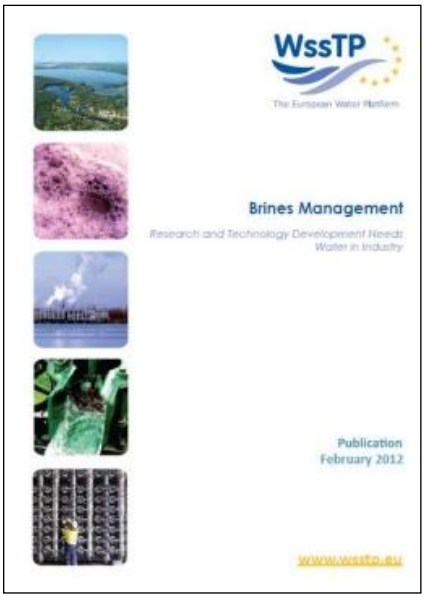
Executive Summary:
Brines Management Report

THE BACKGROUND TO THE BRINES MANAGEMENT REPORT



WssTP's report on Brines Management was published in February 2012, and involved 20 contributors from 10 different countries.

Brines management is fast becoming a specialist field for R&D, as the production of concentrated salt solutions (>50g/l) increases through drinking water production, industrial water production and brine effluents from numerous industrial processes. Effective brine management can sustain industrial processes for the long term, whilst minimising the impact on the environment.

The need for more R&D in this field is being driven by the threat of increased water scarcity and raw materials, increasingly stringent environmental legislation, realisation of economic value obtained through brine valorisation, and a growing awareness of the problem – especially in the Euro-Med region.

This report explains the current brine management pathways, whilst recognising the ultimate need for brine production avoidance. The state of the art of existing treatment technologies is given and examined through two case examples. A number of emerging technologies are explored with recommendations given with which to further their effectiveness and efficiency through more R&D in this field.

THE PURPOSES AND CHALLENGES OF THE BRINES MANAGEMENT REPORT

Various processes release concentrated saline wastewater streams including: the treatment of drinking water from brackish water or sea water; the treatment of industrial water (softening, demineralization, membrane processes); and the treatment of wastewater originating from industrial processes such as the textile, leather, food, and chemical industries, and from salt production.

For brine streams from certain process industries, the direct reuse of the salts in the process itself is usually the most attractive option. Because the contaminants are process specific, reuse is much easier, and only limited components, mostly from organic origin, must be removed. However there is limited demand due to the high demands dictated for the composition of these streams.

Reverse Osmosis (RO) is one of the most well-known sources of concentrated brine. As the desalinated water which passes through the membrane is known as permeate, the remaining water which contains a much higher concentration of salt is called concentrate or brine. The volume of brine produced is usually equivalent to the volume of purified water produced, and subsequently difficult to dispose of.

The most common route for brines produced near coasts is to be discharged into the sea. The concentrate may have a negative environmental impact which has been highlighted in areas such as the Mediterranean coastline, where large areas have been affected by saline intrusion driven by abstraction of water for agriculture and public water supply.

Inland discharges of brines lead to increased salt content of the receiving surface water, and hence it will generally have a negative environmental effect as well. There are many other alternatives with no or little impact, such as crystallization, evaporation ponds, discharge into saline ground water, transport by truck or ships to safe discharge locations, incineration and even land filling, but these can be expensive.

TURN OVER TO SEE THE MAIN FINDINGS & FUTURE RESEARCH NEEDS

Once wastewater is treated and reused, residual contaminated brines must be disposed of or possibly treated in compliance with regional or local statutes. Technologies for treatment of brines are available with limitation to water reuse, and at a relatively high cost. It is also arguable that the cost of concentrated salts treatment has a higher significant impact in determining economic feasibility of utilizing reverse osmosis treatment for producing water sources from saline water.

Thus, evaluations on brine treatment options are very important to achieve zero waste and liquid discharge to the environment. All these treatments and processes pose an ever growing problem, due to the increasing volume of brines, the high treatment costs, the limited marketing and re-use possibilities, and the decreasing discharge possibilities due to more stringent legislation.

MAIN FINDINGS AND FUTURE RESEARCH NEEDS

Research and development at the pilot scale is still needed to ensure the real application of brine treatment technologies to achieve water treatment and recycling. Alternatives on source control options to produce concentrated salts, cost benefit analysis on brine treatment technologies, and environmental considerations will need involvement of all key stakeholders.

Policy decisions will also have an impact on the application of technologies in the market. Recycling and valorisation of salts can be improved by selective separation technologies and/or combined treatments in order to enhance the purity of the produced salts. Again, this needs the collaboration of key stakeholders, including other European Technology Platforms.

Large amounts of brine result from desalination plants for drinking water production, mainly at the Mediterranean coast; as the amount will double in the next two decades, it is recommended to study the environmental impact in more detail and the options to reduce the impact and/or to recover salts from the brines.

Brines from industrial processes have a wide variety, concerning amounts, concentration, composition and contaminants. An in-depth study could reveal the best streams for recovering salts, water and reduction of the environmental impact, in combination with low or even negative costs. Such a study on the optimal utilization of saline waste streams could focus on 1 or 2 countries or even sectors. Positive findings should be transferred to other countries or sectors at a later stage.

The recovered/retained salts might preferentially be sent to salt producers for further processing. Producers are expected to be reluctant because of the limited amounts and the uncertainty about the composition. It should be investigated which factors exist, and how the most important ones can be best alleviated.

The European Commission is encouraged to stimulate the development of brine treating techniques. As technology development takes several years and the margins on brine treatment will remain low, the EU should financially stimulate technology development programs (from emerging technologies to full scale trials). New concepts on separating undesired compounds will be essential for recovering salts in Europe and minimizing the environmental impact. Such innovations are expected to attract many customers in other areas of the world.

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