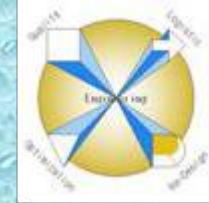


# *Sustainable Projects Engineering*



## **Waste Water re-Purification**

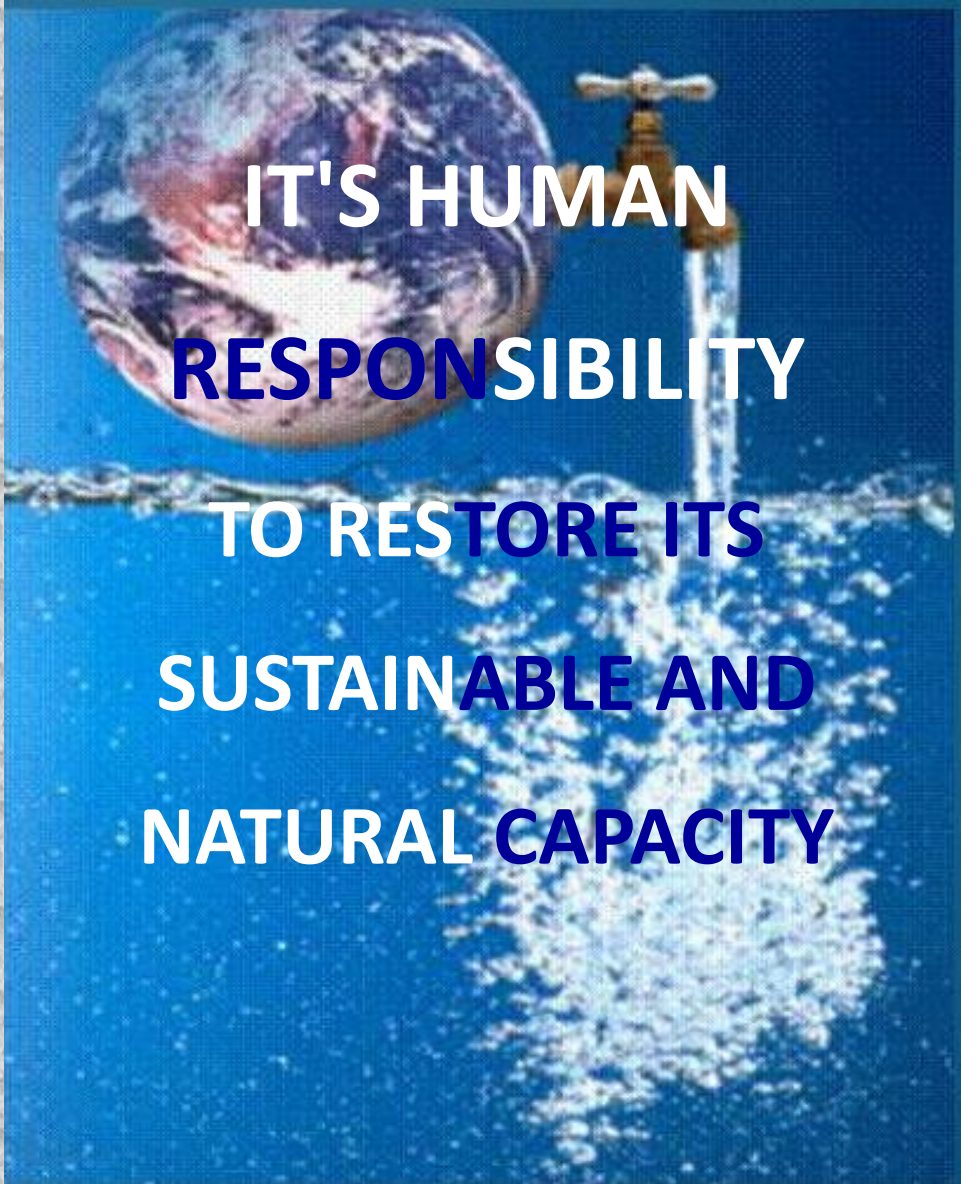
**Arturo Constante**

**Zero Emission Technologies**

# Paradigm Shift



**HUMAN WASTEWATER  
PRODUCTION HAS  
EXCEED THE EARTH'S  
NATURAL CAPABILITY  
TO RESTORE  
DRINKING WATER**



**IT'S HUMAN  
RESPONSIBILITY  
TO RESTORE ITS  
SUSTAINABLE AND  
NATURAL CAPACITY**

# Technological Principle



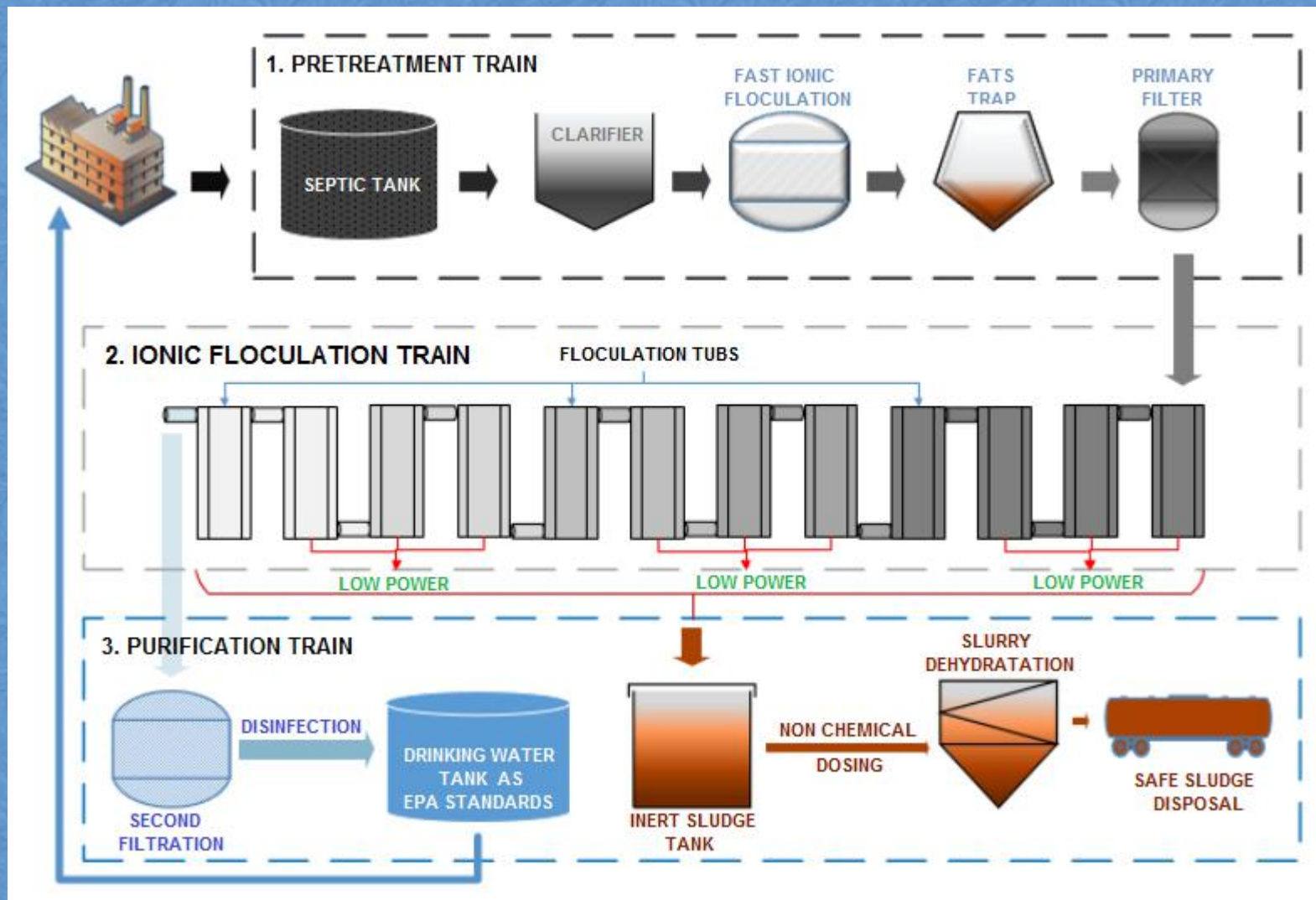
By an Electro-Ionic process without any chemical dosing, the contaminating molecules are dissociated into their basic compounds and allowing their easy removal throughout precipitation and filtration.



Re Purification WW 100 m<sup>3</sup>/d to Drinking Water  
Influent - Mall; Power consumption 4.25 kW-hr  
Located in Mexico City



# Typical Wastewater Purification Process



WW Treatment 75 m<sup>3</sup>/d to sewer disposal  
Influent - TV studio; Power consumption 3.25 kW-hr  
Located in Mexico City



## ADVANCED WASTEWATER REPURIFICATION SYSTEM

### TYPICAL INDUSTRIAL UNITARY PROCESS



# Executed Projects by 2014

| Total Flow | 77.1 lps  | EXECUTED WASTEWATERS RE-PURIFICATION PROJECTS UNTIL 2014 |              |                     |                   |                        |               |               |                          |               |                 |
|------------|-----------|----------------------------------------------------------|--------------|---------------------|-------------------|------------------------|---------------|---------------|--------------------------|---------------|-----------------|
| No.        | FLOW M3/D | WW QUALITY                                               | INFLUENT DBO | WW SOURCE           | EFLUENT QUALITY   | RE USE                 | POWER kW/h/m3 | PLANT AREA M2 | CLIENT                   | HANDOVER DATE | LOCATION        |
| 1          | 48        | Residual doméstica                                       |              | Residential         | NOM-003           | Irrigation             | 2.80          | 26            | Church                   | Dec/2003      | Mexico State    |
| 2          | 6         | Residual Biotóxica                                       |              | Antirrabic          | NOM-127           | Human Use              | 3.50          | 10            | Municipality Institution | Aug/2004      | Mexico City     |
| 3          | 100       | Residual Comercial                                       |              | Mall                | NOM-127           | Drinking Water         | 4.25          | 36            | Retail Chain             | Mar/2006      | Mexico City     |
| 4          | 120       | Residual Biotóxica                                       |              | Farm                | NOM-003           | Irrigation             | 3.25          | 28            | Farming Community        | Feb/2008      | Mexico City     |
| 5          | 120       | Residual Municipal                                       |              | Farm                | NOM-003           | Irrigation             | 3.25          | 28            | Farming Community        | Mar/2008      | Mexico City     |
| 6          | 110       | Residual Municipal                                       |              | Municipality        | NOM-003           | Irrigation             | 3.75          | 225           | Municipality Government  | Oct/2009      | Chiapas State   |
| 7          | 28        | Residual doméstica                                       |              | Offices             | NOM-002           | Sew er Disposal        | 0.85          | 15            | Firm                     | Feb/2010      | Mexico City     |
| 8          | 24        | Residual Industrial                                      |              | Mechanical Workshop | NOM-002           | Sew er Disposal        | 0.45          | 32            | Government               | Jan/2011      | Mexico City     |
| 9          | 24        | Residual Industrial                                      |              | Mechanical Workshop | NOM-002           | Sew er Disposal        | 0.45          | 32            | Government               | Jan/2011      | Mexico City     |
| 10         | 100       | Residual Biotóxica                                       |              | Municipality        | Agua              |                        | 2.00          | 40            | Municipality Government  | Dec/2010      | Cancún City     |
| 11         | 24        | Residual Municipal                                       |              | Municipality        | NOM-003           | Irrigation             | 0.90          | 15            | Construction Firm        | Feb/2011      | Queretaro State |
| 12         | 5,184     | Industrial Textil                                        |              | Textile Industry    | NOM-001           | Aquifer Disposal       | 0.40          | 390           | Industrial Firm          | Apr/2001      | Sonora State    |
| 13         | 24        | Residual Municipal                                       |              | Oil&Gas             | NOM-001           | Aquifer Disposal       | 1.00          | 15            | Refinery Project         | May/2011      | Puebla State    |
| 14         | 380       | Salmuera Marina                                          |              | Seaw ater           | NOM-001           | Aquifer Disposal       | missing       | missing       | Exportadora de Sal Gro   | Jun/2012      | Queretaro State |
| 15         | 60        | Residual Municipal                                       |              | Municipality        | NOM-002           | Sew er Disposal        | missing       | missing       | missing                  | 2013          | missing         |
| 16         | 312       | Residual Industrial                                      |              | Industry            | NOM-003 y NOM-127 | Irrigation & Human Use | missing       | missing       | Industrial Firm          | 2014          | SLP State       |

# WW Big Chanel Purification Results

| RE-PURIFIED WATER OF BIG WASTEWATER CHANEL OF MEXICO CITY |                                 |                                   |                                          |
|-----------------------------------------------------------|---------------------------------|-----------------------------------|------------------------------------------|
| COMPARISON OF RESULTS VS OFFICIAL STANDARDS 041 AND 127   |                                 |                                   |                                          |
| DRINKING WATER PARAMETER                                  | WASTEWATER PURIFICATION RESULTS | NOM-041-SSA1-2003<br>Bottle Water | NOM-127-SSA1-1994:2005<br>Drinking Water |
| ODOR                                                      | NOT ODOR                        | ODORLESS                          | ODORLESS                                 |
| COLOR (U PI-Co)                                           | 2.5                             | 15                                | 20                                       |
| FLAVOR                                                    | NOT TASTE                       | TASTELESS                         | TASTELESS                                |
| TURBIDITY (NTU)                                           | 0.8                             | 5                                 | 5                                        |
| RESIDUAL CHLORIDE (ppm)                                   | 0                               | 0.1                               | 0.2 – 1.5                                |
| ALCALINITY (mg/l)                                         | 102.78                          | 300                               | —                                        |
| CHLORIDES (mg/l)                                          | 88.04                           | 250                               | 250                                      |
| TOTAL HARDNESS (mg/l)                                     | 15.53                           | 200                               | 200                                      |
| NITRITE (mg/l)                                            | 0.121                           | 0.05                              | 1                                        |
| NITRATE (mg/l)                                            | 0.27                            | 10                                | 10                                       |
| SULFATE (mg/l)                                            | 46.28                           | 250                               | 400                                      |
| PHENOL (mg/l)                                             | NOT DETECTED                    | 0.001                             | 0.3                                      |
| FLUOR (mg/l)                                              | 0.58                            | 0.7                               | 1.5                                      |
| pH                                                        | 7.91                            | 6.5 – 8.5                         | 6.5 – 8.5                                |
| CIANUROS (mg/l)                                           | NOT DETECTED                    | 0.05                              | 0.07                                     |
| OZONO (mg/l)                                              | NOT DETECTED                    | 0.4                               | —                                        |
| FREE OXIGEN                                               | NOT DETECTED                    | 2                                 | —                                        |
| CONLIFORM ORGANIS                                         | NOT DETECTED                    | 0                                 | —                                        |

# Drinking Water Certificate by accredite Lab

|                                               |  |                                                                                       |  |
|-----------------------------------------------|--|---------------------------------------------------------------------------------------|--|
| REF : 336-01<br>06 Abril 2001<br>O. T. B19226 |  | <b>REPORTE DE ANALISIS BACTERIOLOGICO DE AGUA</b>                                     |  |
| MUESTRA RECIBIDA DE :                         |  | 03 DE ABRIL DEL 2001                                                                  |  |
| DIRECCION:                                    |  | PERSONAL TECNICO DE ESTE CENTRO                                                       |  |
| FECHA DE RECEPCION DE LA MUESTRA:             |  | LUGAR DE MUESTREO                                                                     |  |
| MUESTREADA POR :                              |  | AGUA PURIFICADA AL FINAL DEL PROCESO                                                  |  |
| MUESTRA No.                                   |  | 92                                                                                    |  |
| 1589                                          |  | UFC/ml                                                                                |  |
| CUENTA DE MESOFILICOS AEROBIOS                |  | Menos de 1.1                                                                          |  |
| ORGANISMOS COLIFORMES TOTALES                 |  | NMP/100ml                                                                             |  |
| ORGANISMOS COLIFORMES FECALES                 |  | NO DETECTABLE                                                                         |  |
| CLORO RESIDUAL TOTAL                          |  | NMP/100ml                                                                             |  |
|                                               |  | 0.0                                                                                   |  |
|                                               |  | ppm                                                                                   |  |
|                                               |  | APTA PARA CONSUMO HUMANO SI                                                           |  |
| Límites sanitarios.<br>NOM-127-SSA1-1994      |  | NOM-041-SSA1-1993                                                                     |  |
| Cuenta de mesofílicos aerobios                |  | Cuenta de mesofílicos aerobios                                                        |  |
| Organismos coliformes totales                 |  | Organismos coliformes totales                                                         |  |
| Organismos coliformes fecales                 |  | Organismos coliformes fecales                                                         |  |
| 2 NMP/100ml                                   |  | 100 UFC/ml                                                                            |  |
| 2 UFC/100ml                                   |  | No detectable NMP/100                                                                 |  |
| No detectable NMP/100ml                       |  | Cero UFC/100ml                                                                        |  |
| Cero UFC/100ml                                |  |                                                                                       |  |
|                                               |  | ATENTAMENTE                                                                           |  |
|                                               |  | CENTRO DE CONTROL                                                                     |  |
|                                               |  |  |  |
|                                               |  | Ing. José Carlos Alvaraz Rivera                                                       |  |
|                                               |  | O.A. Aida Hidalgo Arroyo                                                              |  |

# Advantages of WWRPS vs WWTP

| Parameter                           | RE-PURIFICATION                               | Conventional WWTP                                  |
|-------------------------------------|-----------------------------------------------|----------------------------------------------------|
| Wastewater Quality                  | Any WW, including Lixivates, O&G, Radioactive | Constrained for high DBO and hazardous wastewaters |
| Effluent Quality                    | Drinking Water as EPA standard                | Just to drain into sewer system                    |
| Energy Consumption                  | 1 - 1.4 kW/m <sup>3</sup>                     | 10 - 12 kW/m <sup>3</sup>                          |
| Chemical Dosing                     | NOT required                                  | Chemical and Biologicals                           |
| Operating and Maintenance Costs     | 80% lower than WWTP                           | Too High                                           |
| Sludges Quality & Treatment         | Inert - just dewatering                       | Activated - chemical post-treatment                |
| Required Area (m <sup>2</sup> /lps) | 16 - 30                                       | typically 100 m <sup>2</sup>                       |
| Operating Life Time                 | more than 50 years                            | usually no more than 30 y                          |
| Investment BPE (years)              | Highly profitable 3 to 5                      | very long term or never                            |

# Type of Treated Wastewaters

- ✓ **Municipal**
- ✓ **Industrial**
- ✓ **Sea Water**
- ✓ **Lixiviates**
- ✓ **Hexachlorines**
- ✓ **Lixivated Sludges**
- ✓ **Biotoxic**
- ✓ **Mining**
- ✓ **Radioactive**
- ✓ **O&G Slurry**
- ✓ **etc**



- **We develop Zero Emission Technologies**
- **We help our Clients to be Sustainable**
- **We are committed to help #SDG6 a reality**

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**“Because the Responsible Use and Reuse of Natural Resources”**