

# ADD FRICTION from system flow resistance TO "A.H." figure

*Also known as "Viscous drag" "Scrubbing action" "Rotary flow" "Reynolds effect".*

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## 1. INPUT DATA

GPM	<b>Q gpm</b>	<b>:=</b>	<b>41</b>
Steady state			
mm	<b>D</b>	<b>:=</b>	<b>38</b>
m <sup>2</sup> /sec	<b>v</b>	<b>:=</b>	<b>1,9 × 10<sup>-6</sup></b>
m	<b>L</b>	<b>:=</b>	<b>218</b>
kg/m <sup>3</sup>	<b>ρ</b>	<b>:=</b>	<b>980</b>

## Example

Volumetric flow rate  
 Inside diam of the pipe  
 Kinematic viscosity ——— ( *Approximation*  
*cP "centiPoise" to m<sup>2</sup>/sec ,*  
*multiply by 1 million (for water)* )  
 Length of the pipe  
 Density (SG, [Where 1Gram is 1ml SG=1] Specific Gravity x 1000)

## Pipe Fitting Component

- Round the corner of a Tee
- Past a side opening of a Tee
- Back into line from a side opening in a Tee
- Rounded corner 90° elbow ( Long Rad. or L.R. 90)
- Abrupt 90° elbow ("Hard" 90 or Machined "L")
- Gentle 45° elbow ( Bends & or "5D" 90)

## Fittings

- T1 := 1**
- T2 := 3**
- T3 := 1**
- E1 := 2**
- E2 := 9**
- E3 := 2**

## Estimating : dP @ peak of Flow Fluctuations

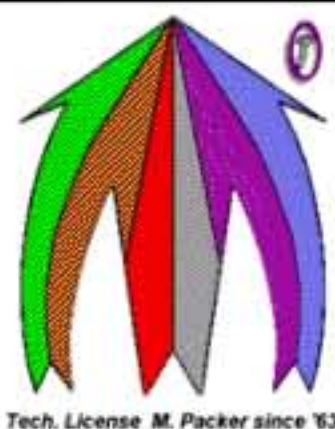
To find the increase in pulsation from flow fluctuation, assume max. fluctuation from simplex pump is 3.25 x steady state Q. Divide 3.25 Q by "F" nbr. for your pump type. Add the result to your steady state Q. Run the formula with your increased Q. Deduct steady state dP from this new dP. The difference is pulsation dP.

## Effective Length of Pipe System

$$L_{eff} := L + (0.0667 \times D \times T1) + (0.0209 \times D \times T2) + (0.0667 \times D \times T3) + (0.0327 \times D \times E1) + (0.0681 \times D \times E2) + (0.0144 \times D \times E3)$$

figures applied for E and T are averages from tests

CONTINUED



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