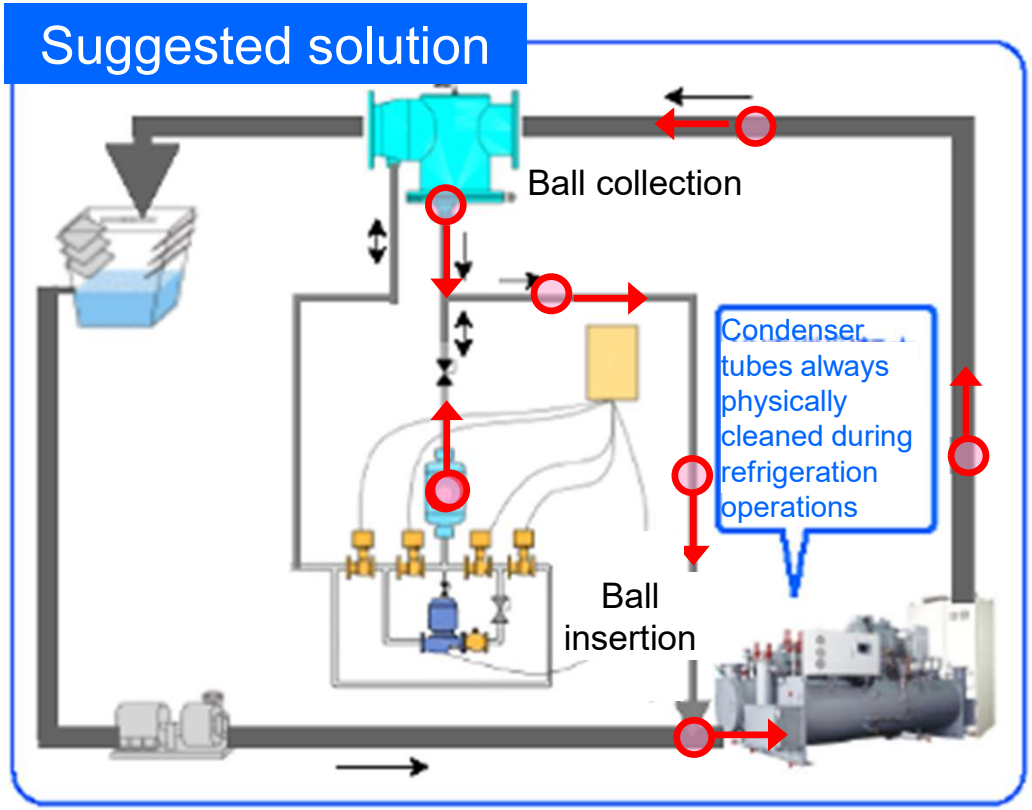
# *Automatic ball-type heat exchanger cleaning system*

**A coolant contamination countermeasure chosen for its cost-effectiveness**

## Why not upgrade to contaminant-free refrigeration heat exchangers?



# Automatic Ball-type Heat Exchanger Cleaner

XAC is applied exclusively to condensers and heat exchangers with water tubeside. The Ball functions through the creation of a closed loop within the greater circulating water system. Within this closed loop sponge rubber balls are circulated, which by random selection flow through all tubes on a frequent basis, thereby maintaining optimum tubeside cleanliness.

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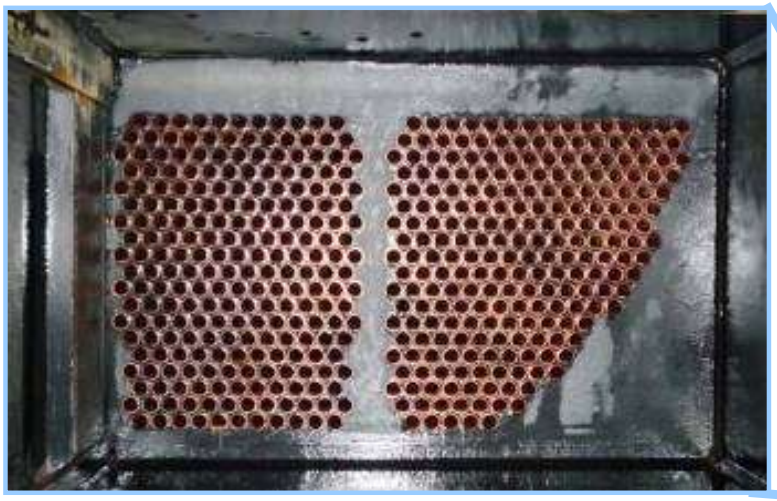
## What is “Automatic Ball-type Heat Exchanger Cleaner ”?

Automatic Ball-type Heat Exchanger Cleaner is a shell and tube heat exchanger cleaning up automatically.

By putting special sponge ball, 10 to 20 mm diameters into the pipeline shell and tube heat exchanger. After that the cooling water (coolant) processes will flowed and transported carbon through the pipe then cleaned it up automatically.

# *Compatible equipment*

This technology can be installed in all shell and tube-type heat exchangers in which coolant flows though tubes.



Above: A refrigeration heat exchanger

Coolant flows through the copper tubes resembling a bee hive.

Right: A contaminated heat exchanger

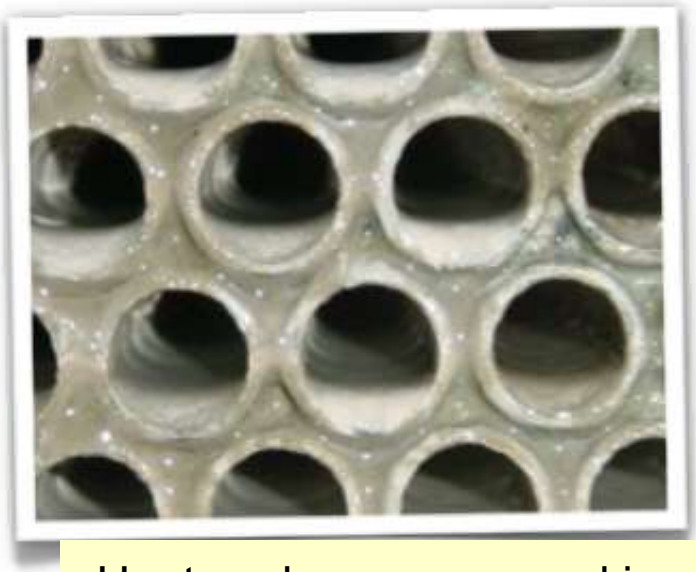
Contaminants in the coolant build up and impede heat exchange.

◆ Typical coolant contaminants

- Minerals such as calcium (that cause scale)
- Slime caused by microorganisms
- Sludge from soil or exhaust fumes

# *Conventional contamination countermeasures*

① Contaminant build up controlled with water treatment and intensive maintenance.
② Brushing or chemical cleaning agents used to remove dirt.



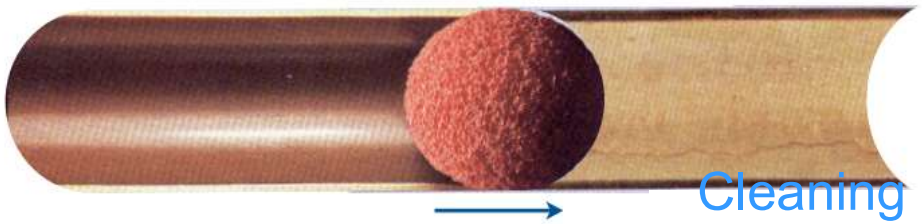
Heat exchanger covered in scale

**In other words…**

**Methods that assume contaminant build-up**

# *XAC contamination countermeasures*

**① Physical cleaning automatically carried out many times each day.**
**② Heat exchanger does not give dirt a chance to accumulate**



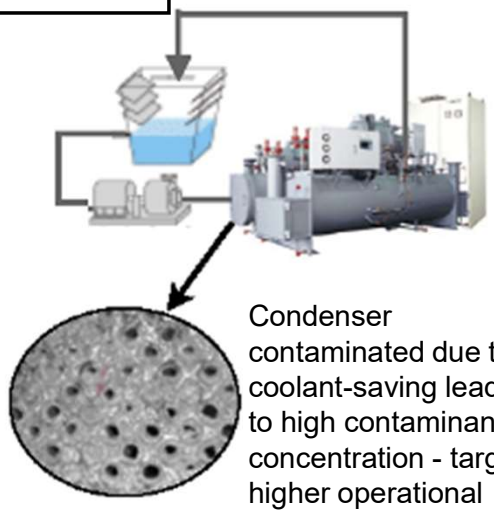

**In other words…**

**Heat exchangers automatically kept contaminant-free**

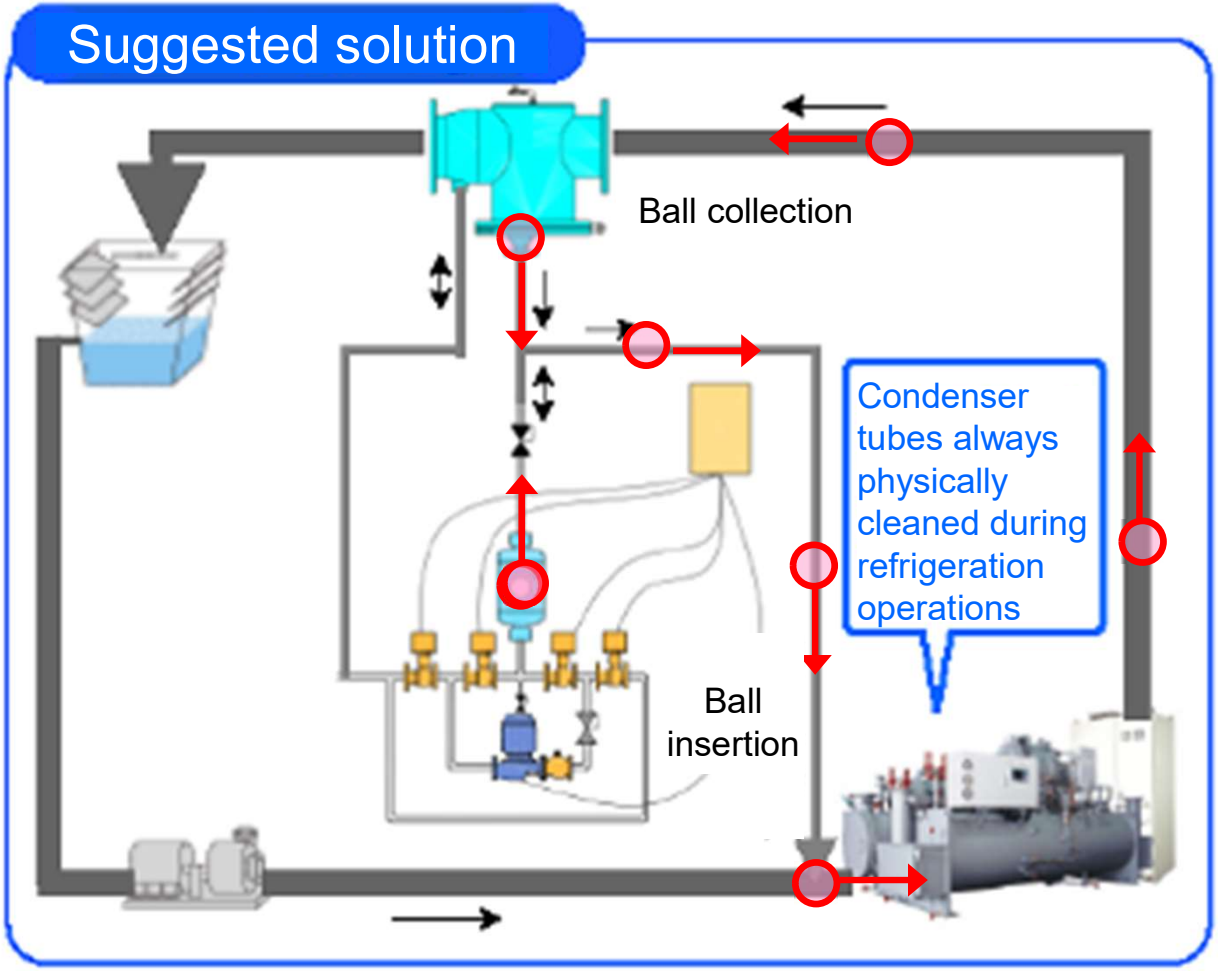
# *Automatic ball type heat exchanger cleaner (XAC) System*

Utilizing coolant flow and sponge balls, regular physical cleaning of tubules in the shell and tube heat exchanger is carried out automatically.

Existing equipment



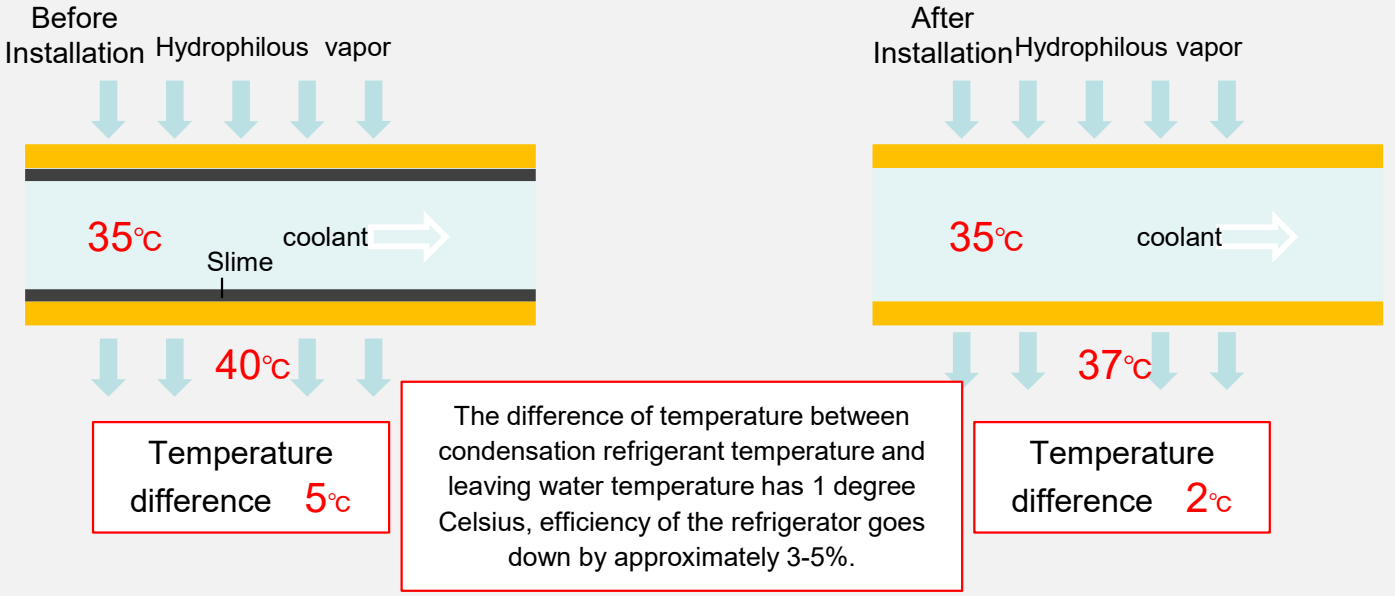
Condenser contaminated due to coolant-saving leading to high contaminant concentration - targeted higher operational efficiency actually falls.

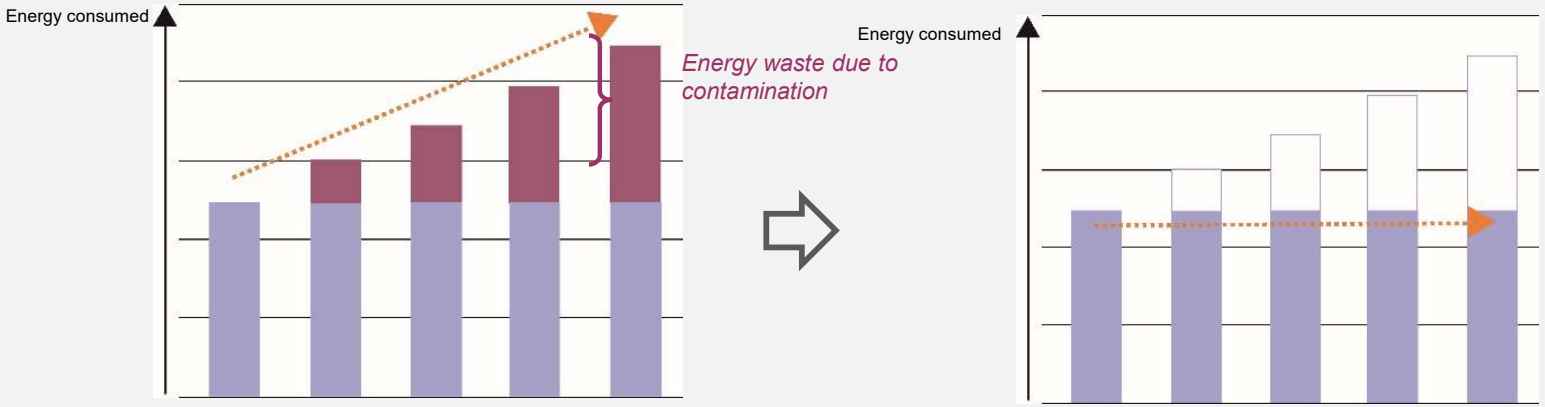



- Repeated physical cleaning using these sponge balls ensures effectiveness
- Cleaning is performed automatically while equipment is operating.
- XAC minimizes energy consumption, reduces maintenance costs and prolongs equipment lifespan

# Energy Saving

The former and latest machinery cleaning  always keeps cleaning repeatedly, but it still results in dirt accumulation and low performance while the machine is waiting for the next cleaning. Therefore, XAC installation can cleaned up  the heat exchanger automatically while the machine is running. XAC installation can reduce dirt accumulation, low performance,  and energy saving.



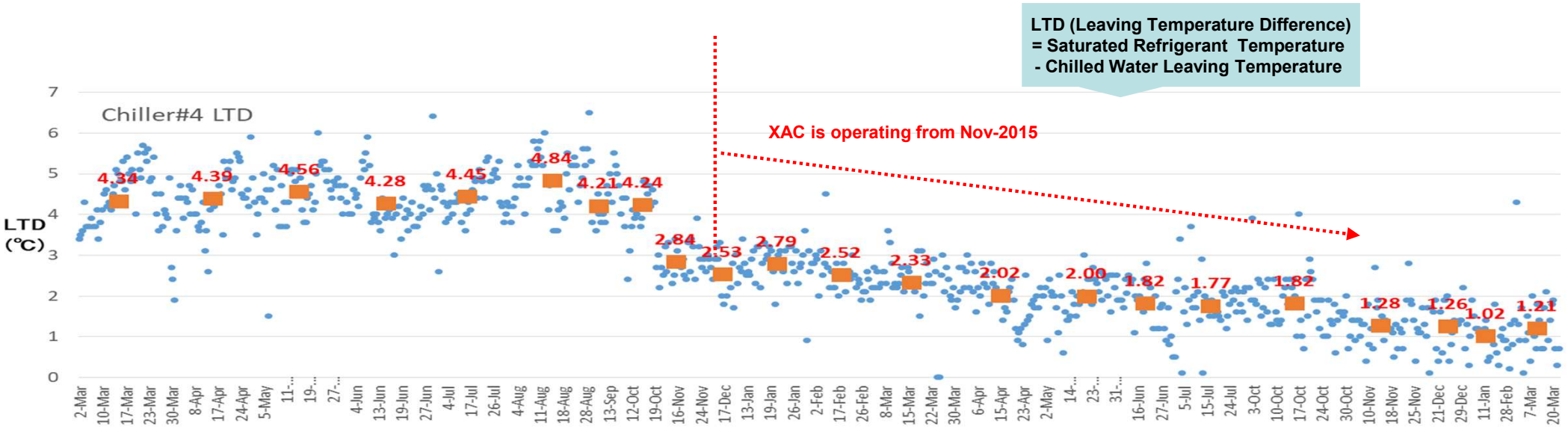




"Automatic Ball-type Heat Exchanger Cleaner " eliminates energy waste due to contamination.

# *Installation types: Multi-specification for 2 refrigeration units with 1 system (Up to 6 units with 1 system possible)*



# *Once the XAC is installed in the machine, the system will automatically cleaned during operation without taking care of or controlling.*




(Date)

| Before | Month | Mar-15 | Apr-15 | May-15 | Jun-15 | Jul-15 | Aug-15 | Sep-15 | Oct-15 | |
|---|---|---|---|---|---|---|---|---|---|---|
| 4.41 | LTD | 4.34 | 4.39 | 4.56 | 4.28 | 4.45 | 4.84 | 4.21 | 4.24 | |
| **After** | Month | Nov-15 | Dec-15 | Jan-16 | Feb-16 | Mar-16 | Apr-16 | May-16 | Jun-16 | Jul-16 |
| 1.88 | LTD | 2.84 | 2.53 | 2.79 | 2.52 | 2.33 | 2.02 | 2.00 | 1.82 | 1.77 |
| **After (2017～)** | Month | Oct-17 | Nov-17 | Dec-17 | Jan-18 | Feb-18 | Mar-18 | | | |
| 1.27 | LTD | 1.82 | 1.28 | 1.26 | 1.02 | 1.00 | 1.21 | | | |

- LTD before installation of XAC : 4.41 ⇔ LTD after installation of XAC : 1.88 → **LTD is improved over 2.6℃.**
- LTD is decreasing trend after installation of XAC . After 2017 : 1.27 → **LTD is improved over 3.1℃.**

# *Cleaning cost reductions – economic effects*

Cleaning to remove built-up contamination costs money.
If scale has built up, it can only be removed with expensive chemical cleaners.
After Installation of the automatic ball-type heat exchanger cleaning system , these cleaning methods become unnecessary.

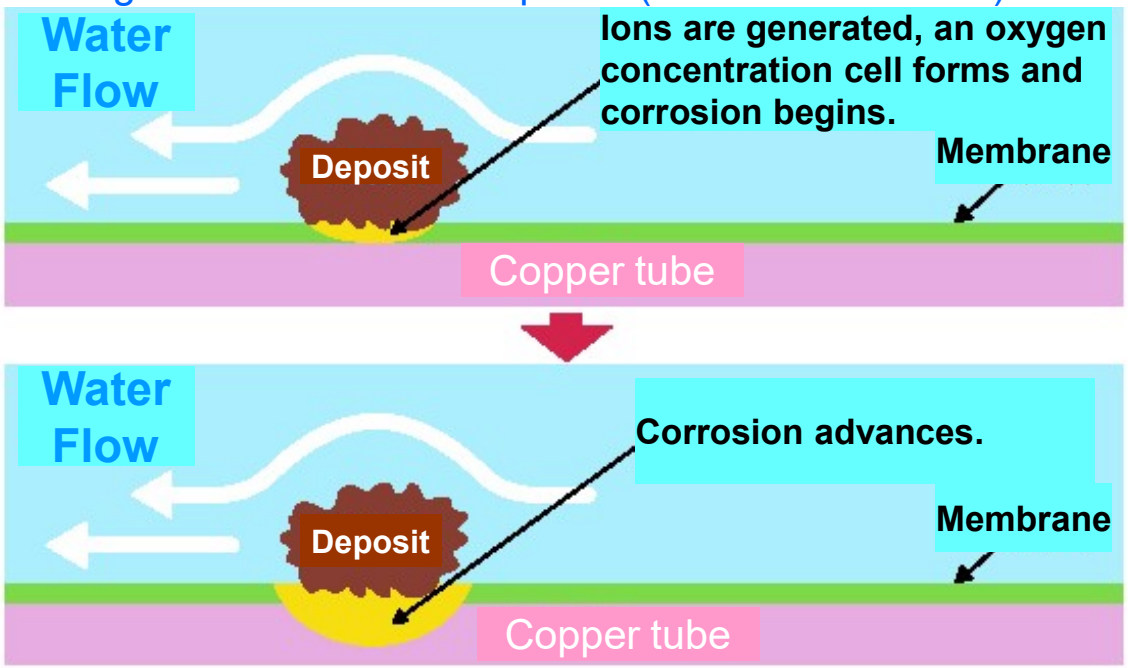
**Tube cleaning unnecessary!!**

# *Prevent corrosion problems - extend equipment lifespan*

Contaminant buildup on heat exchanger tube is a cause of corrosion troubles.
Because XAC reduces the risk of corrosion due to deposits on the tube, it also extends the working life of the equipment.

## Corrosion trouble

E.g. Corrosion due to deposits (localized corrosion)




Others

- Synergistic effects with INV and quantity controls of cold water and coolant pumps etc.
- Reduced need for water supplementation and water treatments

… and so on - there are tremendous benefits of having a clean heat exchanger!

# *Installation* case: Clean room turbo refrigeration

Purpose: Energy-saving by preventing turbo refrigeration condenser contamination
Equipment: Turbo refrigeration 390RT (base machine: XAC installed)×3 + 500RT×3



# *Existing Installations*

**Automotive compressor**

**Chemical plant refrigeration**

**Automotive compressor**

**Automotive refrigeration**

**Space exploration refrigeration**

**Semiconductor-related refrigeration**

**Paper manufacturing on-site generation system condenser**

**Semiconductor-related refrigeration**

Wide-ranging industries such as semiconductor and automobile manufacturers, food and paper producers and chemical plants,

Commercial facility refrigeration

Hospital refrigeration

In-house underground station refrigeration

Chemical plant refrigeration

Semiconductor-related refrigeration

Semiconductor-related refrigeration

large-scale commercial facilities, local heat suppliers, hospitals, underground railway air-conditioning and so on - this technology meets the needs of a diversity of business classes!!

# *Summary*

- Eliminates the need for regular heat exchanger cleaning
  → Reduces maintenance costs and downtime

- Energy-saving
  → Contributes to lower running costs and $CO^2$ emissions

- Extends equipment working life
  → Prevents damage due to chemical or brush cleaning, high workload due to contamination and corrosion due to deposits.