

**Stress and Deflection as a Function of the Number of Planes in a Block  
with E(4y)=0.146 mpsi**

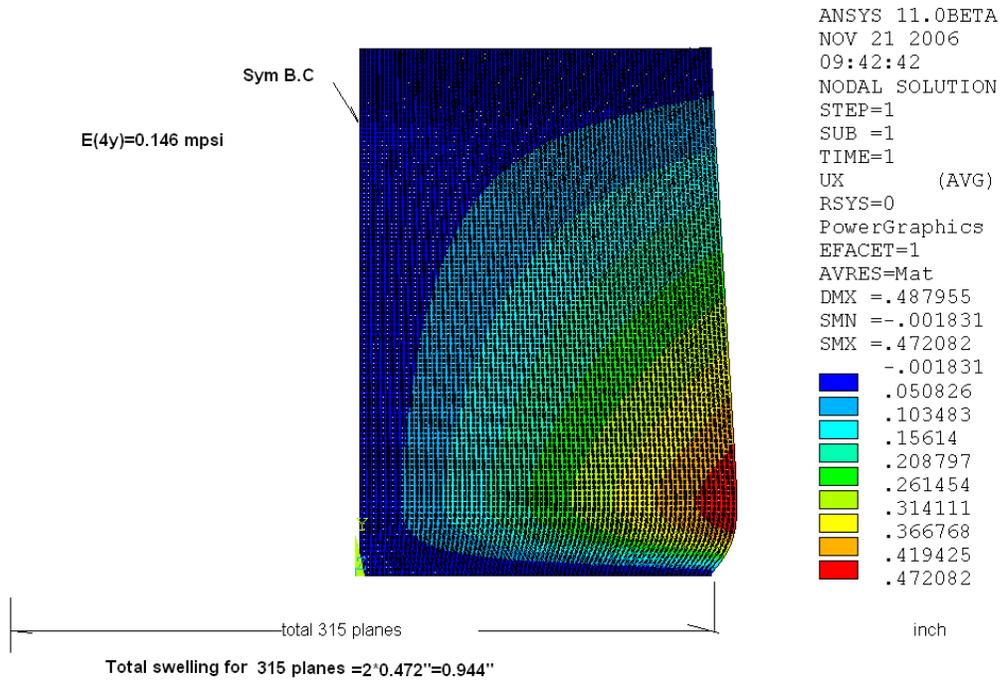
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**Summery**

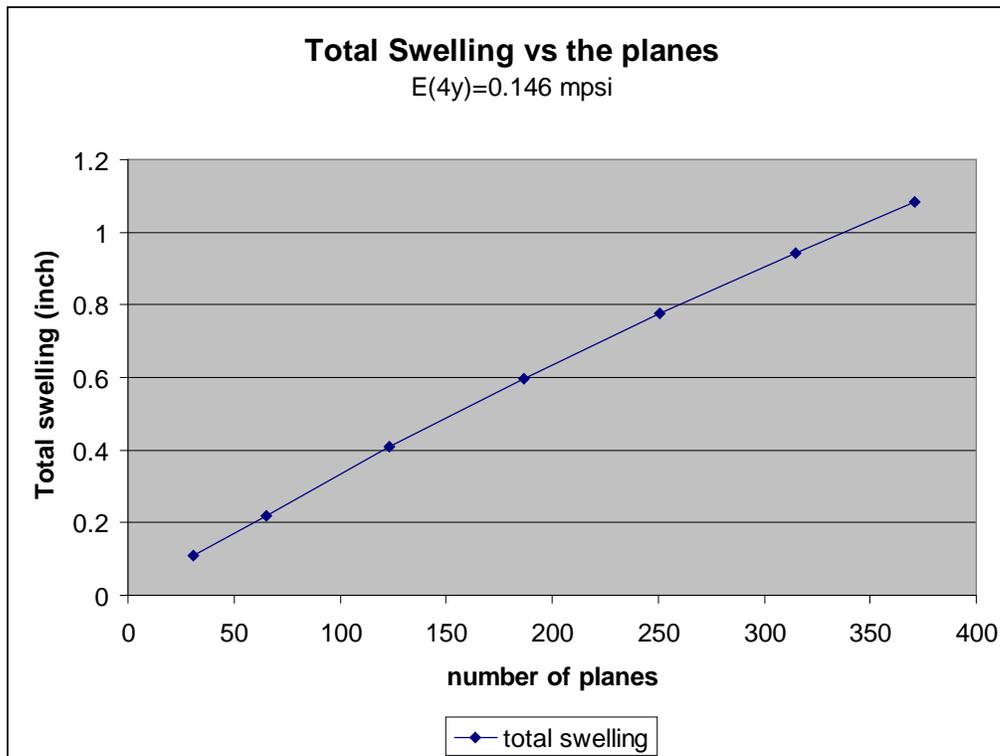
The calculation is done with a similar FEA model as nova-doc-1172, except the number of the planes in a single block being a variable. The PVC modulus used in calculation is 0.146 mpsi, which is a value at the t=4 years from a PET\_B pessimistic curve. The calculation is done for 31, 65, 123, 187, 251,315 and 371 layers in a single block. The result is summarized in Table-1 and Fig 1 through Fig 7. It seems that the number of planes in a block can go as high as ~300 planes if the adhesive peeling strength for Devcon is ~120 lbf/in and 1,200 psi for its shear strength. Pvc stress is around 750 psi.

Table 1 Summery of Result

Number of planes	31	65	123	187	251	315	371
total swelling (inch)	0.110	0.218	0.408	0.598	0.776	0.944	1.084
Stress peak (psi)	777	876	969	1029	1071	1105	1129
Excluding peak (psi)	498	572	664	692	726	752	772
Strain peak (%)	0.53	0.6	0.66	0.7	0.73	0.75	0.77
excluding peak	0.34	0.39	0.44	0.47	0.49	0.51	0.53
Peeling force (lbf/in)	4.27	5.64	9.59	11.83	13.26	14.31	15.01
Shear stress (psi)	159.79	190.25	216.77	232.92	238.76	247.19	252.84

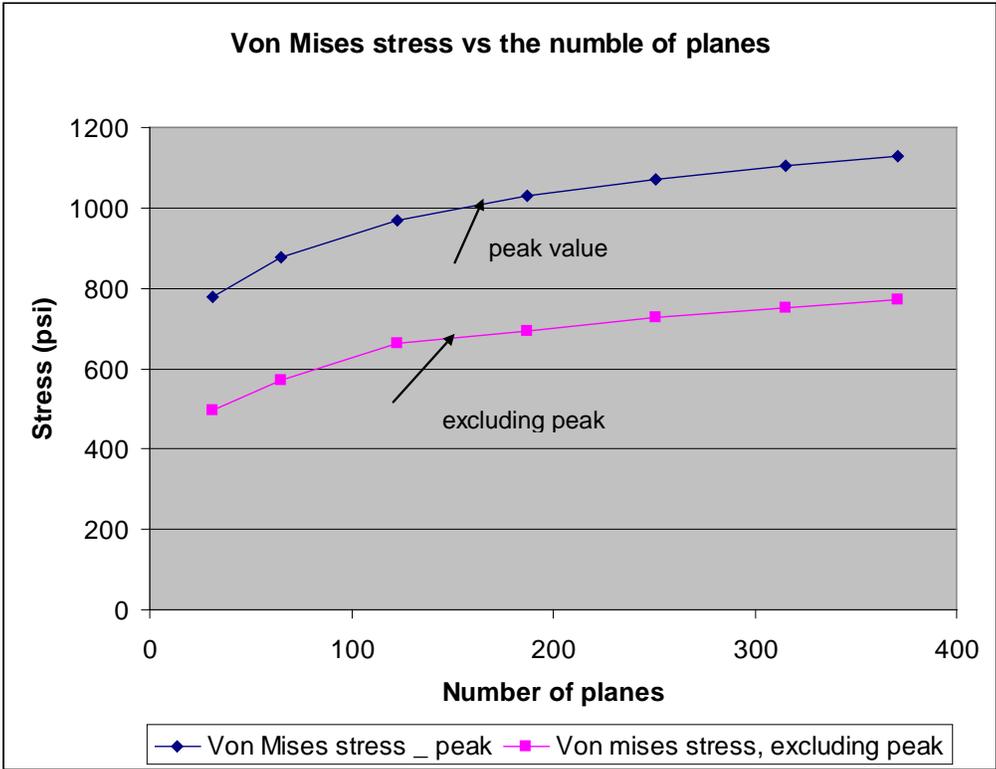


**Fig 1 Total swelling shape for a 315 planes block**

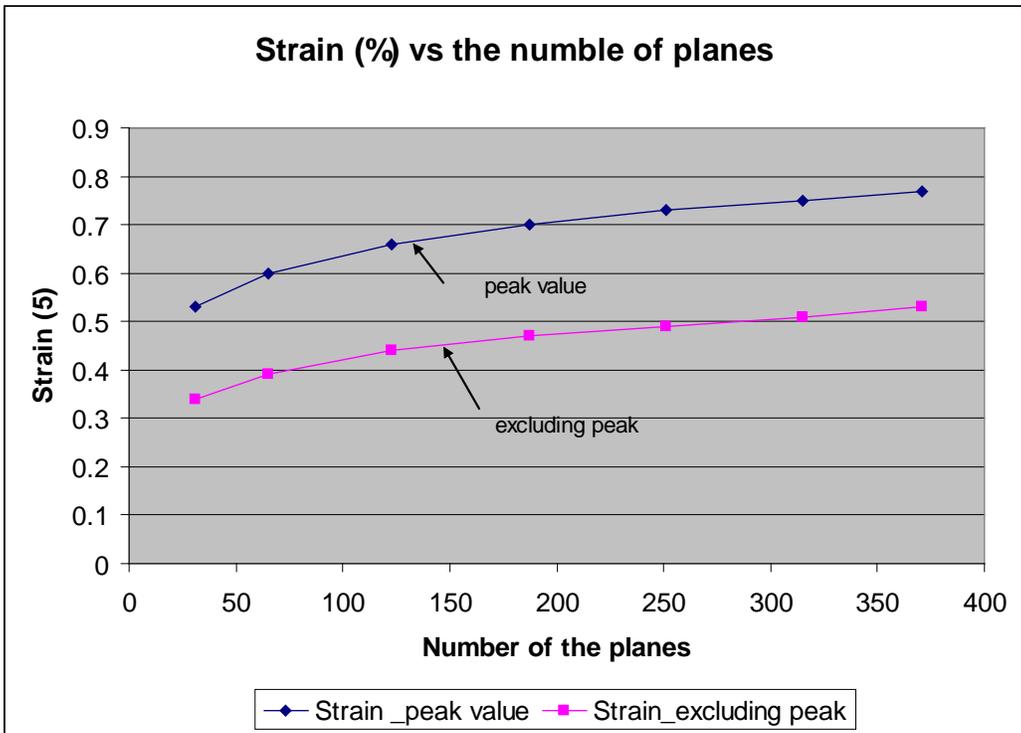


**Fig 2**

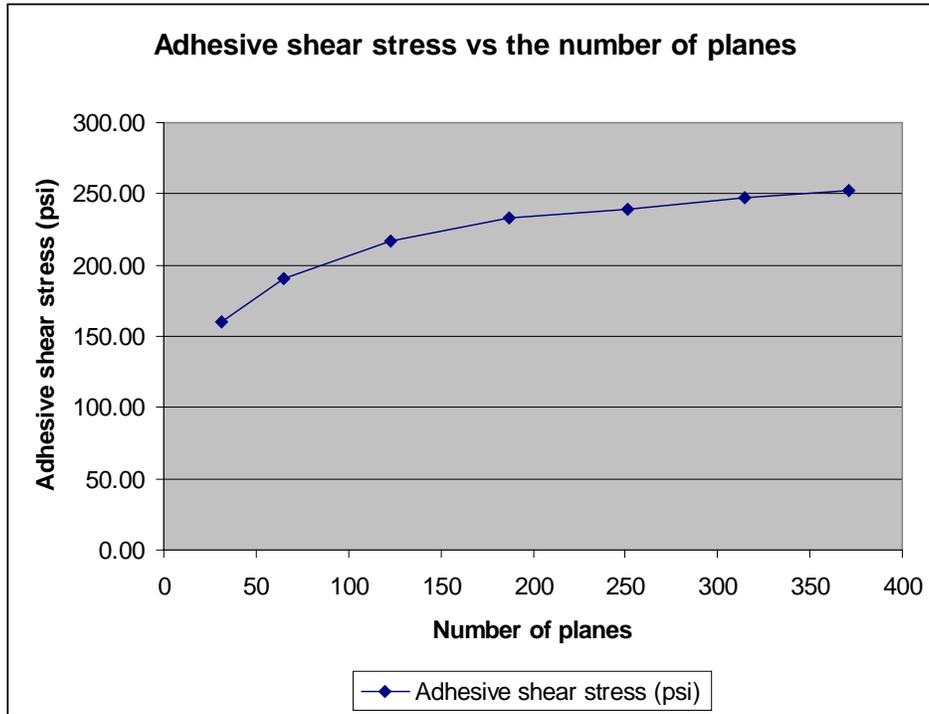
**Total Swelling vs the number of planes**



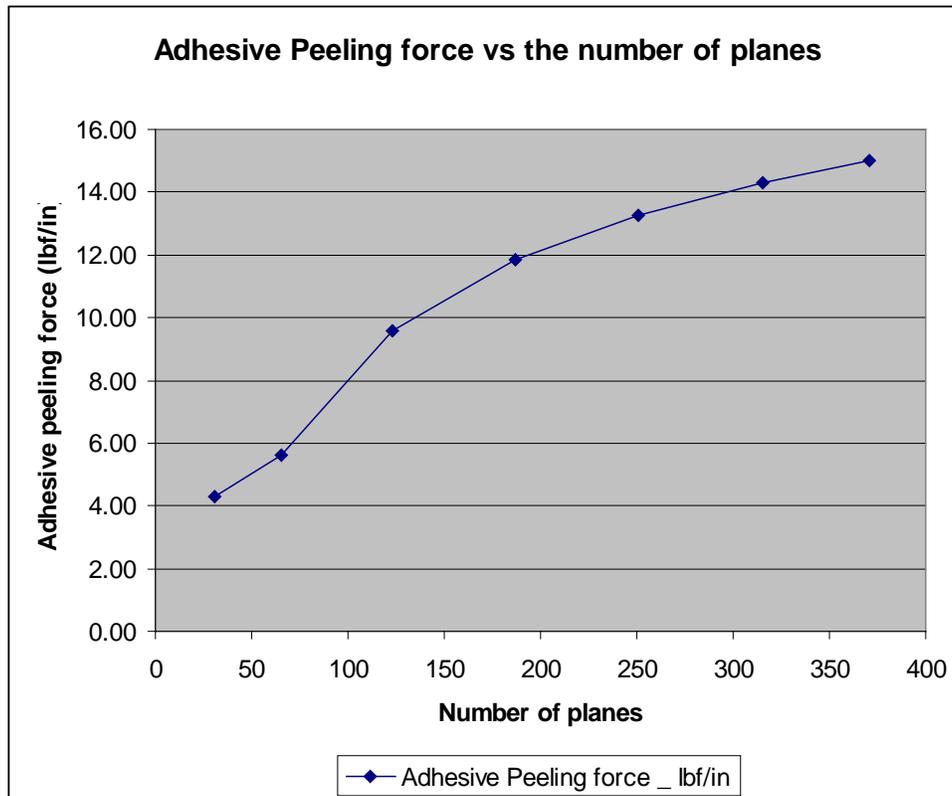
**Fig 3 Von Mises Stress Vs the number of planes**



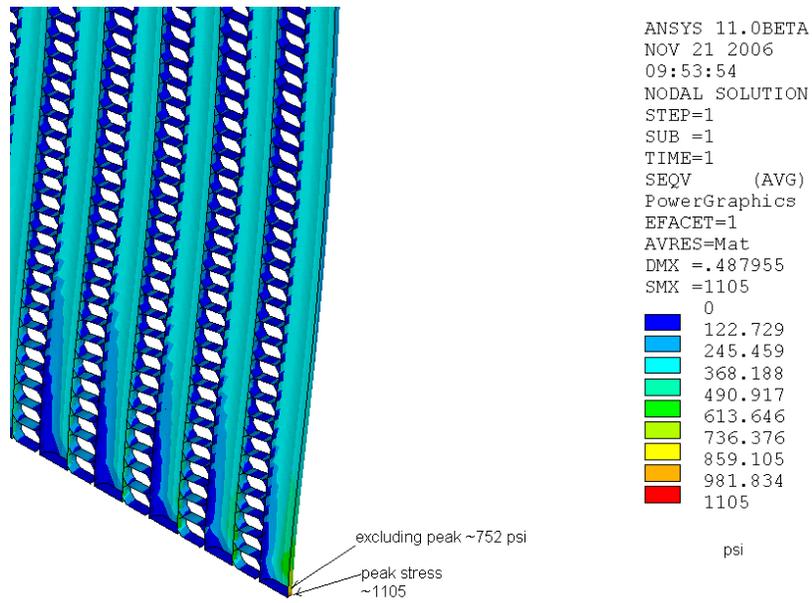
**Fig 4 Von Mises strain (%)**



**Fig5 Adhesive shear stress**



**Fig 6 Peeling force**



**Fig 7 Von Mises stress for a 315 planes block**

Note: The peak stress occurs on its lower end corner. It is a secondary stress. The extra wall thickness (~3 mm) from the end cap has been not used in the calculation.