Remineralization Plants

All Desalination process either Thermal or Membrane based produces water which must be post treated to reach necessary quality for human consumption.

The water quality after remineralization must ensure a well-balanced ions concentration and the level of pollutants lower that what established by World Health Organization and also ensure that the water quality will not degrade during the process of distribution or be corrosive for the pipe network.

Fisia Italimpianti has successfully accomplished the design and construction of many large Remineralization Plants serving desalination plants having in total the treatment capacity of more than 3,400,000 m³/d of potable water.

The following technologies have been consolidated by Fisia Italimpianti for the remineralization of the distillate produced by desalination plants:

- Lime Dissolution Process
- Lime water Process
- Injection of salts

The features of the main Remineralization plants supplied by Fisia Italimpianti are available in dedicated project sheet

Jebel Ali M Station – Dubai (UAE)
Remineralization Plant
# Remineralization Plant References

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<th>Capacity (MIGD)</th>
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MIGD  Million Imperial Gallon per Day  \(1 \text{ MIGD}=189.43 \text{ m}^3/\text{h}\)

LF  Limestone Filters process

LW  Lime Water process
Limestone Dissolution process:

The remineralization is based on the reaction between dissolved carbon dioxide and calcium carbonate to produce soluble calcium bicarbonate as per the following equation:

$$CO_2 + H_2O + CaCO_3 = Ca(HCO_3)_2$$

The main process steps are the following:

**Carbon Dioxide Absorption**

The carbon Dioxide can be either recovered from the vent gas of the thermal desalination units or produced from combustion of natural gas or diesel oil. When the CO2 is sourced from the vent gas of the thermal desalination units, the gas after purification over activated carbon is fed to pressurized packed towers where the carbon dioxide solution is produced by countercurrent of distillate and gas.
Filtration over Limestone beds

The dissolution of the calcium carbonate (recarbonation process) is carried out by filtration over limestone beds. The distillate that has previously acidified with carbon dioxide is fed to pressurized filters containing the limestone and operating with 10 minutes retention time.
3-D model of a Limestone Filter plant

Carbon Dioxide excess removal

The carbon dioxide in excess at the outlet of the limestone filters is removed in atmospheric degassing towers, where the recarbonated water is fed countercurrent with air. The above allows to reduce the dosage of the chemicals for the pH correction of potable water, thus reducing the operating expenditures.

Optimization of the Remineralization process

The lower is the number of limestone filter installed (lowest CAPEX) and the higher is the caustic soda consumption for the pH correction of the product water (highest OPEX). Fisia Italimpianti provides at optimized process solution to match the minimum of the water total cost.
Jebel Ali M Station – Dubai (UAE)
Remineralization plant
**Lime Water process:**

The remineralization is based on the reaction between dissolved carbon dioxide and calcium hydroxide to produce calcium bicarbonate as per the following reaction:

$$\text{CO}_2 + \text{Ca(OH)}_2 = \text{Ca(HCO}_3\text{)}_2$$

Calcium hydroxide is injected as saturated solution (lime water solution) in order to obtain the highest quality of the product water.

Fisia Italimpianti makes available the experience accumulated in several industrial installations, to design and supply complete systems for:
- lime storage,
- lime milk preparation;
- lime water preparation.

to guarantee reliable and efficient operations.
Al Taweelah B – Abu Dhabi (UAE)
Lime Water Saturator
Al Taweelah (UAE) – Remineralization plant based on Lime Water process
160 MIGD (30,307 m³/h)

**Injection of salts:**

\[ \text{CaCl}_2 + 2 \text{NaHCO}_3 = \text{Ca(HCO}_3\text{)}_2 + 2 \text{NaCl} \]