

Colebrook memo

```

ε(m) = "0.00003<ε>0.0001"
D(m) = "Pipe ID(m)"
f = "friction factor [dimensionless]"
R = "Reynolds [dimensionless]"
[ε D] = "in the same units system"
f := 0.02 = "initial guess all cases"
    
```

Moody Diagram from Colebrook

Colebrook formula

$$\frac{1}{\sqrt{f}} = -2.0 \cdot \log_{10} \left( \frac{\epsilon}{3.71 \cdot D} + \frac{2.51}{R \cdot \sqrt{f}} \right)$$

t0 := time( 1)

time = 1.2 · min

$$\text{Find}( f , R , D , \epsilon) := \text{solve} \left( \frac{1}{\sqrt{f}} = -2.0 \cdot \log_{10} \left( \frac{\epsilon}{3.71 \cdot D} + \frac{2.51}{R \cdot \sqrt{f}} \right), f , 0 , 1 \right)$$

```

Moody := eval (
    ""
    ε := 0.00005
    R := 10000 , 20000 .. 1000000
    D := [0.04 0.05 0.06 0.07 ]^T
    for i ∈ 1 .. rows( R)
        for j ∈ 1 .. rows( D)
            fij := Find( f , Ri , Dj , ε )
            [
                augment( R , col( f , 1))
                augment( R , col( f , 2))
                augment( R , col( f , 3))
                augment( R , col( f , 4))
            ]
    )
    
```

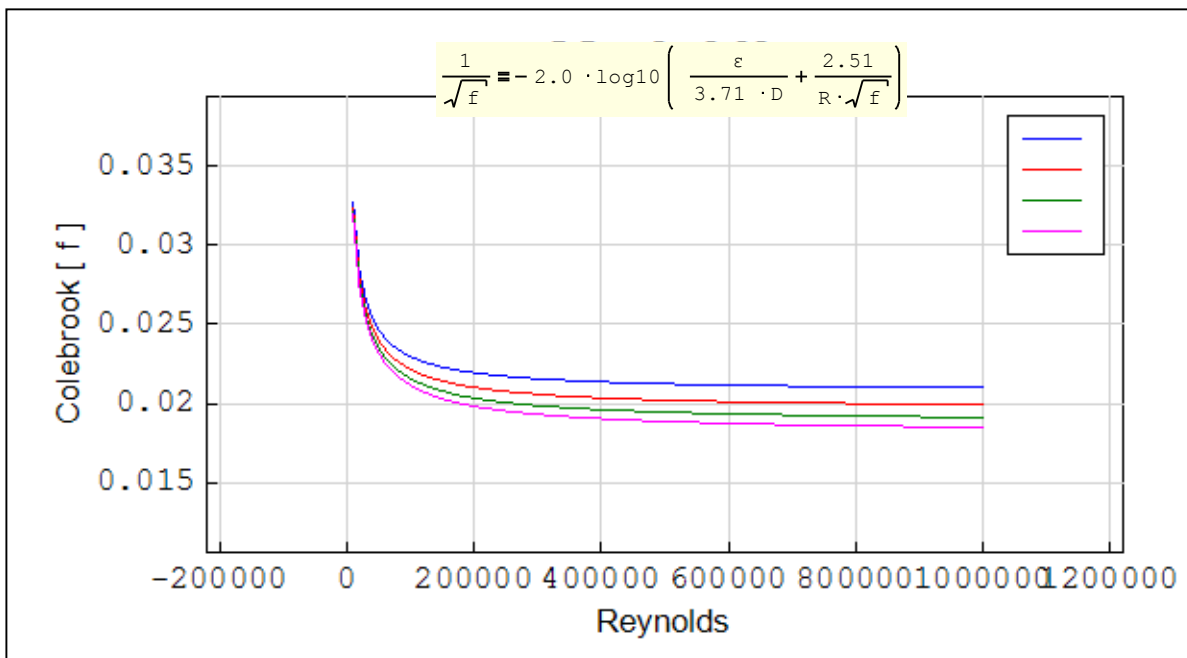
Read this:  
 X\_Y plot is for publishing, project collection.  
 It is terribly slow compared to Smath QuickPlot  
 1. Smath => 5 min  
 2. X\_Y => 27 min.  
 The other interpretation is that X\_Y plot is I  
 directly compatible to Smath construction.  
 Alternately: spool to file => 1.2 min.

No need for "spool to file",  
 eval() the Moody function instead.

```
CWD := CurrentDirectory( "C:\SmathFile" )
```

```
wfile( Moody , CWD , "Moody" ) = 1
```

```
Moody := rfile( CWD , "Moody" )
```

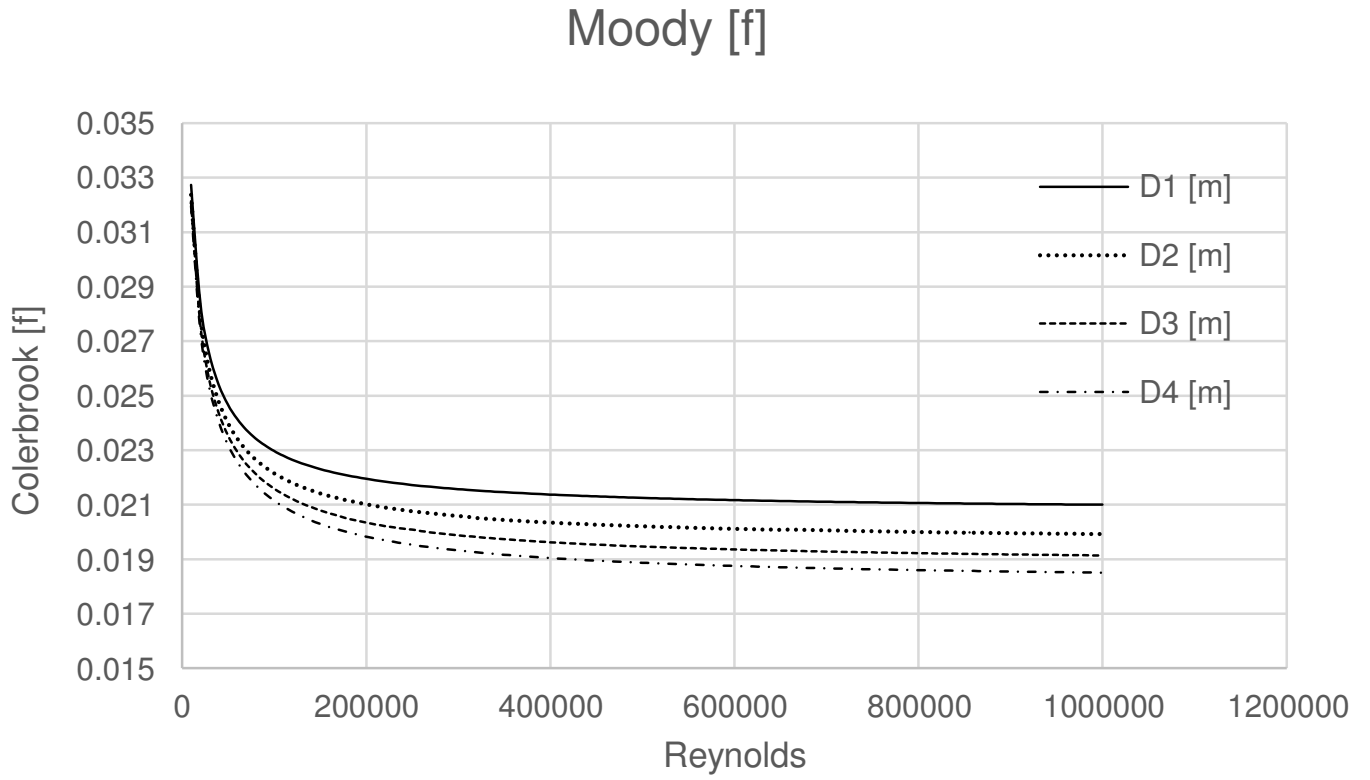


- Moody 1
- Moody 2
- Moody 3
- Moody 4

$$\frac{\text{time}( 1) - t_0}{60 \text{ sec}} = 0.3$$

Next associated Engineering piping stuff:  
 "Inst\_Colebrook Pipe Data"

```
excel_IN("yes", "moody_plot.xlsx", "Sheet1", "A1", eval(stack(["D1 [m]", "D2 [m]", "D3 [m]", "D4 [m]"])))
```



```
excel_EMF("moody_plot.xlsx", "Sheet1", "K6:R22", 1)
```