



# Salinity Gradient Solar Ponds

**Jordi Estevadeordal**



## **Salinity Gradient Solar Ponds:**

*Salinity Gradient Solar Ponds* John R. Hull, 1988-12-31 Despite a dearth of both water and love the family discovers through sorrow and fear the green kiss of the Kappa Child a mythical creature who blesses those who can imagine its magic back cover

Salinity Gradient Solar Ponds University of Texas at El Paso. Mechanical and Industrial Engineering Department, 1995

**Salinity Gradient Solar Ponds** Ibrahim Alenezi, 2012 Solar thermal energy generated by a salinity gradient solar pond SGSP is one of the most promising techniques for providing heat for desalination and other applications A solar pond is a unique free energy source system for collecting converting and storing solar energy Saudi Arabia is one of the most solar radiation abundant countries on the planet but the region also has limited water resources Studying the thermal behaviour of a SGSP under Saudi Arabian conditions for heat generation for a thermal desalination application is the aim of this study An empirical equation is developed and a Matlab script is programmed to calculate hourly averaged daily solar radiation from sunrise to sunset The results are validated through NASA's 22 year average data for solar radiation Mathematical models are developed to describe and simulate the thermal behaviour of a SGSP The results are compared with a SGSP in Kuwait the results of the steady state model are sufficiently close to the measurements The efficiency of a solar pond depends on the salt gradient stability in the middle non convecting zone and the diffusion and erosion of these salt layers are considered in this study The proposed SGSP in Riyadh Saudi Arabia has an area of 100 x 100m<sup>2</sup> and the predicted temperature of the storage zone is about 100°C Higher temperatures can be reached through improved insulation and covering the surface Additionally an SGSP in a cold climate is suggested to compare with and test our model The University of Surrey SGSP exceeded 80°C This renewable and sustainable heat source can be employed in desalination the energy cost of desalinated water constitutes over 50% of operating costs The heat removal process from the solar pond is investigated and coupling the proposed solar pond with a Multi Effect Evaporator MEE is described the effects of various factors on the SGSP MEE coupling are studied

**Feasibility and Design Study of Salinity Gradient Solar Ponds for Providing Industrial Process Heat in Wisconsin** Mark A. Henning, 1996

**Quantitative Exploration for Salinity-gradient Solar Ponds in West Texas and Eastern New Mexico** Juan Antonio Sandoval, 1995

*SOLPOND-a Simulation Program for Salinity Gradient Solar Ponds* Jon Henderson, 1980

*Exergy* Marc A. Rosen, Ibrahim Dincer, Marc A. Rosen, 2007-09-18 This book deals with exergy and its applications to various energy systems and applications as a potential tool for design analysis and optimization and its role in minimizing and or eliminating environmental impacts and providing sustainable development In this regard several key topics ranging from the basics of the thermodynamic concepts to advanced exergy analysis techniques in a wide range of applications are covered as outlined in the contents Comprehensive coverage of exergy and its applications Connects exergy with three essential areas in terms of energy environment and sustainable development Presents the most up to date information in the area with recent developments Provides a number of illustrative examples

practical applications and case studies Easy to follow style starting from the basics to the advanced systems *SOLPOND-a Simulation Program for Salinity Gradient Solar Ponds* Jon Henderson, Cécile M. Leboeuf, Solar Energy Research Institute, 1980 Modelling the Thermal Potential and Operation of Salinity Gradient Solar Ponds Sirajadien Alzin, 2020 Monitoring the Performance of a Salinity-gradient Solar Pond, 2012 Solar Energy Update, 1986 **Critical Withdrawal from the Storage Zone in Salinity-gradient Solar Ponds** Jordi Estevadeordal, 1992 *Enhancing the Thermal Efficiency of a Salinity Gradient Solar Pond. Implementation of the Study in the Design, Construction, Salinity Gradient Establishment, Operation and Energy Transfer at Industrial Scale* Aurora Alcaraz Segura, 2019

The energy model in the last decades has been dominated by the consumption of fossil fuels assuming a high environmental cost Global warming and the destruction of the ozone layer are two examples of the deterioration that is being suffered due to the use of these energy sources Increasingly the use of renewable energy one of the alternatives in building a sustainable economic model Among renewables solar energy is presented as an inexhaustible and accessible source of energy The solar pond is a technology that meets all requirements to be considered an energy storage device It can store solar energy charging during the months of high solar incidence Spring Summer storing the energy through the time and making possible its use when it is requested A salt gradient solar pond is a body of saline water with long term thermal storage capacity The aim and scope of this PhD thesis is divided in two parts First the improvement of the efficiency of the solar pond technology through experimental evaluation the heat extraction and heat supply processes under different weather conditions These experiments were carried out in a 50 m<sup>2</sup> solar pond pilot plant located in Martorell Catalonia Heat extraction experiments were performed using both heat exchangers installed lateral and bottom individually or both at the same time The results demonstrated that the efficiency of the pond increases when the heat is removed from the lateral heat exchanger compared to either using the bottom heat exchanger or using both heat exchangers simultaneously On the other hand the use of solar collectors as an external source of heat were conducted together with heat extraction process under two different seasonal temperature conditions winter and summer The results indicated that the use of solar collectors allowed a 50% increase in daily efficiency during the cold season tests The second part was focused on the design construction and operation of a 500 m<sup>2</sup> solar pond in Solvay Minerales facilities Granada The solar pond was designed to supply the heat required to preheat the water 60 °C and the reagents in the mineral flotation unit at the mineral processing facility The overall efficiencies obtained after the first and second operation periods are 9.7 and 12.3% respectively with maximum values of 28 and 24% obtained during the first months of operation Regarding the economic savings reductions of 52 and 68% were obtained in the first and second periods compared with the traditional system without solar pond Also the environmental impact is clearly reduced considering the reduction of CO<sub>2</sub> emissions The experience of the Granada solar pond proves that the main advantage of a solar pond is the capacity to store energy in the months with the highest solar radiation to provide a flux of heat to an

external system during the whole year even under strong weather conditions as observed during the January 2015 snowfall

Computational Modeling of Performance of a Salinity Gradient Solar Pond Minoo Mehdizadeh,2014      *Conceptual Application and Feasibility of Salinity Gradient Solar Pond Technology in San Joaquin Valley, California* Huanmin Lu,John C. Walton,Scott Irvine,Harry Remmers,2002      **ERDA Energy Research Abstracts** ,1985      *Salt Concentration Gradient Solar Ponds* ,1979 A computer simulation design tool has been developed to simulate dynamic thermal performance for salinity gradient solar ponds This program will be available to the public through the SERI Solar Analysis Methods Center Dynamic programming techniques are applied to allow significant user flexibility in analyzing pond performance under realistic load and weather conditions Finite element techniques describe conduction heat transfer through the pond earth and edges Results are presented that illustrate typical thermal performance of salinity gradient ponds Sensitivity studies of salty pond thermal performance with respect to geometry load and optical transmission are included      **Passive Heat Extraction System for a Salinity Gradient Solar Pond** ,2012      Scientific and Technical Aerospace Reports ,1985

**Maintenance of and Heat Extraction from a Salinity Gradient Solar Pond** Terence R. Fonseca,2003

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