AquaBlok™

TEST REPORT #6: Hydrated-State Physical Characteristics of Typical Freshwater AquaBlok Formulations

Background and Purpose of Testing

Typical AquaBlok™ use involves placing dry quantities of product through water and across the surface of contaminated sediments or a leaking pond liner. In several days, the material hydrates and expands, with particles coalescing into a homogeneous and cohesive, low-permeability barrier.

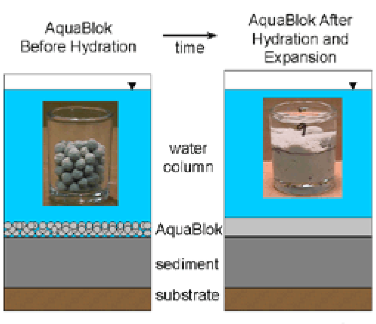


Figure 1. Development of Typical AquaBlok Caps

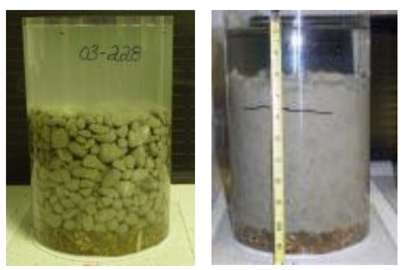
The rate and degree of product hydration and expansion depend on water salinity; thickness and formulation of product; number of layers applied; water depth; sediment type and thickness; and other factors. In this test report, information is presented related to thickness, bulk density, and moisture contents of selected freshwater-compatible product formulations in their hydrated state.

Methods

Numerous laboratory scale studies have been conducted to evaluate product and cap development as a function of variable product formulation; substrate conditions; water-column thicknesses; dry product coverage rates; and testing scales.

Different results may be expected when testing at different scales, and when using different water- column and substrate conditions. To facilitate a more direct comparison of relative physical characteristics and performance of different freshwater formulations, results presented here involve: (a) one test vessel per dry product coverage rate per formulation; (b) clear, ~2.3 to 10- gallon vessels, with basal areas of ~0.3 to 1.4 square feet; (c) a ~1 inch-thick basal layer of gravel in test vessels prior to AquaBlok placement; (d) a hydraulic connection between the gravel layer and overlying water column to promote basal hydration of product; (e) placing even, single lifts of dry product at rates equaling ~10, 20, 30, 40, or 50 pounds per square foot (lbs./SF); (f) inundating dry product with freshwater (municipal tap water); and (g) collecting baseline (initial) product thickness measurements and measurements over the next 5 to 23 days.

Photograph 1 illustrates typical setup and development of product in testing vessels.



Photograph 1. Cap Development Studies

At the end of testing, multiple sub samples of hydrated material are collected from each vessel (e.g. Photograph 2) for determination of mean net vertical expansion; wet bulk density; and oven-dry moisture content.

Photograph 2. Core Collection

Mean net vertical expansion equals mean hydrated thickness/mean initial thickness x 100. Mean wet bulk density is determined by weighing a hydrated sample and also determining the volume of water it displaced.

If needed, much larger testing vessels can also be used to assess product development in the laboratory (Photographs 3 and 4).

Photograph 3. 8ft Acrylic Column

Photograph 4. 12ft Steel-Reinforced Acrylic Column

Results

Testing results are summarized in Figures 2 and 3 on the following page.

AquaBlok® Composite Particle System

Observations and Conclusions

Photograph 1B illustrates the typical appearance of AquaBlok after hydration and expansion. Note pore-space infilling and thickness increase over time.

Regardless of product formulation (eg. 2080, 4060, etc.) or aggregate gradation (AASHTO aggregate type in parenthesis), approximately linear relationships exist between mean dry thickness and coverage rate, as expected (Figure 2). A similar relationship also exists between mean hydrated thickness and coverage rate, with dry trends typically paralleling hydrated trends for most formulations.

Relatively thinner applications of dry product tend to expand greater than do thicker applications (Figure 3A), primarily because of the slow rate of water migration into central portions of product.

As a result of relatively slow water flow into progressively greater thicknesses of product, the wet bulk density tends to increase with increasing coverage rate (Figure 3B). This also results in lower moisture content with increasing dry product thickness (Figure 3C).

Figure 2. Dry and Hydrated Product Thickness as a function of formulation, aggregate size gradation, and coverage rate.

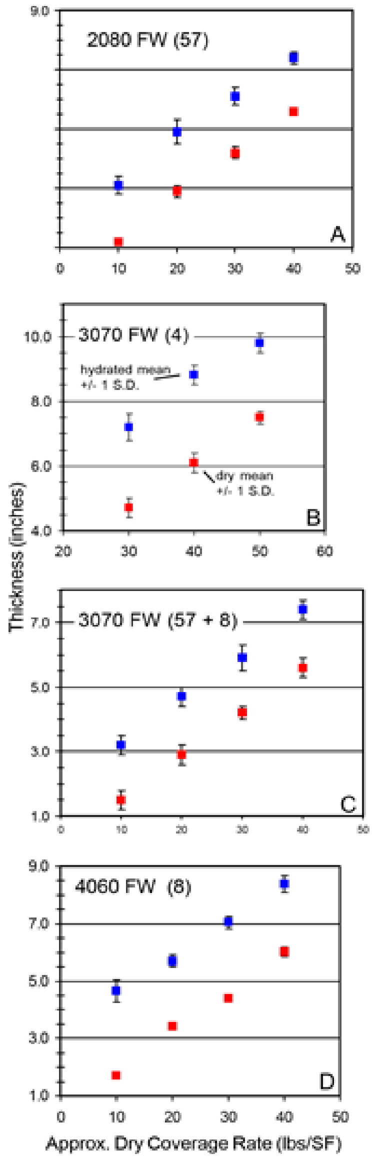
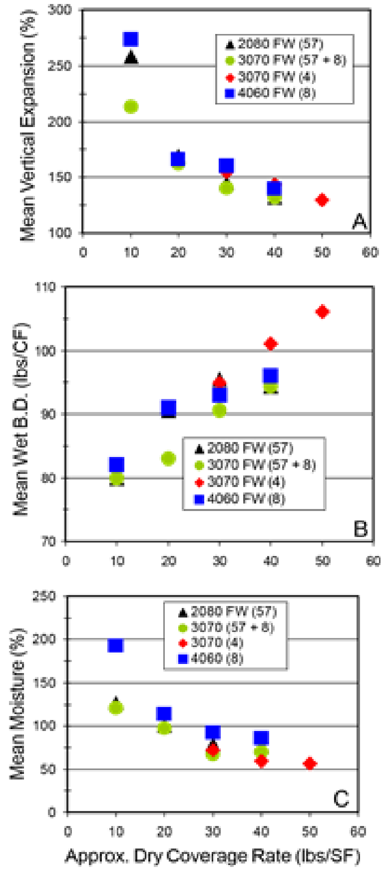


Figure 3. Mean Wet Bulk Density, Vertical Expansion, and Percent Moisture of Hydrated Product



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