

## Michigan State University Aquatrols Surfactant Studies 2007

*Performed by*

Thomas A. Nikolai, Ph.D.

During the summer of 2007 a surfactant study was performed by Michigan State University at the Hancock Turfgrass Research Center for Aquatrols Inc. on an area known as the sloping green. The sloping green measures 80-foot by 120-foot and is constructed with 4 different root zones measuring 80-foot x 8-foot. Three of the 80-foot x 8-foot plots are constructed with 2NS sand. 2NS sand is generally used for construction on highways or for brick mortar and is a very coarse material to try and grow turfgrass upon. The particle range of the 2NS sand ranges from 3/8-inch (9.5mm) to #200 mesh (75um).

In addition to the 2NS sand plots the sloping green is comprised of four 80-foot x 8-foot plots constructed with straight sand, four with an 80:20 sand/peat mix and four with an 80:20 sand/soil mix. With the exception of the 2NS sand plots the particle size of the sand in the other plots is identical and meets USGA particle size specifications.

The profile of the green (from North to South) consists of an 8' long flat portion (toe-slope North), followed by a 7% 17.3' long slope (back-slope North) to the summit, followed by a 3% 40' long downward slope (back-slope South) followed by a final 14.7' flap portion (toe-slope South). The green was constructed to investigate the phenomena of localized dry spot on the summits and black layer on the toe-slopes which can both be attributed to moisture extremes in the soil profile.

The research is reported as two separate studies due to differences in the number of replications of root zones. Performing research on the 2NS plots resulted in three replications of each treatment with each plot measuring 2' x 80'. The surfactants were applied on the other three root zones (2' x 80' plot size) with four replications for each root zone. This portion of the research was analyzed as a two factor study (factor 1 root zone and factor 2 is wetting agent). Treatments consisted of ACA 1820 and ACA 2634 applied at the rate of 6 fl. oz. / 1000 sq. ft. in 2 gallons of water and a non-surfactant check. Treatments were applied June 8, July 12, and August 8.

Data collection included localized dry spot (LDS) ratings on a 1-5 scale and TDR moisture readings obtained from a 3-inch depth from four different locations (north slope, crown, south slope, and south flat) on most occasions. The scale for LDS was 1 = excellent (no LDS), 2 = very good or (minimal LDS), 3 = good (some noticeable LDS but still acceptable) 4= fair (very noticeable LDS distributive to the playing conditions and concern for turfgrass necrosis) and 5 = poor (predominantly LDS and necrotic turf). Additionally, individual LDS rating often included numbers with ratings with one digit to the right of the decimal point (i.e. 3.5).

Results from the 2NS root zone surfactant study are reported in Tables 1-17 with Tables 1-7 reporting TDR readings and Tables 8-7 reporting LDS ratings, respectively. On July 27, 2007 (Table 7) the only TDR readings of statistical significance on the 2NS plots is reported. On that date TDR reading from both the crown and the south slope indicated that both surfactants were retaining more moisture in the 2NS root zone compared to that of the check plot.

In Tables 8-17 four-LDS ratings are reported from the north slope and 10-LDS ratings are reported from the crown, south slope and south flat. 50% of the data reported from the north

slope and crown are statistically significant within a probability of 0.05 while 30% of the data is significant from the south slope and only 10% significant from the south flat. This indicates that areas with the highest topography and/or greatest slope resulted in the greater amount of dry down. With the exception of the crown location on August 17 (Table 14) both surfactants ACA 1820 and ACA 2634 resulted in less LDS compared to the control. On the crown location on August 17 ACA 1820 was significantly better than the check with no significant difference occurring between the check and ACA 2634.

Results from the root zone/surfactant study are reported in Tables 18-43 with Tables 18-30 reporting TDR readings, Tables 31-41 reporting LDS ratings, and Tables 42 and 43 reporting the only two root zone x surfactant interactions.

A total of 13-TDR readings are reported from the north slope, crown, south slope, and south flat in Tables 18-30. Regarding the different root zones 15% of the TDR reading from the north slope were significant (within a probability of 0.05), 38% from the crown, 15% from the south slope, and 8% from the south flat. On all of those dates the sand peat root zone retained at least a portion of the most moisture recorded with the TDR probes. On four occasions July 6 crown (Table 20) August 13 south flat (Table 28) August 14 north slope (Table 29) and August 15 south slope (Table 30) there was no significant difference between the amount of moisture retained in the sand root zones and the sand-soil root zones at the 3-inch depth. On July 20 moisture readings from the south flat (Table 23) was the only data of statistical significance in which the sand plot was not the driest at a 3-inch depth as the sand-soil retained the least amount of moisture on that date and location.

In terms of surfactants and TDR readings the only location resulting in significant differences was the crown. On all three dates July 27, August 3, and August 10 (Tables 24, 25 and 27, respectively) ACA 1820 retained more soil moisture than the check plot. On July 27 and August 10 ACA 2634 also retained more soil moisture than the control with no statistical difference between ACA 2634 and the control occurring on August 3.

In Tables 31-41 five-LDS ratings are reported from the north slope, 11-LDS ratings reported from the crown and south flat, and 10-LDS rating reported from the south slope. Regarding each location and root zone factor 100% of the data reported from the north slope was significant with 55% of the data from the crown, 20% from the south slope and 0% of the data significant from the south flat. On all occasions the sand-peat root zone resulted in the least amount of LDS. With the exception of the significant data on June 26 (Table 32) the sand soil always resulted in a lower (better) LDS rating than the 100% sand root zone.

In terms of LDS ratings and surfactant treatments 80% of the data reported from the north slope, 64% from the crown, 70% from the south slope and 27% of the data from the south flat is statistically significant. On all but three of those ratings ACA 2634 resulted in a share of the lowest (least amount of localized dry spot) LDS rating. The three occasions that ACA 2634 did not result in the least amount of LDS are June 20 south slope (Table 31) July 24 south slope (Table 34) and July 26 south slope (Table 35). On those three dates and locations the check plot had significantly less LDS than either surfactant. Additionally, on July 24 crown (Table 34) ACA 1820 received a higher LDS (more localized dry spot) rating than the check plot. Other than those four dates and locations both surfactants resulted in lower (better) LDS ratings than the check plots.

In Tables 42 and 43 interactions between root zone and surfactant treatment are presented. Both interactions took place on the north slope and in both instances the 100% sand root zones resulted significantly less LDS from the plots treated with the surfactants.

In closing, regarding TDR readings at a 3-inch depth the type of root zone had a greater impact on soil moisture than surfactant treatment. However, on every occasion that surfactant treatment resulted in a significant difference from TDR readings the check plot resulted in the least amount of soil moisture. Additionally, given 43 Tables presented in this paper the only significant data between surfactants resulted from TDR readings obtained August 3 crown (Table 25) when ACA 1820 retained more moisture than ACA 2634.

In regard to LDS ratings and the 2-factor study the surfactant had a greater impact on LDS than the root zone (57% of ratings were significant due to surfactant and 35% were significant due to root zone). An obvious difference between the TDR and LDS ratings is the 3 inches that separate them. For future studies a 1.5-inch TDR probe has been ordered.