

Electronic Pipe Scale Removing Device and Corrosion Prevention Device

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➤ Scale removing and corrosion prevention device using Lorentz force through electromagnetic field from induction coil installed outside the pipe without using chemical substance



Client / Market

- General industrial facilities and all structures requiring fluid transmission for cooler, heat exchanger, boiler, and compressor

Necessity of this Technology

- Comparison of scale removal method

Method	Detail	Drawback
Magnetic type	Have fluid pass through the magnetic field to disturb molecular binding of Ca ⁺⁺ , Mg ⁺⁺ ion and prevent solvent from adhering to the pipe wall	Effect is insignificant unlike stated in the theory; issue of durability of magnet force
Electronic type	Neutralize and eliminate the potential difference in water-metal surface to disperse ion on the heating surface	Effectiveness in limited space
Supersonic type	Continuously apply micro vibration to the water with ultrasonic waves from the ultrasonic oscillator for removal	Can be used only within the limited range where ultrasonic wave can reach
Ion exchange resin method	Remove scale by converting hard water into soft water	Needed for corrosion prevention with Na ⁺ ion
Ion type	Prevent oxygen in advance by adhering metal with higher oxidizing power than steel to control rusting and remove scale	Effect differ depending on water potential level and pH, expensive cost Pipe cutting issue during installation
Catalyst type	Change the magnetic properties of water to prevent rust and scale, Weaken coherence of rust and scale for removal	
Inductive coil method	Using Lorentz force in the magnetic field to accelerate CaCO ₃ union in the water to drain, and disassemble existing scale with CO ₂	

DESIRED PARTNERSHIP

Technology Transfer

Licensing

Joint Research

Other



TECHNOLOGY READINESS LEVEL [TRL]



Existing Pipe Scale and Newly Developed and Installed Scale Removal Device



Technical Differentiation

- Smooth fluid flowing in the pipe such as coolant by removing scale at all times
- High-efficiency inductive coil type does not require replacement of existing pipe nor injection of chemicals.
- Energy saving effect from reduction in pipe loss in various systems including cooling system
- By having electricity flow through the coil installed outside the pipe, scale inside the pipe is removed with Lorentz force in the electromagnetic field.
- Red rust inside the pipe is changed into black rust (magnetite) to prevent corrosion.
- The effect is exercised up to 1 to 2 km downstream from the location where inductive coil is installed.
- The composition is simple consisting of inductive coil, power supply, and controller.

Excellence of Technology

- Development of scale remover to suit the domestic circumstances
- Can be applied for pipe for 1,000 W and with the diameter of 2,000 mm
- Change the square wave frequency sweep according to the test result (e.g. 100 Hz to few dozen kHz)
- Test on effectiveness on other matters other than scale removal (pipe rusting, bacterial infection) completed
- Possible to control the remover operation state according to the scale condition at the site
- Possible to monitor operation state by displaying related data while operating the scale remover
- Monitor the change in scale inside the pipe (relative changes) by installing a scale sensor
- Installation of current meter for easy check of operating point during installation and operation
- Control device displaying voltage, coil connection, operation signal, error and other alarm signals
- Possible to control the operating point by measuring the fluid running velocity when necessary
- Possible to control operating signal frequency and waveform for optimal scale removal

Current Intellectual Property Right Status

PATENT

- Scale Measurement Device for Pipe and Method (KR1379934)
- Electronic Pipe Scale Removal Device (KR1438765)
- Scale Measurement Device for Pipe and Method (KR2013 – 0124189)

KNOW-HOW

- System installation technology for simultaneous scale removal and corrosion prevention
- Technology for sweep frequency domain setting according to pipe and fluid type
- High-efficiency switching inverter driver design and manufacturing technology