

Have you been plagued by Scale?



WE have a new SOLUTION for YOU!

MORKO Ultrasonic Scale Preventer

Proven & Tested Ultrasonic Technology



Common Scale Problems



- Blockage of Tubing or Pipelines
- Clogging
- Corrosion
- Energy Loss
- Shutdown Loss
- Shortening of facility lifespan
- Unknown Damages
- Cost of cleaning and repair
- Cost of chemical usage
- Environment and safety issues

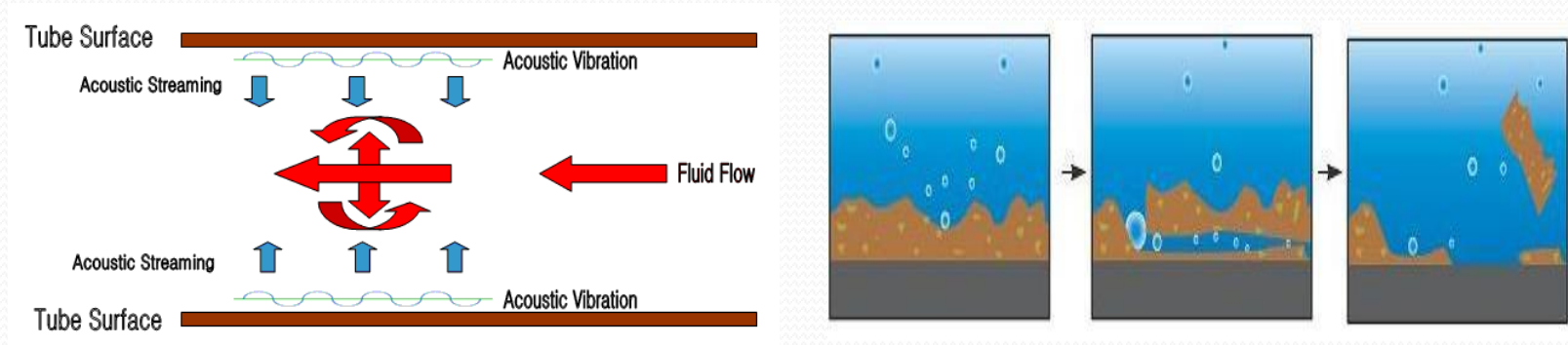
Why Need Scale Treatment?

- **Reducing Maintenance Costs**
- **Reducing Downtime**
- **Enhancing Productivity**
- **Saving Energy & Costs**
- **Extending Facility lifespan**
- **Improving Environments**



MORKO USP is Solution!!

By removing and preventing scales, foulings & slimes,

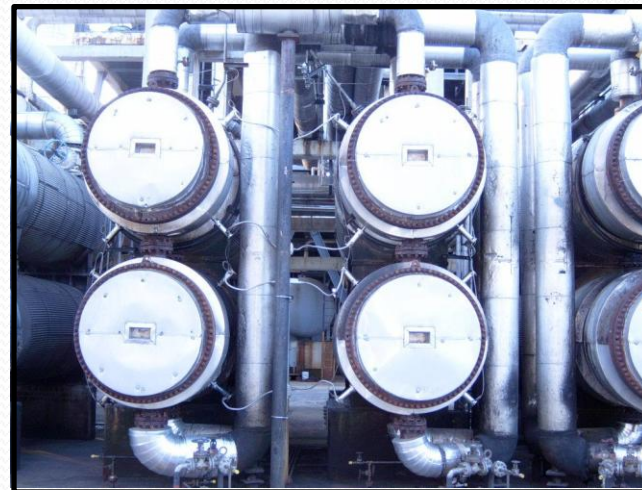


USP can bring to :

- **Reduce maintenance cost**
- **Reduce downtime**
- **Increase productivity**
- **Increase energy saving**
- **Extend equip. lifespan**
- **Improve Environments**

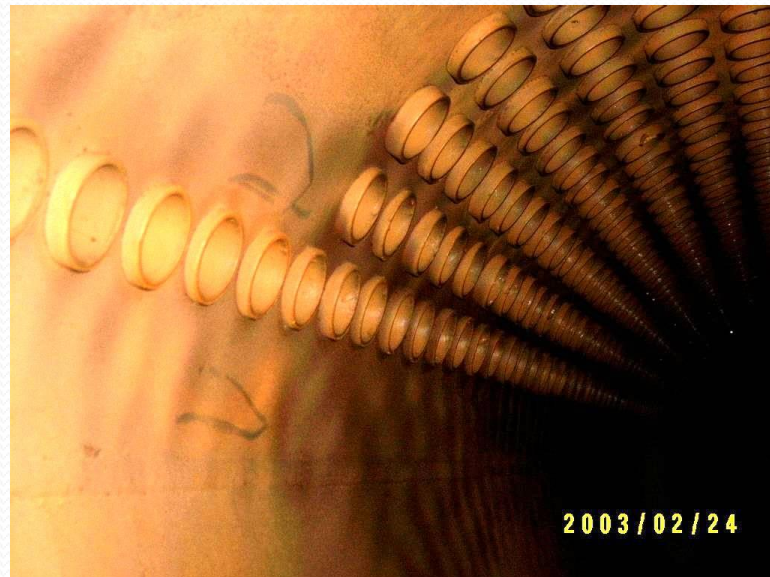
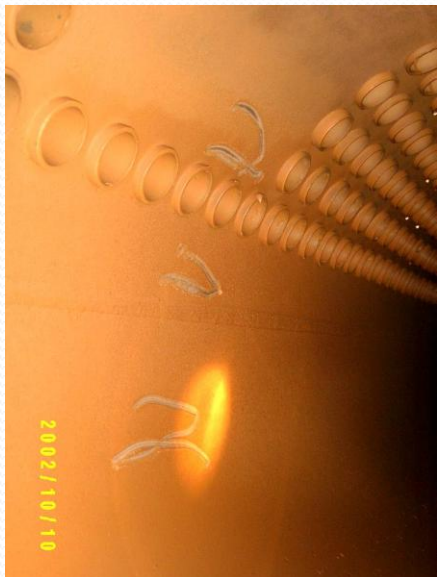
Benefits for maintenance

- **Reduced labor work cost**
- **Reduced downtime**
- **Reduced usage of anti-fouling chemicals**
- **Reduced preventive maintenance cost**
- **Less Frequent maintenance**



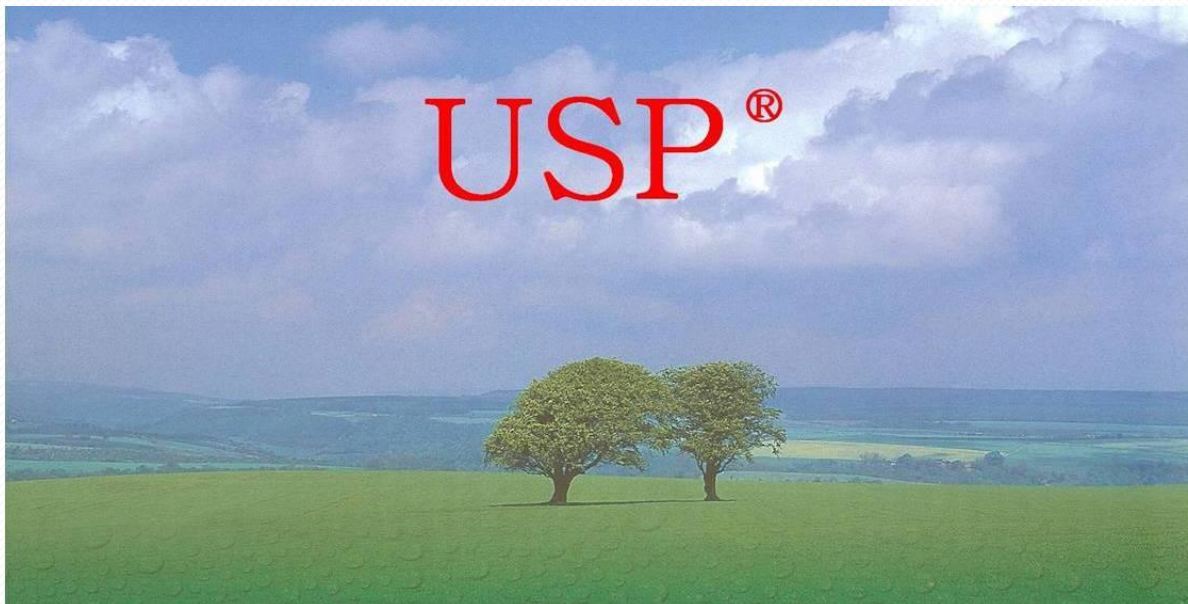
Improved Production & Efficiency

- **Extended lifespan of facilities**
- **Improved functions of equipment**
- **Less frequent shutdown**
- **Expected higher productivity**



Environmental Benefits

- **Less usage of chemicals for cleaning**
- **Improved fouling prevention**
- **Preventive effect for environmental pollution**



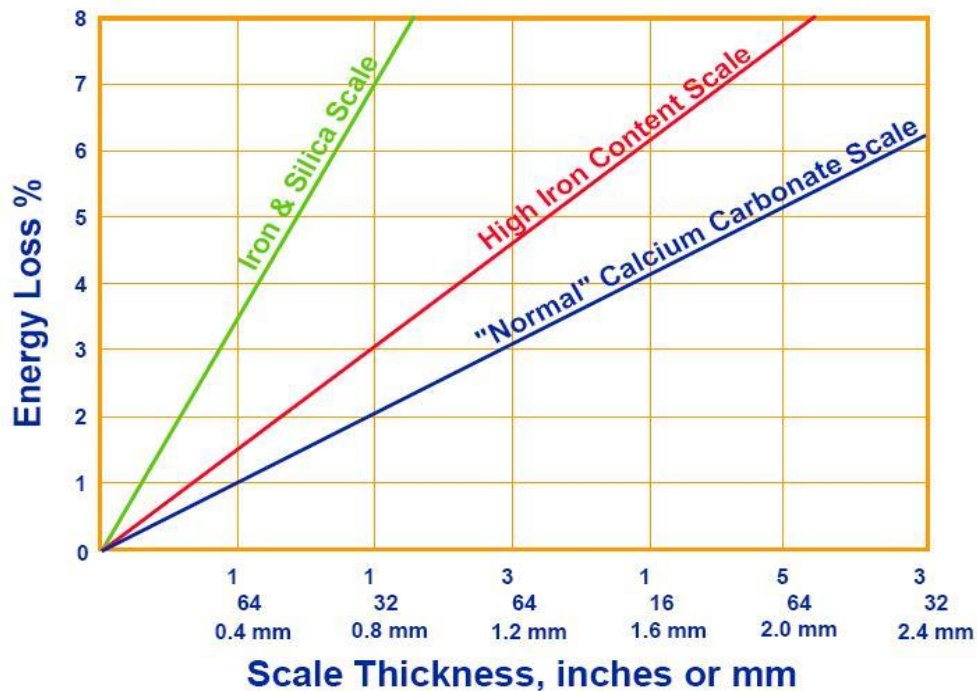
Scale Thickness vs. Fuel Loss

Data from EU

Thickness of Scale[mm]	0.5	1	2	4	8	16	30
Loss rate of fuel [%]	2	4	6	10	20	40	80

Energy Loss from Scale Deposits

(from Energy Conservation Programme Guide for Industry & Commerce)



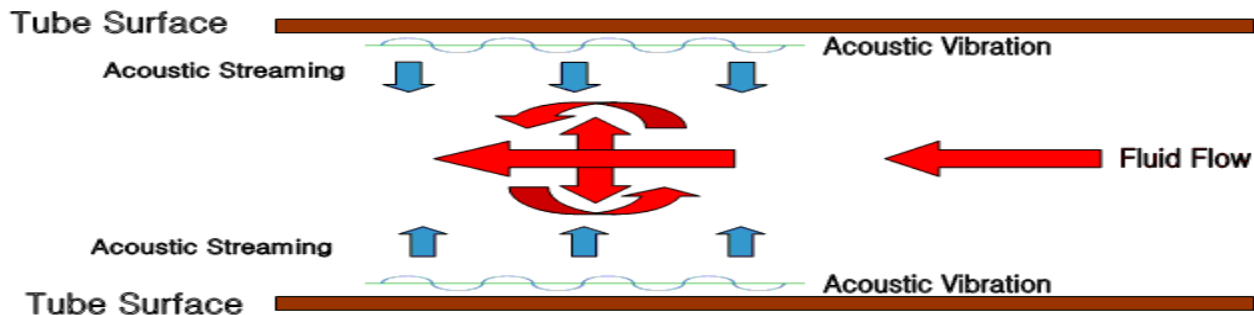
How it works?

- **Vibration**

When Ultrasound is applied to a metal of facility, **small vibration wave** is generated and transmitted into the whole facility through the metal.

- **Acoustic Streaming**

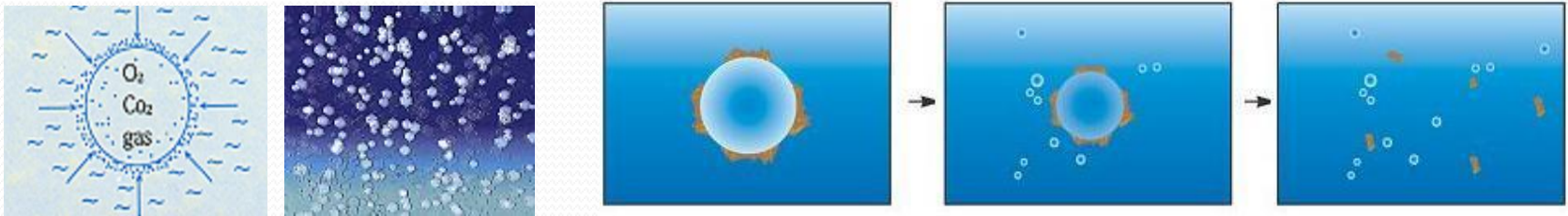
When ultrasonic energy is transferred to fluid through metal, **acoustic radiation** is generated in the fluid and also at the contact surface between the fluid and the metal. This **acoustic streaming** prevents fouling forming in the fluid and scale deposit on the metal surface. This improves heat circulation in the facilities and so enhances the efficiency of heat transmission.



How it works? *(cont'd)*

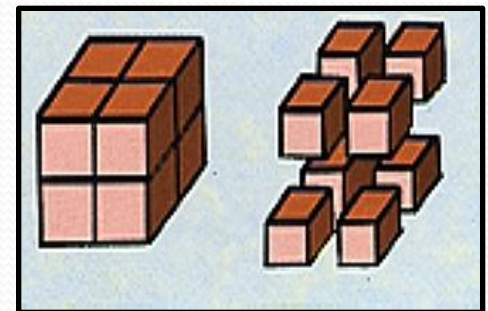
- **Cavitation**

Ultrasonic vibration causes to occur “**empty effect**” in the liquid, giving rise to repeated forming lots of **air bladder** in a moment. When air bladder is absorbed and exploded, very high power of energy (about 30,000 G-force) & temperature are generated at each location.



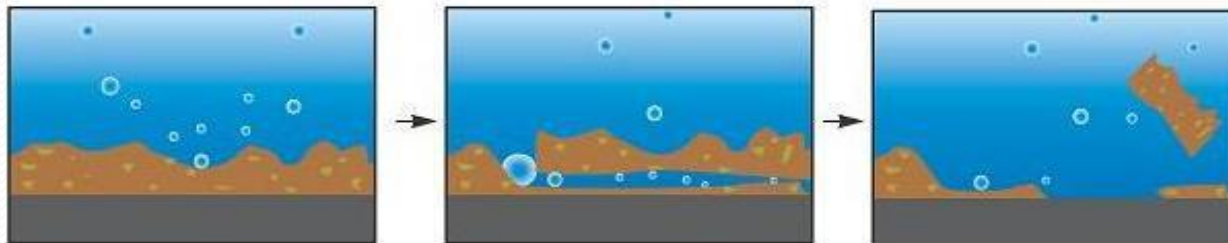
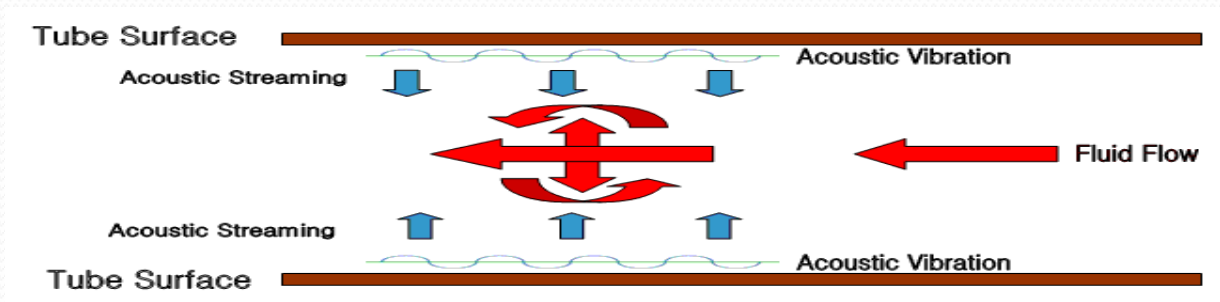
- **Increase of Surface Area**

When a particle in a liquid is shattered by ultrasonic waves, its **surface area increases** and it is bonded with other particles and shattered into pieces again. With the repetition of this process, the particle continues to be **smaller and smaller**.



How it works? *(cont'd)*

- Prevention and Removal of Fouling and Scale**
 When the combination energy of Vibration, Acoustic streaming and Cavitation generated by USP acts on metal surface and in fluid, it can prevent scale deposit on metal surface and fouling forming in the fluid and further can remove preformed fouling or scale.



Application I

(for Tancheon Sewage Treatment Plant)

- Comparison of Pipe after 6 months operation



**WITHOUT
USP**



WITH USP

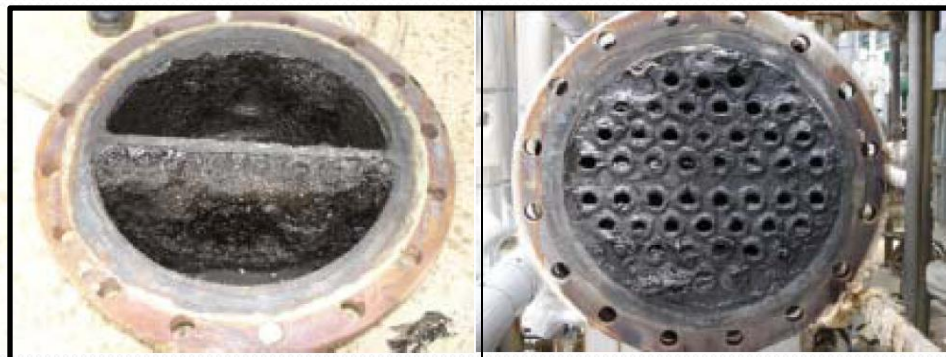
Application II (for S-Oil)

- **Test Site : #3 CDU, 2 train of Crude AR Exchanger**
- **Test Run 12 months**
- **Energy saving: 220K USD/yr per train**
- **Total 50 sets at Crude AR Exchangers in #1,#2,#3 CDU installed in 2007**

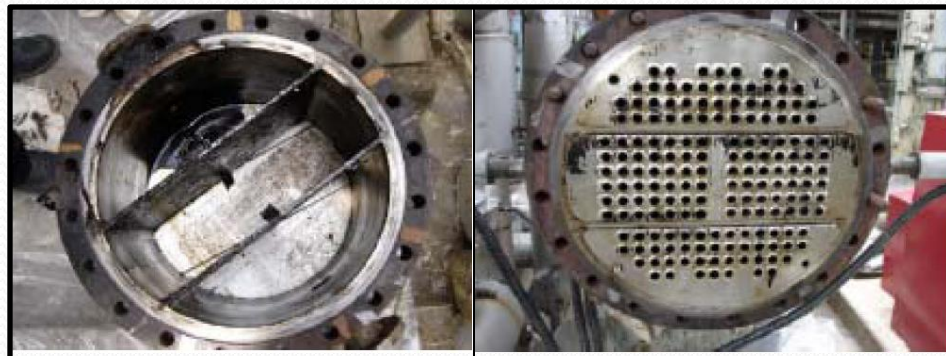


Application III (for KUMHO PNB)

- Comparison of 2 heat exchangers after 1 year operation

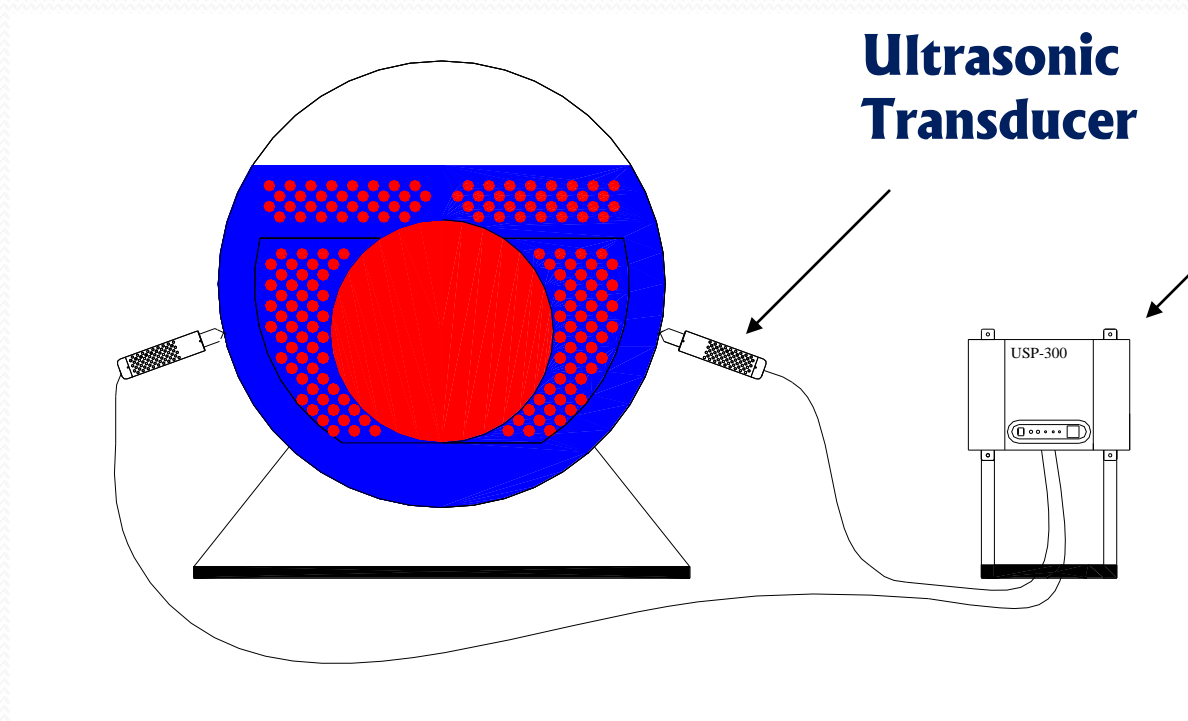


**WITHOUT
USP**



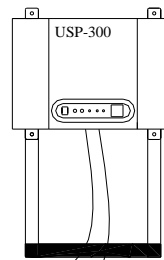
WITH USP

Installation

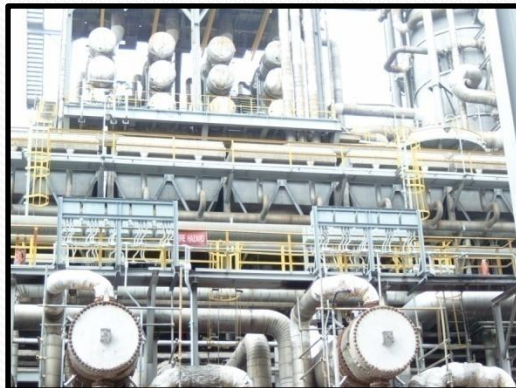


**Ultrasonic
Transducer**

**Ultrasonic
Generator**



Installation References



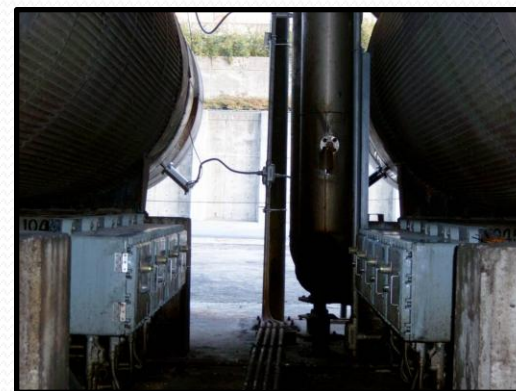
S-Oil



Tancheon Sewage Treatment Plant



GS Caltex



SK Energy

Reference List

Company	Application
GS-Caltex Corp.	Oil refining facility (CDU & Piping)
SK Corp.	Oil refining facility (CDU & Piping)
Hyundai Oilbank Corp.	Oil refining facility (CDU & Piping)
S-Oil Corp.	Oil refining facility (CDU & Piping)
Samsung Fine Chemicals	Heat Exchanger, etc.
Kumho Mitsui Chemicals	Piping in Process, etc.
Kumho P&B	Heat Exchanger, etc.
SK Chemicals	Re-Boiler in Process
Tancheon Sewage T. P.	Sludge Processing Pipes
Busan City Sewage T. P.	Sludge Processing Pipes

Conclusion

Morko USP is:

- **Physical Method rather than Chemical Method**
- **Cost-Effective and Proven Solution**
- **US Patent Application process in Progress**

Best solution with advantages and benefits due to:

- **Reduced maintenance cost**
- **Reduced shutdown time**
- **Elevated productivity**
- **Increased Energy saving**
- **Prolonged lifespan of facilities**
- **Environmentally friendly approach**



THANK YOU

Morko America

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