The desire is to determine the amount of excess cement pumped, excess cement that is required and averages of each of the above. Some of the data that we do not know and needs to be calculated is the Gauge Annular Volume, Gauge Open Hole Annular Volume. This will allow the Excess cement pumped and required to be determined.

In order that are items that need to be known. These are listed below:

**Known Items:**

Cement Volume Pumped (m3 or tonne – will need to convert to m3 if in tonne)

Surface Casing OD (mm)

Surface Casing Weight (kg/m)

Surface Casing Depth (mD)

Surface Casing Capacity (m3/m) – lookup or calculate

Production Casing OD (mm)

Production Casing Weight (kg/m)

Production Casing Depth (mD)

Open Hole OD (mm)

To calculate the excess cement, the Gauge Annular Volume and Gauge Open Hole Volume must first be determined.

In this example, if I differentiate by wellbore and tubular, there is 1 tubular (production casing) and 2 wellbores (surface casing and open hole)

NOTE: 0.0007854 = pi()/4000 conversion.

**Gauge Annular Volume (m3):**

=((0.0007854\*([Open Hole OD (mm)]]^2-[[ Production Casing OD (mm) ]]^2))/1000)\*([[ Production Casing Depth (mD) ]]-[[ Surface Casing Depth (m) ]])+([[ Surface Casing Capacity (m³/m) ]]-([[ Production Casing (mm) ]] / 2000)^2\*PI())\*[[ Surface Casing Depth (m) ]]

**Gauge Open Hole Annular Volume (m3):**

=((0.0007854\*([[ Open Hole OD (mm) ]]^2-[[ Production Casing OD (mm) ]]^2))/1000)\*([ Production Casing Depth (mD) ]]-[[ Surface Casing Depth (mD) ]])

**Excess Cement Pumped (%):**

=(([[ Cement Volume Pumped (m3) ]]-([[Gauge Annular Vol (m³) ]]-[[ Gauge Open Hole Annular Volume (m³) ]]))/[[ Gauge Open Hole Annular Volume (m³) ]])-1

There are different situations with different wellbore and tubular configurations that need to be considered.

There may be only 1 wellbore and 1 tubular

There may be 2 wellbore and 2 tubulars, or other configurations.