「emiiR」Water Treatment System presentation

Nihon Jisui Hanbai Corporation

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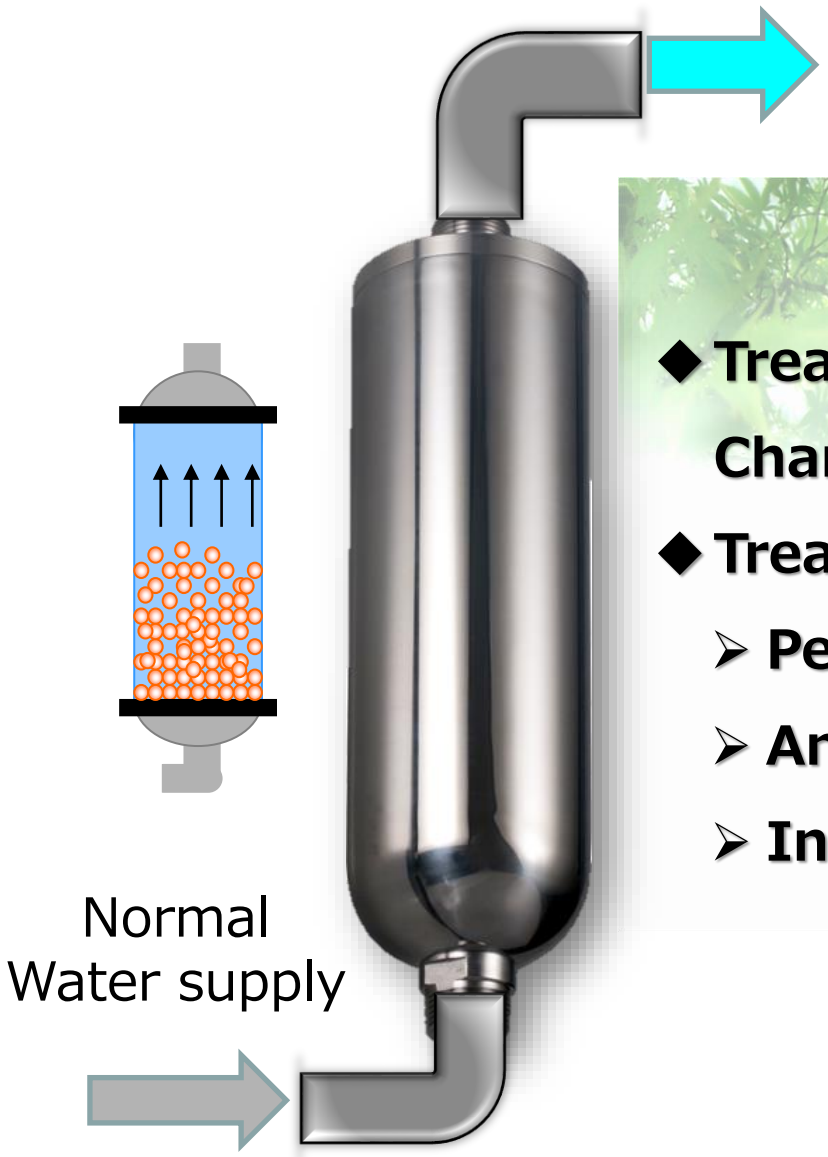
ECO Friendly Concept

- **ECO** / Resource Protection

- Resolve Water used Equipment System problems by "**emiiR**" Water Treatment Technology

- Reduce Work Process
- Reduce Operation COST
- Maintain NON-Chemical Operation

What is emiiR



- Treated Water becomes Positively Charged Water
- Treated Water makes
  - Penetration into Particles
  - Antioxidative effects
  - Increase Detergency

What is emiiR

Montmorillonite

Pulverization

Burning

2 – 3 mm Ceramic ball

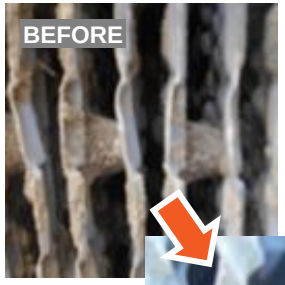
6 – 8 mm Ceramic ball

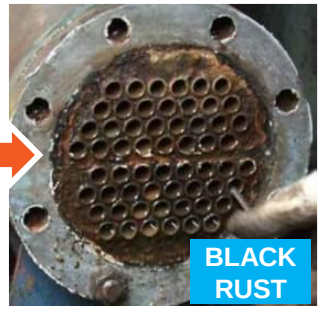
emiiR product series

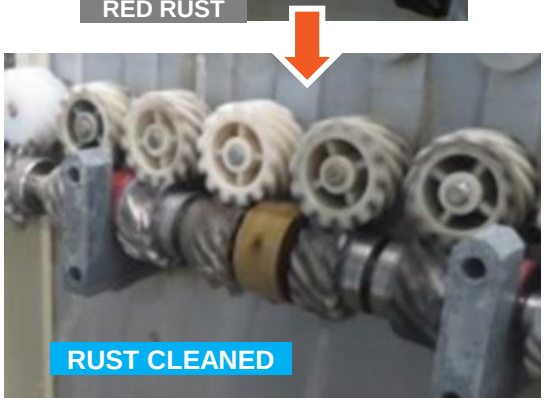
Inside view Scope
for Ceramic activity

emiiR Treated Water Works

Cooling Tower — **Water supply & drainage Pipe** — **Factory Production line**







Target Market

Cooling Tower — **Water supply & drainage Pipe** — **Factory Production line**

- **Water-saving** by Non Blow water
- **Environmental** prevention of Chemical insertion
- **Power saving** by no-Scale adhesion

- **Cost saving** by Small initial cost with Lower maintenances
- **Protect Corrosion** and expand life time
- **Preservation** of Water Pipe & Toilet

- **Prevention Scale** adhesion of cleaning line
- **Extended Life** of RO filter of Pure water equipment
- **Improve** Production efficiency

Cooling Tower

Outstanding issue

Standard Cooling System

【Global Environment】

- Environment ravage by Chemical water drainage increase

【Operation Cost】

- Chemical & disposal cost
- Blow water cost

【Outstanding problem】

- Not enough Scale protection by chemical
- Maintenance Expense of corrosion pipe
- Needs plenty of water supply for treatment
- Additional power by thermal conductivity decrease

Solution

emiiR Installed System

【 Global Environment 】

- No Chemical operation
- Save Electric Power

【Cost decrease】

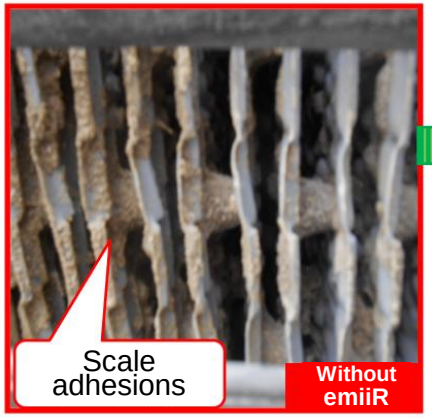
- No Chemical, Blow water or disposal cost

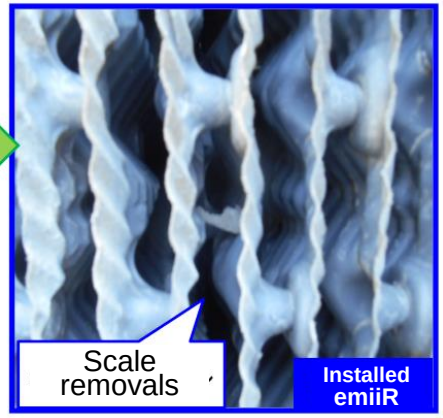
【Resolution】

- Protect scale adhesion without Chemical
- No Corrosion pipe by treatment water
- Save water supply amount
- Save power by increased thermal conductivity

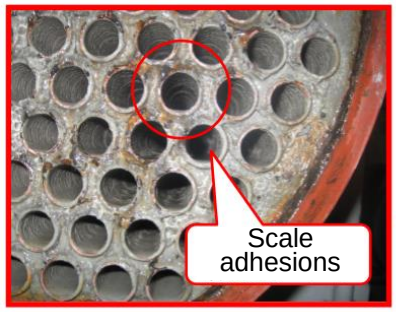
Cooling Tower

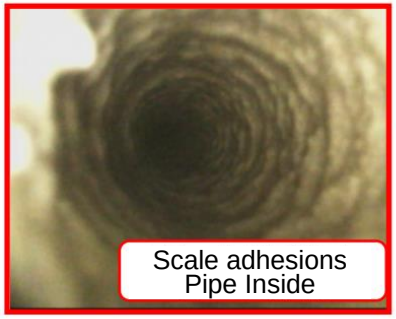
Thermal conductive fin





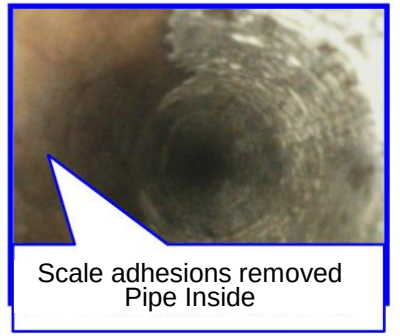
Peeled off Scale were precipitated at bottom pan.





Without emiiR

Installed emiiR



Privente Scale adhesion without Chemical & plenty of Blow Water

Customer's proof

After installed emiiR system into Customer's Cooling tower,
Confirmed all scale were removed.
And installed all factories !

Closed type Cooling Tower Installation - 1

Undersea cable factory

Closed Type Cooling Tower
with emiiR installed

- emiiR install each spray pipe of the distribution devices in case Closed Type Cooling Tower

SCALE adhere to the Heat exchanger after Chemical injection stopped 3 days.

8 month after emiiR installed,
all SCALE were removed

Closed type Cooling Tower Installation - 1

emiiR technology had approved !

Tire Company's factory in Shimonoseki

1 year after emiiR installed to New Cooling Tower,
NO SCALE were adhered

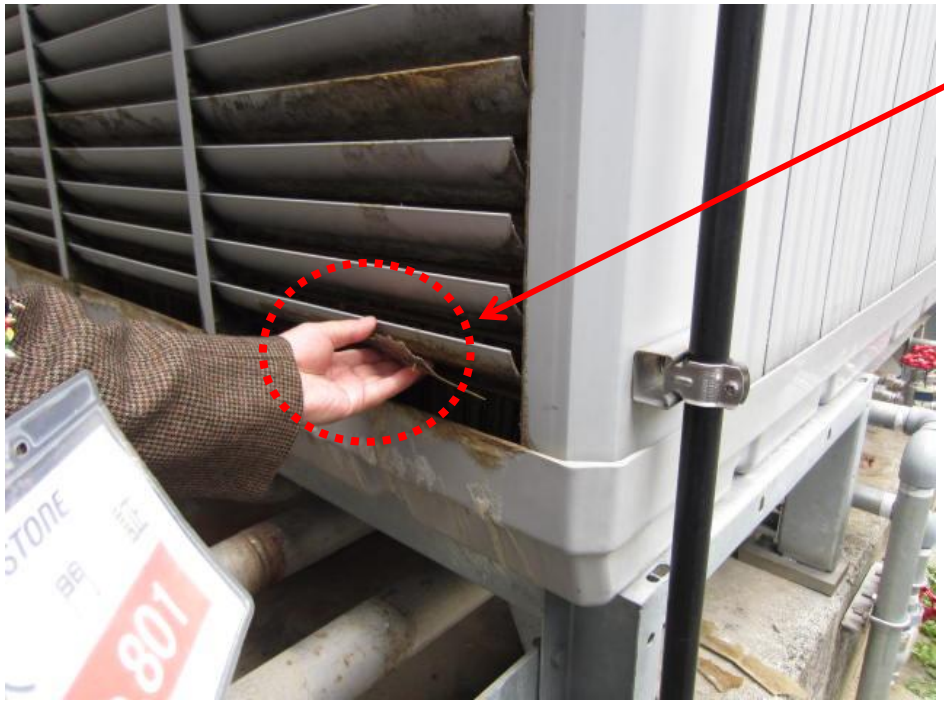
NO Scale Adhesion on Copper pipe & the blade

Closed type Cooling Tower Installation - 2

Corporate HQ decided to install emiR to All Factory

Tire Company's factory in Shimonoseki

1 year after emiiR installed to New Cooling Tower,
small adhered scale can be removed easier

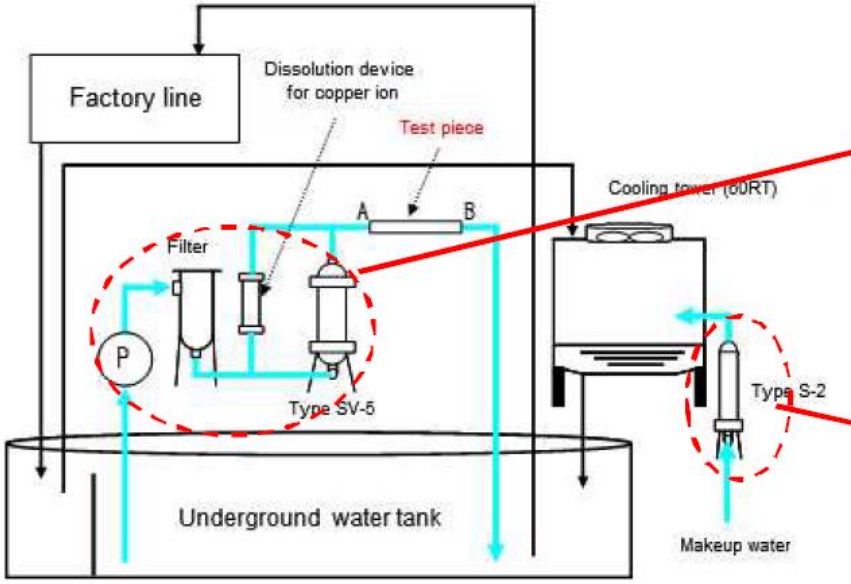


Positively charged water protect to adhere the SCALE & curing !

Molding plant in Miyazaki, Japan

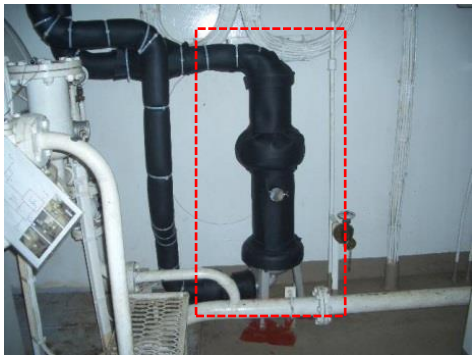
Molding palant factory in Miyazaki

- Prevent concentration of the water, Factory line require continuous over blow.
  - After installed emiiR, saved 90% of blow water.
  - Thermal exchange effectiveness was improved, and increased production efficiency.
  - Scale on inner pipe was removed.
  - emiiR works both Molding line & Tower cooler



Water supply & drainage Pipe

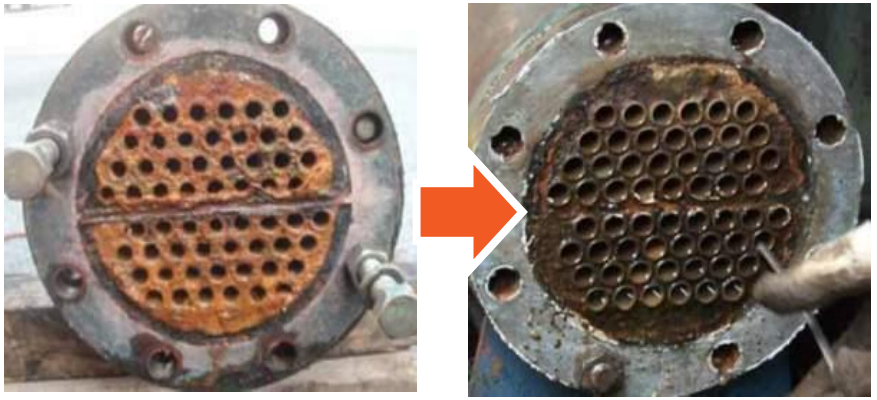
Asuka II Cruise



Extended Equipment life

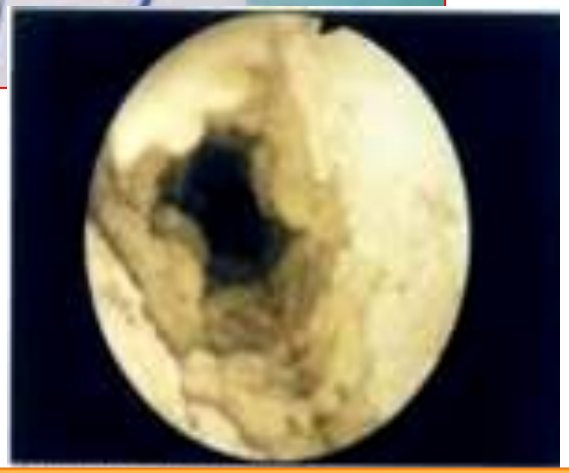
- Small initials & NO operation cost
- Prevent corrosion by Black rust
- Covered all drainage pipe including Toilet

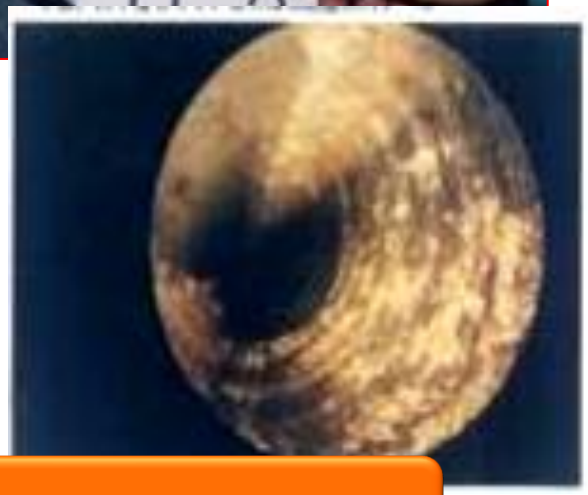
Non Chemical improvement !



Red Rust becomes Black Rust !

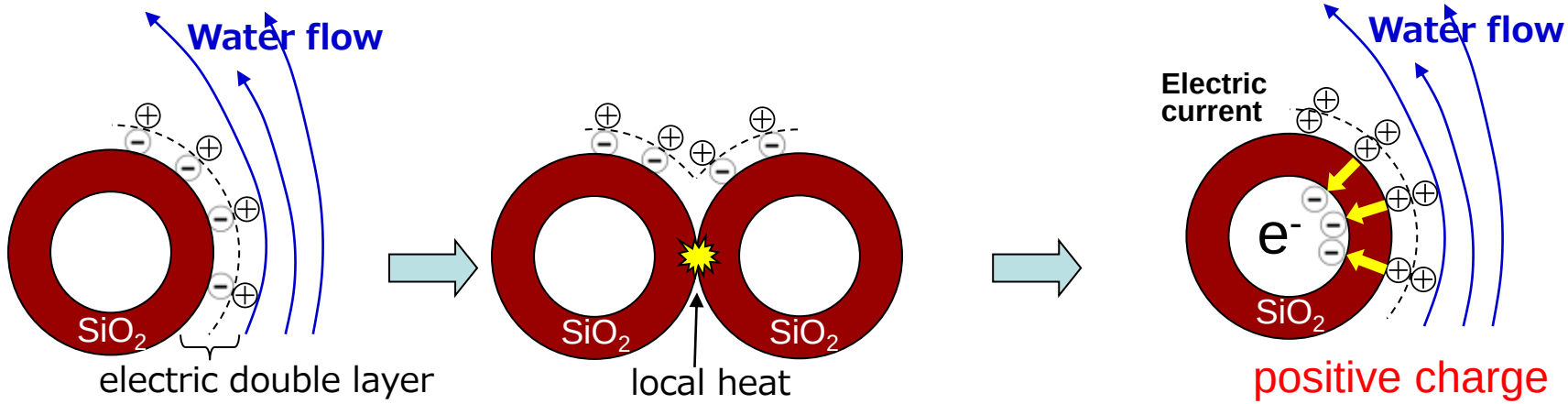
Drainage Pipe treatment at Lavatory





Remove Urine Stone, NO Ammonia odor from Toilet bowl !

emiiR principal theory



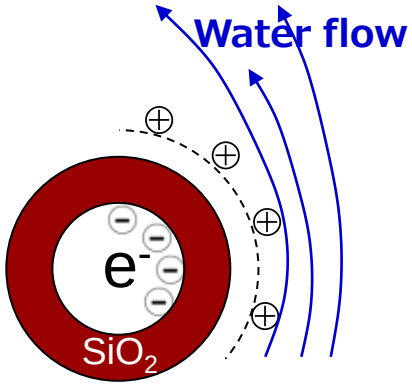
Ceramics surface is highly Negative（−）

electric double layer

Seebeck effect by Thermoelectric conversion effect

Highly exchange capacity to Cation

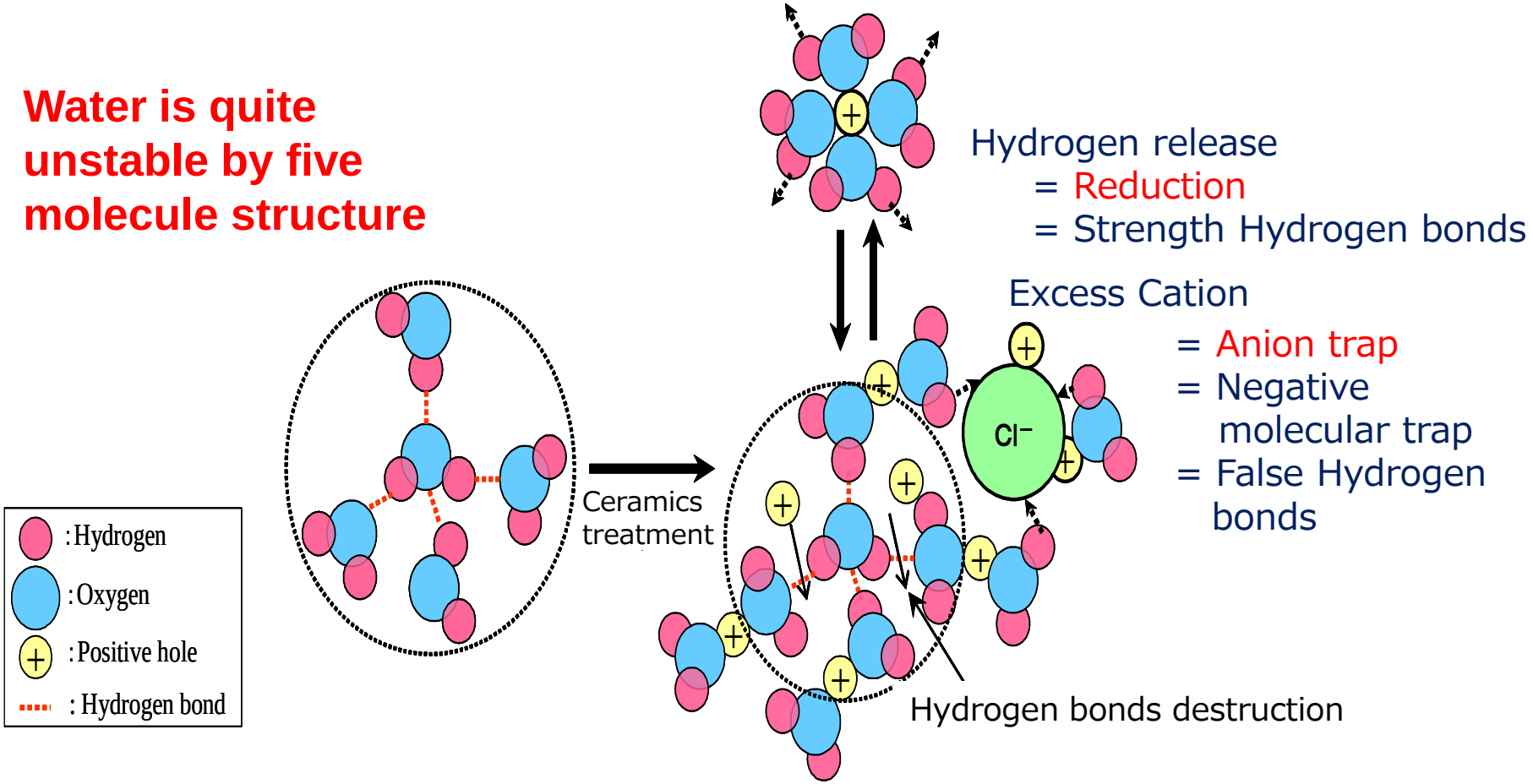
＊Anti-Adhesion effect of Ceramics surface by fluidization



Treated water charged positive and electric action araises（Cationic）

emiiR principal theory

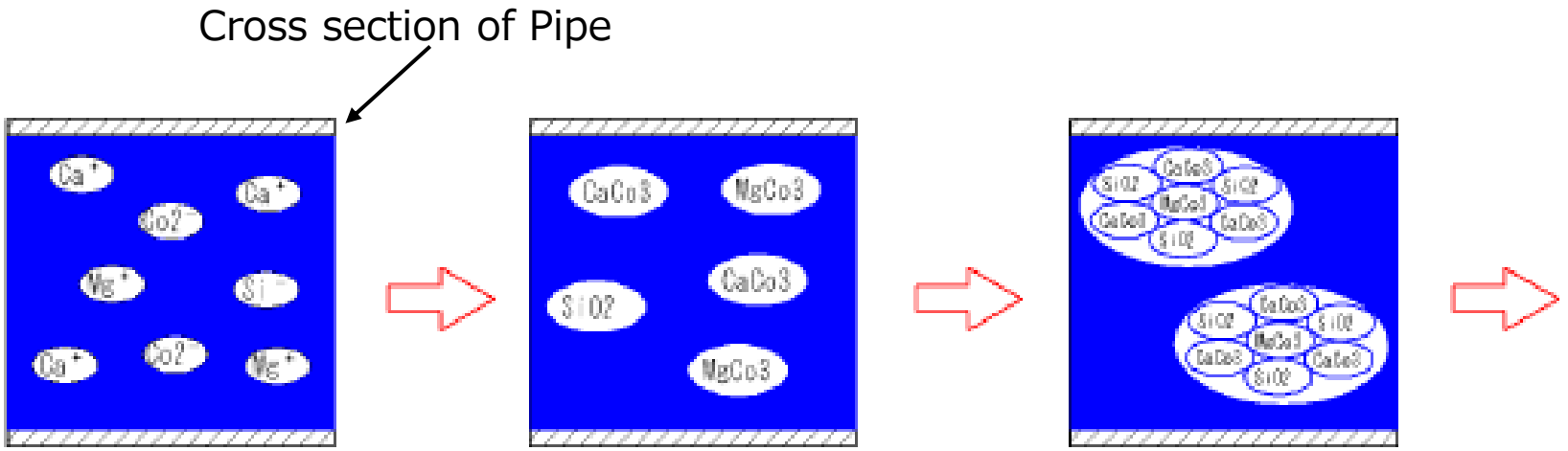
Water is quite unstable by five molecule structure



Positive Charge ⇒ Hydrogen bonds stability ⇒ High penetration force

Hydrogen bonds stability ⇒ Space stability ⇒ Increase dissolution force

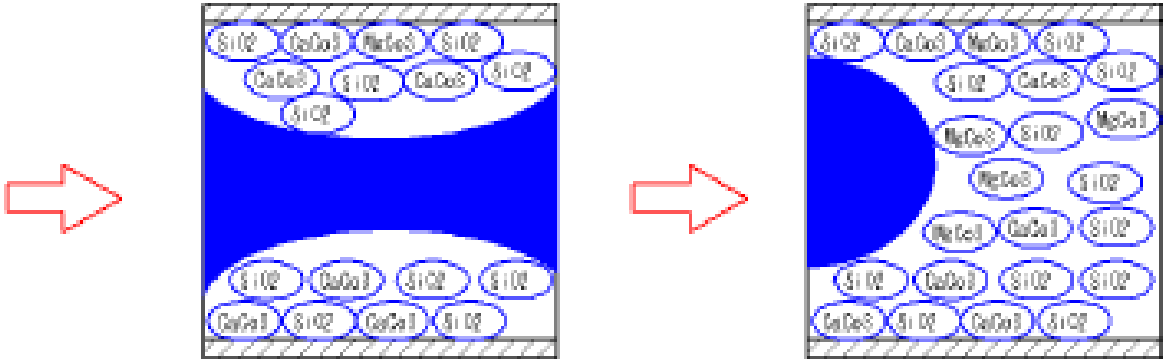
Scale Adhesion Progress



Hardness elements, Si, Carbon Dioxide Gas, etc. exists in the water

Colloidal fine particle generates after ionic bond by Cation and Anion

After being ionic bonding by various of Colloidal fine particle, they grow up bigger

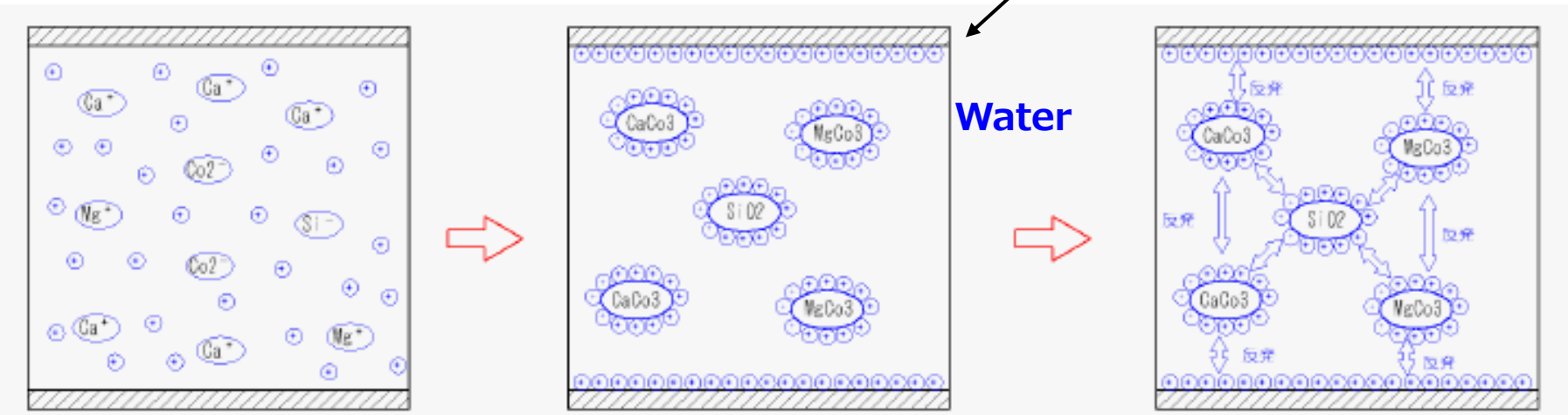


Bigger grown crystals adhere at inner wall of Pipe, becoming SCALE, and Pipe line is getting narrow.

Finally, inner pipe will be obstructed by SCALE

Prevent Scale Adhere

Ceramics treated water

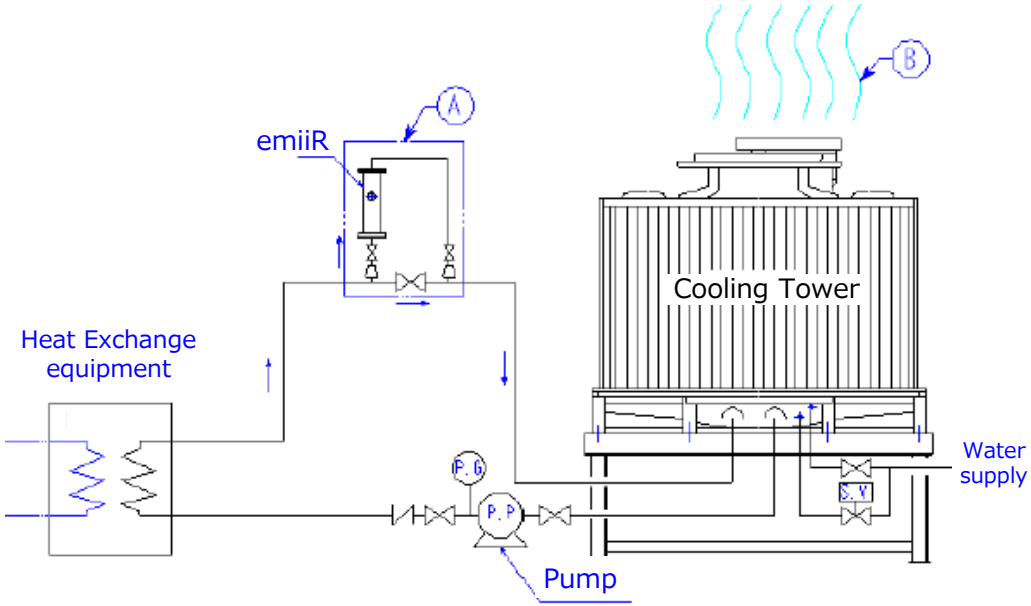


After the Water treated by Ceramics flow, Ionic state of water hardness, Si and Carbon dioxide gas are remain.
And added Positive charge (Cation) state

However Colloidal fine particle generates after ionic bond by Cation and Anion, they are covered by Cation Water. (Hydration)
And also inner wall of pipe will be coated by Cation.

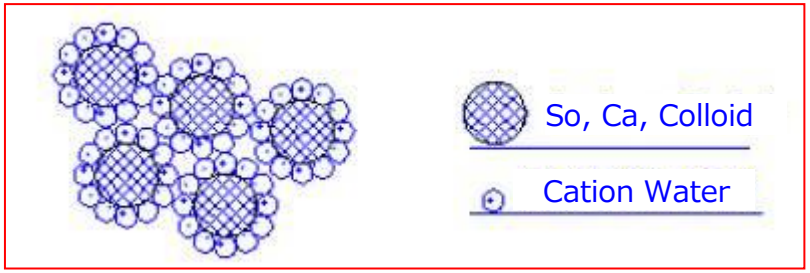
The Hydrated Colloidal particle by Cation water are rebounded each other, NO Scale generated, and also no Scale at inner wall of pipe due to rebounding with it.
So, Colloidal particle is flowing downstream without Scale adhere.

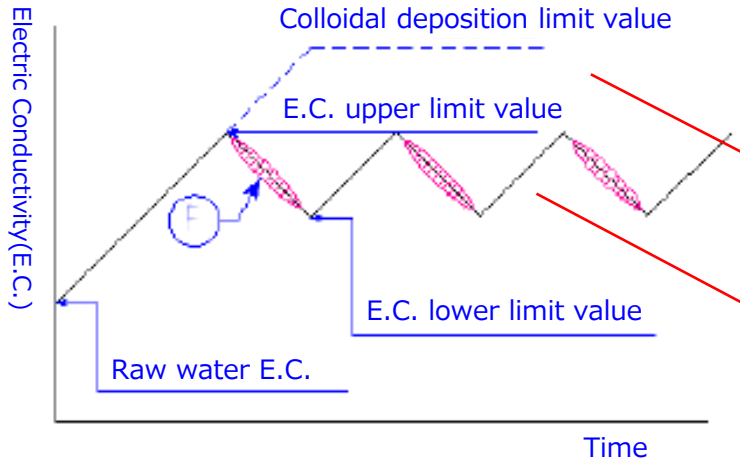
Cooling Tower installation



Install emiiR at location A in left side fig.,
It is completely NEW operation system without replenishment of Water by the water evaporation of Cooling Tower at location B, or adding chemicals and blowing of water in order to avoid SCALE filure.

＊Image of Hydration



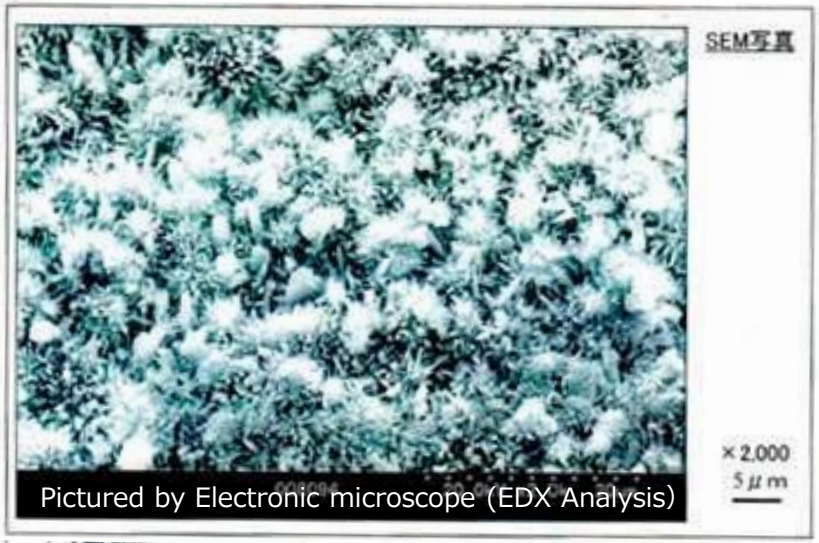


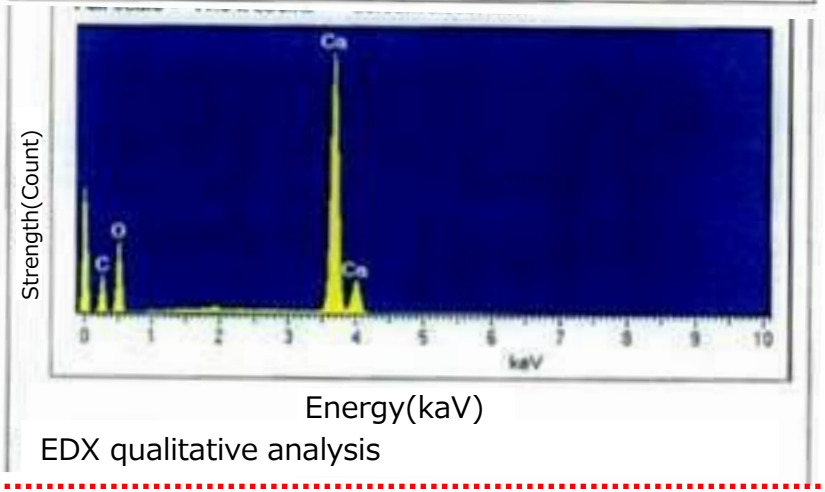
emiiR works : Colloidal SCALE are precipitated and hydrated

Chemicals injection and Water blow (High operation cost & Environmental load)

Difference of Scale crystal by emiiR treatment

Scale crystal after installed emiiR

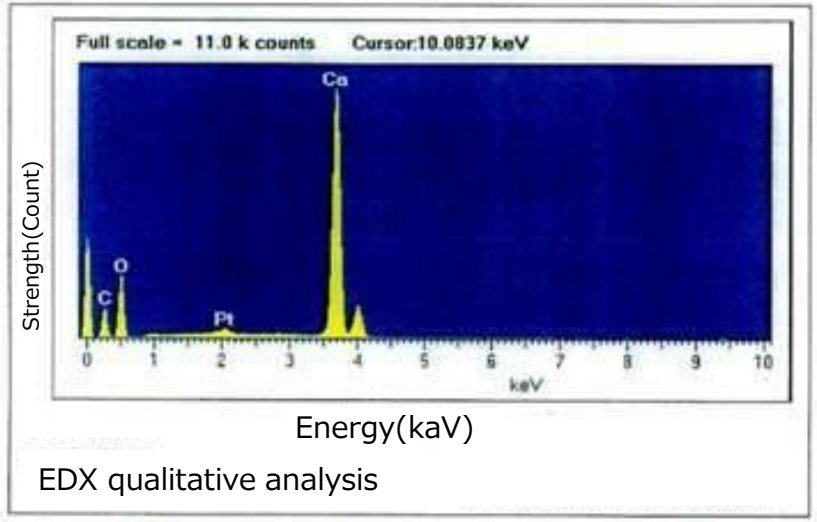




Energy(kaV)

EDX qualitative analysis

Scale crystal without emiiR installation

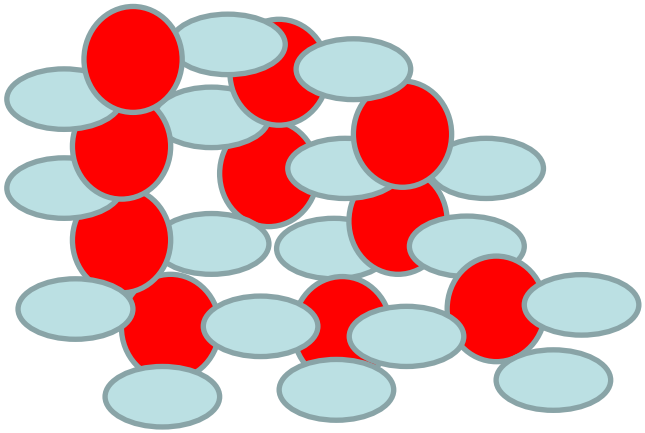


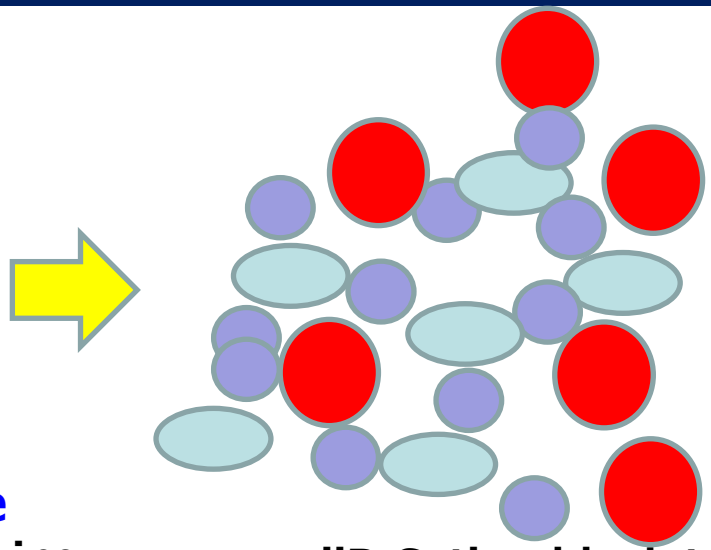
Energy(kaV)

EDX qualitative analysis

SCALE by emiiR treated water is *Fine & Soft, NO Adhesion & Hardenings*

emiiR treatment effects Hydrogen Bonds





Hard mesh structured Scale

emiiR Cation effects & dissolving SCALE gradually

emiiR Cation block to create Hard mesh structured Scale

Once Sparingly soluble base (AB) added different ionic soluble base (MX) at concentration C, it's solubility can be improved as below : This soluble salt should be emiiR cation base.

OH → +OH-

$CaCO_3 \rightarrow Ca^{2+} + CO_3^{2-}$ as equilibrium reaction, in case Ca is "A" and CO_3^{-} is "B", Equilibrium constant is,

$K_S = \gamma A \cdot \gamma B[A][B]/[AB]$, and [AB] which is [CaCO3] is Individual due to sparingly soluble, the figure is 1. And γA・、γB are each activity coefficient.

Ca^{2+}, CO_3^{2-} concentration [A], [B], and their solubility is "S", S=[A] =[B], and also $K_S = \gamma A \cdot \gamma B S^2$, $\log S = (\log K_S - \log \gamma A \cdot \gamma B)/2$

In other hand, Debye-Hueckel's limiting law shows $\log \gamma A \cdot \gamma B = -AC^{1/2}$.

In this group, Concentration C is the atmosphere of soluble salt MX,

$\log \gamma M \cdot \gamma X = \log \gamma A \cdot \gamma B = -AC^{1/2}$

therefore, $\log S = (\log K_S + AC^{1/2})/2$ and Solubility S is always to increase.

Track Record in Japan

Installed Japanese Giant Companies & Cruise Ship

ASUKA Cruise Ⅱ

241m/29.6m 1,500(Guest & Crew)
• For Water treatment

Tokyo Metro

Nagata-Cho Subway Station
• For Remove Urine stones at Lavatory

Panasonic

Tsuyama Factory Plant
• For Scale Protection (Cooling Tower)

Tokyo Fire Dept.

Shibuya Training Center
• For Scale Protection (Cooling Tower)

JR EAST

Sendai Station (JR)
• For Water Treatment & Remove Urine stones at Lavatory

Nippon Steel & Sumitomo Metal

Geothermal Power Generation
• For Scale Protection