

MAGNETIC WATER TREATMENT FOR HEATING, REFRIGERATION, AND AIR CONDITIONING SYSTEMS

C., Jack Quinn, P.E., Member ASHRAE Chairman, Manufacturing Technology
Indiana University-Purdue University Fort Wayne, Indiana

INDEPENDENT STUDIES

The **UNITED STATES TESTING COMPANY, INC.**, performed a test to determine the effectiveness of magnetic water treatment in preventing boiler scale build-up. Upon subsection of the residual salts from both the treated and non-treated samples to x-ray diffraction examination, a distinctive difference in the crystalline structure of the deposited residues was noted. The two samples were found to have the same chemical constituents but the x-ray diffraction analysis indicates that the dominant crystal species in the untreated sample is calcium sulfate and calcium silicate, while in the treated sample the dominant species is a calcium carbonate and calcium sulfate (non corrosive elements). The samples are therefore physically different.

United States Testing Center Inc. Schmutzer, M.A., and Hull, G.W., "Examination to Determine the Physical or Chemical Differences Between Untreated and Magnetically Treated Water". Hoboken, 1969.

The **Advanced Research Agency of the Department of Defense** sponsored research in magnetic treatment of water reporting that the fact generally agreed upon is that a magnetic field reduces the kinetics of crystallization processes and the freedom of movement of charged particles. This limitation of the motion of particles in the field results in an increase in the number of collisions and the formation of crystallization centers. Magnetic treatment is effective if the liquid is passed through the flux of a magnet having a sufficiently field and magnetic gradient, providing that the temperature of the liquid is not too high.

Advanced Research Agency of the Department of Defense, Hibben, Stuart G., "Magnetic Treatment of Water" 1973.

The **National Aeronautics and Space Administration NASA** tested magnetically treated water against chemically treated water for corrosion rates of steel corrosion coupons placed in the two water systems. Reported results were excellent with corrosion rates of 1 to 50 mils per year using chemical inhibitors, with four mils per year considered to be acceptable, while corrosion rates of 0.0 mils per year were recorded for the magnetic treatment.

National Aeronautics and Space Administration NASA. Kuivinen, David E., "Comparing Corrosion Rates of Steel Corrosion Inhibitors". Lewis Research Center, Cleveland, 1975.

From "The Institute of Mineral Fuels of the USSR Academy of Sciences", Dr. V.I. Klassen reports that no one argues about the effectiveness of magnetic treatment of water. In the Soviet Union the use of magnetic treatment of water is used extensively and with tremendous economic effect. These practitioners are making extensive use of magnetic treatment but are in serious need of scientific assistance. Marked reduction of scale formation in steam boilers has been

verified in practice and confirmed in laboratories but the theory which explains the nature of the processes is not clearly understood.

Anon, Tekhnika Molodeshi, Vol. 10 pg. 22, 1972

Fedotkin, L.M., Energetika I Elektrifikatsia, Vol. 5, pg. 42

. . . in addition, magnetic treatment does not change the processes in the setting of cement, but stimulates and intensifies these processes quantitatively (specifically the initial steps of the crystallization process and the character of nucleation). For example a magnetic field produces larger numbers of crystals, shortens the induction period of crystallization and increases the number of crystals per unit volume of cement suspension.

Grashko, I.M., Belova, L.A., and Lishanskii, B.A., 'operations of the Magnetic Treatment of Water Used for the Mixing of Cement Concentrates', Izv. Vyyssh. Uchebn. Zavedi Stroit Arkhit, No. 3 pgs. 87-88, 1982.

LTiazovskiyi, V.A. and Ananliua, 'S.A., "Electrochemical Studies of Cement Suspensions in :.Magnetically Treated Water", Unobtainable Russian Journal Article.

COMMENTS PUBLISHED BY RESEARCH SCIENTISTS:

"Several thousand magnetic water conditioners are now rendering great service in buildings of all sizes, from private homes to hospitals, schools, military buildings, etc. These units will protect the whole circuit of cold and hot water as well as sanitary installations against scale formation and corrosion when placed where the water main enters the premises. It is remarkable to note that algae, such as normally grow on coolers in the open air and in swimming pools, die rapidly under the effects of the magnetic treatment.'

Vermelren, T., Corrosion Technology (Belgium), July 1958, pg. 215-219. Belgian patents #460560 (1945) AND #560199 (1960).

"No one argues whether magnetic treatment is effective or not; in the Soviet Union the magnetic treatment of water is used extensively and with tremendous economic effect."

Klassen, V.I., Ph.D. Doctor of Technical Sciences, Institute of Mineral Fuels, Academy of Sciences, USSR, Khimiya I Zhizn' (USSR), September, 11969, pg. 24-27 (Translated by The Clearing House for Federal Scientific & Technical Information, Springfield, Virginia, USA).

"The magnetic water treatment phenomenon has been scientifically investigated extremely thoroughly throughout the world, and has been known for many years ... in nearly every case, in Great Britain, where magnetic treatment devices have been fitted, the results have been as favorable as in Europe."

Diamant, R.M.E., M.Sc., Hospital Engineering (Great Britain), October, 1970, pg. 231-232.

"It may sound rather surprising that water can be purified by magnetic treatment but the fact is unquestionable. The answer as to why a magnetic field affects the properties of waste has not yet been found; it can only be expected when further research has elucidated the properties of the water molecule."

Belova, V., Ph.D., Doctor of Chemical Sciences, Institute of General and Inorganic Chemistry, Academy of Sciences, USSR, Soviet Science Review (USSR), May 1972, pg. 150-156.

'Based upon analyses of existing technical literature on the magnetic treatment of water and its ability to alter water properties, there are many basic areas where the utilization of this method has great practical merit, such as elimination of scale; control of encrustation; reduction of salt deposits; intensification of coagulation and crystallization; improving bactericidal function of disinfectants; acceleration of reagent diffusion; increasing the efficiency of ion-exchange resin; removal of fine particles in the purification or recycling of waste water; extraction of valuable metals from; acceleration of the solidification of cements, increasing the density and strength of casting molds, etc."

Stevovich, V.A., Liebhold, K., Hibben, S.G., Air Force Office of Scientific Research,

Advanced Research Projects Agency of the United States Department of Defense,

Arlington, Virginia, USA. (Unclassified, 30 JAN 73, Project Code #627OIE3FIO.)

MORE COMMENTS PUBLISHED BY RESEARCH SCIENTISTS:

"It was concluded that the magnetic unit used in these tests was very effective in controlling scale and corrosion in water systems, in such diverse applications as a large air conditioner condenser, syrup evaporators in a sugar mill, cooling exchangers in a large chemical processing plant in a boiler and a steam generator. Significant savings in time, cost and equipment were effected in all cases."

Raisen, E., Ph.D., The Control of Scale and Corrosion in Water Systems Using Magnetic Fields. Paper #117, CORROSION'84.

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REFERENCES

"A study of the influence of magnetics on corrosion control showed that magnetic treatment inhibits the rate of corrosion . . ."

Reimers, R.S., de Kernior, P.S., Culpepper, V.C.. Tulane University.

'This work has shown that voltages and currents reproduced when conducting solutions are made to flow through a magnetic treatment device in which the magnetic field is orthogonal to the fluid flow. Although many earlier papers dealing with Magnetic Water Treatment Devices have discussed the theory of magnetohydrodynamic voltage generation, none has ever demonstrated

that this voltage could be measured and none has considered what the consequences of the induced voltage and concomitant current might be for scale control."

Bush, K.W., Busch, M.A., Parker, D.H., Darling, R.E., McAtee, J.L., Jr., Laboratory Studies Involving Magnetic Water Treatment Devices. Paper #251, CORROSION'85.

'Despite adverse evaluation by some water technology experts and inconsistent performance in field tests, a variety of magnetic water treatment devices (MTDS) employing permanent magnets continues to be promoted for the prevention of scale and other de-posits in water-using systems . . . The studies reported here by the Baylor Water Research Group are unique. For the first time, researchers in an American laboratory have been able to conclusively demonstrate that something fundamental does in fact happen when water is circulated, to just through a magnetic field, but through an actual magnetic water treatment device ... In summary, the potential benefits which could be derived from a non-chemical method of water conditioning of this type include reduced energy requirements, water conservation, reduction or elimination of chemical feed and control requirements, and reduced pollution."

Evaluation of the Magnetic Water Treatment

American Petroleum Institute, Washington, D.C., API Publication 960, September, 1985.

1. Atkin W., Physical Chemistry, Freeman and Company, San Francisco, 1978, p. 761.
2. Schmutzer, M. A., and Hull, G. W., "Examination to Determine the Physical or Chemical Differences Between Untreated and Magnetically Treated Water," United States Testing Center, Inc., Hoboken, 1969.
3. Hibben, Stuart G., "Magnetic Treatment of Water,' Advanced Research Projects Agency of the Department of Defense, 1973.
4. Kuivenen, David E., 'Comparing Corrosion Rates of Steel Corrosion Coupons in Magnetically Treated Water and in a Water System Utilizing Corrosion Inhibitors," National Aeronautics and Space Administration, Lewis Research Center, Cleveland, 1975.
5. Klassen, V. E., "Magnetic Water: Between Scylla and Charybdis," "Institute of Mineral Fuels of the USSR Academy of Sciences," Moscow, 1969,25-27.
6. Rubin, Alan J., "To Determine if Magnetic Water Treatment is Effective in Preventing Scale," Ohio State University, 1973.
7. Reimers, Robert S., deKernion, P.S. and Leftwich, D. B., 'Sonics and electrostatics- An innovative Approach to Water and Waste Treatment,' Proceedings of Water Reuse Symposium, Vol. 2 AWWA Research Evaluation, Denver, Colorado, March 1979, pp 1350-1416.
8. Skorobogator, V. I., "Mechanism of the Action Of Ultrasound, Magnetic and Electric Fields on a Scale Forming Liquid," IZV. Vyssh Ucheb Zared,Energy Vol. 13 (5), 1970, 58-62.