Advertisement for Incubation of Technology

Title of technology	Process system for clean-up of dissolved oil and salt contaminated waste water for gainful utilization

Current state of Technology

- ✓ Basic principles observed
- ✓ Technology concept formulated
- ✓ Experimental proof of concept
- ✓ Technology validated in lab
- ✓ Technology validated and demonstrated in relevant environment
- ✓ System prototype demonstration in operational environment System complete and qualified
- ✓ Actual system proven in operational environment
- ✓ Demo system available

General Information

The technology is based on degradation of dissolved oil/organics present in produced water (water coming out of oil wells in addition to crude oil). Micro-nano bubbles of ozone gas is used to degrade the dissolved oil present in water. Once dissolved oil is oxidised and removed the water is passed through a series of filter and then goes into a RO module for TDS removal. The product water from the plant is free from dissolved oil (O&G is nil) and TDS is much below 2100 ppm (suitable for irrigation use).

Specification of system

The current system is capable of treating produced water at 500 LPH and is able to reduced O&G content from 10 (design limit 12 ppm) to 0 ppm. TDS can be reduced from ~10000 ppm to ~500 ppm.

General features of current system

- ✓ Ozone micro-nano bubble degradation of dissolved oil/organic in waste water
- ✓ Primary ozonation reactor is a single /multiple CSTRs in series
- ✓ Secondary polishing step for trapping dissolved oil escaping primary reactor
- ✓ Reverse osmosis (RO) module for removal of TDS.
- ✓ Process is scalable and flexible. For example if feed water is having only oil contamination RO step may be removed

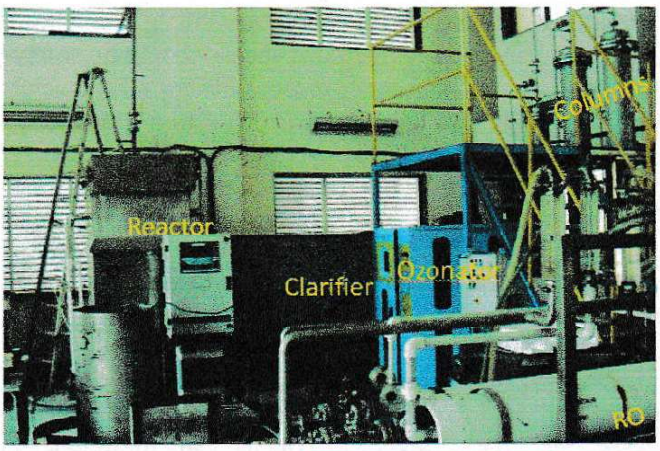
Features of the current and Target systems

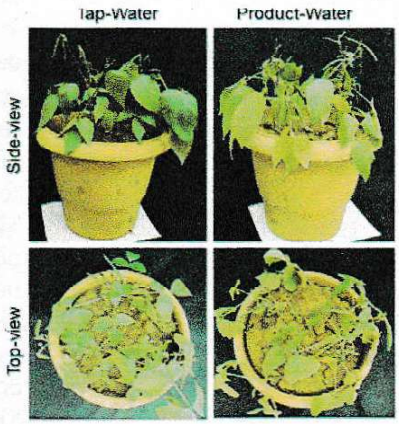
	Current system	Target system
Feed throughput	10 m^3/day	500 m^3/day
O&G at exit of primary step	0.5 ppm	0.5 ppm
O&G at exit of secondary step	0 ppm	0 ppm
TDS at exit of tertiary step (permeate)	<2000 ppm	<2000 ppm
Specific energy consumption	30 kW-hr/m^3	15-20 kW-hr/m^3

Working Principle of the System

Ozone gas infused in produced water reacts with the unsaturated organic molecules (dissolved oil) and oxidised them leading to a drastic reduction in O&G, COD/BOD and TOC content of water. Micro-nano bubbles of ozone injected in water increases the ozone utilisation factor drastically which ensures that no other oxidant (chemical) is needed. This makes the process "green". After ozonation step the water is passed through a set of activated carbon filter to remove any slippage of organics. Once dissolved oil is removed the water is treated in a Reverse osmosis module to remove TDS content below permissible limit.

Photograph(s) of the System





	Feed	Exit of ozonation reactor (first step)	Exit of RO unit (final step)
TOC (ppm)	120	50	8
TDS (ppm)	20700	20529	404
COD (ppm)	208	140	10.28
BOD5 (ppm)	42	34.8	14
pH (-)	8.5	8.7	7.4
EC (micro S/cm)	~35000	~35000	811

Areas of Applications of the Existing System-

The area of application of the existing/current system is treatment of oil/organic contaminated waste water with/without high levels of TDS. One example of high dissolved oil and TDS contaminated waste water is produced water coming from oil field. The technology can also be used to treat organic contaminated waste water without much TDS load. One such example is coloured dye/ink contaminated waste water from textile/dyeing/printing industries.

Justification for Incubation

Typically the quantities of produced water in an on-shore oil filed are very large (~4-20 MLD) depending upon size and age of the filed. Presently this huge quantity of water has to be rejected inside the well which constitute an energy intensive process. The technology developed, once scaled up, have potential to treat a large quantity of water which will enable it to be utilised for irrigational/industrial use. This also reduced requirement for reinjection of the water into wells thereby saving costs.

Facility and Infrastructure requirements:

Title Head	To be provided by BARC	To be provided by Incubatee
Manpower/ expertise	Manpower: 3 (SO/F (1 No), SO/C (1 No) and Foreman (1 No) **Role:** 1) BARC will provide design documents of the scaled up plant. Documents will include P&ID, PFD, List of equipments, Electrical load, GA drawing, SoP, EoP. 2) BARC will review the design documents/drawings submitted by incubatee (including bought out items) and will approve documents for fabrication 3) BARC will inspect the plant during installation/erection and provide guidance (if needed) 4) BARC will help in commissioning of the plant 5) BARC will be involved in analysis of data and/or trouble shooting as and when required.	**Role:** Incubatee will facilitate 1) Selection of a suitable contractor/vendor (LSTK type) for carrying out the project. 2) Identification of a suitable site (on shore oil field generating significant quantities of produced water). 3) Awarding contract (Incubatee should be solely responsible for all financial costs associated with setting up of the scaled up plant). 4) Overviewing the progress of fabrication, installation and erection activities periodically. 5) Plant commissioning (along with BARC personnel). 6) Awarding O&M contract to run the plant for its design life at rated capacity.
Machinery and Equipment	Nil	1) LSTK contract to be awarded by Incubatee to set

		up the scaled up (0.5 MLD) plant. 2) Site to be provided by Incubatee
Others		1) It is responsibility of Incubatee to award O&M contract to run the plant for its design life at rated capacity.
Economic Viability:		
a. Investment and unit cost of production	Investment for 0.5 MLD scale ~ 20-25 Cr (INR) Targeted energy cost of operation ~ 15-20 kWhr/m3 of produced water processed.	
b. Imported/indigenous market price of equivalent product, if available.	N.A	
Special Requirements:		
Any special requirements for plant, industry, location utilities, handling storage, safety etc.	Plant has to be located at the site of an on shore oil field generating significant quantities of produced water.	

Note: As per in-house technology incubation policy, the incubatee should be a licensee of the existing technology. Alternatively, the applicant will be required to take the license of the existing technology before entering incubation agreement.

If interested in Incubation, kindly download -> fill -> scan -> send the application form to –

Convener

Task Force, Incubation Centre - BARC

Knowledge Management Group

Training School Complex

Anushakti Nagar

Mumbai - 400094.

Email: incubation@barc.gov.in