Cementing Jobs

Design Process

Type of string that is being cemented (Intermediate-Production).
This gives the type of cemented needed.
Intermediate volume is needed
Production bond and strength
The volume required for the job

Once the type of cement is known
Additives that are required
Density
Viscosity control
Set time

Plan the job itself
Type of cement
Cementing equipment float
Volume required, converted to sx
Spacer fluid
The amount of water required for the job
Pump rates required
The pressure that will be encountered
Example of Primary Cement Job

Data

- Hole size: 10"
- Casing: 7" ID 6.004"
- TD: 5000’
- Cement: G
- From lab: $n'=30$, $K'=0.195$, 15.6 ppg

Pumping rate for Turbulence

\[
v_c = \left[ \frac{1129K'\left(\frac{96}{d_i}\right)^{n}}{\rho} \right]^{\frac{1}{2-n'}}
\]

\[
v_{c}^{2-n} = \left[ \frac{1129K'\left(\frac{96}{d_i}\right)^{n}}{\rho} \right]
\]

for the annulus

\[d = d_h - d_c = 10 - 7 = 3\text{in}\]

\[
(\frac{96}{d})^n = (\frac{96}{3})^3 = 2.83
\]

\[
v_{c}^{2-n} = \left[ \frac{1129K'\left(\frac{96}{d_i}\right)^{n}}{\rho} \right] = v^{1.7} = 40
\]

\[v = 8.7 \text{ ft/sec}\]

\[
q = \frac{vd^2}{17.15} = \frac{8.7 \cdot (10^2 - 7^2)}{17.15} = 25.8 \text{bpm}
\]
Friction drop

\[ \Delta p_f = \frac{0.039 L \rho v^2 f}{d_i} \]

\[ \Delta p_f = \frac{0.039 L \rho v^2 f}{d_i} = \frac{0.039 \cdot 5000 \cdot 8.7^2 \cdot 0.0074}{3} = 568 \text{ psi} \]

In the casing

\[ v_d = \frac{17.15 q_b}{d_i^2} = \frac{17.15 \cdot 25.8}{6.004^2} = 12.19 \text{ ft/sec} \]

\[ N_{re} = \frac{1.86 v^{(2-n)} P}{K'(96/d_i)^{w'}} = \frac{1.86 \cdot 71 \cdot 15.6}{.195 \cdot 2.3} = 4590 \]

\[ \Delta p_f = \frac{0.039 L \rho v^2 f}{d_i} = \frac{0.039 \cdot 5000 \cdot 12.29^2 \cdot 0.0062}{6.004} = 475 \text{ psi} \]