstacles that needs to be addressed, and expectations of the results that should be achieved. With these assumptions handled, osmotic power can develop into a new, renewable source of energy well capable of competing on the energy market in the near future. Once again, Prof. Sidney Loeb contributes to solve one of the major challenges to establish a sustainable world for the next generations.

Keywords: Osmotic power; Renewable energy
