Zero Liquid Discharge Facility for Textile Dyeing Effluents & Pulp and Paper Effluents

International Conference on
"Green Enterprises and Green Industrial Parks"
a step forward for innovative and resource efficient entrepreneurships

Tamilnadu Water Investment Company Limited

June 28 - 30, 2013; Hyderabad

CONTENTS

- **Section A : Introduction to TWIC**
- **Section B : Concept of ZLD**
- **Section C : Case Study of Textile CETP**
- **Section D : Case Study of Pulp & Paper ETP**

Section A: Introduction to TWIC

Genesis

- TWIC is a pioneering developer of water/waste water projects in India

- Promoted by Infrastructure Leasing and Financial Services Limited (IL&FS) [54%] and Government of Tamil Nadu (GoTN) [46%]

- Over the last few years, TWIC has been in the forefront of a number of initiatives both in the urban water space as well management of industrial effluent

Focus Areas

Water Reuse

- Industrial Effluent
- Sewage Reuse
- Desalination

Urban Water

- Treatment Plants
- Urban Water Distribution

Section B: Concept of ZLD

Concept of ZLD

- ZLD - stands for Zero Liquid Discharge – meaning zero discharge of wastewater from Industries.
- A ZLD system involves a range of advanced wastewater treatment technologies to recycle, recovery and re-use of the 'treated' wastewater and thereby ensure there is no discharge of wastewater to the environment.
- A typical ZLD system comprises of the following components:
  - Pre-treatment
  - Reverse Osmosis
  - Evaporator & Crystallizer

Need for ZLD ..1

- Most polluting industries such as Pharma, Pulp& Paper, Tanneries, Textile Dyeing, Chemicals , Power Plants etc generate wastewater with high salinity/TDS.
- Conventional 'Physico-chemical-biological' treatment does not remove salinity in the treated effluent. The TDS content is well above the statutory limit of 2100 mg/l.
- Discharge of saline but treated wastewater pollutes ground and surface waters.
- Several states in India including Tamilnadu are water stressed. Competing demands for water from agriculture and domestic use has limited industrial growth.

Need for ZLD .. 2

- TN has taken a lead on ZLD due to absence of fully flowing perennial river Most rivers originate from neighboring states and water sharing is enmeshed in disputes. Several landmark pollution cases and court battles have hastened this, such as the Vellore and Tirupur court cases. Other states such as Gujarat and Karnataka also are now are considering ZLD.
- Location of industries in 'Inland areas' and issues related to sea discharge of 'treated' wastewater.
- High cost of water (> Rs. 40) and statutory regulations are prime drivers for ZLD.
- MAIN MOTIVATORS- Water Scarcity, water economics, regulatory pressure.

Benefits of ZLD

- To save costs and reduce the capacity needed, comprehensive water audits are usually performed which also ensure that the system deals only with the most polluting streams. Installing ZLD technology is therefore often beneficial for the plant's water management; encouraging close monitoring of water usage, avoiding wastage and promotes recycling by conventional and far less expensive solutions.
- High operating costs can be justified by high recovery of water (>90-95%) and recovering of several by products from the salt.
- A more sustainable growth of the industry while meeting most stringent regulatory norms.
- Possibility of use of sewage for recovery of water, for Industrial and Municipal use, using ZLD technologies.
- Reduction in water demand from the Industry frees up water for Agriculture and Domestic demands.

Challenges in ZLD

- "Is the Holy Grail of Industrial wastewater Treatment..." Global Water Intelligence.
- ZLD results in generation of hazardous solid wastes creating disposal challenges- need to think of Zero Waste Disposal (ZWD) Plants. Generate products/ by-products out of the waste.
- Economic viability- cost and availability of water, regulatory pressure are the real driving force.
- High Carbon foot print- is this environmentally sustainable?
- High Operating cost and financial impact on the industry and its Regional/ National/Global competitiveness.
- Technology shortcomings.

Section C : Case Study of Textile CETP

Tirupur Textile Effluent Management Project, Tirupur.. 1

- Project: TWIC has developed and established 9 Textile dyeing CETPs with a capacities ranging from 3 MLD to 11 MLD(Combined Capacity 53 MLD) in Tirupur based on Zero Liquid Discharge. The major components are BIOT, RO, Evaporator and Pipeline.
- Project Cost : Rs 420 Crores + Additional Cost for modification work
- TWIC Role : TWIC has supported the Client in the following areas,
  - Preparation of Detailed Project Report
  - Selection of Technology & Preparation of Project Specification
  - Design Engineering, Procurement of contractor
  - Arranging Finance for the project
  - Implementation Supervision
  - O&M for 15 yrs as Independent Operator as advised by GoTN

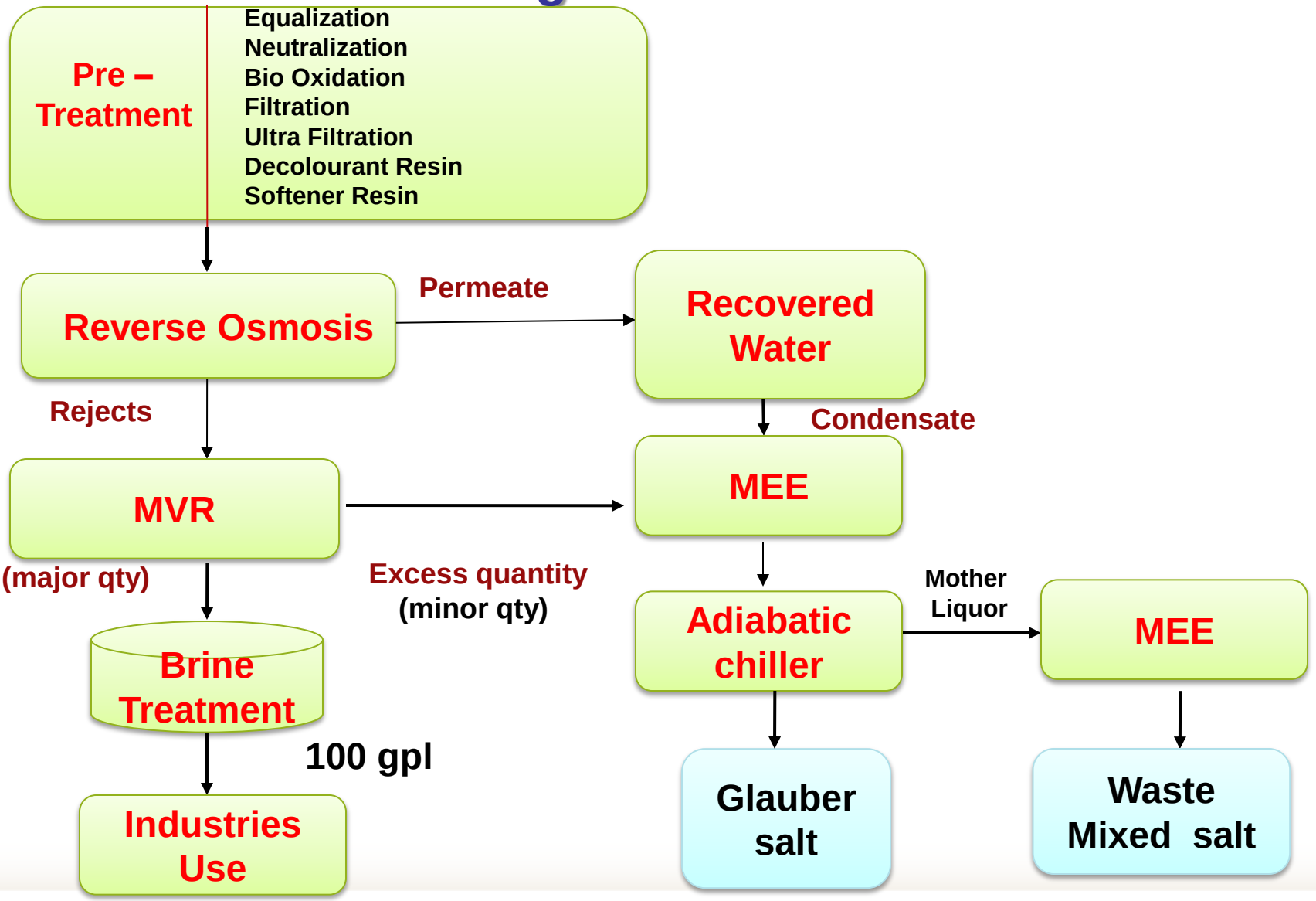
Tirupur Textile Effluent Management Project, Tirupur.. 2

- **Benefits of this Project:**

- The project for ZLD is perhaps the first of its kind in the world. Key benefits of the project are
  - Recycling >98% of the water.
  - Reuse of > 90% of the salt.
  - Cleaning of the local environment

- **Current status:**
  - TWIC has also developed an alternate technology called “Treated Brine Reuse Technology” which substantially reduces the dependence on evaporator.
  - Technology demonstration has enabled reopening of the dyeing units after closure by high court.
  - This has been successfully demonstrated at Arulpuram CETP and is now being implement in the remaining 6 TWIC developed CETPs.

Process Flow diagram of Textile CETPs



Stage wise Quality Details .. 1

S.No	Parameter	Units	Influent	Recovered Water	Brine Solution (MVR Concentrate)
1	pH @ 25^0C		9.0	7.0	5.5
2	TDS	mg/l	6744	170	103972
3	Chloride as Cl^-	mg/l	734	34	11976
4	Sulphates as $SO_4 2^-$	mg/l	3142	19	56459
5	BOD @ 20^0C	mg/l	251	BDL	NA
6	COD	mg/l	1034	BDL	1820
7	TH as CaCO3	mg/l	111	BDL	129
9	Total Alkalinity as $CaCo_3$	mg/l	1538	48	178

Stage wise Quality Details .. 2

Quality of Recovered Glauber Salt:

S.NO	Parameter	Recovered Glauber Salt
1	Purity (%) as Sodium Sulphate @ 105^0C	98.5%
2	TH as $CaCO_3$ (mg/l)	Nil

Textile Effluent Management Project

Pretreatment

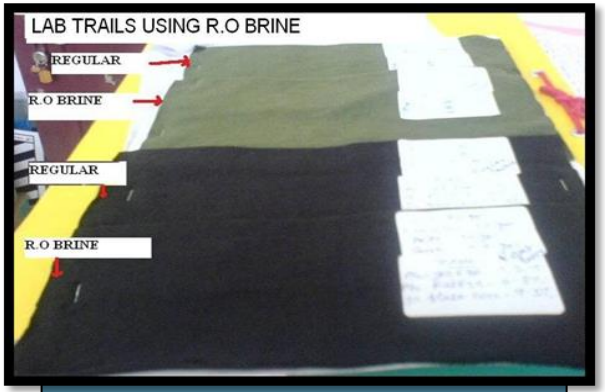
Biological Treatment

Reverse Osmosis

Untreated & Treated Effluent

R.O reject – before treatment

R.O reject – after treatment



Lab trails using RO brine

Section C: Case Study of Pulp & Paper ETP

Technical and Commercial Feasibility for Development, Financing, Implementation and Operation of Zero Liquid Discharge Effluent Project for Pulp & Paper Mill ..1

- Project: This project is for a major paper and newsprint manufacturer in South India. In order to meet its environmental obligations the mill has decided to implement a 10 MLD project for reuse of water.
- TWIC Role : Implementation and operation of the pilot plant and preparation of technical and commercial feasibility report as a precursor to development, financing, implementation and operation of Zero Liquid Discharge facility
- Benefits of this Project:

  The project would enable the Pulp & Paper Mill reducing its water consumption and further improve on the quality of treated wastewater used for irrigation.
- Current Status: Currently the 120 m3/day pilot plant has been successfully demonstrated. A full scale plant is now proposed.

Technical and Commercial Feasibility for Development, Financing, Implementation and Operation of Zero Liquid Discharge Effluent Project for Pulp & Paper Mill ..2

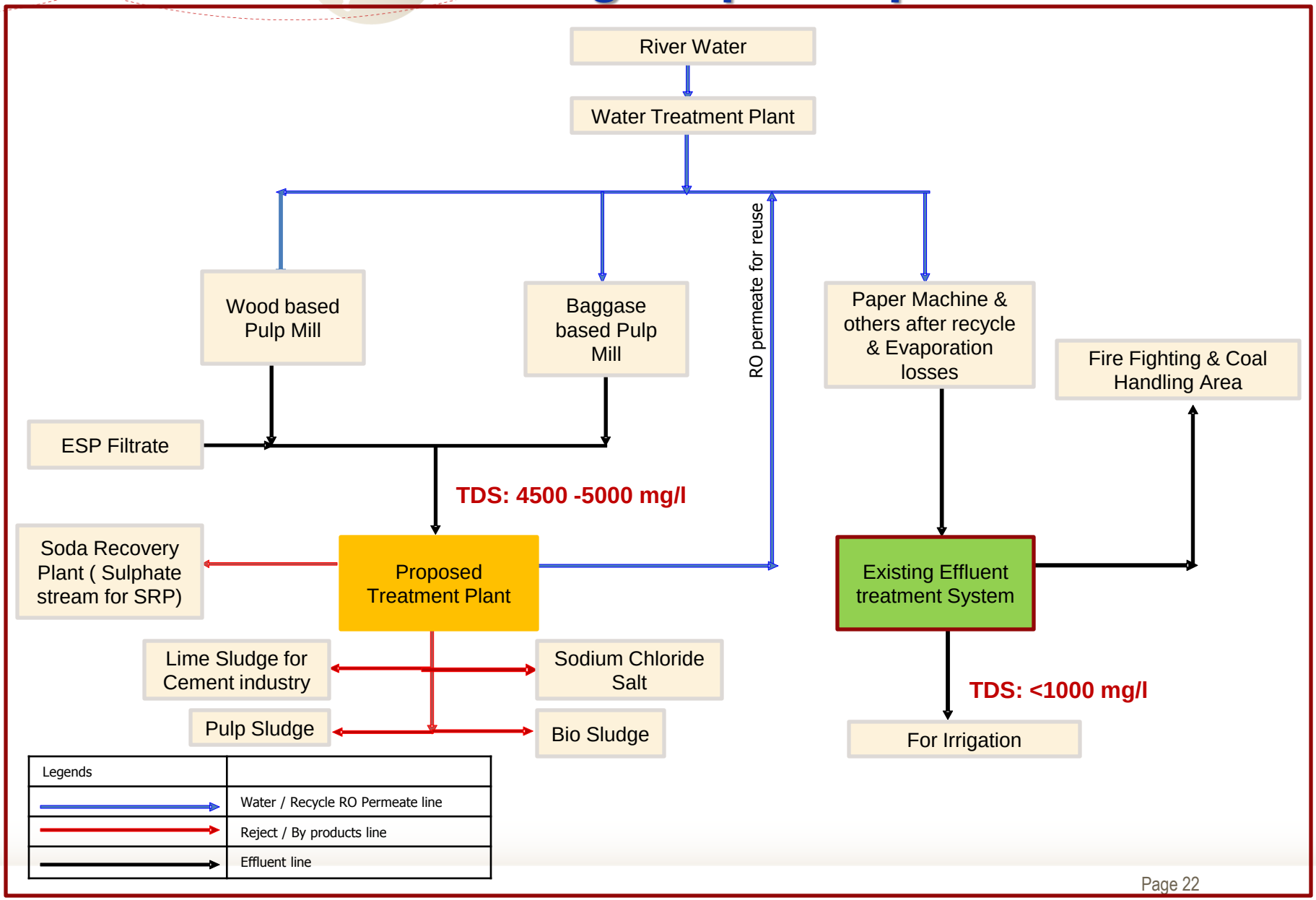
Aeration Tank

Ultra Filtration

Nano Filtration

Reverse Osmosis

Proposed Treatment Scheme for Bleaching Effluent & Existing Pulp & Paper Mill ETP

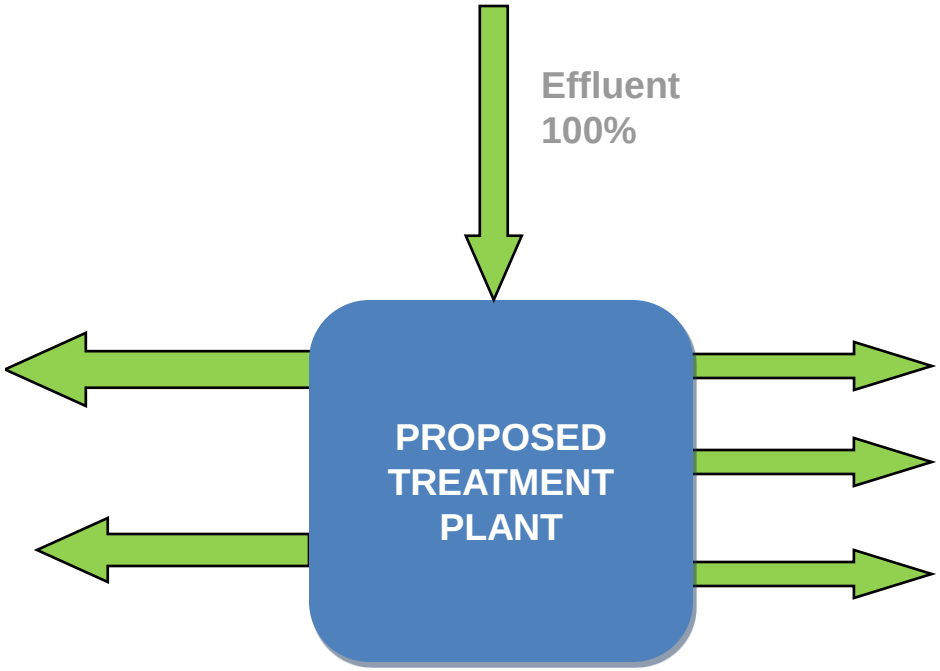


Effluent characteristics of Bleach Liquor for Pulp & Paper Effluent

Sl.No	Parameters	Range
1	pH	5.0 – 6.0
2	BOD	900-1100
3	COD	2000 - 3400
4	TSS	450 - 1000
5	TDS	4500 - 5800
6	Cl^-	1500 - 2000
7	SO_4^{2-}	500 - 600
8	Total Hardness	900 - 1200

All values are expressed in mg/l except pH.

Summary of recoveries and wastages



Wastages

Chloride Brine (6.28%)

Bio Sludge (0.04%)

Total: 6.30%

Recoveries

Pulp and Lime Sludge (0.42%)

Sodium Sulphate Liquor (13.16%)

Water (81%)

Total: 93.70%

Quality Of Various Recovered By-products

S. No	Parameters	units	Recovered Water (RO Permeate)	Sulphate stream (NF Reject)
1	pH		6	7.1
2	TSS	mg/l	0	21
3	TDS	mg/l	177	31328
4	Turbidity	NTU	0	8
5	COD	mg/l	1	1587
6	BOD	mg/l	1	3
7	Total Hardness	mg/l	0	51
8	NaCl	mg/l	134.4	5286
9	Total Silica	mg/l	0	29
10	Na_2SO_4	mg/l	0	16543

Lime sludge for cement plant

Description	Composition in % (Dry wt basis)
$CaCO_3$	75%
$MgCO_3$	12.6%
SiO_2	0.7%
Organic matter	9.15%
Moisture	1.8%

Quality of Crystallized salt

Parameters	Purity in %
NaCl	90% - 95%
Na_2SO_4	3 %- 4%
Inert	1%

Name : I. Sajid Hussain

Designation : Chief Operating Officer

Contact address : Tamilnadu Water Investment Company Ltd,
"Polyhose Towers"(SPIC Annex BLDG)
1st Floor,No.86, Mount Road,
Guindy, Chennai – 600 032

Email : sajidhussain1@twic.co.in

Phone : 044 – 223561890/ 91

Mob : +91 9940676679

Website : www.twic.co.in

THANK YOU