Model of a stiffened pressure vessel with a vacuum resulting in an external pressure of 100,000 Pa. End closure is 0.0508 m thick, shell 0.3492, frames are 0.5 m high, 0.127 m thick and space 1 m apart. Quarter symmetry, mesh is 10 m long, radius of end closure is 5 m.

Use shell model and solid elements

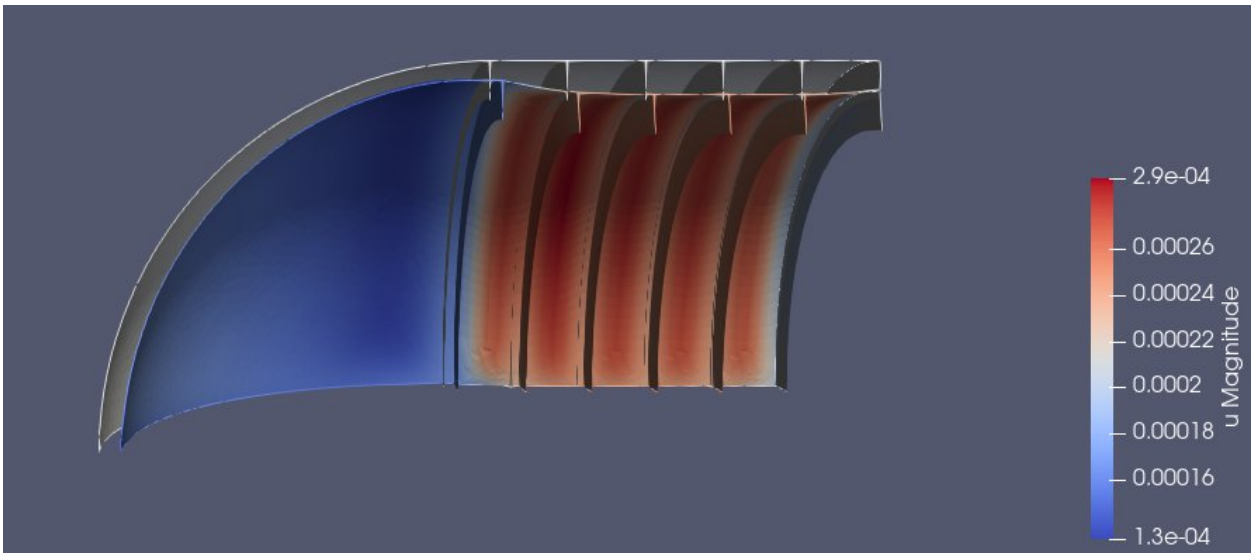
Elmer , shellsolver, stresssolver

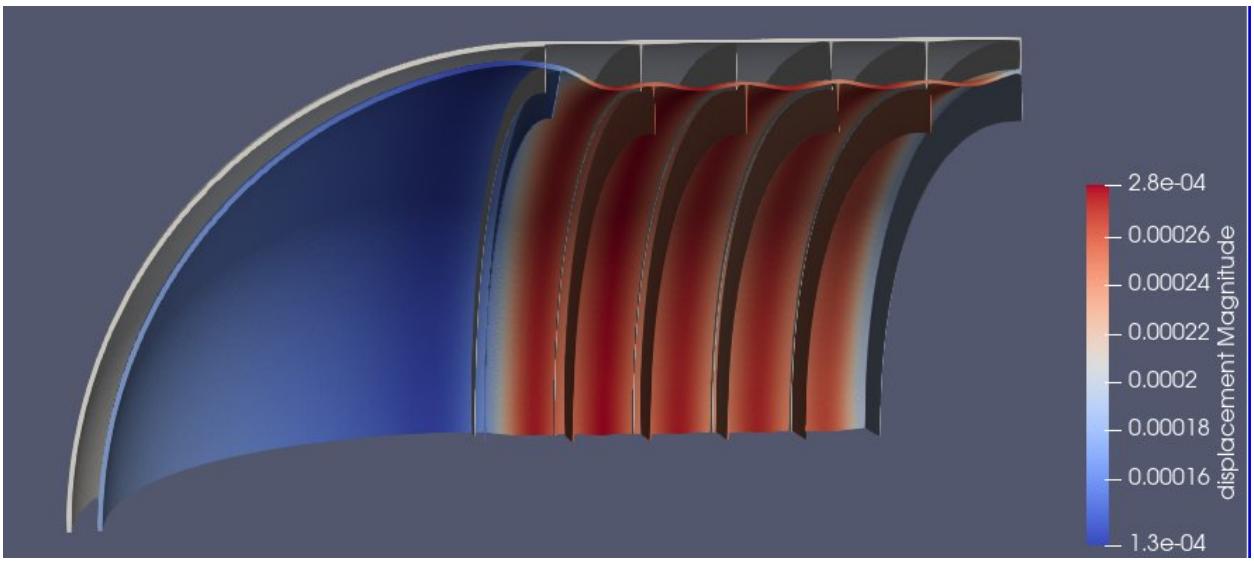
feenox, solid elements

CalculiX, solid, and shell model

ABAQUS, shell Model

Table of results after images





	Frequency Calculation Results	Hz		solid	shell	shell
Mode	Elmer Shell Solver	Elmer Solids	feenox	CalculiX	CalculiX	ABAQUS
1	34.31	30.86	30.85	31.47	30.12	30.54
2	45.09	44.93	44.93	62.18	45.54	43.91
3	45.16	45.02	45.02	95.19	45.98	43.74
	Displacement X direction at nose of tank		meters	solid	shell	shell
	Elmer Shell Solver	Elmer Solids	feenox	CalculiX	CalculiX	ABAQUS
	0.000177	0.000177	0.000177	0.000175	0.00019	0.00019
	Stess XX at aft side of first frame	Pa		solid	shell	shell
	Elmer Shell Solver	Elmer Solids	feenox	CalculiX	CalculiX	ABAQUS
	No stress calc available	-1.20E+07	-1.20E+07	-1.00E+07	-1.00E+07	-1.08E+07
Mode	Buckling			solid	shell	shell
	Elmer Shell Solver	Elmer Solids	feenox	CalculiX	CalculiX	ABAQUS
1	Not available	17.33	Not Available	180.60	23.86	14.46
2		17.38		290.00	24.98	14.50
3		17.47		298.00	26.12	14.65

Displacements and stresses seem consistent across the solvers.

Buckling looks on par except for the CalculiX solid element model

Frequency looks consistent across feenox, CalculiX shell, and ABAQUS shell