# A NOVEL WATER DESALINATION AND EUTECTIC SALT CRYSTALLISATION PROCESS

The invention is capable to viably desalinate high salinity water like reject brine of sea water reverse osmosis (SWRO) plants and highly saline produced water with a level of salinity up to eutectic saline composition. It is capable of concentrating salt water to its maximum possible eutectic composition of 230000 mg/l. Further it works as a eutectic salt crystallizer resulting in crystallization of salt if operated on eutectic saline. Numerous innovations included in the invention makes it probably the cheapest gas hydrate based desalination technology possible at an anticipated operating energy consumption of just around 0.05 kwh/ litre of desalinated water produced. Also the desalination system based on the technology is supposed to have very low capital cost requiring very few and simple components. The invention has applications in TDS reduction of wastewater including desalination of highly concentrated produced water coming out of fracking oil and gas wells. Produced water desalination can solve a big pollution problem in lot of developed countries where pollution control laws prohibit discharge of highly saline water into surface bodies requiring it to be discharged into deep wells located in seismically safe zones which may be far off from the oil and gas well site. In addition, the invention has applications in lot of other areas like salinity reduction of sea water, separation of costly minerals and chemicals from water, waste water treatment etc.

I have developed the technology independently without any affiliation to any organization, university or research lab. Elaborate literature survey has been conducted in the field of gas hydrates to find out the latest practices in the field of gas hydrates in general and hydrate based desalination in particular. As a result of this literature survey, I

have finalised on microbubble technology to form gas hydrates easily and instantly. As you know, hi-tech research like the one leading to this invention requires cutting-edge research labs and latest softwares. As I do not have access to all this so I have developed my own engineering software tools over past 12 years which are equivalent or better than similar commercial software tools and have modelled and simulated various equipments and processes which otherwise would have required live experimentation in hi-tech research labs. My engineering software tools are showcased and are available for use by paying nominal charges on my website, www.eq-comp.com. I have used basic calculation tools like MS Excel and VBA for developing my engineering softwares and simulations as only these were readily available to me. Numerous simulations of the desalination process has been developed during the course of the invention between year 2009 and year 2015 to do virtual experiments on the system in order to optimize and improvise the system. Simulations have been developed for microbubble generation system which is a critical component for the gas hydrate based desalination system so as to find out the specifications of the microbubble generation system for the required operating conditions of the desalination system and further optimize the microbubble generation system. This simulation was required as finding out the specifications of the microbubble generation system for the required operating conditions of the desalination system would otherwise have required live experimentation in a high-tech research lab requiring large monetary expenses.

The technology has been designed and simulated to great details, a US and an Indian patent has been filed for the technology and the technology is ready for licensing/ commercialisation. A small prototype of the desalination system based on the technology may be developed for practically validating the effective working of the

technology and fine-tuning the operating parameters of the desalination system.