Hytran v 3.5.5 to v3.6.2 New Features

1.0 DRES, URES,VALD, VALI : % opening vs Coefficient added to Input
2.0 VALI: New algorithm and Optional inclusion of the additional headloss
3.0 SURG: Option to allow the tank to empty

Hytran v3.5.6

4.0 Pump/RUNS allows the user to input pump curve
5.0 Pump/STAR/CHEK and PUMP/SHUT/CHEK allow users to input pump curve
6.0 PUMP/STAR/VALI and PUMP/SHUT/VALI allow users to input pump curve
7.0 Text Boxes to label the drawing
8.0 Additional Dialog box for convenient editing of node and pipe data

Hytran v3.5.7

9.0 AIRV: Back Siphon Break Option
10.0 Help for VISTA

Hytranv 3.5.9

11.0 Drawing Parallell Curved Pipes
12.0 PUMP/VALI Input. Valve coefficients vs % Stem Movement as input
13.0 Composite Pipes added to the Pipe Input Dialog
14.0 Pipe Constraints added to Pipe Dialog box

Hytran 3.6.0

15 EPANET import now reads alpha names in the *.inp file
16 Place EPANET Flow BC's on upstream node of the EPANET definition
17 Where there is BC already on the Uspstream node or it is an Branch node, the pipe is split and the BC is located at split location
18 Curved pipes available for parallel pipes in EPANET
19 Pipes ++ can have the same features as EPANET

Hytran3.6.1

20 AIRC: MASSAL Air Chamber New algorithm to include air valve specification

Improvements

Hytran v3.5.6

1 **Vali:** The headloss through the in-line control valve have been recoded to provide more stability when the flow is reversing through the valve while it is closing

Hytran v3.5.7

2 **Pipe Selection indicator:**When selecting a pipe, a rectangular box appears enclosing the selected pipe

3 **DRES/VALVE Bug** removed for reverse flowout of Reservoir

Hytran v3.5.8

4 **Fluid properties** Hytran now requires the atmospheric pressure to be enters in bar or psi

Hytran v3.6.0

1 **EPANET** conversion of MLD to m^3/s corrected

Hytran v3.6.1-2

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1 **Pump/Part/Shut/Check**: Corrected bug in Pump/Part/Shut/Check which prevented th edialog box closing when this option is selected

2 **STAN**: Stan Pipe at an end nodes did not read the run correctly as misreads the end node type

Hytran3.6.1-3

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1 **SURG** dialog did not record some charges to the Spill included and Tank Area options.

2 **SURG** Simple Branch did not stop at RL min corrected

3 **Surg Orifice** junction and branch can continue at RL Min

4 **Surg** Inflow to all surge tanks

5 **PIPE:** Additional Pipe Ratings available from 2.5 - 64 bar

6 Min pressure envelop availble

Hytran3.6.2-3

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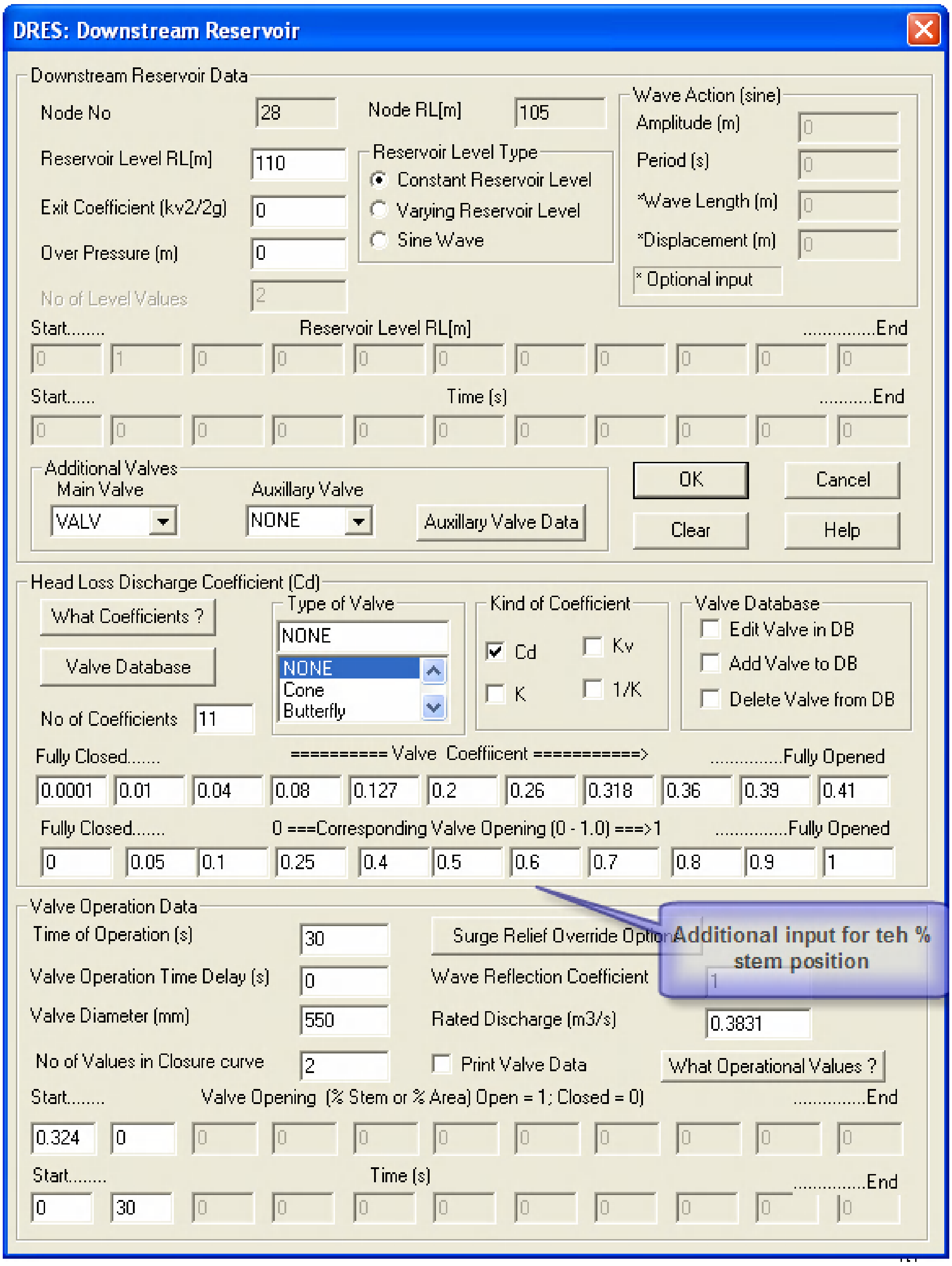
1 Dummy Pipes now in RED colour

1.0 DRES, URES,VALD, VALI: % opening vs Coefficient added to Input

An additional row of table has been added to the above input dialog. Previously the coefficients of discharge have been spaced out at constant intervals for the valve % stem position. At smalll openings the coefficient can vary widely. The coeffiicents are now paired with the % stem opening position.

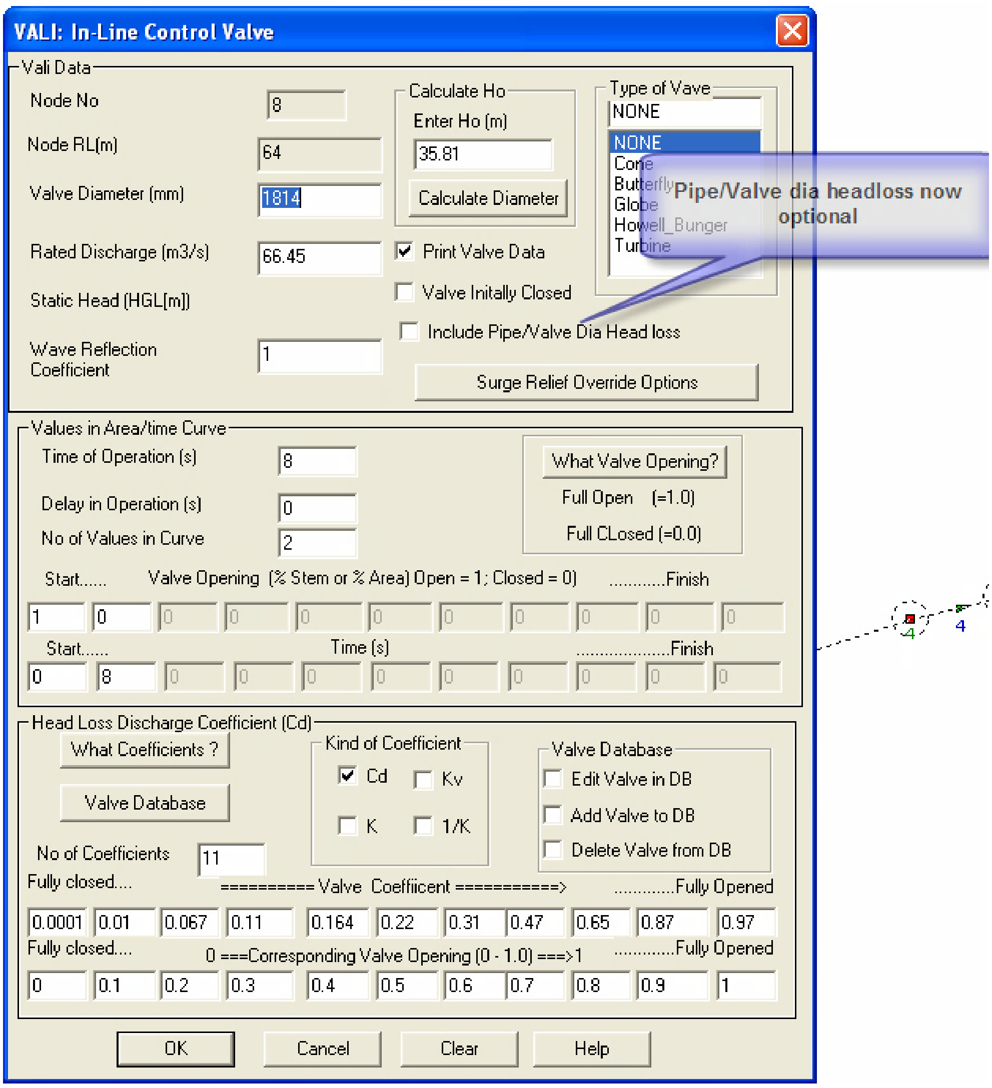


2.0 VALI: New algorithm and Optional inclusion of the additional headloss

A new algorithm is now used for the in line control valve. Previously the discharge coefficients were converted to 1/K. Now the Cd is used.

Previously if the incoming pipe diameter is smaller than the valve diameter, an additional head loss Was added to the discharge coefficients.

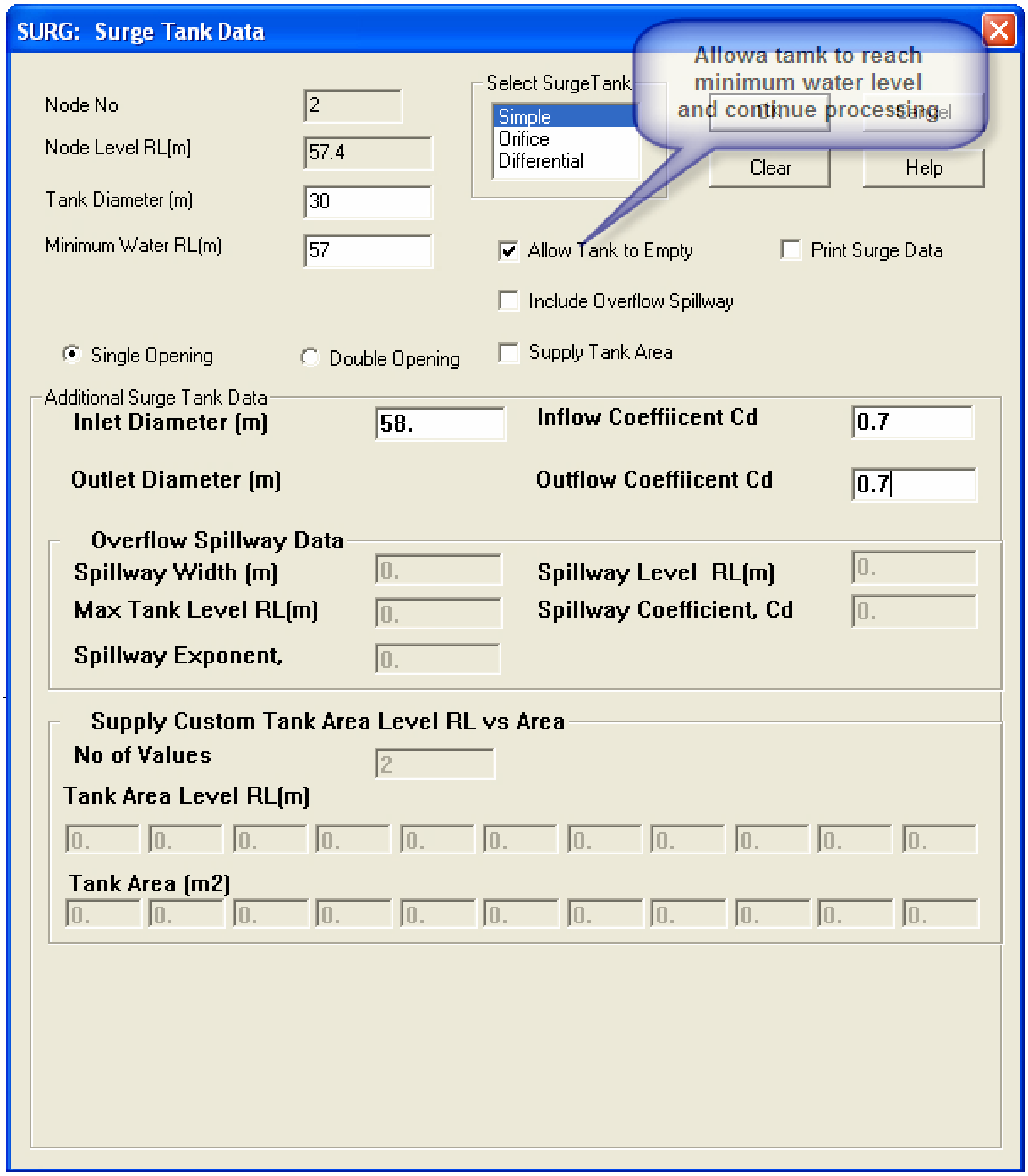
$$K_o^* = K_o + 1.5\left(1 - \frac{D_{valve}^2}{D_{pipe}^2}\right)^2$$



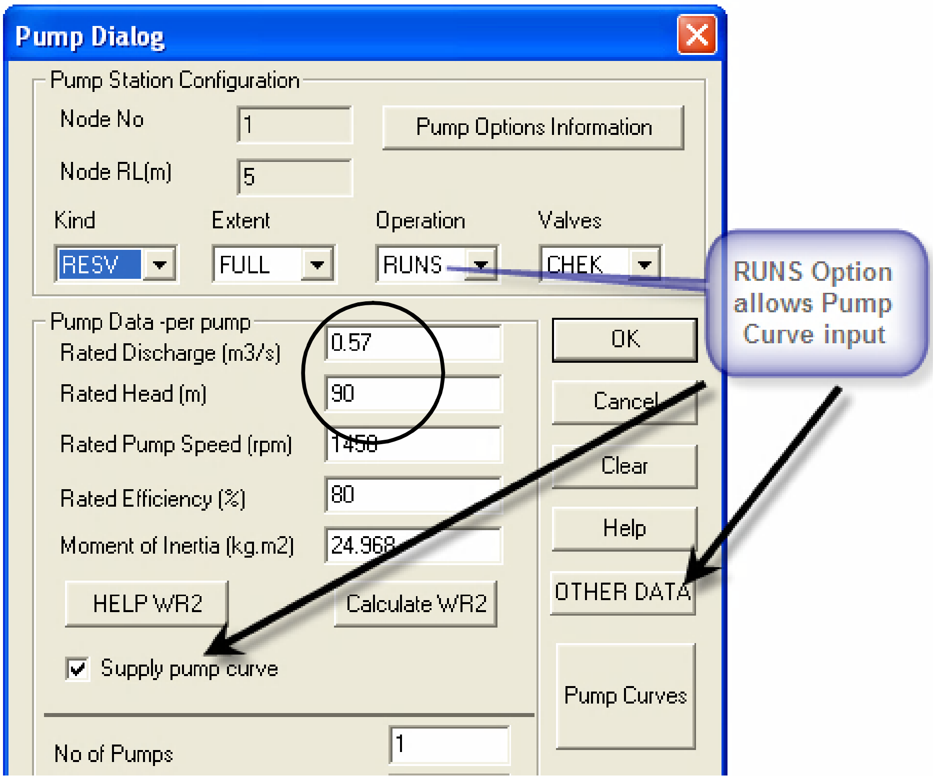
The additional headloss inclusion is now an option. For example, in using the valve to model turbine gate closure it is more appropriate to exclude this additional headloss. Aditioanl head loss can be added as a minor loss in the incoming pipe.

3.0 SURG: Option to allow the tank to empty

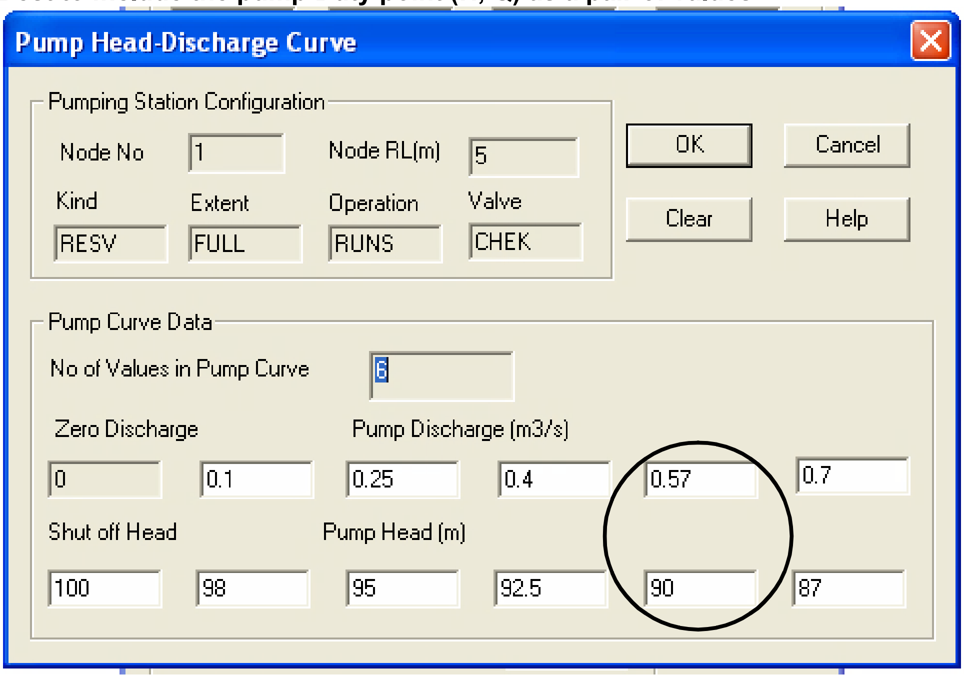
Thi sis only availble for simple surge tnaks at junctoions only. This optipn models a standpipe which empties an dallows air into the pipeline. Used with an air valve in series (+ DUMMY pipe)



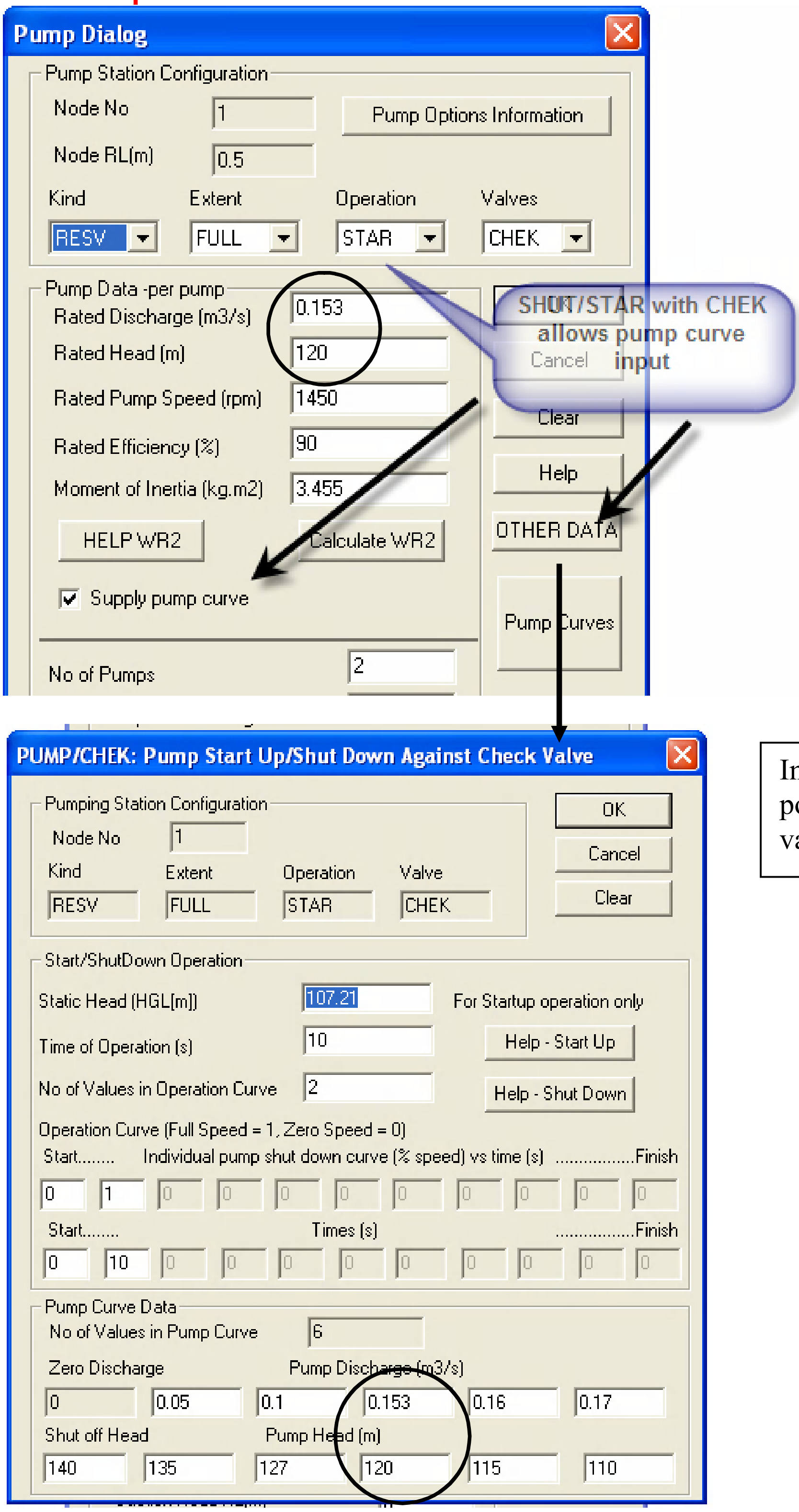
4.0 Pump/RUNS allows the user to input pump curve



Enter the pump head vs discharge curve.
Best to include the pump Duty point (H, Q) as a pair of values

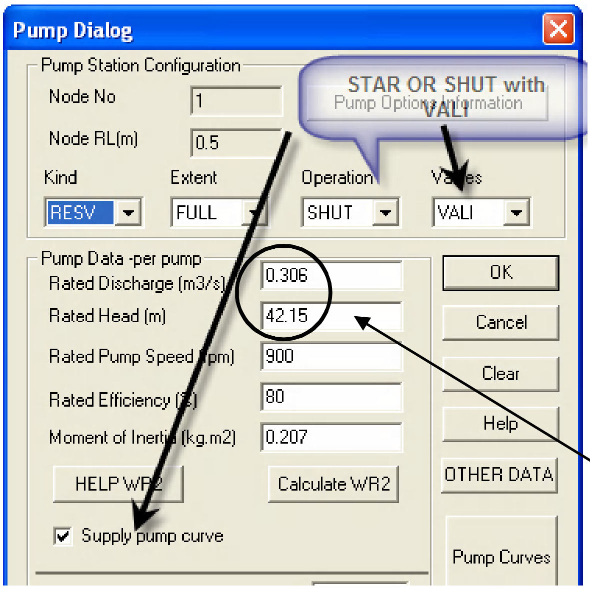


5 Pump/STAR/CHEK and PUMP/SHUT/CHEK allows the user to input pump curve

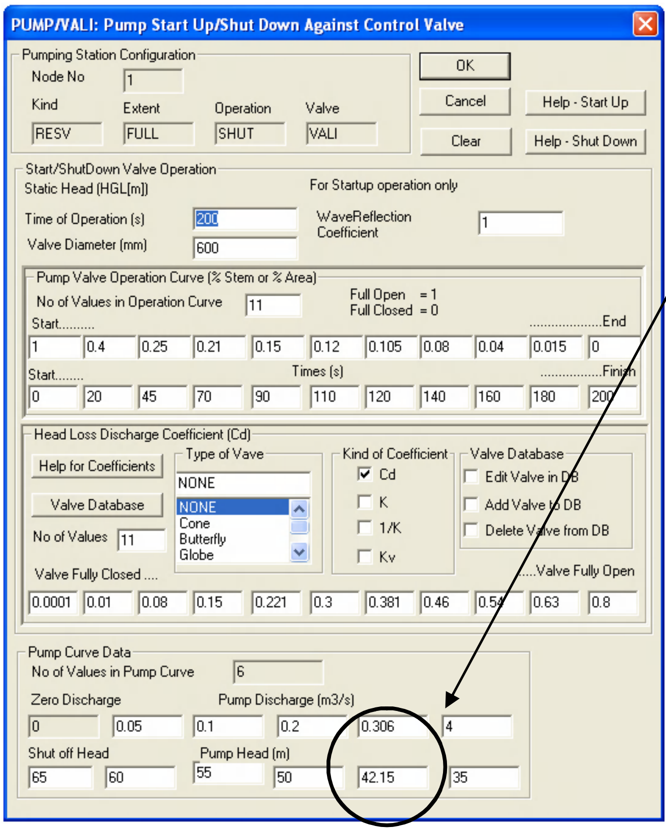


Include the pump duty point Q, H as a pair of values

6.0 PUMP/STAR/VALI and PUMP/SHUT/VALI allow users to input pump curve



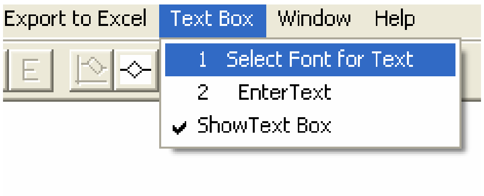
Include the pump duty point Q, H as a pair of values



7.0 Text Boxes to label the drawing

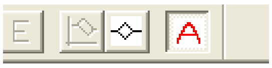
Text boxes may be added to label parts of the drawing

First select the the font



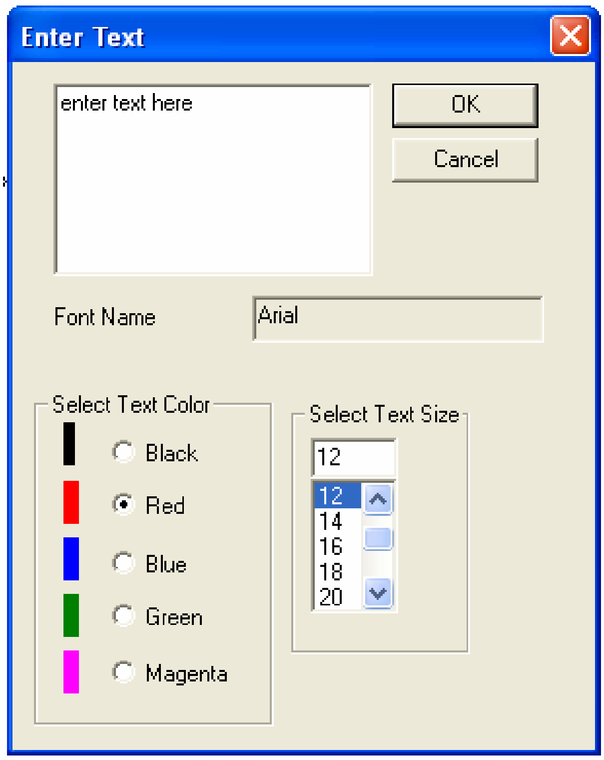
Only Regualr fonts are used. The default font is the 12 point Arial black color.

To insert the text select the **A** iocn



Place the cursor at the desired location and left click

To bring up the dialog box and enter text, select color or change font size



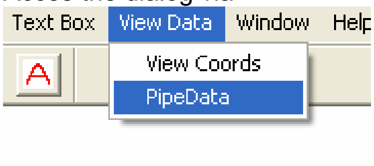
The Text box may be edited by clicking the A button and then palce the cursir on the text to be edited

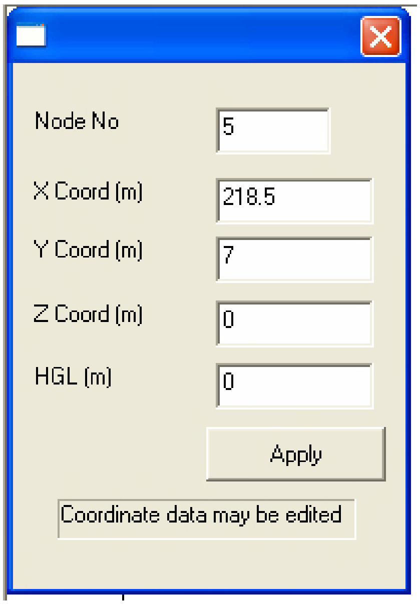
The Text box may be moved to a new location by selecting the  icon and then place the cursor on the text to be moved, left click and hold the button down and drag the text box to new location.

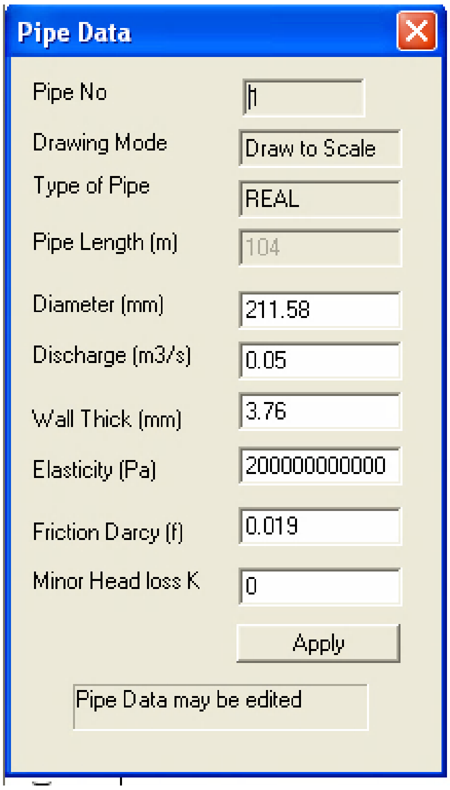
8.0 Additional Dialog box for convenient editing of node and pipe data

An additional dialog is avaialble to edit and view node and pipe data.
The dialog stays open until it is shut.

Acces the dialog via





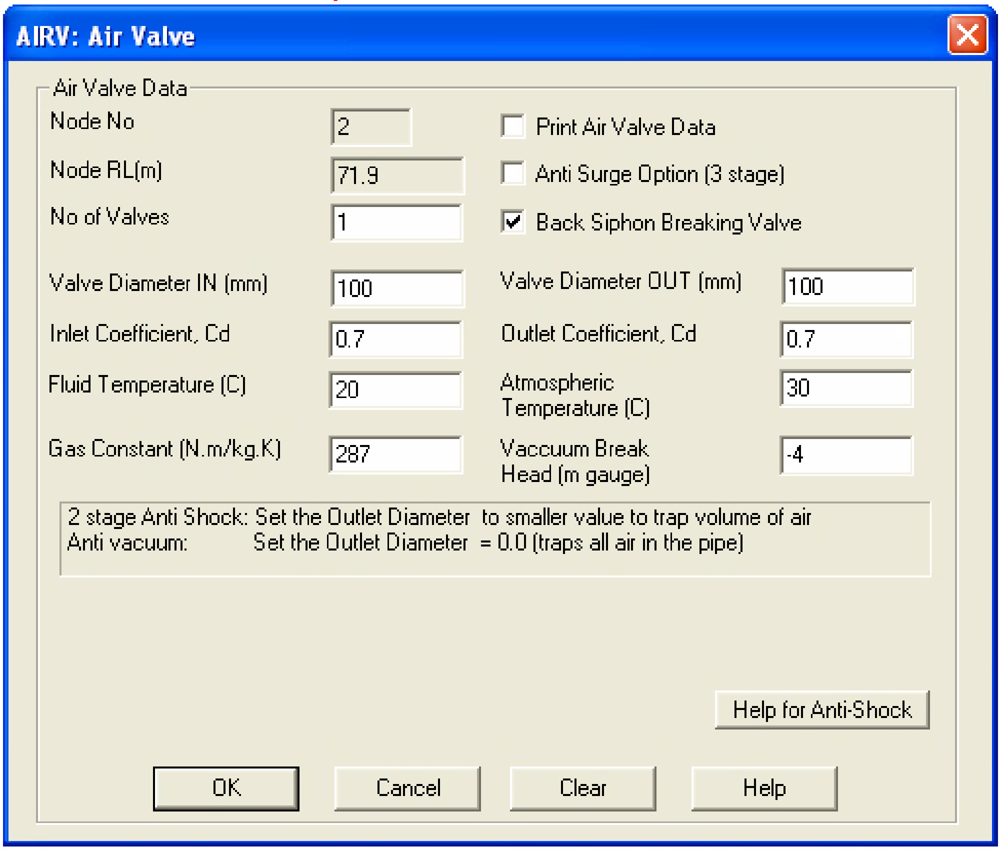


Once the dialog box is open move the cursor over a node (of the coordinate box is open) th enode coordinates wil be shown in the input boxes.

If the pipe dialog box is open, move the cursor on a pipe to show the pipe data.

The node coordinates and the pipe data may be edited

9 AIRV: Back Siphon Break

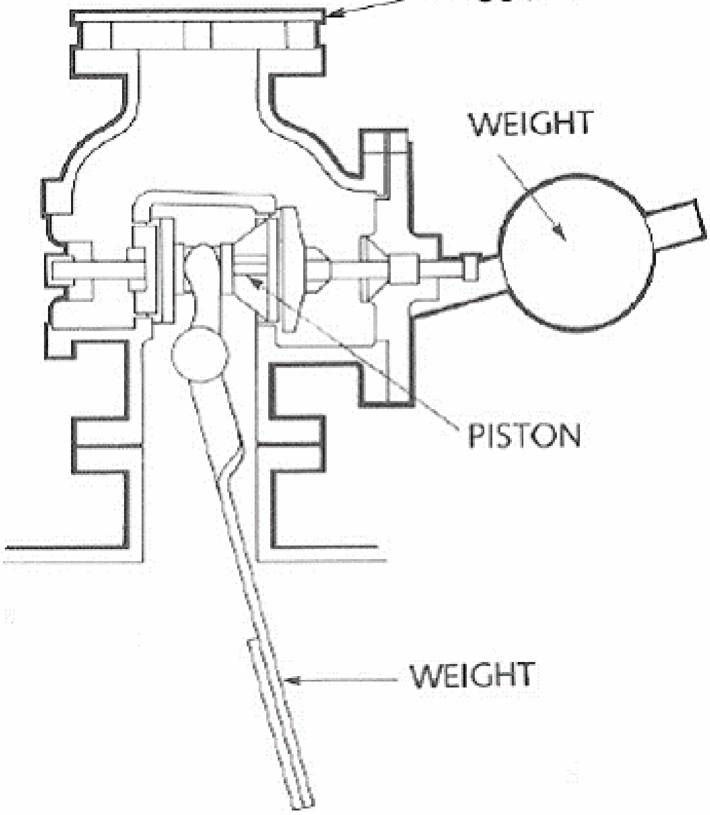


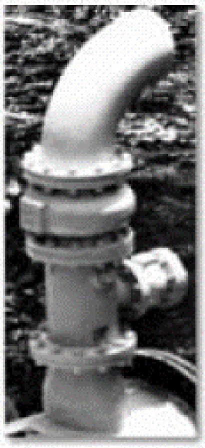
Notes

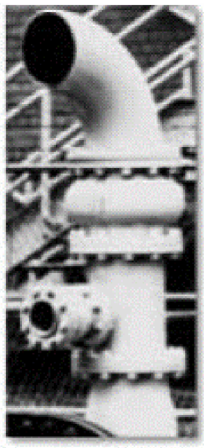
- Anti Surge Option and Back Siphon Breaking Valve options mutually exclusive.
- Back Siphon acitvated to admit air when the flow reverses to break the siphon.
- Vaccum break head may still be used for the forward flow to provide vacuum break protection
- To deactivate the vaccum break, select head less than vacuum so the valve does not open

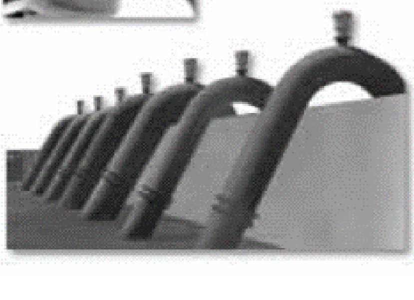
To model this type valve see next page

1235 Paddle Operated









SYPHON AIR VALVE
(MAKE AND BREAK)

SYPHON AIR VALVES are a unique type of Air/Vacuum Valve incorporating a paddle which hangs down into the main pipeline flow stream. The valve will allow a syphon flow to be developed and maintained. Subsequently should the syphon flow reverse, the paddle swings in reverse causing the float to drop and breaking the syphon. The APCO Syphon Air Valve requires no electrical connections or regular maintenance and is ideally suited for remote outdoor environments. In recent years with the emphasis on energy conservation, consulting engineers for water and waste water, often consider pumping by means of a syphon loop. APCO SYPHON AIR VALVES are ideally suited for this application. Solenoid valves for small diameter syphons, or pneumatically operated butterfly valves for large diameter siphons, may also be adapted for this application, but installation and maintenance is complicated and cumbersome. For example, power lines and air lines must be installed to operate these valves. An air compressor is also needed. APCO SYPHON AIR VALVES are mechanically operated, requiring no auxiliary power. They merely respond to flow, in either direction, to make the syphon or break it. Maintenance is virtually non-existent.

Series 5200 available in sizes 3"-16" for syphons up to 60" in diameter.

10 Help for Vista

It seems that the classic Windows Help is not currently supported in the Windows Vista OS.

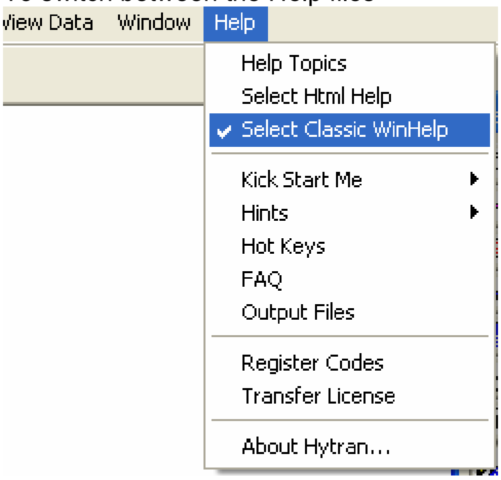
In anticipation of Vista becoming more common Hytran now ships a Help file that is compatible with Vista

Classic Help files
Hytran.cnt
Hytran.hlp

Vista Help
Hytran.chm

These file are all located in the c:\Program Files \Hytran Solutions folder

To switch between the Help files

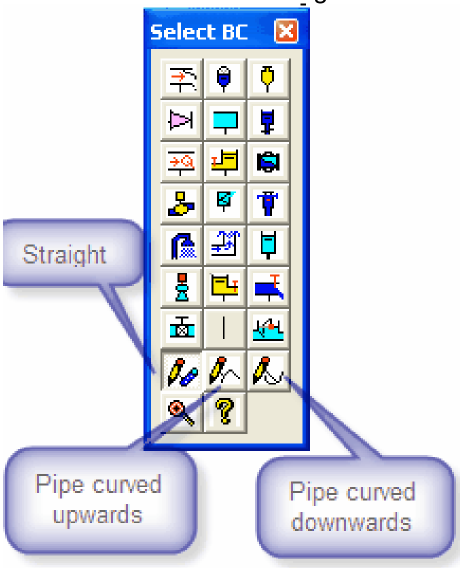


Important Note for Network License
A Window security patch does not allow *.chm to be found over network drives. The Hytran.chm Help file must be installed on the local C Drive. (Special Instructions are available.)

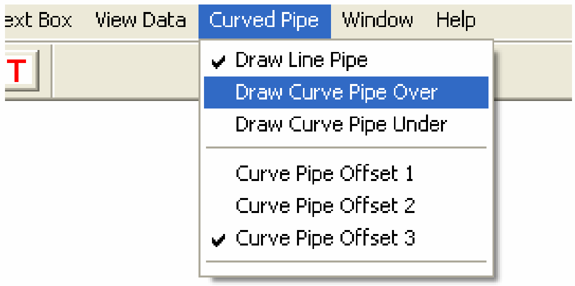
11.0 Drawing Parallell Curved Pipes

Pipes are by default drawn as a straight line joining 2 nodes. A parallel pipe may be drawn but would lie on the same line between the 2 nodes. To differentiate between the parallel pipes, they may be drawn as a curve with different curvature and over or above the initial straight pipe.

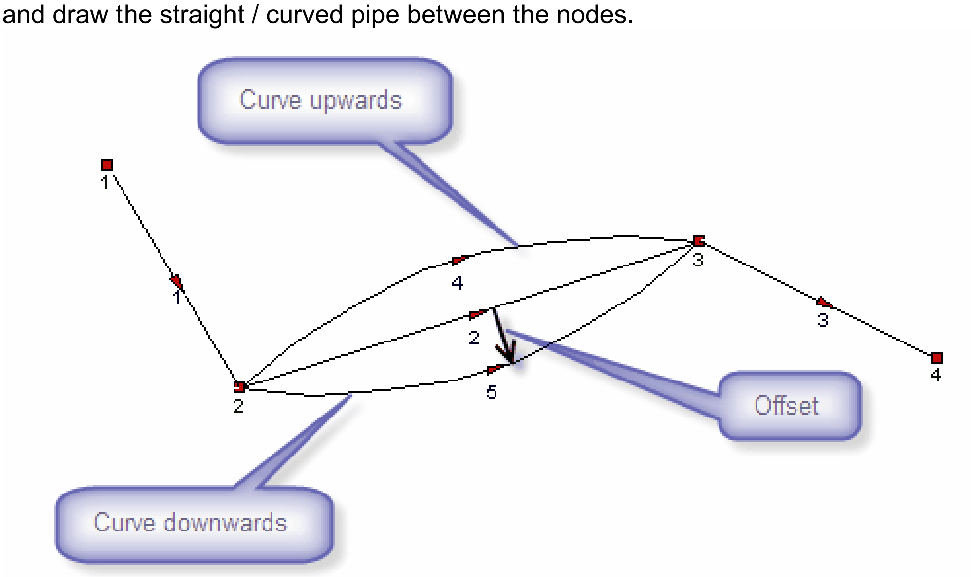
To select between the straight and curved pipes from the toolbar.



or the menu item

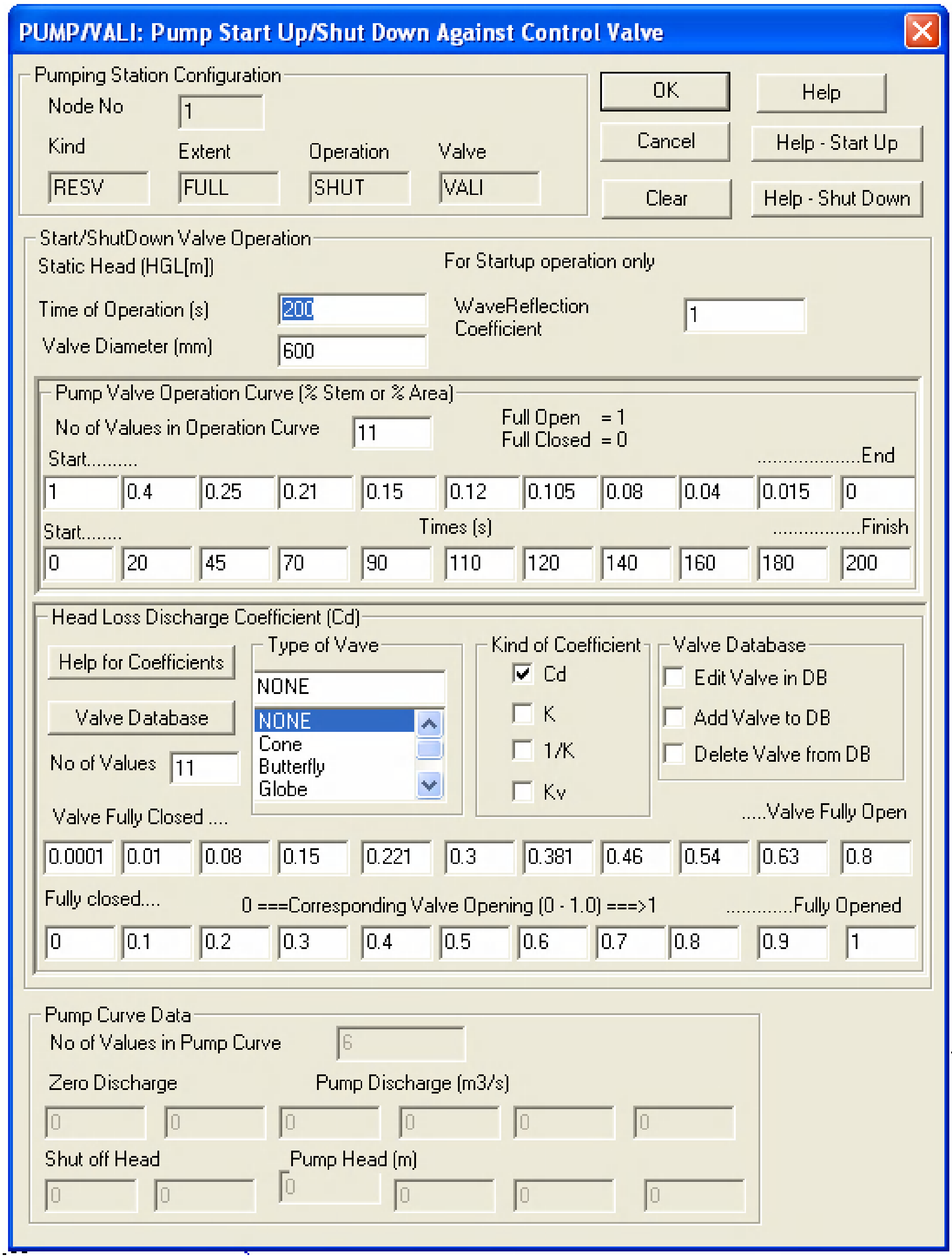


and draw the straight / curved pipe between the nodes.



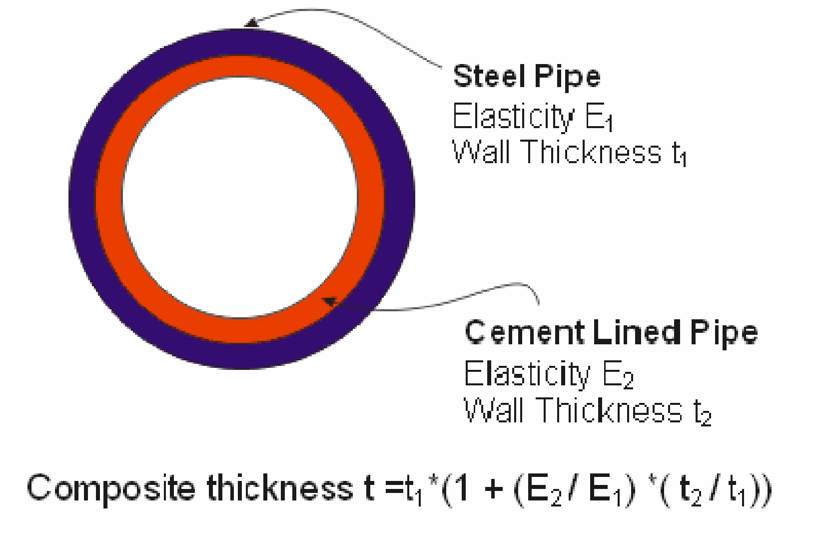
Note:
In the Elevation or Plan View, a curved line is actually represents a straight pipe between the 2 nodes. To select a curved pipe, place the selection cursor on the pipe arrow.

12.0 PUMP/VALI Input. Valve coefficients vs % Stem Movement as input

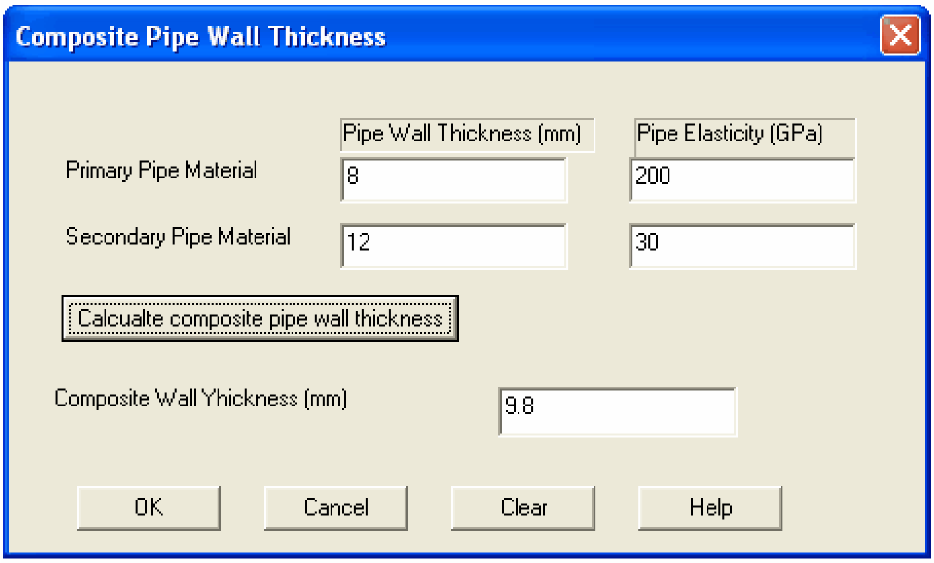


13 Composite Pipes added to the Pipe Input Dialog

Composite pipes are made from materials of different wall thickness and elasticity which will affect the wave speed. Hytran uses the following procedure to calculate the equivalent pipe thickness for the pipe.



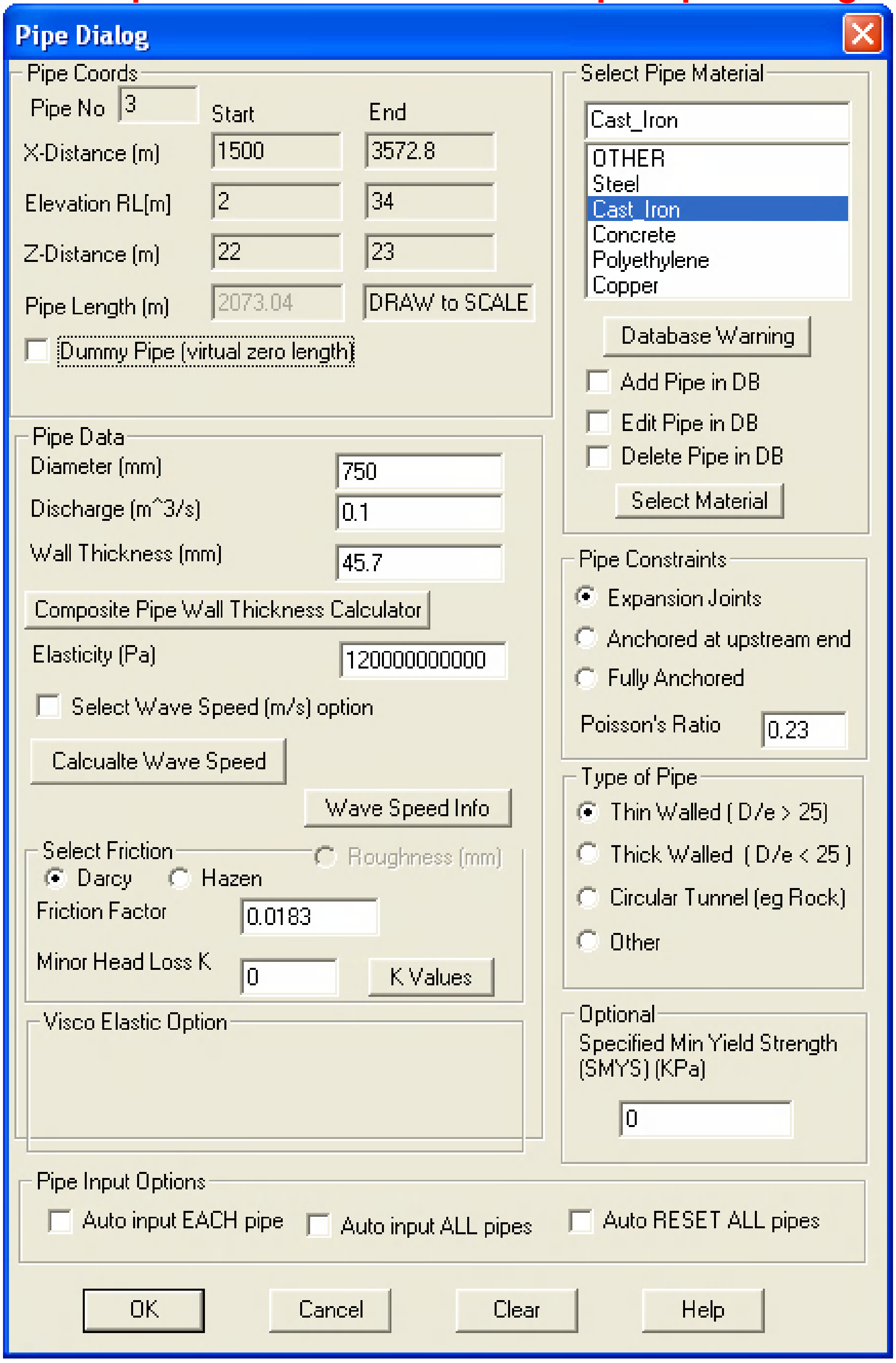
Click on the "Composite Pipe Wall Thickness Calculator to open the dialog box



Input

1 Primary pipe wall thickness
2 Primary Pipe Elasticity
3 Secondary pipe wall thickness
4 Secondary Pipe Elasticity

14 Pipe Constraints Added to Pipe Input Dialog box



Pipe constraints and the type of Pipe added to dwfiiwn the pipe
This reauires the Poisson's ratio as required input.

The default is pipe line with expansion joints and thin walled (disregards Poissons ratio) .

Add the Poisson's ratio to pipe data base file "PipeDB.pdb"

Other factors affecting the wave speed include

- Whether the pipeline is constrained against longitudinal movement
- Type, shape and material of the conduit (thin walled , thick walled, Rock tunnels or composite materials
- The wave speed varies with the passage of a pressure wave.
- Free gas entrained in the fluid affects the bulk modulus, K. Even a small amount of free gas can decrease the wave speed dramatically. Further, the amount of free gas in a fluid cannot be determined accurately. For a conservative analysis, use a low or zero free gas percentage.

1 For Thin and Thick Walled Pipes (from V CStreeter, "Fluid Transients")

Constraint Coefficients	Thin Walled (D/e > 25)	Thick Walled (D/e < 25)
The pipeline has expansion joints throughout its length	$C_1 = 1$	$C_1 = \frac{2e}{D}(1+\mu) + \frac{D}{D+e}$
The pipeline is anchored at upstream end only	$C_1 = 1 - \frac{\mu}{2}$	$C_1 = \frac{2e}{D}(1+\mu) + \frac{D}{D+e}\left(1 - \frac{\mu}{2}\right)$
The pipeline is anchored against longitudinal movement	$C_1 = 1 - \mu^2$	$C_1 = \frac{2e}{D}(1+\mu) + \frac{D}{D+e}(1-\mu^2)$

Where μ is the Poisson Ratio for the pipe material.

2 Circular Tunnels (where the rock thickness is very large)

Formula quoted in V CStreeter, Fluid Transients	Formula quoted in M H Chaudhry, Applied Hydraulic Transients
In this case $C_1 \rightarrow \frac{2e}{D}(1+\mu)$ $a = \sqrt{\dfrac{K/\rho}{\left(1+\dfrac{2K(1+\mu)}{E}\right)}}$	$a = \sqrt{\dfrac{K/\rho}{\left(1+\dfrac{K}{E}\right)}}$

Note: The wave speed calculated by formula in Streeter's book is less than value calculated from the formula quoted in Chaudhry's book.

3 Steel Line Rock Tunnels

Formula quoted in V C Streeter, Fluid Transients	Formula quoted in M H Chaudhry, Applied Hydraulic Transients
$a = \sqrt{\dfrac{K/\rho}{\left(1+\dfrac{KD}{Ee}\right)*\left(\dfrac{2Ee}{E_R D + 2Ee}\right)}}$ where E_R = *Young's Modlus for* rock e = steel thickness E = *Young's Modlus for steel*	$a = \sqrt{\dfrac{K/\rho}{\left(1+\dfrac{K}{E}\right)*\left(\dfrac{DE}{E_R D + Ee}\right)}}$ where E_R = *Young's Modlus for* rock e = steel thickness E = *Young's Modlus for steel*

Note: The wave speed calculated by formula in Streeter's book is less than value calculated from the formula quoted in M H Chaudhry's book

4 Reinforced Concrete Pipe (from M H Chaudhry, Applied Hydraulic Transients)

Replace the pipe with an equivalent steel pipe of equivalent thickness given by

$$e_e = E_R e_c + \frac{A_s}{l_s}$$

where

- E_c = modulus of elasticity of concrete
- E_s = modulus of elasticity of steel
- E_r = ratio of E_c/E_s
- e_c = thickness of concrete pipe
- A_s = Reinforcing steel cross sectional area
- l_s = spacing of the reinforcing steel

E_R may vary between 0.06 to 0.1. Chaudhry suggests a value of E_R = 0.05 to allow for cracks in the rock

Editing the Pipe Data base

Hytran supplies a text database file containing coefficients for typically a **Cone, Butterfly and Globe valve.** The file is listed below. The name is **ValveDB.dba** and is found in the **Hytran Solutions** folder**.**

```
6
OTHER
0.  0.  0.0
Steeler3
2.e+011  3.3e-002 0.28
mPVC2
600000000  25.39  0.35
Concrete
3.1e+010    5.    0.2
CLS
3.e+010     3.    0.2
Cast_Iron
23000000.   0.45  0.25
```

Format for the Text File PipeDB.dba

<Line 1> Number of pipes in database
<Line 2> Name of Pipe
<Line 3> Elasticity (Pa) Pipe Wall Roughness (mm) Poisson's Ratio
<Line 4> Name of Pipe
etc, etc
.
.
Repeat <lines 2-3> for each new pipe.

DO NOT use blank spaces for the pipe name and only 20 non blank characters allowed.

Editing the Pipe Data base File

Prior to Hytran Version 360, the Pipe Database only required the Elasticity and the Pipe Roughness

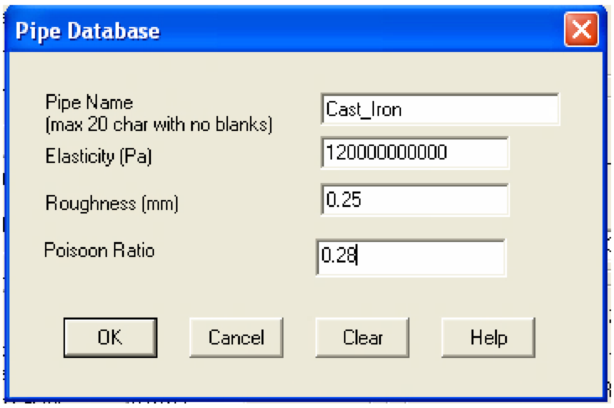
1 Manual Editing

Use any Test Editor (eg NotePad, Word) to edit the file and add the Poisson's Ratio to each line eg Line 3 above

```
Concrete
3.1e+010    5.    0.2
```

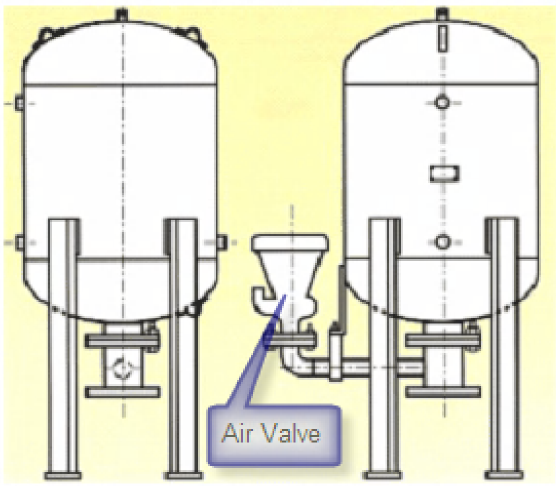
2 Pipe Input Data

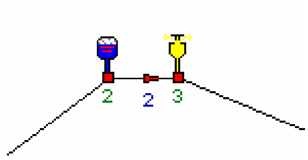
Select the Edit Pipe Data base and enter the Poisson's Ratio for each pipe



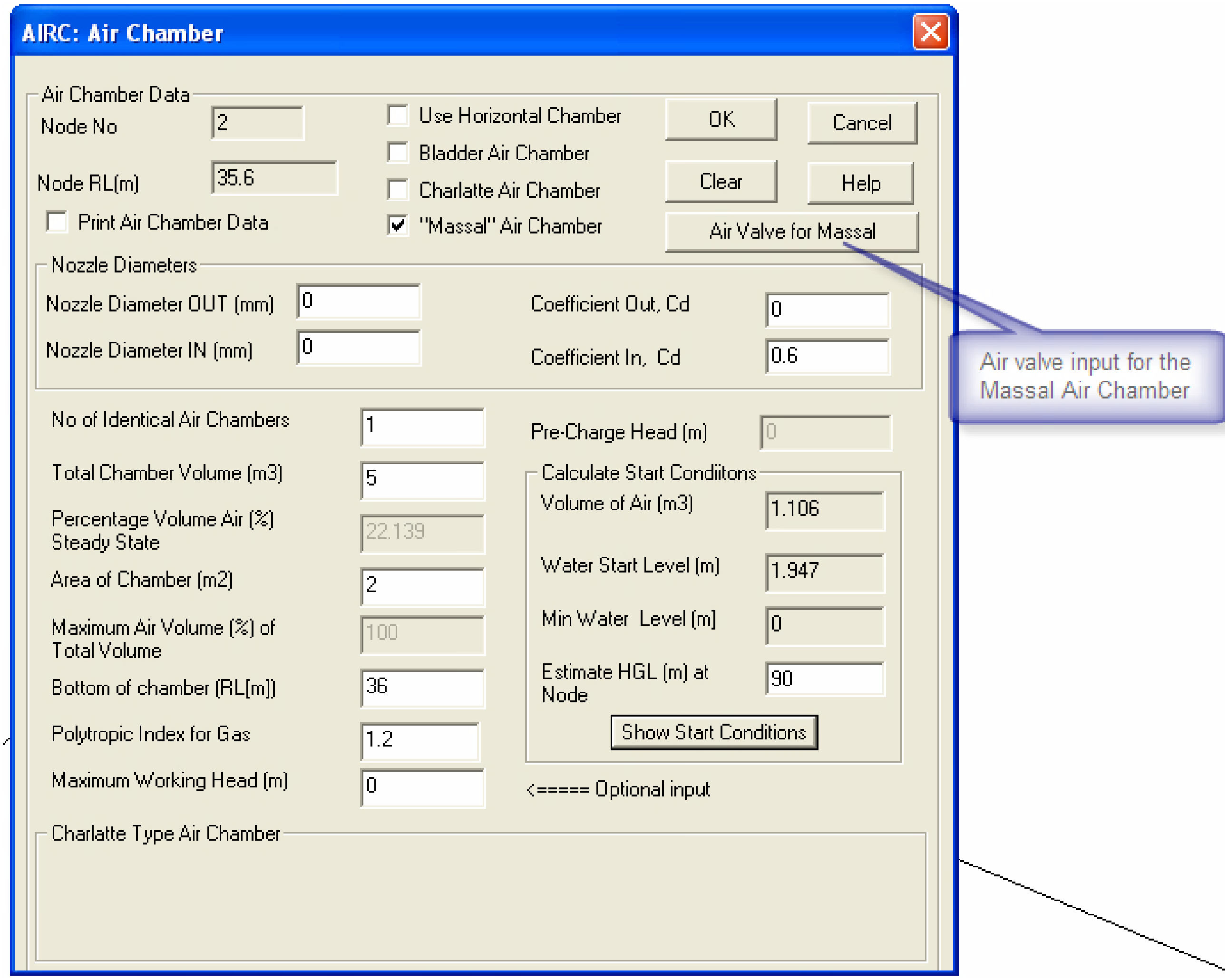
20 AIRC: MASSAL Air Chamber New algorithm to include air valve specification

Previous the Massal Air chambe could be modelled by linking the air chamber with an air valve using a DUMMY Pipe.



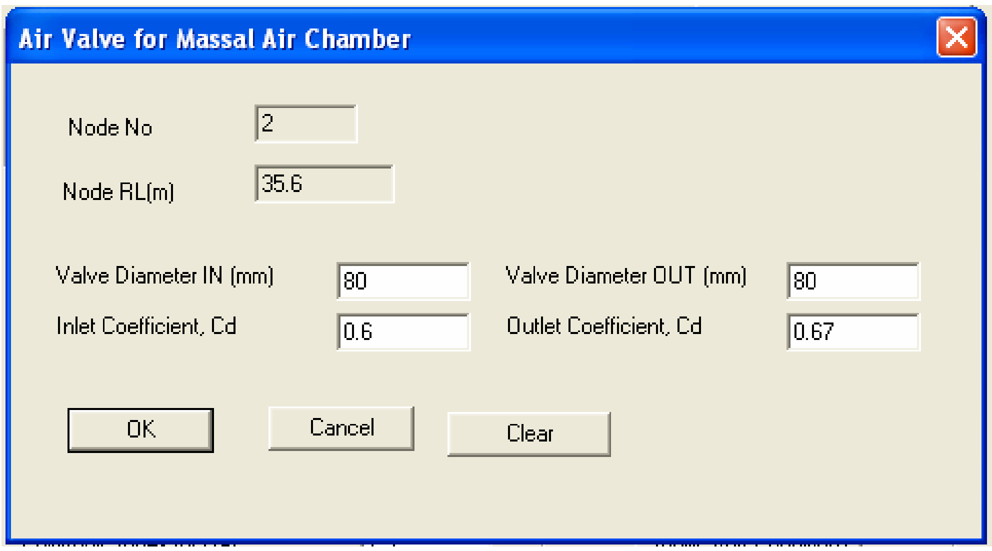


The new algorithm no longer uses the external air valve but has additional input data to specifiy the air valve parameters. The new alogrithm swtiches between the air valve and the air chamber



.

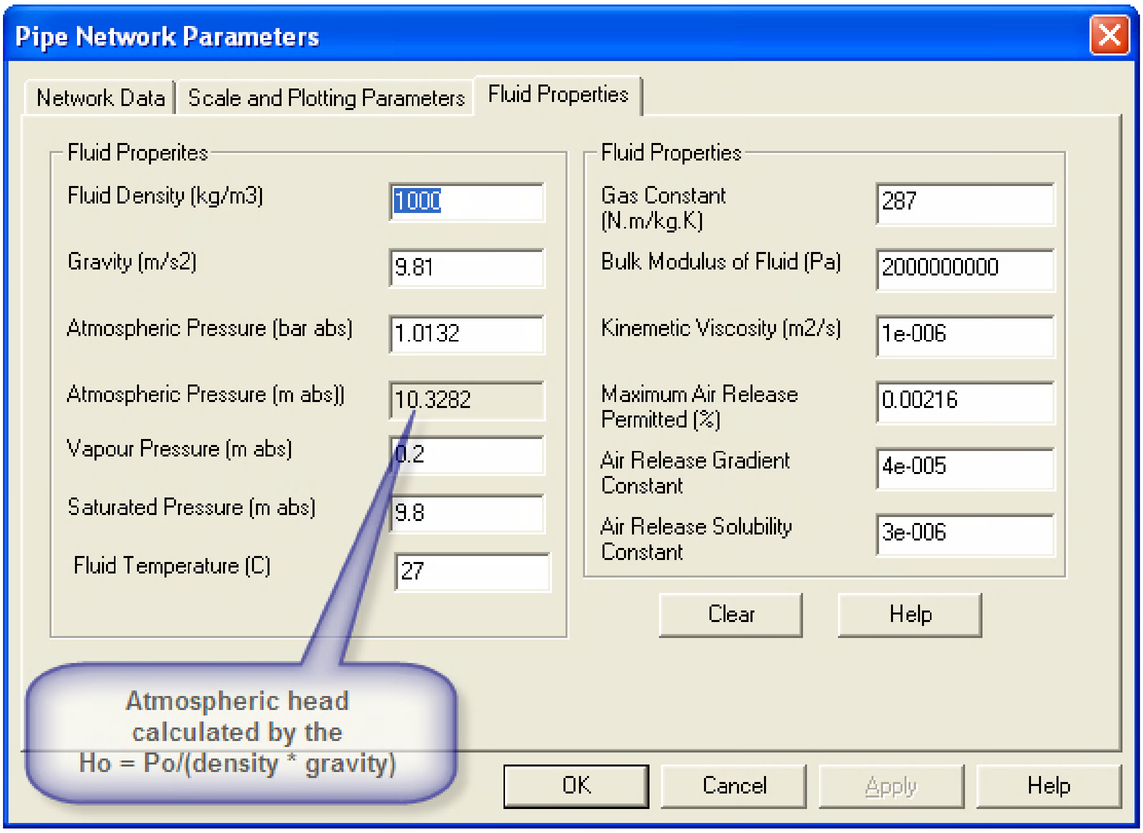
The additioanl data is



Improvments

Fluid Properties (menu item Paramters. Fluid Proeries

Atmospheric pressure entered as an input as Po = 1.0132 bar / 14.607 psi



The atmospheric head Ho = Po/(density * gravity)