



MAKING THE MOST OF MOSS

By Dr. David R. Knighton
& Vance Fiegel

Combating cooling tower corrosion and scale with moss treatment

Sphagnum moss is a natural bog plant that decays and forms peat. It has been used in the horticulture industry for years, and has a long folk history for its ability to purify water, heal wounds and preserve food. Today you can add “preventative measure for cooling tower scale and corrosion” to the growing list of its many attributes as a viable, all-natural water treatment alternative.

The Creative Water Solutions LLC (CWS) team became intrigued with Sphagnum moss after reading an article about its use in World War I as a wound dressing. After studying the properties of certain species of Sphagnum moss in the research laboratory at Embro Corp., a correlation was noted between the pristine lakes in northern Minnesota, Wisconsin and Michigan and the presence of expansive tracts of Sphagnum moss bogs in the lakes.

CWS decided to see if the correct species of moss could affect the water in residential spas. After seeing excellent results, it progressed to testing residential pools, commercial pools and spas, residential and commercial fountains and ponds, and industrial applications.

During this time, the science of biofilm and its role in scale formation and corrosion intersected with the company’s experience with Sphagnum moss water treatment. Employees noticed that scale on swimming pool water features and at the water line of pools and water parks significantly decreased when the water was exposed to the moss, to the point that manual cleaning was no longer necessary.

One facility, the Barry Family Campus in Saint Louis Park, Minn., used the product in its swimming pools and spas and reported that the

corrosion associated with its iron-rich water supply was dramatically reduced. The facility had needed to replace its pump seals every six months before adding the Sphagnum moss, but has not had to replace them in the three years since adding the product.

The campus also has a single cooling tower that had significant problems with corrosion and scale formation requiring yearly acid treatment to remove scale. It also required more than eight hours of cleaning at the beginning of each spring.

From Pools to Cooling Towers

Corrosion and scale are significant problems in cooling towers. The same biocides used in the swimming pool industry also are employed in cooling tower water treatment. In addition, cooling tower water traditionally is treated with chemical corrosion and scale inhibitors. Three years ago, Jon Sweet, director of physical plant for the Barry Family Campus, wanted to know if the moss possibly could have the same effect on the cooling tower that he saw in the pools and spas.

After studying the cooling tower and the water treatment program, CWS agreed to devise a system to deliver Sphagnum moss to the water and monitor the effect over the cooling season. The system holds 1,000 gal of water and is monitored for conductivity, biocide levels, corrosion inhibitor levels and water consumption.

Determining what amount of Sphagnum moss to use was an interesting problem. CWS has developed dosing schedules for swimming pools and spas based on water temperature, bather load, bather type and water volume. A cooling tower has

a relatively small volume of water with organic contamination from the natural elements in the vicinity of the tower (e.g., trees). Unlike a swimming pool or spa, there is significantly greater water loss due to evaporation and constant freshwater delivery to maintain a predetermined conductivity. Based on these factors, CWS decided to significantly increase the dose of moss from that used in spas.

The product it used comprises the leaves of a species of Sphagnum moss from the South Island of New Zealand, which has a moss industry that has supplied the orchid-growing industry in Asia for years. The moss is placed in the water in a mesh bag, which is contained in a contact chamber submerged in the water. As the water circulates in the cooling tower basin, it is exposed to the moss leaves. Because the leaves (which are sterilized before use) are dead, they act like a tea bag. The moss dosage lasts for a month.

Testing the Moss Method

The moss conditions the water by removing positively charged ions (iron, calcium, mercury and magnesium) from the water and releasing soluble molecules into the water. Years of extensive laboratory studies at Embro Corp. have shown that the moss:

- Inhibits the growth of bacteria, algae, fungus and mold;
- Removes and inhibits the formation of bacterial biofilms;
- Removes and inhibits the formation of scale; and
- Stabilizes pH.

These properties, and the recent scientific evidence that biofilm is a major source of corrosion, led CWS to

believe that Sphagnum moss could be ideal for cooling tower water treatment.

During the first summer of moss treatment in 2010, the benefits became apparent:

- The building operator noticed an immediate improvement in water clarity and odor.
- There was less foaming in the water tower.
- All water chemistry remained stable.
- There was a reduction in the amount of biocide needed to maintain a constant water concentration.
- There was an overall reduction in maintenance time.

During the summer, the campus also noticed that scale was starting to flake off and settle in the basin of the cooling tower. By the end of the season, Sweet said, "We have seen a significant drop in the build up [of scale] on the fill packs of the cooling tower and have greatly reduced the maintenance of the tower and chiller. We have not had to punch tubes on the condenser of the chiller, as they remained in perfect condition."

The next spring, the company that the Barry Campus uses to clean the tower required only one hour to clean the interior, without acid washing to remove scale. With the reduction in scale formation and corrosion, the campus has been able to increase the cycles of water addition, so it uses and disposes of less water to obtain the same cooling efficiency.

This year marks the center's third season using Sphagnum moss, and the center plans to further increase the water retention cycle and decrease the corrosion inhibitor concentration. To monitor corrosion, CWS installed a corrosion probe using galvanized electrodes.

In a study last summer, CWS monitored corrosion on three other cooling towers that used Sphagnum moss without the addition of any other standard corrosion inhibitors. It used two probes in each system and monitored the corrosion using mild steel and galvanized steel electrodes. Corrosion levels for the galvanized steel electrode remained at 0.02 mils per year (mpy) and the mild steel electrode maintained corrosion rates of 0.05 to 0.07 mpy. Both values were equal to the range of the corrosion seen when standard corrosion inhibitors were employed.

Because freshwater usage by cooling towers generally puts a major drain on the water resources of a community, and adds a significant expense to the facility for the water and its disposal, use of Sphagnum moss can reduce water

consumption while also reducing scale formation and corrosion in most applications. Thus far, the delivery of the moss to the tower has been inexpensive and required no plumbing or system modification. In summary, Sphagnum moss has proven to be a green method to

reduce water consumption, scale formation and corrosion. *wqp*

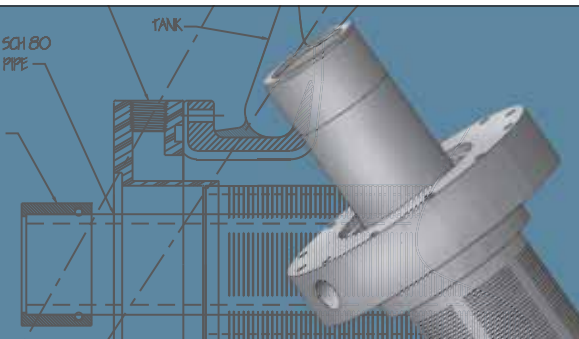
Dr. David R. Knighton is president and CEO of Creative Water Solutions LLC. Knighton can be reached at kelmart@aol.com or 763.398.0141.

Vance Fiegel is chief scientific office for Creative Water Solutions LLC. Fiegel can be reached at 763.398.0141.

For more information on this subject write in 1004 on this issue's reader service card.

No more heavy lifting.

3" SCH 80 PIPE
ADAPTER 3" PIPE O.D.
X 2-1/2" PIPE SOCKET W/ O-RING



When an off-the-shelf plastic component won't fit the bill, Mattson/Witt engineers one that will. For example: how could a customer add dry chemicals to a 3" system without removing the control valve or sacrificing the system's higher flow rates? With our suite of custom-designed parts—valve mounting adapter, 6" flange with fill port and a slotted upper strainer—he can easily add the chemicals... and not break a sweat.



Custom Machining from Mattson/Witt Precision Products.
We don't see problems—just solutions.

www.mattsonwitt.com | 1.800.663.4371



Write in 758

PT2
pH / Temperature Pen
Expert Water Analysis!

- Accurate
- Reliable
- Simple to use

AWT Booth Number
#313
MYRONL.COM 760-438-2021

MYRON L COMPANY
Water Quality Instrumentation
MADE IN USA ... Since 1957

Write in 759