

Caepipe : Materials (1) - [07_TimeHistory_fluidhammer.mod (C:\Temp)]

File Edit View Options Misc Window Help

#	Name	Description	Type	Density (lb/in3)	Nu	Joint factor	Yield (psi)	#	Temp (F)	E (psi)	Alpha (in/in/F)	Allowable (psi)
1	B12	A312 TP316 (16Cr-12Ni-2Mo)	AS	0.289	0.3	1.00		1	-325	30.3E+6	8.15E-6	20000
2								2	-200	29.7E+6	8.47E-6	20000
								3	-100	29.0E+6	8.75E-6	20000
								4	70	28.3E+6	9.11E-6	20000
								5	200	27.6E+6	9.34E-6	20000
								6	300	27.0E+6	9.47E-6	20000
								7	400	26.5E+6	9.59E-6	19300
								8	500	25.8E+6	9.70E-6	17900
								9	600	25.3E+6	9.82E-6	17000
								10	650	25.1E+6	9.87E-6	16700
								11	700	24.8E+6	9.92E-6	16300
								12	750	24.5E+6	9.99E-6	16100

Caepipe : Pipe Sections (3) - [07_TimeHistory_fluidhammer.mod (C:\Temp)]

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#	Name	Nom Dia	Sch	OD (inch)	Thk (inch)	Cor.Al (inch)	M.Tol (%)	Ins.Dens (lb/ft3)	Ins.Thk (inch)	Lin.Dens (lb/ft3)	Lin.Thk (inch)	Soil
1	B	6"	STD	6.6248	0.28			11	2.5591			
2	8	8"	STD	8.6248	0.322							
3	10	10"	STD	10.75	0.365							
4												

Caepipe : Loads (2) - [07_TimeHistory_fluidhammer...]

File Edit View Options Misc Window Help

#	Name	T1 (F)	P1 (psi)	Specific gravity	Add.Wgt (lb/ft)	Wind Load
1	L1	365	145	0.1		
2	L2	500	464	0.1		
3						

Caepipe : Time functions (2) - [07_TimeHistory_fluidhammer.mod (C:\Temp)]

File Edit View Options Misc Window Help

#	Name	#	Time (Sec)	Value
1	TFUN_FR_002	1	0	0.06677
2	TFUN_FR_001	2	0.001799	0.06463
3		3	0.003599	0.06443
		4	0.0054	0.06402
		5	0.0072	0.06339
		6	0.008999	0.06255
		7	0.010799	0.06152
		8	0.0126	0.0603
		9	0.014399	0.05891
		10	0.016199	0.05736
		11	0.018	0.05566
		12	0.0198	0.05383
		13	0.021599	0.05187
		14	0.023399	0.0498
		15	0.0252	0.04763
		16	0.026999	0.04527

Step 2:

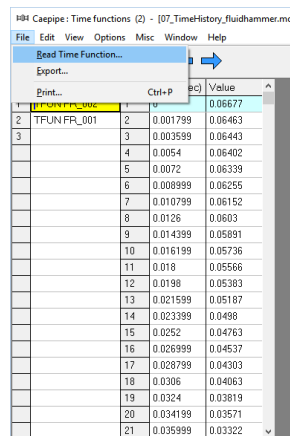
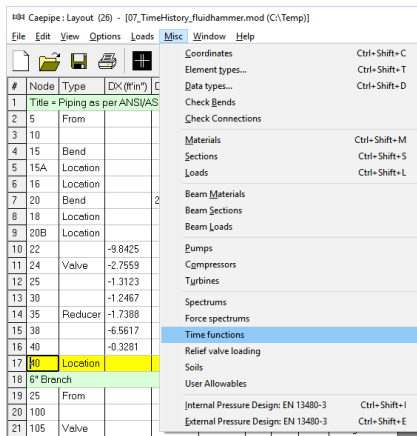
For the sample layout described above, let us assume that the CFD analysis is carried out using the software “ROLAST”. As a result of this simulation, the forces are obtained as a function of time at Bend center nodes 16 and 18 in Global Z direction and Global Y direction respectively.

Step 3:

The forces thus obtained as a function of time at Nodes 16 and 18 are then exported to an ASCII file “SampleSteamHammerLoad.txt” attached herewith. In the attached ASCII file, the value in the first column is time in seconds, while the second column is the force in lbs.

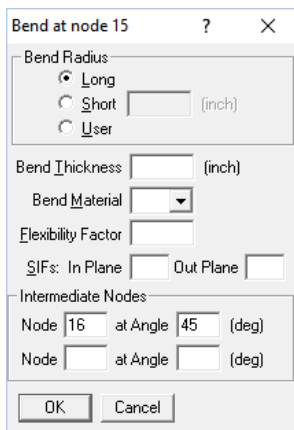
Step 4:

Import this ASCII file into CAEPIPE through Layout window > Misc > Time Functions > File > Read Time Functions. See snap shots below for details.



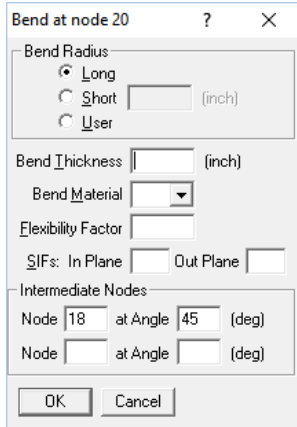
Step 5:

Now create Bend Center Node 16 by editing the “Bend at node 15” as shown below.



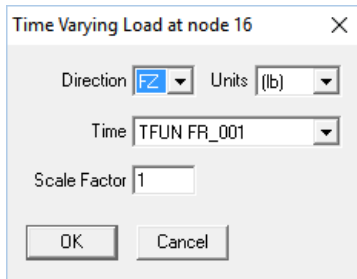
Step 6:

Similarly, create the Bend Center Node 18 by editing the “Bend at node 20” as shown below.



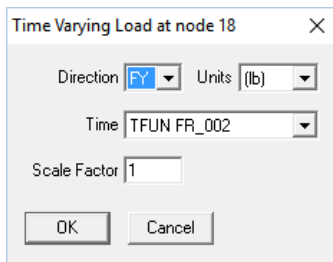
Step 7:

Insert a new row after node “15A” and define a “Location” card with node number as “16”. Add a “Time Varying Load” under data column for node 16 and fill/select the details as shown below.



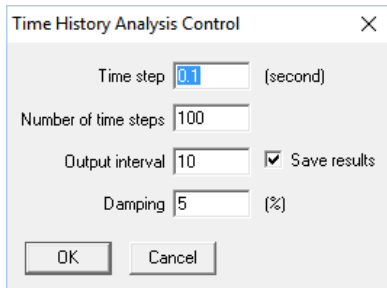
Step 8:

Similarly, insert another row after bend node “20” and define a “Location” card with node number as “18”. Add a “Time Varying Load” under data column and fill/select the details as shown below.



Step 9:

Specify various parameters for time history analysis in the Time History Analysis Control dialog under menu Loads > Time History. See Snap shot below.



Time step

The time step (time interval) at which the analysis is performed should be typically no more than 10% (smaller the better) of the period of the highest frequency of interest, i.e., higher the frequency, smaller the time step, e.g., for a 33 Hz maximum frequency, the time step would be less than 0.003 seconds.

Number of time steps

The time history response is calculated for a total time (seconds) of Time step × Number of time steps. This is how long you want to study system response. The total time may exceed the range of available data in the time function. The time function is only a forcing function. But, CAEPIPE can compute system response to it well after the forcing function ceases. For example, the effect of a heavy steam hammer could linger on for a minute while your forcing function data could span only 8s (seconds).

Output interval

The output interval is a multiple of time step at which you want CAEPIPE to save (and later display) results. For example, assuming a time step of 0.001s, if you wanted to see results at every 100th time step (0.1s, 0.2s, 0.3s, and so on), enter 100 for output interval. You need to check the “Save Results” checkbox to see these time varying results which are saved in the file “modelname.rth”. If the “Save Results” checkbox is not checked, only the enveloped results are available but not their variation in time. The .RTH files may be big for large models with many time steps (so ensure that you have adequate storage and permission settings).

Damping

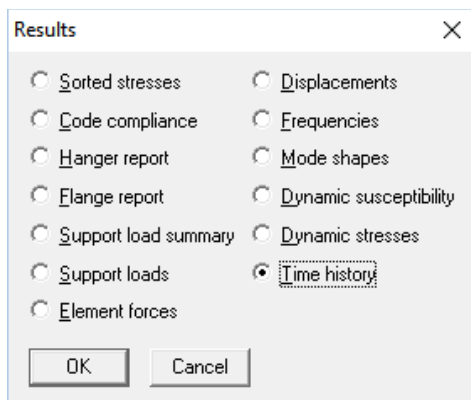
Express the damping factor as a percentage (not as a fraction). Enter 5, not 0.05, for 5% damping.

Step 10:

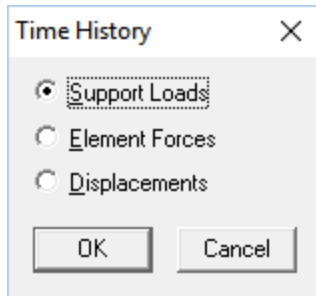
Save the model and perform the analysis through Layout window > File > Analyze. CAEPIPE will apply these loads to compute the response of the piping system by performing a time history analysis along with other load cases defined in the piping system.

Step 11:

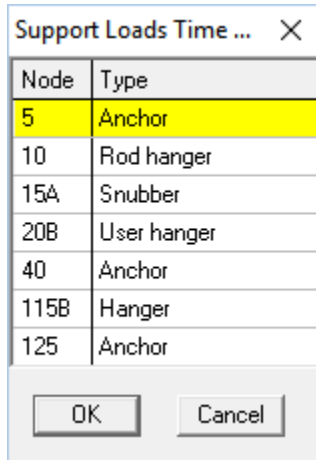
Upon successful analysis, CAEPIPE will now show a new item “Time history” in results dialog as shown below.



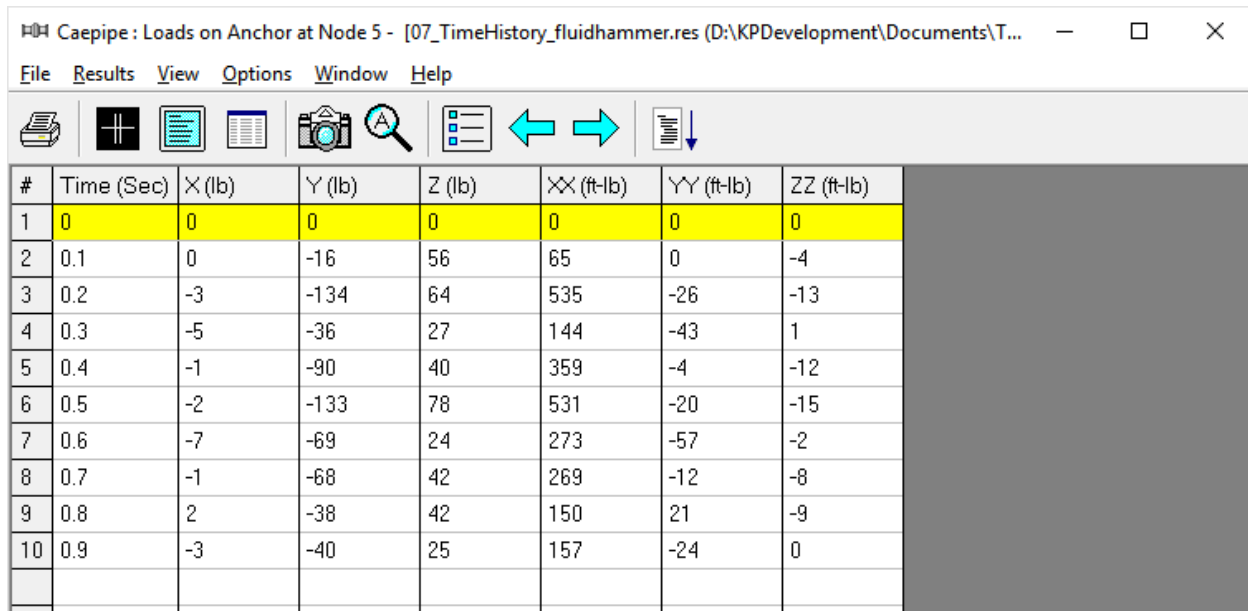
For time history results, you are shown the following dialog from which you need to select an item.



Then, you are shown a list of supports in the model from which you need to select one.



Once you select a support from the list, then you are shown the time history at that location.



While viewing these results, you can export time history results to a comma separated values (.csv) file that can be read by a spreadsheet program such as MS-Excel (see menu File > Export) for further processing.