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From the Desk of Mike Bell

This issue of On Line with Mar Tech provides an article on pulp-water relationships. Slurries where a solid is combined with a liquid reside in a class of liquids that exhibit non-newtonian characteristics and are complex in their behavior. Stock-water slurries are no exception to this description. The information presented in this article provides the means and tools to generate water and stock balances for pulp mills, bleach plants and paper machines. The formulas and data presented were obtained from old Tappi, Black Clawson, and private sources. The formula

$$GPM = \frac{16.65\ TPD}{C}$$

has been a widely used formula for quickly generating stock flow balances. However, the 16.65 constant is an approximation and should be corrected for temperature and stock slurry density for a more precise answer as indicated in the article.

Word Origin

Lagniappe: just a gift

This word is the Louisiana version of the Spanish term la napa, "the gift." This in turn seems to come from the American Indian word yapa, a "present to a customer," for that's exactly what a lagniappe is—an incidental gift by a tradesman to a customer. Mark Twain wrote of these gifts-with-purchases in his Life on the Mississippi: "The English were trading beads and blankets to the Indians for a consideration and throwing in civilization and whiskey 'for lagniappe.'"

Word Origins—Wilfred Funk

IN THIS ISSUE

Our hearts and prayers are especially with those who have lost loved ones through the terrorist attacks against our nation. Let us continue praying for President Bush and our nation's leaders.

GOD BLESS AMERICA!

Pulp-Water Relationships

Definition of Terms

W = Weight of Water
W_S = Pound of Water per pound of Stock Fiber
S = Weight of Stock Fiber
S_G = Pounds of Stock Fiber in one gallon of Stock Slurry
SS = Weight of Stock Slurry (Fiber + Water)
GPM = GPM of Stock Slurry (Fiber + Water)
A.D. = Air Dry
O.D. = Oven Dry
C = Stock Consistency %
C_{AD} = Air Dry Consistency %
C_{OD} = Oven Dry Consistency %
TPD = Tons/day of Stock Fiber
TPD_{AD} = Tons/day of Air Dry Stock
TPD_{OD} = Tons/day of Oven Dry Stock
D_{SS} = Density of Stock Slurry (lbs/gal)
D_W = Density of Water (lbs/gal)
G_W = Gallons of water
G_P = Gallons of Water per pound of Stock Fiber
G_T = Gallons of Water per ton of Stock Fiber
G_{SS} = Gallons of Stock Slurry

Constants and Conversion Factors

7.48 gal/ft3
8.34 lb/gal (water @ 50°F)
62.40 lb/ft3 (water @ 50°F)
16.65 Conversion factor (approximation to convert TPD to GPM)
3.33 Rate of change factor

C_{OD} = .9 C_{AD}
C_{AD} = 1.11 C_{OD}
TPD_{OD} = .9 TPD_{AD}
TPD_{AD} = 1.11 TPD_{OD}

Continued next page

Chesapeake Bay Bridge-Tunnel

At the mouth of the Chesapeake Bay there is a narrow causeway that stretches as far as the eye can see. When you cross the bridge and reach the middle of the bay, you are completely out of sight of all land.

When engineers began planning the Chesapeake Bay crossing, they knew that the channel's width—over 17 miles at the narrowest point—called for the construction of a low causeway. Yet through this channel would pass some of the largest ships in the world, bound for Baltimore, Norfolk, and other cities that make up the largest single port area in the United States. These deep-water vessels could not pass under a causeway. A tunnel under the ship channels seemed to be in order, yet the cost of a 17-mile tunnel—five miles longer than the longest tunnel ever built—was prohibitive. So the engineers decided to build both--a combination causeway and tunnel that would carry vehicles across the bay yet permit ships of any size to pass over the roadway tunnels. Construction of the Chesapeake Bay Bridge-Tunnel began in 1961. Four man-made islands were built in the bay to anchor two tunnels—each over a mile long—directly under two ship channels. Close to 15 miles of causeway was constructed on pillars rising 30 feet over the bay, with a 28-foot wide roadway on top. Higher trestle bridges were built near both shores.

In 1964 after 37 months of work and over $210 million in construction costs, the bridge-tunnel was completed, stretching 17.6 miles between Cape Henry and Cap Charles, both in Virginia. Today, for a toll in excess of $10, drivers can save hundreds of miles of travel around Chesapeake Bay.

The Chesapeake Bay Bridge-Tunnel is not the longest bridge in the world. That title belongs to the bridge across Lake Pontchartrain, a 24-mile causeway connection between New Orleans and Lewisburg, Louisiana. But the Louisiana Bridge crosses a shallow lake. The Chesapeake Bay Bridge-Tunnel traverses a deep ocean bay, and its combination of bridge, tunnel, and causeway makes the Chesapeake, if not the longest, at least the most unusual water crossing in the world.

-Incredible Facts
Richard D. Manchester

Equations

1. Consistency is the pounds of fiber per pound of Stock Slurry expressed as a percent.

$$C = \frac{S \times 100}{S+W} = \frac{S \times 100}{SS} \%$$

2. Weight of Stock Slurry

$$SS = S+W \qquad \text{lb slurry}$$

$$SS = \frac{S}{C/100}$$

3. Pound of Water per pound of Stock Fiber

4. Gallons of Water per pound of

$$W_S = \frac{100\text{-}1}{C} \quad \frac{\text{lb Water}}{\text{lb Fiber}}$$

Stock Fiber

5. Gallons of Water per Ton of

$$G_P = \left(\frac{100}{C} - 1\right) \times \frac{1}{D_W} \quad \frac{\text{gal Water}}{\text{lb Fiber}}$$

Fiber

6. Pounds of Stock Fiber in one gallon of Stock Slurry

$$G_T = \left(\frac{100}{C} - 1\right) \times \frac{2000}{D_W} \quad \frac{\text{gal Water}}{\text{ton Fiber}}$$

7. Density of Stock Slurry or Pounds Total Stock Slurry per

$$S_G = \frac{CD_{SS}}{100} \quad \frac{\text{lb Fiber}}{\text{gal Slurry}}$$

gallon

8. Convert Production Rate (TPD) to GPM Stock Slurry Flow

$$D_{SS} = D_W + 3.33 \times \frac{C}{100} \quad \frac{\text{lb}}{\text{gal}}$$

Example:

Given: 500 O.D. tons/day of pulp

$$GPM = \frac{16.65\ TPD}{C} \qquad \text{Approximation}$$

$$GPM = \frac{139\ TPD}{C\ D_{SS}} \qquad \text{Corrected}$$

production at 12% O.D. consistency

Find: GPM of Stock Slurry flow

For a more exact solution find D_{SS} first,

@ 50°F

$$GPM = \frac{16.65\ TPD_{OD}}{C_{OD}} \qquad \text{Approximation}$$

$$= \frac{16.65 \times 500}{12.0}$$

$$GPM = 694 \qquad \text{Approximation}$$

$$D_{SS} = D_W + 3.33 \times \frac{C}{100} \quad \frac{\text{lb}}{\text{gal}}$$

$$= 8.34 + 3.33\ \frac{12}{100} \quad \frac{\text{lb}}{\text{gal}}$$

$$= 8.34 + 0.4$$

D_{SS} = 8.74 lbs/gal (density for Stock Slurry)

$$GPM = \frac{139\ TPD_{OD}}{C_{OD}\ D}$$

$$= \frac{139 \times 500}{12 \times 8.74}$$

$$GPM = 663 \qquad \text{(corrected)}$$

Mar Tech Engineering: 2001 Projects

- Skid Mounted Acid & Caustic Systems
- B.S. Washer Monorail
- Calendar Stack Guards/Paper Machines
- Paper Machine (Partial) Roll Paper Stop
- Causticizer and Platforms
- Chiller Replacement
- Truck Dumper Estimate & Study
- Truck Dumper
- Chip Screen Replacement
- Digester Operator Interface Upgrade
- Electrical Power Studies (Several)
- Finishing Broke Pulper
- H.P. Feeder Monorail
- Kiln Motor Base
- MACT-I Detailed Engineering
- Paper Machine pH Control System Upgrade
- Package Boilers (Three for Various Clients)
- Chemical Additive Pipe Bridge Replacement
- Fuel Oil Additive Pipe Bridge Replacement
- Plant Electrical Service Upgrade
- Power Boiler Monorail
- Process Safety Management Documentation
- Pulper De-Thrashing System
- Rail Car Fall Protection System
- Recovery Boiler Precipitator Rebuild
- Stacker Building
- Stock Chest Dilution
- Trim Separator
- Electrical Design for Wet Lap Machine
- Electrical Design for New Woodyard
- Site Electrical Project Management
- Site Mechanical Project Management

The above partial list shows a sample of the wide diversity of projects accomplished this year. They have ranged from the calculation and containment of the energy in a spinning calendar roll with a broken journal to a $10,000,000 MACT-I project. We have worked in all areas of the mill including a chip dumper installation in the woodyard, a causticizer in recausticizing, blow heat revisions in the pulp mill, a pH control acid system in the paper mill electrical power studies and the electrical design for a wet lap machine. Our work has taken us across the south involving clients in Louisiana, Texas, Mississippi, Arkansas and Alabama.

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