Workshop: Brine Discharge Management - Environmental planning, prediction and management of brine discharges from desalination plants

Monday / Tuesday, 03./04. November, 2008, Muscat, Sultanate of Oman

Background
Numerous large scale desalination plants have been built and are being planned in arid zones and water-scarce areas, where other drinking water sources are close to depletion. Sea water desalination plants carry a number of waste products into the coastal environment: concentrated salt brine that may also have an elevated temperature, often containing anti-foulings and anti-scalents, corrosion by-products and other substances. Depending on physical and ecological characteristics these substances can have a harmful impact on the local environment (including fisheries or tourism resources).

Modern, large capacity plants require submerged discharges that ensure a high dilution in order to minimize harmful impacts on the marine environment. Worldwide, the use of submerged multiport diffusers is increasing rapidly gaining increased acceptance as effective means for the disposal of treated municipal or industrial wastewater, stormwater and combined sewer overflows, cooling water, and brine effluents from desalination plants into coastal waters and estuaries. Especially for latter application existing design practice is limited to poor modeling concepts and a very heterogeneous or weak regulatory base. Stakeholder opinions vary from “negligible very localized impacts” up to major objections leading to significant project modifications and unnecessary delays.

Content
The main objectives of the workshop are the planning, design and environmental assessment of brine discharges. The lecturers are currently working on a joint research project funded by MEDRC, called: “Environmental planning, prediction and management of brine discharges from desalination plants”. The workshop presents the current state of the project and its products and discusses further needs and improvements necessary. It is therefore designed to provide technical training and guidance to engineers, scientists, regulators, and consultants on the discharge management. The course will cover an introduction to pollutant transport modelling, and mixing zone water quality assessment. Mixing processes are discussed in detail and will be described by simple screening equations and further detailed modelling with the CORMIX system. Participants will be able to conduct several case studies applying the model during the second day.

A special forum will be offered for the participants to present and discuss their activities. Besides the lectures it is given enough space for discussion and elaboration of emerging problems and possible solutions regarding environmental impacts of discharges.
CORMIX

The CORnell MiXing Zone Expert System (www.cormix.info) was developed at Cornell University in USA from G. H. Jirka and R. L. Doneker. CORMIX presents an efficient three-dimensional modeling of numerous mixing and transport processes with high spatial detail and multiple complex discharge characteristics and receiving waters characteristics. For point source discharges the CORMIX modelling system is appropriate to predict near-field mixing processes and therefore water quality impacts. CORMIX is user friendly and already used worldwide (it is the standard model for environmental impact studies of the U.S. EPA). Quantitative elements to describe and analyze water quality impacts are given by text and graphic information as well as additional qualitative features. This allows the engineering design of discharge structures and regulatory licensing in short time. The software is divided in several modules to model either submerged single port or multiport discharges as well as surface discharges.

CORMIX simulates discharge problems for:
- Conventional waste water discharges
- Industrial discharges
- Cooling water discharges
- Desalination plant discharges
  in:
  - Rivers and channels
  - Reservoirs (influence of stratification considered)
  - Estuaries (density stratification and tides considered)
  - Coastal waters
  - Deep ocean

Target group
Engineers from Agencies, Governmental institutions, Industry and cities, as well as consultant firms who are working with planning, analysis, design, licensing and monitoring of brine discharges into water bodies.

Lecturers
Prof. Hamdi H. Al-Barwani, Sultan Qaboos University, Oman
Dr.-Ing. Tobias Bleninger, Universität Karlsruhe, Germany
Prof. Robert L. Doneker, MixZon Inc., Oregon, USA
Prof. Gerhard Jirka, Ph.D., Universität Karlsruhe, Germany
Sabine Lattemann, M.Sc., ARSU-Regional Planning and Environmental Research group, Germany
Prof. Anton Purnama, Sultan Qaboos University, Oman

General Information
Location
MEDRC (Middle East Desalination Research Center) in-house facility, Muscat, Oman

Registration
To register, please send an email to K. Venkat Reddy (kreddy@medrc.org.om)
The course is limited to a maximum of 35 participants. The participants are asked to bring their notebooks, if possible, to apply the program directly within the course. A free evaluation version of CORMIX can therefore be downloaded and installed under: http://www.mixzon.com/sales/

The workshop will be given in English.
Program

Monday, 03. November, 2008

Morning
- Welcome (MEDRC, SQU)
- Desalination and the Environment in the MENA region (Lattemann)
- Seawater desalination in Oman: Overview and environmental impacts (Al-Barwani)
- Environmental impact assessment approach and regulatory issues (Lattemann)
- Physical Mixing Processes and Mixing Zone Analysis (Jirka)

Afternoon
- CORMIX Expert system for outfall design and discharge assessment (Doneker)
- Far-Field Modeling (Purnama)
- Near-Field / Far-Field coupling (Bleninger)
- Forum: Possibility for participants to present and discuss their works and projects (5min. each, to be announced in advance)

Joint dinner

Tuesday, 04. November, 2008

Morning
- CORMIX application: Input and output options, visualisation and interpretation (Doneker)
- Case studies with CORMIX (Doneker, Bleninger)

Afternoon
- Hands-on applications: Case studies with CORMIX

Further information

Publications:
- Jirka, G.H., 2007, "Improved Discharge Configurations for Brine Effluents from Desalination Plants", J. Hydraulic Engineering

Project homepage: www.brinedis.net.ms

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