**Equivalent Circulation Density (ECD)**

1. Determine n :

2. Determine K :

3. Determine annular velocity (v)(ft/min) :

4. Determine critical velocity (Vc)(ft/min):

5. Pressure loss for laminar flow (Ps), psi:

5. Pressure loss for turbulent flow (Ps), psi :

7. Determine equivalent circulating density (ECD), ppg :

*ECD (ppg) = Ps ÷ 0.052 ÷ TVD (ft)- 0MW (ppg)*

Sample Case : Equivalent circulating density (ECD), ppg :

Data : Mud weight = 12.5 ppg   
 Plastic viscosity = 24 cps  
 Yield point = 12 lb/100 sq ft  
 Circulation rate = 400 gpm  
 Hole diameter = 8.5 in.  
 Drill pipe OD = 5.0 in.  
 Drill pipe length = 11,300 ft  
 Drill collar OD = 6.5 in.  
 Drill collar length = 700 ft  
 True vertical depth = 12,000 ft

NOTE : If Ɵ600 and Ɵ300 viscometer dial readings are unknown, they may

be obtained from the plastic viscosity and yield point as

follows :

24 + 12 = 36 Thus,36 is the Ɵ300 reading  
 36 + 24 = 60 Thus,60 is the Ɵ600 reading

1. Determine n:

2. Determine K :

3a. Determine annular velocity (v)(ft/min), around drill pipe :

b. Determine annular velocity (v)(ft/min), around drill collars :

4a. Determine critical velocity (Vc)(ft/min), around drill pipe :

b. Determine critical velocity (Vc)(ft/min), around drill collars :

Therefore :

Drill pipe : 207 ft/min (v) is less than 223 ft/min (Vc), laminar flow,

so use equation 5 for pressure loss.

Drill collars : 327 ft/min (v) is greater than 309 ft/min (Vc) turbulent

flow so use equation 6 for pressure loss.

5. Pressure loss opposite drill pipe :

6. Pressure loss opposite drill collars :

Total pressure loss :

Psi = 163.8 psi + 35.4 psi

= 199.2 psi

7. Determine equivalent circulating density (ECD) (pg) :

ECD (ppg) = 199.2 psi : 0.052 : 12,000 ft + 12.5 ppg

= 12.82 ppg