Magnetic Treatment of Fluids
(no date)

Paper #20
Author: Donaldson, J. D.

This was a presentation at a symposium organized in the United Kingdom by HDL Fluid Dynamics, a magnetic device manufacturer. Article starts out in a favorable tone right away.

- Refers to few very positive field demonstrations first.
- Reports on "laboratory" studies.
- Experimental procedures not clearly spelled out.
- Reports results showing changes in particle size, crystallinity, crystal morphology, crystal phase, solubility, and rate of precipitation.
- Changes in crystal morphology is shown by studying the x-ray diffraction of particles subjected to magnetic treatment for 30, 40, and 150 minutes.
- Solubility of $Ca_3(PO_4)_2$ is reported to be affected significantly by magnetic treatment applied for 24 and 120 hours.
- Rest of the changes reported are not based on numbers, but words.

Performance Analysis of Permanent Magnet Type Water Treatment Devices
(1981)

Paper #29
Authors: Gruber, Carl E.
Carda, Dan D.

This is a straightforward performance test of:

- Class I (clamps on to the outside of a pipe and produces a longitudinal magnetic field).
- Class III (radial with annular flow tube consisting of a series of alternately poled cylindrical magnets along the axis of the unit).
- water softener against no treatment.

Water(s) coming out were heated to 62°C in separate heaters and:

- flow was during four, ten-minute periods within 24 hours.
- total volume per day was 70 gallons through each heater.
- test period was July 6 through August 27.

Results:

Unit	Weight Loss at Anode	Scale on Heaters	Scale on Temperature Sensor
Softener	16.9 g	0.5 g	0.0
Class III	5.0 g	6.3 g	0.7 ± 0.1 g
Raw	6.2 g	4.5 g	0.4 ± 0.1 g
Class I	5.6 g	3.4 g	0.2 ± 0.1 g

Other measurements included boiling point depression, surface tension, water conductivity, and "scaling rate". There was no difference noted between raw and the two magnets.

Based on all of these and appearance of scale in the tanks, heating rods, sensor, etc., the paper concludes that there is no measurable effect in these circumstances resulting from the selected magnetic devices.

A Revue of Scale Formation and Scale Prevention, with Emphasis on Magnetic Water Treatment
(1983)

Paper #24
Author: Ellingsen, Frank

This is from a person employed by a magnetic water treatment device (POLAR) manufacturer in Norway. Initial discussion of scale formation and scale prevention is technically good.

Gives a definition of nonchemical water treatment as "A method based on mechanical (e.g. vibration), electrical, or magnetic principles." (May be useful later for discussing protocol common for physical or nonchemical devices).

Has done laboratory work. But not clearly explained as to what was done. Very confusing. Used different magnetic strength treatment to a naturally hard water raised to pH levels nine or higher by hydroxides.

- Shows in one graph, the higher the magnetic strength, the lower will be the pH after about 20 minutes. But also claims that the magnet accelerates the rate of precipitation.
- Talks about turning point with zeta potential at zero at that point. But, pH is very high.

In another example, water flows through what is called a crystal growth cell. Shows photos with larger crystals in magnetic treated waters.

Not clear as to what the hypothesis is. In one test, higher precipitation due to magnets. In another, less crystals due to magnets. It is not clear as to what is concluded in the conclusion section. This paper is not entirely useful for water treatment assessment.