



## MAGNETIC WATER TREATMENT WHITE PAPER

Before going into detail on how magnets affect water, it is important to understand the water molecule ( $H_2O$  or H-O-H).

The water compound molecule has two physical characteristics that separate it from virtually all of nature's other compound molecules. (1) It expands when frozen and (2) there is a  $104.45^\circ$  inclusive angle between the 2 hydrogen atoms as opposed to a  $109.5^\circ$  angle (called the BOND ANGLE) that theoretically is "correct". These 2 characteristics are related because the bond angle encourages water to cluster in hexagonal clusters (see our white paper on Structured Water) and when freezing occurs, these clusters create voids which take up more space than liquid water. When reading in detail about bond angles and freezing it's not unusual to encounter the word phenomena.

The studies published in *The Fourth Phase of Water* by Dr. George Pollack and a 2016 publication by the Oak Ridge National Lab titled *The Fourth State of Water* both explaining the effects applied energy has on the properties of water. In Dr. Pollack's work, energy was applied via heat, light, electricity and infrared and the water super hexagonal clustered (structured), released protons (hydrogen), created hydronium ( $H_3O$ ) in adjacent water and became denser. The Oak Ridge experiment applied synthetic emerald forming ultra-high pressures to water. This resulted in a quantum physics change to the hydrogen/oxygen bond referred to as tunneling – a proof of energy response but as a topic it is beyond the understanding of this author except to say that this water also formed in hexagonal clusters. Perhaps the most understood experiment involving energy applied to water is hydrolysis. This is often conducted in high school physics classes by placing 2 wires spaced about  $\frac{1}{2}$  inch apart and covered by inverted glass test tubes into a beaker of tap water. When a DC voltage in excess of 1.5 volts is applied, the water begins to separate into their distinct atomic components of oxygen and hydrogen which are both gasses and collect in their respective test tubes—oxygen at the positive (anode) wire and hydrogen at the negative (cathode) wire. This experiment is also used in demonstrating the electrical conductivity of water.

With knowledge based on numerous experiments that water reacts to various forms of energy input, let's explore what affect permanent magnets can have on water.

A permanent magnet has a field that emanates from one end (pole) and circles around in elliptical lines to the other end (pole). These are called lines of flux and the stronger the magnet, the more lines there are and the further out from the magnet they can be measured. The 2 poles of a linear magnet are named North N and South S and it's known that with 2 magnets in proximity to one another N & S are attracted to one another while N to N and S to S placements repel one another. Further, it's known that by placing 2 magnets each with N and S poles and placed N to S and held apart with minimal spacing a strong field of magnetic force field exists between the two. Additionally, by encompassing the outside

of the magnets with a ferromagnetic material, the field between the two magnets can be 8X as strong as that of a single magnet.

Although there appears to be no actual test of water after dangling a permanent magnet in a volume of water, intuitively we would suspect that little if anything to happen to the water. Therefore, let's explore passing the water between the magnetic field described above. To do this one needs to review a basic premise in electrical engineering and physics that by rotating a wire (electrical conductor) between N & S magnets (magnetic field), electrons in the conductor material are induced to move in a prescribed direction which by definition is an electrical current – energy. The moving water replaces wire and becomes the conductor in what is essentially a direct current (DC) generator – wouldn't Nikola Tesla be happy. A more powerful generator, either AC or DC, relies on 2 energy sources. One is the motor or turbine spinning the wire (conductor) and the other is the magnetic field supplied by permanent magnets or coils powered by battery or parasitic power from the generator itself. The 2 powers making our low power generator work are whatever (pump or gravity) moving the water (conductor) and the permanent magnet field. Both are converting mechanical energy to electrical energy.

The energy from a generator is expressed by Faraday's law as  $EMF = v \times B \times L \times \sin A$  where

EMF = Electro Motive (or Magnetic) Force or Volts (V) output

v = the velocity of the conductor in meters/sec.

B = magnetic field strength in gauss as measured with a gauss meter

L = length of conductor in meters

A = the angularity of the conductor relative to the magnetic field. It is  $90^\circ$  in our units and  $\sin 90 = 1$   
Volts represent potential energy and in many discussions, volts are simply called potential.

If we applied the well established **RIGHT HAND RULE** to the conductor (water) in a sketch of the system, we will determine that current flow (I) is from the inlet (becomes the positive pole) to the water in the magnetic field to the outlet (becomes the negative pole) of the water in the magnetic field. We now have a kinetic electrical circuit.

By applying Ohms law which is  $V=IR$  and determining the R (resistance) of the water column in ohms by measurement with an ohmmeter or by calculation using a TDS meter we can solve  $I = V/R$  for the value of I in amps.

To then determine power supplied to the water in watts (W) using the formula  $W=VA$ . We know the measurement will be in the milliwatt range.

If approximately 1.5 volts (V) = (current (I) x resistance (R) breaks the hydrogen / oxygen bond completely (see hydrolysis above), it's hypothesized that the small current and resulting voltage in the described process will disrupt the bond to some extent liberating hydrogen and forming hydronium. This actually describes EZ water as identified and explained in detail by Dr. H. Pollack in his book referenced above. We refer to it in our literature as Structured Water.

The energy effect is amplified as the energy level increases which is proportional to the conductivity of the conductor (water). Effect is therefore minimal at low conductivity water such as distilled water (actually a good insulator) and is best with brackish water.

One of the primary applications for magnetically treated water is crop watering with brackish well water. This water poorly penetrates plants resulting in low growth and poor yields. The reason the untreated water is behaving poorly is failure of much of the water and nutrients to reach the extremities of plants through the internal capillary channels in plants called the xylem system. The capillary action is actually more involved than the descriptions in many texts and is reliant on the transfer of protons (hydrogen) from the water and the creation of hydronium as discussed above. As an aside, while studying the topic, I learned that Isaac Newton is said to have postulated the effect of static electricity on capillary action in the 18<sup>th</sup> century. Once treated, the water produces a demonstrable improvement to crops even with less water being used.

Interestingly, there are many available university level studies on magnetically treated water and improvement of crops with almost all conducted in China and other Asian countries. Also, though the studies document crop improvement and changes in water properties, none found ventured what actually changed the water as we have attempted to do.

Next is a release of a line of devices to magnetically treat water based on science and engineering by Dime Water, Inc.