

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