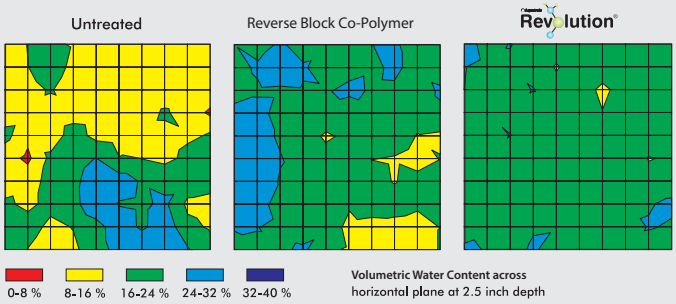
REVOLUTION®

HYDRATION

# Optimising Soil Moisture

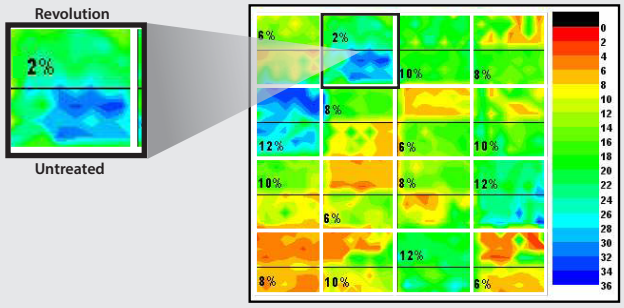
From day to day and season to season, you never know what nature has in store for you. That's why Revolution is trusted by superintendents worldwide in a variety of climates. More than 10 years of trials from respected universities around the world have shown that Revolution is a superior surfactant for optimizing moisture. Whether you're battling too much rain or not enough on your golf course, Revolution can help you regain the balance you need in the rootzone to grow healthy, resilient turf and produce drier, firmer playing surfaces.

## University of Wageningen 2003




Revolution maintains soil moisture in a tighter distribution range, that falls within the specifications for USGA rootzone mixes. While the reverse block co-polymer (a commonly used surfactant chemistry) improved moisture uniformity over the control, it still exhibited soil moisture content in some areas that would be considered too wet in a native sandy soil.

## University of Arkansas 2005



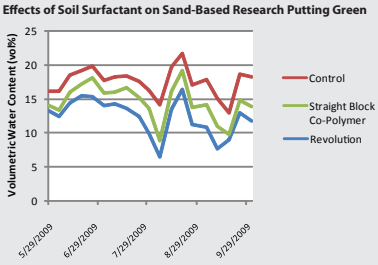

Trial results indicate that the regular use of Revolution resulted in more uniform soil moisture conditions. When more water than necessary was applied, the untreated plots had excessively high soil moisture levels while the Revolution treated plots had lower, more favorable soil moisture levels.

## FarmLinks, LLC 2007

In 2007, a glitch in FarmLinks' irrigation schedule caused the greens to receive a heavy watering of about 5/8 inches for four nights in a row. Toro TurfGuard Sensors had been installed in #17 green, so Mark Langner, CGCS, Director of Agronomy, could see exactly what the soil moisture was doing.

Revolution had been applied monthly to the greens starting that spring. According to Mark Langner "because of the TurfGuard Sensors we could see how Revolution kept the greens from getting too wet even with all this excess water being applied. The soil moisture would go up to field capacity at 22% moisture during the night and drain down to 14% during the day. Revolution protected us from excess water getting caught in the rootzone."

## University of Wisconsin - Madison 2009




Revolution significantly lowers soil moisture levels during excessively wet conditions. Research during a very rainy 2009 showed that plots treated with Revolution had statistically lower soil moisture levels than untreated plots on every sampling date. In addition, plots treated with Revolution also had significantly lower soil moisture levels than plots treated with a common class of surfactant chemistry used in many other wetting agent products on almost every sample date.

## Optimal Soil Moisture - Rain or Shine

Weather conditions can change drastically from day to day and season to season. Whether you're dealing with too much rain or not enough on your golf course, Revolution can help you regain the balance you need in the rootzone to grow healthy, resilient turf and produce drier, firmer playing surfaces.

A 2013 study conducted by Dr. Kevin Frank at Michigan State University showed that Revolution produced more favorable soil moisture levels under deficit and excess irrigation regimes. When water was limited, Revolution maintained higher soil volumetric water content than the control (Figure 1). However, when plots were overwatered, Revolution produced similar volumetric water content to the control and even trended lower (Figure 2). In other words, Revolution helps to increase volumetric water content when water is scarce, yet maintains drier soils when rain is excessive. This confirms studies conducted by major universities in 2003, 2005, and 2009.

### Michigan State University - 2013

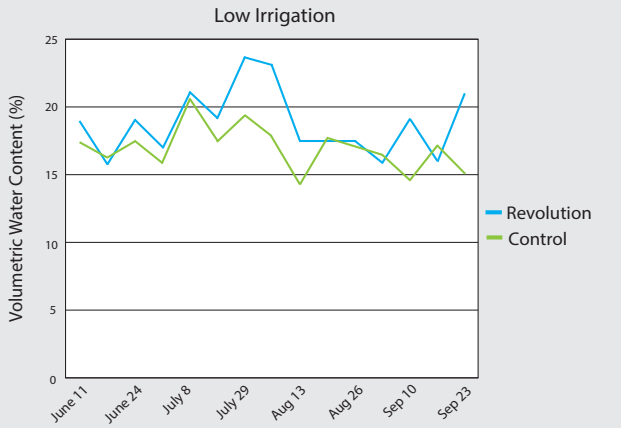



**Figure 1. Revolution increased VWC in plots irrigated at a low irrigation threshold of 8% VWC. (Dr. Kevin Frank, Michigan State, 2013)**

### Michigan State University - 2013

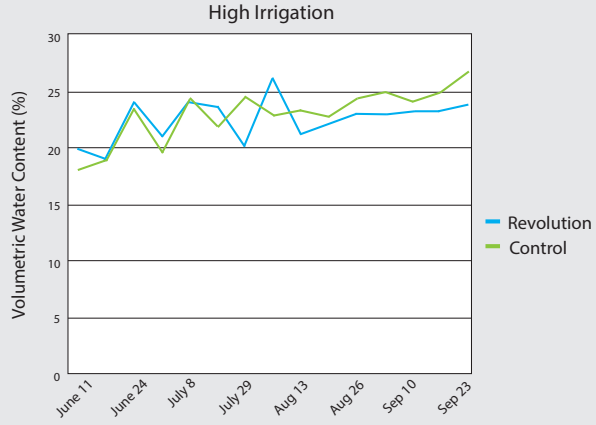



**Figure 2. Revolution maintained similar VWC in plots irrigated at a high irrigation threshold of 16% VWC. (Dr. Kevin Frank, Michigan State, 2013)**

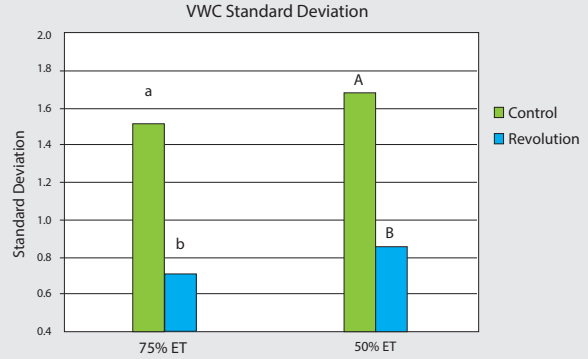
## A Model of Consistency

A separate study conducted at the University of Missouri in 2013 showed that Revolution produced remarkably uniform soil moisture under a variety of conditions.

When researchers looked at volumetric water content readings, they saw that Revolution produced a much lower standard deviation than the control under normal and deficit irrigation conditions (Figure 3). Standard deviation is a measure of variation from the average for a given set of data points. In short, lower standard deviation means less variability within the data set.

Put simply, Revolution produced volumetric water contents that were significantly more consistent than the control, no matter how much water was applied. This type of consistency in the rootzone provides a basis for healthy turf growth and firm playing conditions, rain or shine.

### University of Missouri - 2013




**Means with different letters above bar are statistically significant using Fisher's Protected LSD (P=0.05)*

**Figure 3. Revolution produced a much lower Standard Deviation for VWC at 75% and 50% ET replacement (Dr. Xi Xiong, University of Missouri)**

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