GMX INTERNATIONAL

GMX Makes Water Conditioning History

Scientific Verification of the Effectiveness of GMX Magnetic Water Conditioning

The first US patent in magnetic treatment of water was lodged in 1890[1]. But it has taken more than a century for scientific experimentation to be designed to comprehensively test single-pass magnetic treatment.

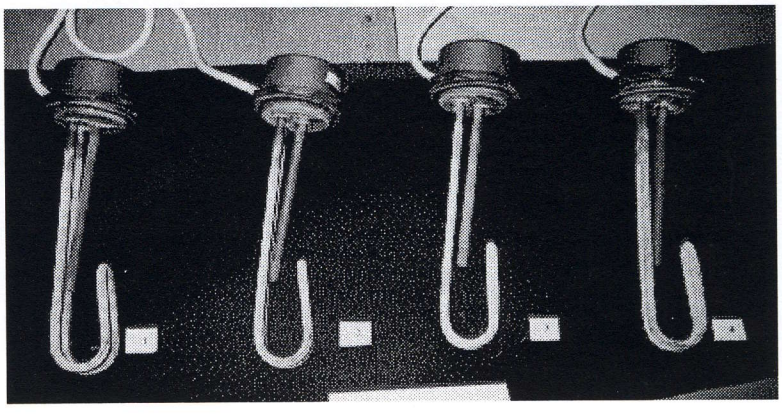
GMX International is sponsoring research at Cranfield University, UK, one of the leading international water sciences academic and research institutions. The GMX-sponsored research into scale suppression based on single-pass magnetic treatment is the first of its kind, being based on duplicated samples of both treated and untreated water of precisely defined water quality. Additional tests are being carried out on a specially-designed recirculation rig in which all parameters are rigorously defined.

Establishing Protocols • Initial Results
Initial trials conducted on the recirculation rig have been encouraging. These have shown a significant suppression of scale formation due to the *GMX Model 800*. Work on the single-pass boiler rig has also yielded positive results, and future work will be focused on identifying those parameters responsible for enhancing or suppressing the magnetic effect in the single pass mode.

One of the most challenging aspects of this research has been the establishment of protocols. Since there is no identical research to serve as a test model, we have had to create the mechanisms and the methods by which to produce credible and reproducible data. By sponsoring research in this way, GMX has placed itself at the forefront of international scientific research and development in magnetic technology.

The Single-Pass Boiler Rig
The boiler rig was built and commissioned in 1996. Trials were initially conducted by only sampling the quality of the water entering and leaving the boiler.

Subsequent experiments have focused on the boiler elements themselves. Although the four elements shown may look approximately the same, analysis of the scale formed on them shows up to a **52% decrease** in the scale formed on the two outer elements. These are the ones that have been supplied with water treated using the *GMX Model 800*.



Continuing Research
As this research continues, the supervising scientists expect test results to further demonstrate the effectiveness of GMX magnetic technology, and to expand our scientific knowledge and understanding of magnetic water conditioning.

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[1] US Patent no. 438579, Fawnce and Cabell • Commercial in Confidence •

GMX Model 800 Creating Results!

Scale Reduction Reproduced at Cranfield University

By: Dr. Simon Judd, Ph.D., Cranfield School of Sciences, Water Technology

Magnetic Treatment of Scale Formation: structure of the $CaCO_3$ layers

An interesting phenomenon has been observed as a result of the GMX trials being conducted at Cranfield on the recirculating rig. Whilst, over the two week periods of each test, there appears to be little effect on overall scale growth, there is a very pronounced effect on the scale ($CaCO_3$) structure.

When scaling of $CaCO_3$ takes place it appears to do so in two layers (Fig. 1). The first layer is a "hard" scale composed mostly of calcite (cubic crystals). The second layer is a softer scale mainly composed of aragonite (needle-like crystals). The existence and stratification (layering) of these forms of scale has been noted by previous workers, but this behavior appears to have profound consequences for magnetic treatment.

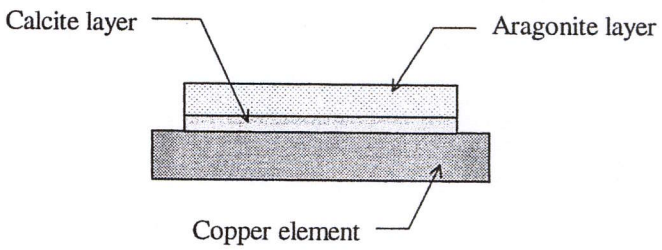

figure 1.

SEM. (scanning electron microscope), pictures of the strata interface reveal both calcite and aragonite in the scale (Fig. 2). The calcite layer adheres much more strongly to the copper element than the aragonite layer, such that by simply gently tapping the scaled copper element on a hard surface, it is possible to dislodge the second layer from the first and weigh the scale layers separately.

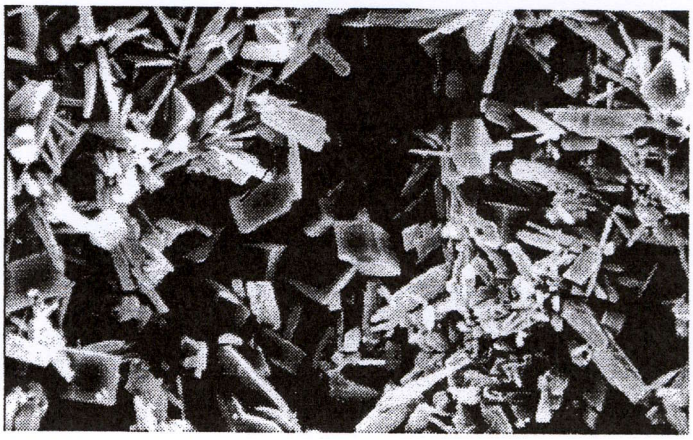

figure 2.

A summary of the comparative masses of the hard and soft scale layers is given in (Table 1) for successive commutated runs. According to these data, magnetic treatment appears to reproducibly change the amount of hard scale, by more than 50%. If the amount or thickness of the initial hard scale layer is instrumental in determining the extent of the deleterious consequences of scaling, then magnetic treatment would appear to be beneficial on this basis. It is possible that magnetic treatment acts solely at the interface between the two scale layers, reducing the adhesion and thereby allowing the second layer to be more readily removed mechanically.

Table 1: Effect of Magnetic Treatment on Relative Amounts of Hard and Soft Scale

	Run 1		Run 2	
	GMX	Control	GMX	Control
Hard-scale, mass (mg.)	124	228	101	198
Soft-scale, mass (mg.)	1244	1177	1046	1134
% Reduction in Hard Scale	**59 %**		**51 %**	