Electrochemical Systems using Electro-Coagulation & Electro-Oxidation Methods

SEWAGE TREATMENT TECHNOLOGIES

Electrochemical Sewage Treatment Plant

Uses advanced electrochemical technology, viz.,

- Electro-Coagulation
- Electro-Oxidation

CONVENTIONAL PROCESS

BIOLOGICAL TREATMENT

Aerobic	Consumes lot of atmospheric air
COD reduction	Maximum 70%-80%
Foot print	Very large
Capital cost	Very high
Civil works	Very huge

Still, the quality of treated water may not be suitable for re-use.

ELECTRO-CHEMICAL SEWAGE TREATMENT PROCESS

- Electro-coagulation – a century old technology (Dietrich patented in 1906).
- Aids in coagulation of wide range of contaminants.
- Effective in the removal of contaminants from black and gray water.
- It can be used for the treatment of sewage containing food waste, oil wastes, dyes, suspended particles, organic and inorganic chemical contaminants.
- Affordable technology for sewage treatment.

Electro-coagulation:

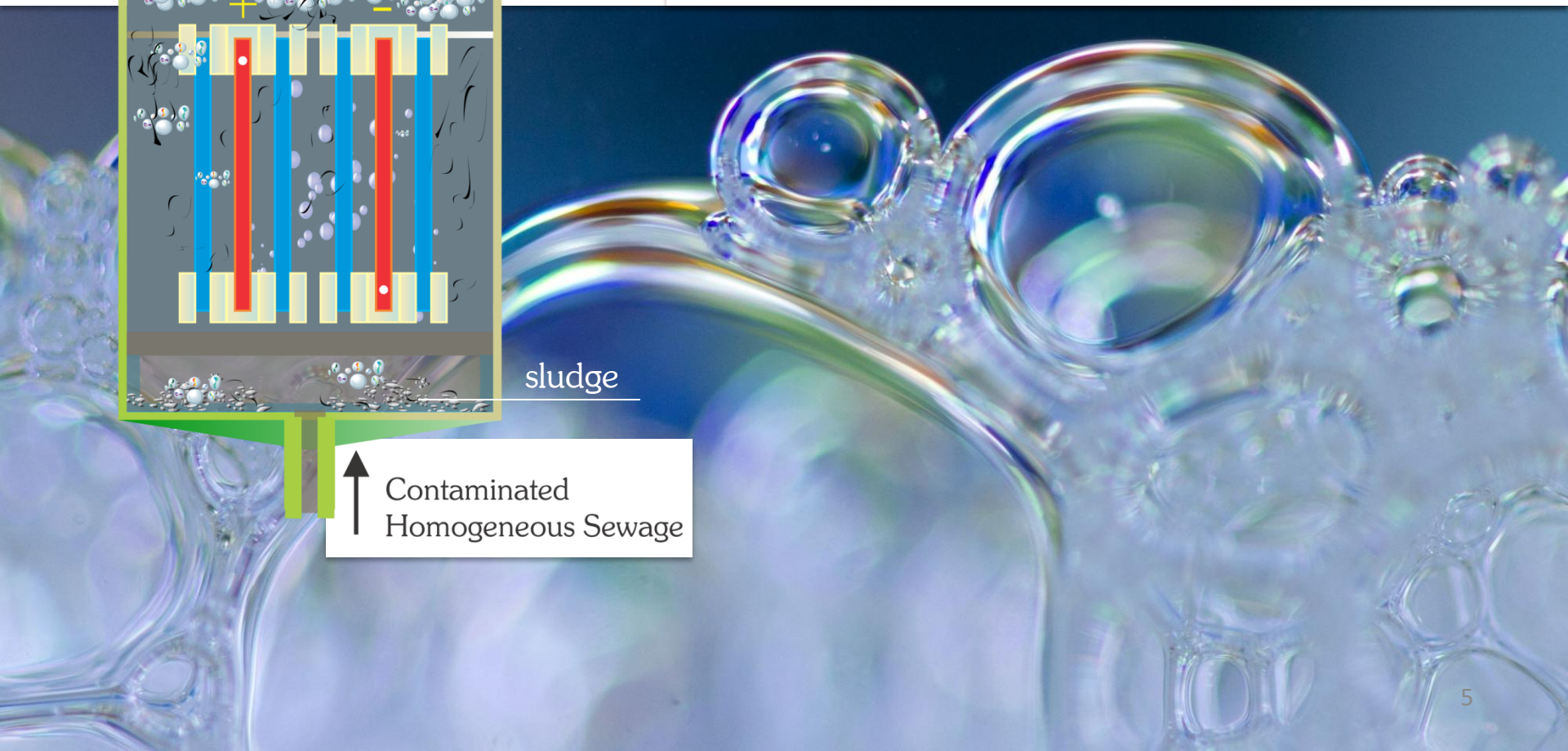
Destabilizes suspended solids & pollutants by coagulation and flocculation of contaminants which could be separated by settling process.

Electro-oxidation:

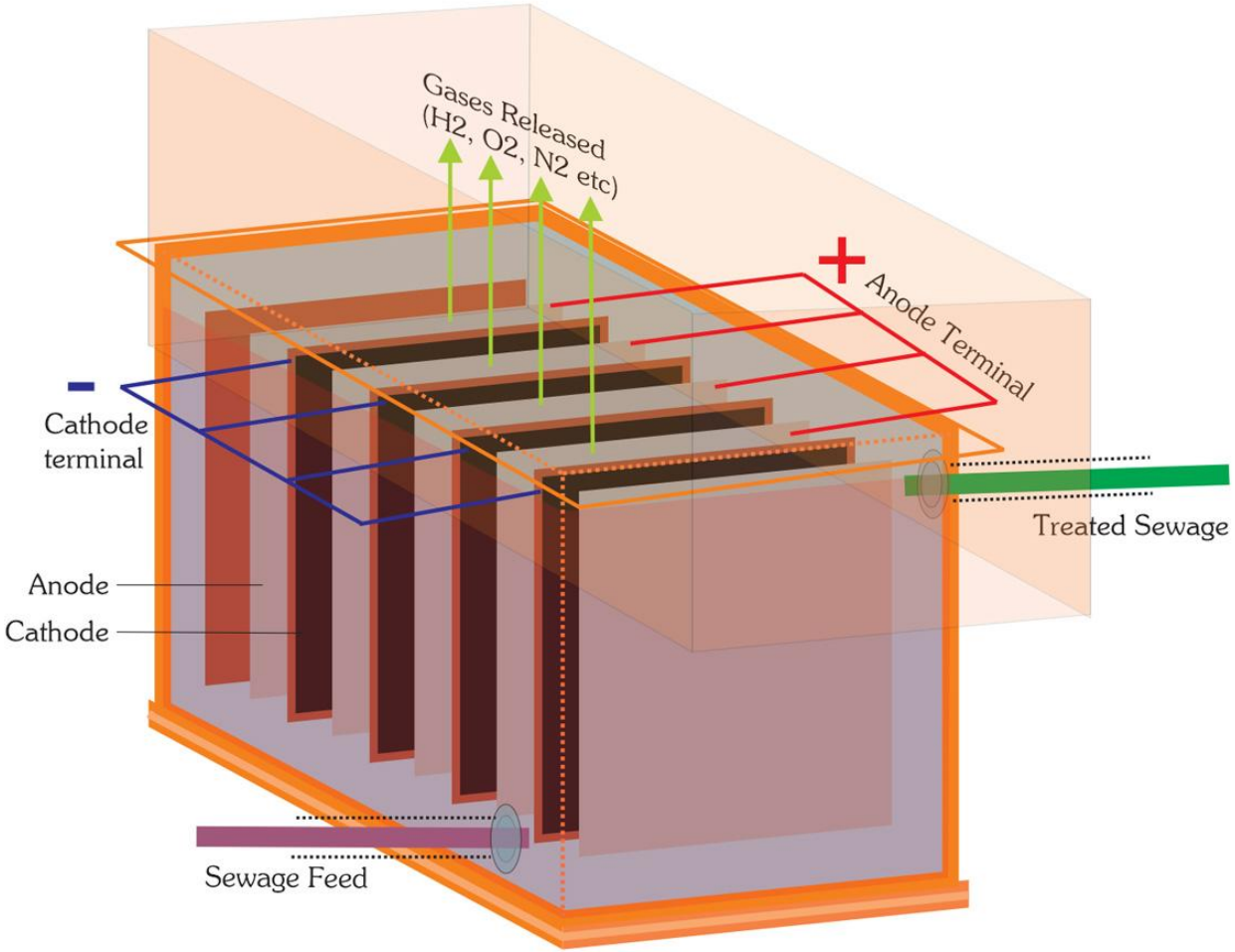
Oxidizes both organic and inorganic electrolytes, by direct oxidation on the anodes or indirect oxidation through by-products such as hypochlorous acid (HOCl).

ELECTRO-COAGULATION PROCESS

A process wherein flocculating metal ions are electrolytically added to polluted water at an anode, and gas micro bubbles are released at a cathode. The flocculating metal ions adhere to pollutants in the water, increasing their size, and the gas micro bubbles capture the flocculated pollutants and float them to the surface, from where they can be easily removed.



ELECTRO-COAGULATION REACTOR ARRANGEMENT



ELECTROCHEMICAL OXIDATION

Oxidizing agents and catalysts are introduced into wastewater and effluent.

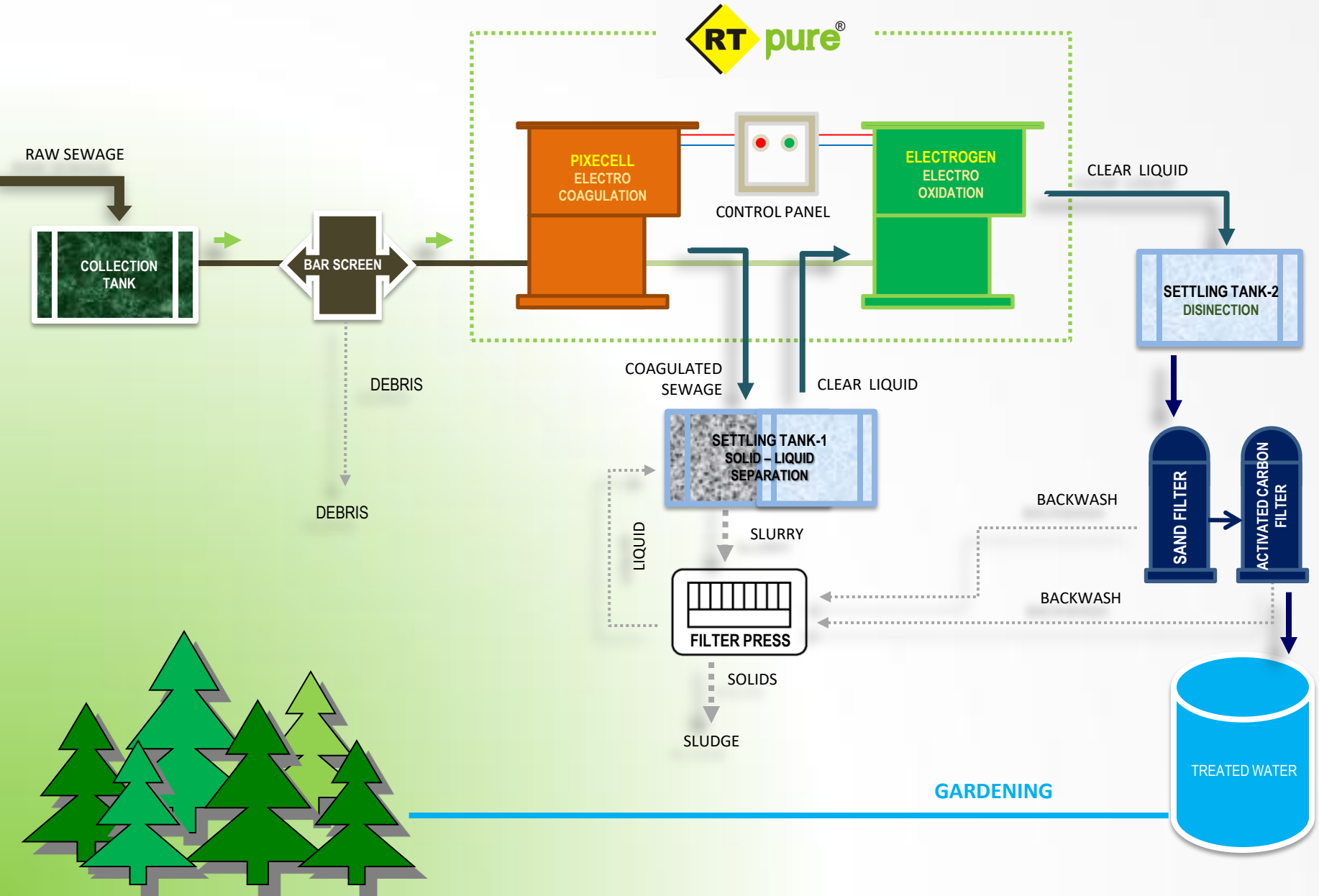
The process oxidizes dissolved organic and ammonia compounds, sulfides and mercaptans, etc., to carbon dioxide, water, nitrogen and simple salts, which were not removed by electrocoagulation

What can Electrochemical Oxidation do?

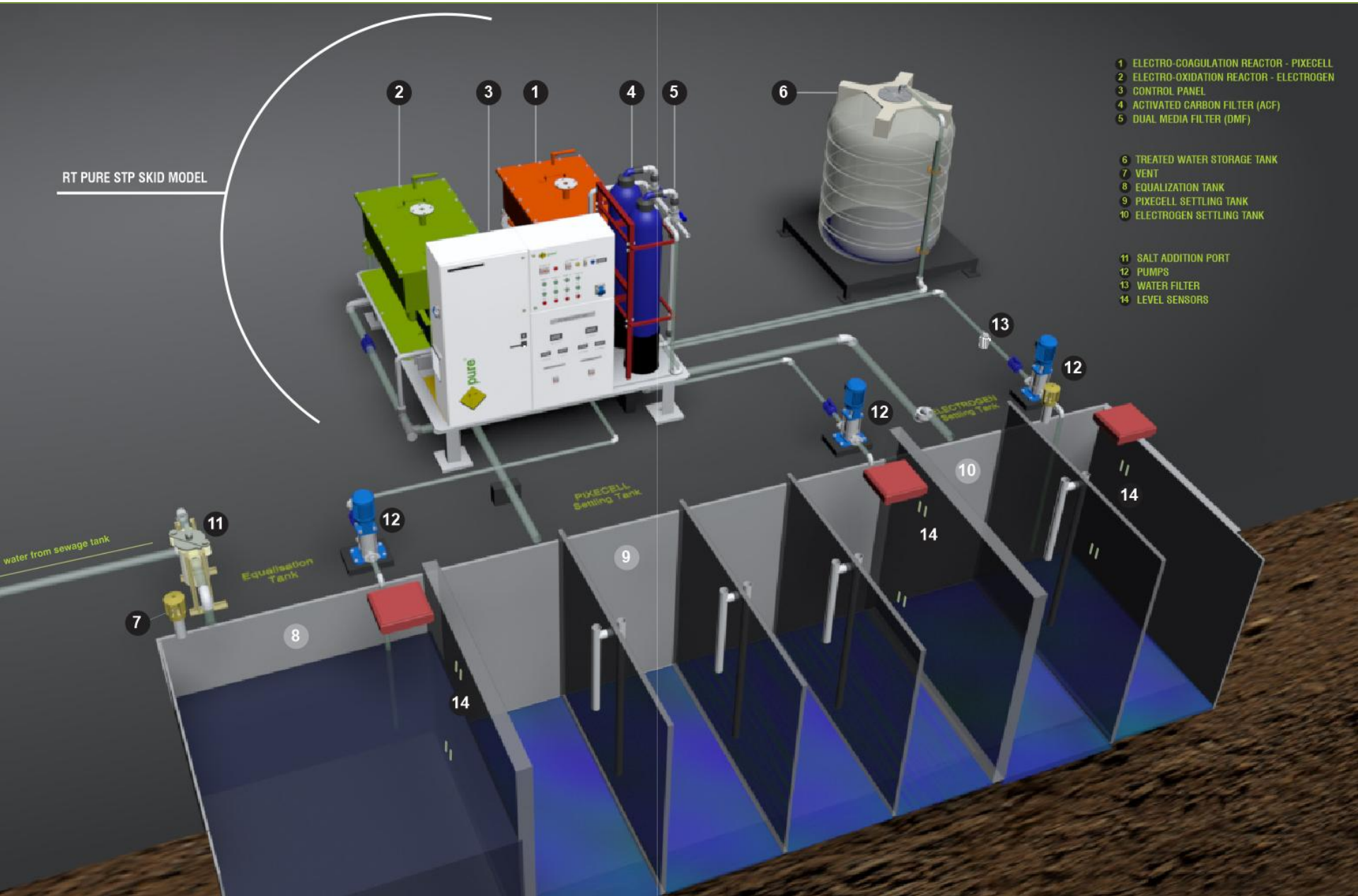
- Coagulates dissolved / suspended solids and aid in settling into sludge
- Oxidizes organics and reduce soluble COD
- Disinfects sewage by killing pathogens
- Aids in facilitating re-use of treated water

TYPICAL PROCESS FLOW

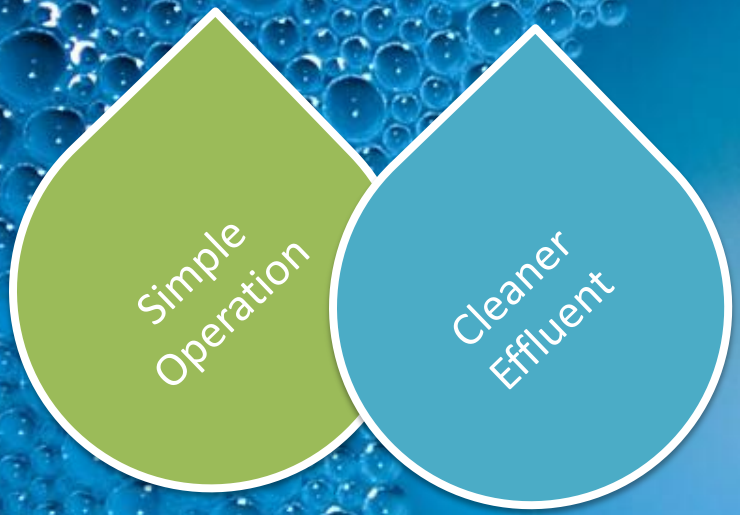
ELECTROCHEMICAL SEWAGE TREATMENT



TYPICAL SEWAGE TREATMENT SYSTEM
(ELECTRO-CHEMICAL BASED)

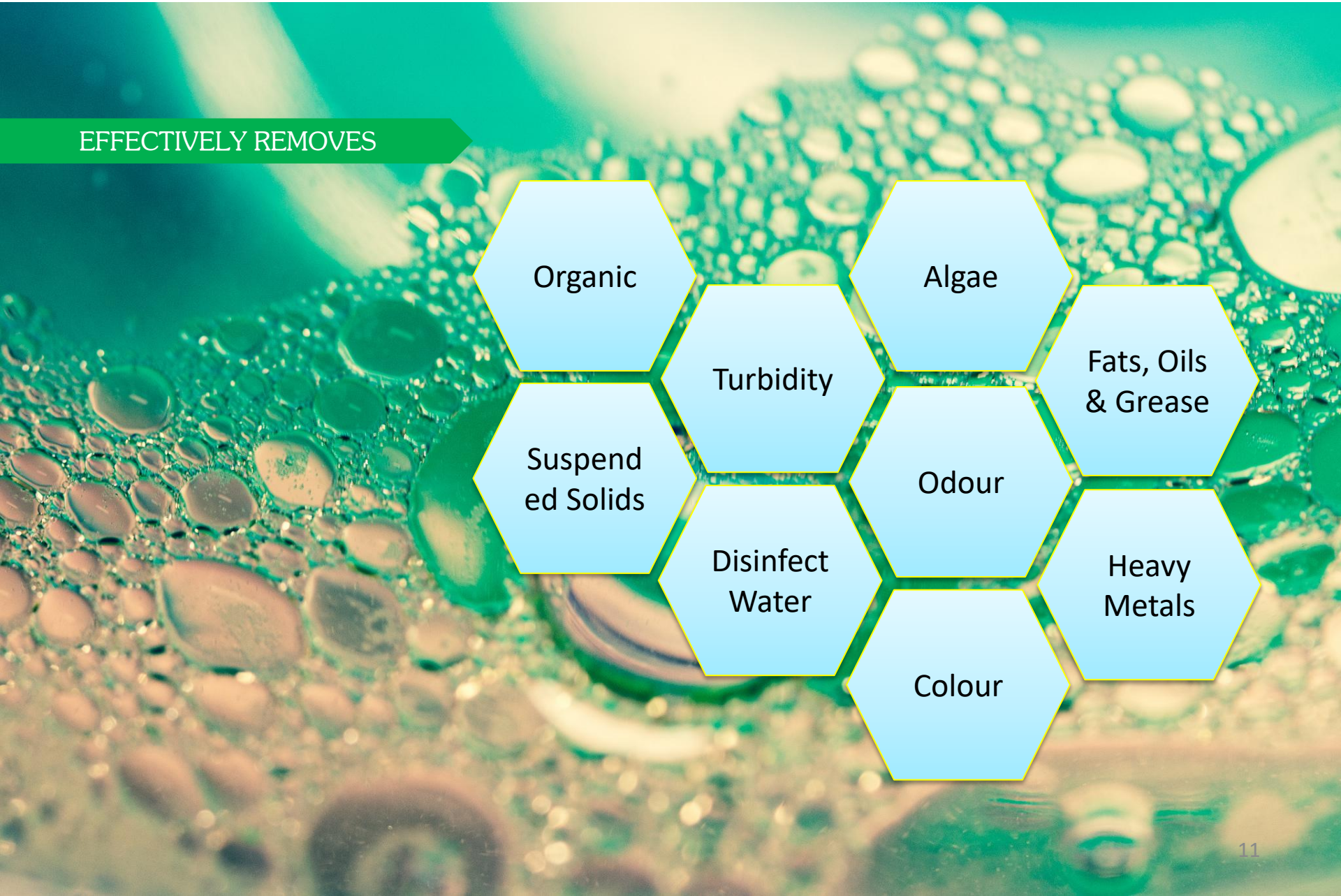


BENEFITS OF ELECTROCHEMICAL TREATMENT PROCESS



- Facilitates water re-use
- Converts dissolved solids into suspended solids aiding in physical separation
- Removes broad spectrum of pollutants
- Reduced treatment cost
- Reduced chemical usage
- Reduced sludge generation
- Broad spectrum of treatment

CONTAMINANT REMOVAL EFFICIENCY (ELECTRO-COAGULATION)



ADVANTAGES OF ELECTROLYTIC SYSTEMS

Aeration ⊘	Construction Modular	Startup Process Instant, Simple Procedures
Performance Always Consistent	Foot Print Compact	Toxicity Tolerant ✓
pH Maintenance ⊘	Portable ✓	Operator Friendliness ✓
Noise ✗	Depletion of Atmospheric O_2 ✗	Chemical Addn. ⊘
Civil Work Very Minimal	Environmental Friendliness ✓	

CONTAMINANT REMOVAL EFFICIENCY (ELECTRO-COAGULATION)

Electrocoagulation process facilitates higher removal efficiency of various contaminants from sewage.

Contaminants	Removal efficiency
TSS	95 – 99%
BOD	85 – 98 %
COD	85 – 96%
Phosphorus	98 – 99.99%
Oil & Grease	98.5 – 99.5%
Bacteria	98 - 99.99%
Colour	90 – 98%

COMPARISION BETWEEN ELECTRO-CHEMICAL & BIOLOGICAL

Chemical coagulation operating costs are > 10x higher than electro-coagulation system.

Electrocoagulation system delivers superior contaminant removal performance across a far wider range of contaminants.

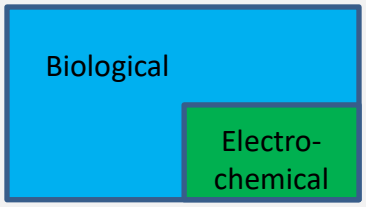
Constituent	Percentage of removal by	
	Electrochemical Coagulation	Chemical Coagulation
TSS	95 to 99%	80 to 90%
BOD	85 to 98%	50 to 80%
Bacteria	98 to 99.99%	80 to 90%
Sludge formed (g/m^3)	22 (40% less)#	37
Chemicals in sludge	< 0.5 %	49 %

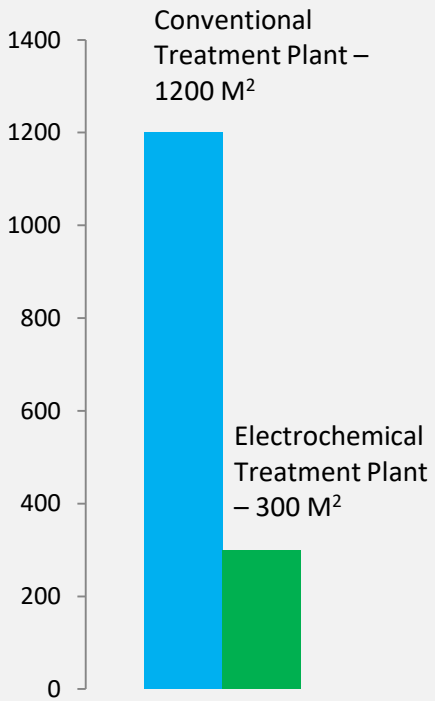
Suitable for land-filling. No pH correction required.

Source: Powell water (http://powellwater.com/electrocoagulation-vs-chemical-coagulation/

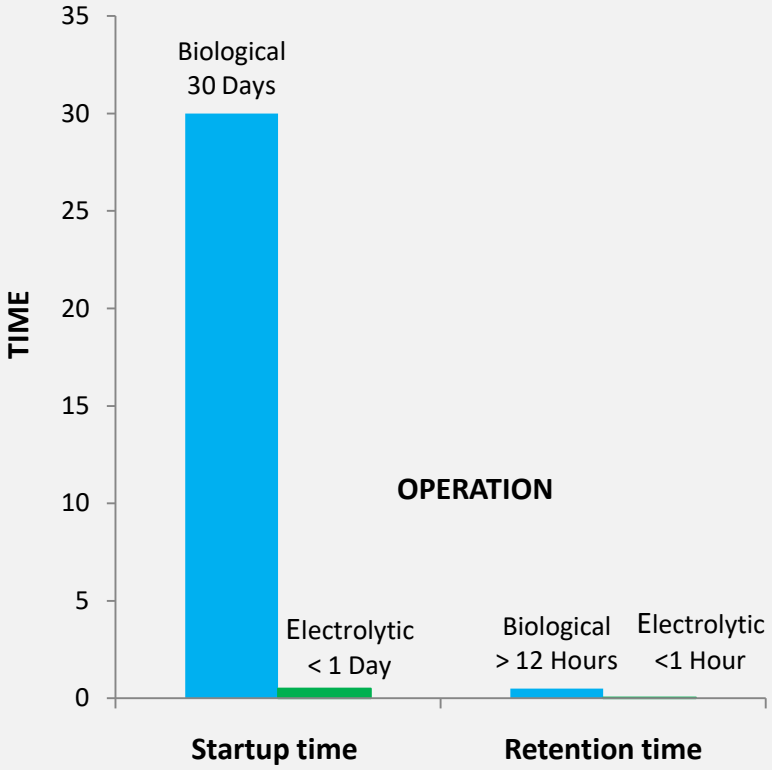
COMPARISION CHART

LAND REQUIRED



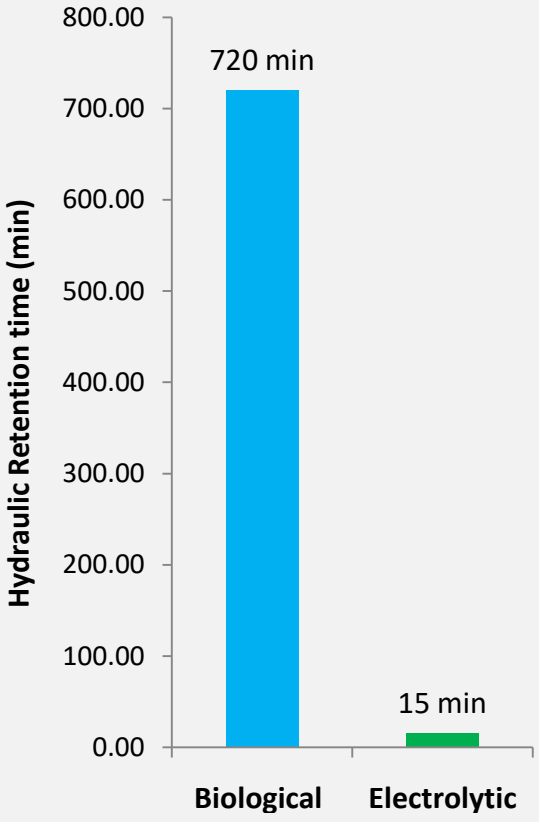


STARTUP & RETENTION TIME



HYDRAULIC RETENTION TIME

Hydraulic treatment time is 48 times faster than Biological treatment



SPACE & COST ASPECT – COMPARISION TABLE

ELECTRO-CHEMICAL & BIOLOGICAL

	ELECTROLYSIS	BIOLOGICAL
Foot print	Compact plant & small footprint	Needs large foot print
Area required	300 M^2 AREA FOR 1000 KLD	1200 M^2 AREA FOR 1000 KLD
Civil work requirement	Less civil work	More civil work
Manpower	Requires less manpower	More manpower needed
Storage tank requirement	Less number of storage tanks	More number of storage tanks
Civil cost	Low civil cost	High civil cost
Equipment cost	Marginally higher equipment cost	Low equipment cost
Operating cost	Low operating cost	High operating cost

TREATMENT PROCESS – COMPARISION TABLE

ELECTRO-CHEMICAL & BIOLOGICAL

FEATURES	ELECTROLYSIS	BIOLOGICAL
Terminal treatment	Better terminal treatment	Poor terminal treatment
Oil and Grease	Removes oil and grease	Needs oil and grease traps
Heavy metals	Removes heavy metals	Heavy metals affects the bacteria
Complex & recalcitrant organics	Removes recalcitrant & complex organics	Less efficient in removing recalcitrant organics
Disinfection	Destroys and removes bacteria, cysts and viruses	Additional disinfection required to remove bacteria, cysts & viruses
Toxicity	Toxicity tolerant	Can not tolerate toxicity
Laundry waste	Treats laundry waste	Needs separate laundry treatment
Nutrients	Removes nutrients	Nutrient removal needs extensive additional unit operations
Sludge	More stable sludge	Less stable sludge
Shelf life	Better self life of treated water	Lower self life of treated water.
External chemical	No need of external chemical to disinfect	Needs external chemical to disinfect
Consistency	Consistent and reliable	Low consistency; require constant monitoring

OPERABILITY & MAINTAINABILITY– COMPARISION TABLE

ELECTRO-CHEMICAL & BIOLOGICAL

	ELECTROLYSIS	BIOLOGICAL
Moving parts	Less moving parts	More moving parts
Process	Less unit process	More unit process
Chemical	Chemical free	Needs chemicals
MLSS	No need to maintain MLSS	Needs to maintain MLSS
pH maintenance	No need to maintain pH	Needs to maintain pH
Temperature	Temperature independence	Temperature dependent
Start and Stop	Start and stop at will	Needs continuous running
Start up time	Accelerated start up	Slow start up
Toxicity tolerance	Toxicity tolerant	Toxicity intolerant
Bacteria requirement	Process doesn't involve bacteria	Revival needed bacterial in case of inactivation and is time consuming
Cleaning and replacement	Periodic cleaning and replacement of electrodes needed	Periodic cleaning and replacement of diffusers needed
Operation and maintenance	Easy to operate and low maintenance	Not so easy to operate and maintain

ENVIRONMENTAL IMPACT – COMPARISION TABLE

ELECTRO-CHEMICAL & BIOLOGICAL

	ELECTROLYSIS	BIOLOGICAL
Green House Gas (GHG) generation	Generates less GHG.	Generates more GHG
Atmospheric oxygen	Does not deplete atmosphere oxygen.	Depletes atmosphere oxygen (250 Kg/MLD) (4,000 Trees, 20 Acre Land/MLD).
Oxygen in stream	Does not deplete oxygen from stream.	Depletes oxygen from stream
Stream eutrophication	Does not cause stream eutrophication. Better nutrient removal.	Causes stream eutrophication
Conservation of resources	Significant conservation of valuable resource.	Less conservation of water resource.
Chemical usage/conservation	Conserves chemicals	Uses chemicals
Sludge treatment	Single component sludge treatment.	Multi-component sludge treatment
Odor	Odor free atmosphere.	Atmosphere is not odor free
Noise	Noiseless operation.	Makes lot of noise.

SEWAGE TREATMENT PLANT

COMMERCIAL SYSTEMS (MODULAR)

*Designed to meet the waste water discharge standards. Utilizes **electro-coagulation** and **electro-oxidation** principle to treat sewage (black and grey water).*

Features

Commercial sewage treatment
Compact and light weight
Semi-automatic process
Instant push-button start
No lead time for process initiation
Anti-corrosive material/treatment used to increase plant life
Modular design; can be installed in multiple modules for higher capacities, expansion and up-gradation

PRODUCT MODELS

COMMERCIAL SYSTEMS (MODULAR)

Commercial Models

MODEL	DESIGN CAPACITY (LITRES/HOUR)	PLANT CAPACITY (KLD)
RT PURE C 15	625	15.0
RT PURE C 20	850	20.0
RT PURE C 25	1050	25.0
RT PURE C 50	2100	50.0
RT PURE C 75	3125	75.0
RT PURE C 100	4200	100.0
RT PURE C 125	5200	125.0
RT PURE C 150	6250	150.0
RT PURE C 200	8500	200.0
RT PURE C 300	12500	300.0
RT PURE C 400	16700	400.0
RT PURE C 500	21000	500.0
RT PURE C 1000	42000	1000.0

DOMESTIC SEWAGE TREATMENT SYSTEMS

SKID BASED / LAND BASED MODULAR SYSTEMS

*Designed to meet the waste water discharge standards. Utilizes **electro-coagulation** and **electro-oxidation** principle to treat sewage (black and grey water).*

Features

Domestic sewage treatment
Compact and light weight
Semi-automatic process
Instant push-button start
No lead time for process initiation
Anti-corrosive material/treatment used to increase plant life
Modular design; can be installed in multiple modules for higher capacities, expansion and up-gradation

*** Stainless Steel Cabinet with protected Control Panel.*

PRODUCT MODELS

DOMESTIC SEWAGE TREATMENT SYSTEMS

*** Stainless Steel Cabinet with protected Control Panel.*

Domestic Models

MODEL	DESIGN CAPACITY (LITRES/HOUR)	PLANT CAPACITY (KLD)
RT PURE D 1.2	50	1.2
RT PURE D 2.4	100	2.4
RT PURE D 4.8	200	4.8
RT PURE D 7.2	300	7.2
RT PURE D 10	425	10.0

pixecell REACTOR MODELS
ELECTRO-COAGULATION REACTORS

RT pure®

pixecell·s for Sewage Treatment

Model	Design Capacity (Litres/Hour)	Plant Capacity (KLD)
PIXE-S-1.2/50	50	1.2
PIXE-S-2.4/100	100	2.4
PIXE-S-4.8/200	200	4.8
PIXE-S-7.2/300	300	7.2
PIXE-S-10/425	425	10.0
PIXE-S-15/625	625	15.0
PIXE-S-20/850	850	20.0
PIXE-S-25/1K	1050	25.0
PIXE-S-100/4.2K	4200	100.0
PIXE-S-500/21K	21000	500.0

pixecell·e for Effluent Treatment

Model	Design Capacity (Litres/Hour)	Plant Capacity (KLD)
PIXE-E-10	500	10
PIXE-E-25	1250	25
PIXE-E-50	2500	50
PIXE-E-100	5000	100
PIXE-E-250	12500	250
PIXE-E-500	25000	500
PIXE-E-1000	50000	1000

pixecell REACTOR MODELS
ELECTRO-COAGULATION REACTORS

RT pure®

pixecell-s for Sewage Treatment

Model	Design Capacity (Litres/Hour)	Plant Capacity (KLD)
PIXE-S-1.2/50	50	1.2
PIXE-S-2.4/100	100	2.4
PIXE-S-4.8/200	200	4.8
PIXE-S-7.2/300	300	7.2
PIXE-S-10/425	425	10.0
PIXE-S-15/625	625	15.0
PIXE-S-20/850	850	20.0
PIXE-S-25/1K	1050	25.0
PIXE-S-100/4.2K	4200	100.0
PIXE-S-500/21K	21000	500.0

pixecell-e for Effluent Treatment

Model	Design Capacity (Litres/Hour)	Plant Capacity (KLD)
PIXE-E-10	500	10
PIXE-E-25	1250	25
PIXE-E-50	2500	50
PIXE-E-100	5000	100
PIXE-E-250	12500	250
PIXE-E-500	25000	500
PIXE-E-1000	50000	1000

electrogen REACTOR MODELS
ELECTRO-OXIDATION REACTORS

RT pure®

electrogen·s for Sewage Treatment

Model	Design Capacity (Litres/Hour)	Plant Capacity (KLD)
ELECTROGEN-S-50/1.2	50	1.2
ELECTROGEN-S-100/2.4	100	2.4
ELECTROGEN-S-200/4.8	200	4.8
ELECTROGEN-S-300/7.2	300	7.2
ELECTROGEN-S-425/10	425	10.0
ELECTROGEN-S-625/15	625	15.0
ELECTROGEN-S-850/20	850	20.0
ELECTROGEN-S-1K/25	1050	25.0
ELECTROGEN-S-4.2K/100	4200	100.0
ELECTROGEN-S-21K/500	21000	500.0

electrogen·e for Effluent Treatment

Model	Design Capacity (Litres/Hour)	Plant Capacity (KLD)
ELECTROGEN-E-10	500	10
ELECTROGEN-E-25	1250	25
ELECTROGEN-E-50	2500	50
ELECTROGEN-E-100	5000	100
ELECTROGEN-E-250	12500	250
ELECTROGEN-E-500	25000	500
ELECTROGEN-E-1000	50000	1000

APPLICATIONS

Railway – sewage treatment

Airport – sewage treatment

Municipalities – chemical free sewage treatment

Restaurants – waste water treatment

Schools – sewage treatment for water reuse

Residential Colony – waste treatment for discharge / gardening

Refugee Camp – waste water treatment for water reuse

Grocery store & Shopping Centers – waste water treatment

Golf Courses – mobile sewage treatment

CONTACT US

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Thank You