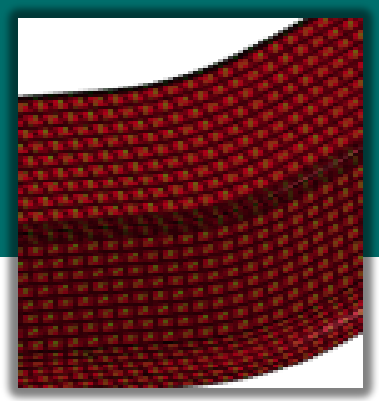

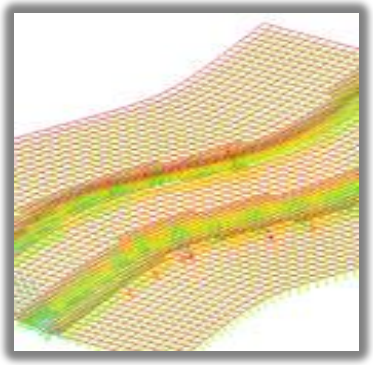

Neuerungen in LS-PrePost für das Pre- und Postprocessing von Composites

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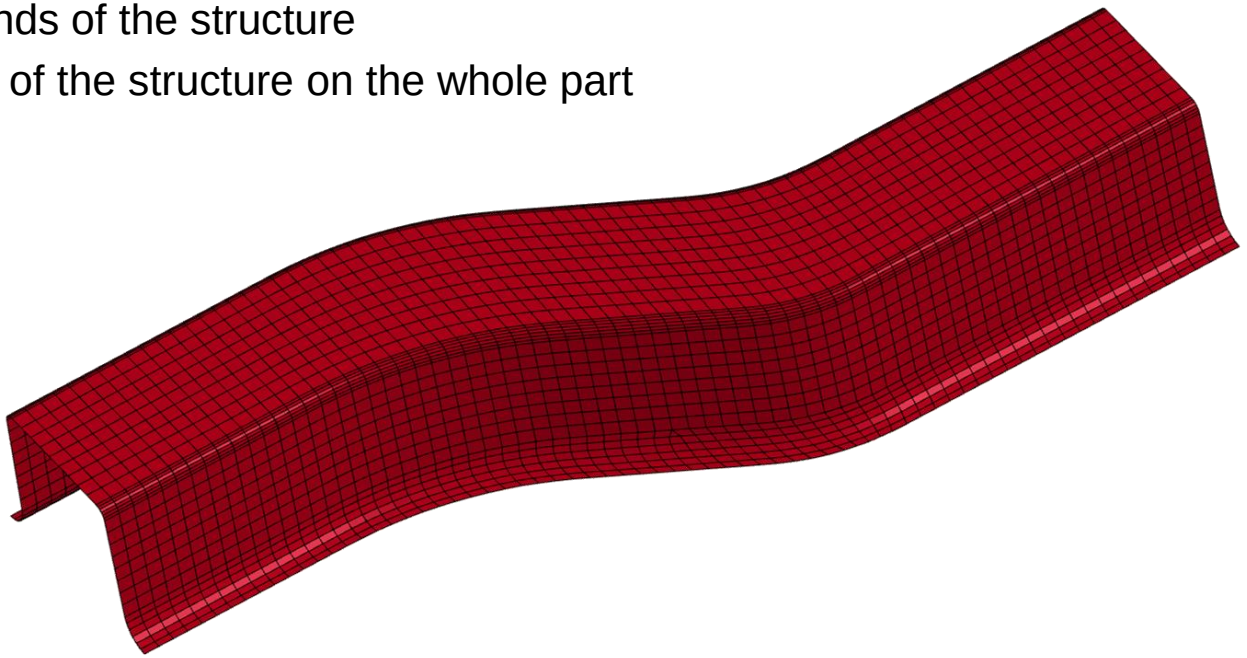
Linköping

Pre-Processing

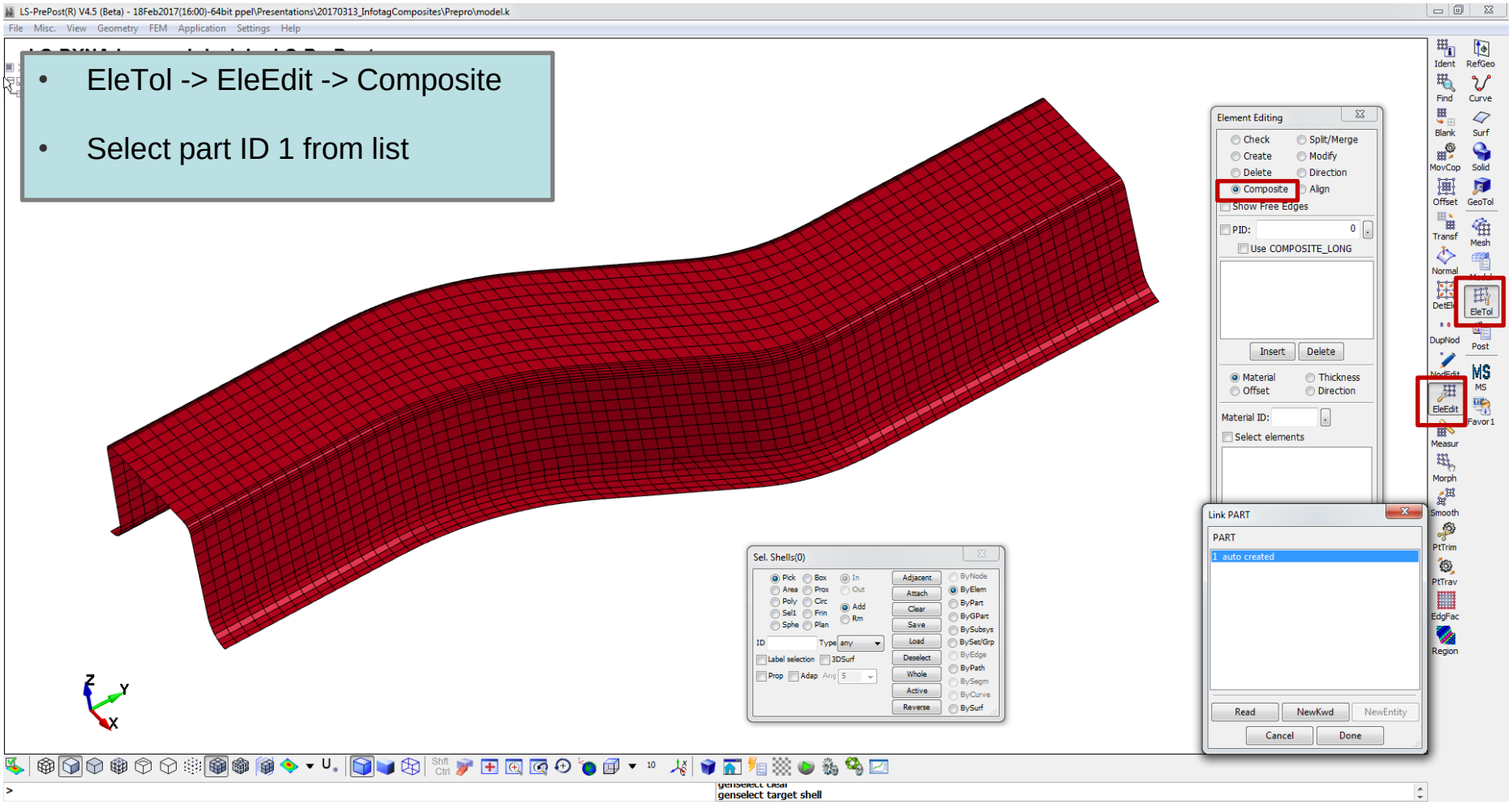
Example case

- **Definition of a composite structure for S-Rail**

- **Lay-Up**
  - 0° whole part
  - 45° whole part
  - 90° only near the ends of the structure
  - along the curvature of the structure on the whole part

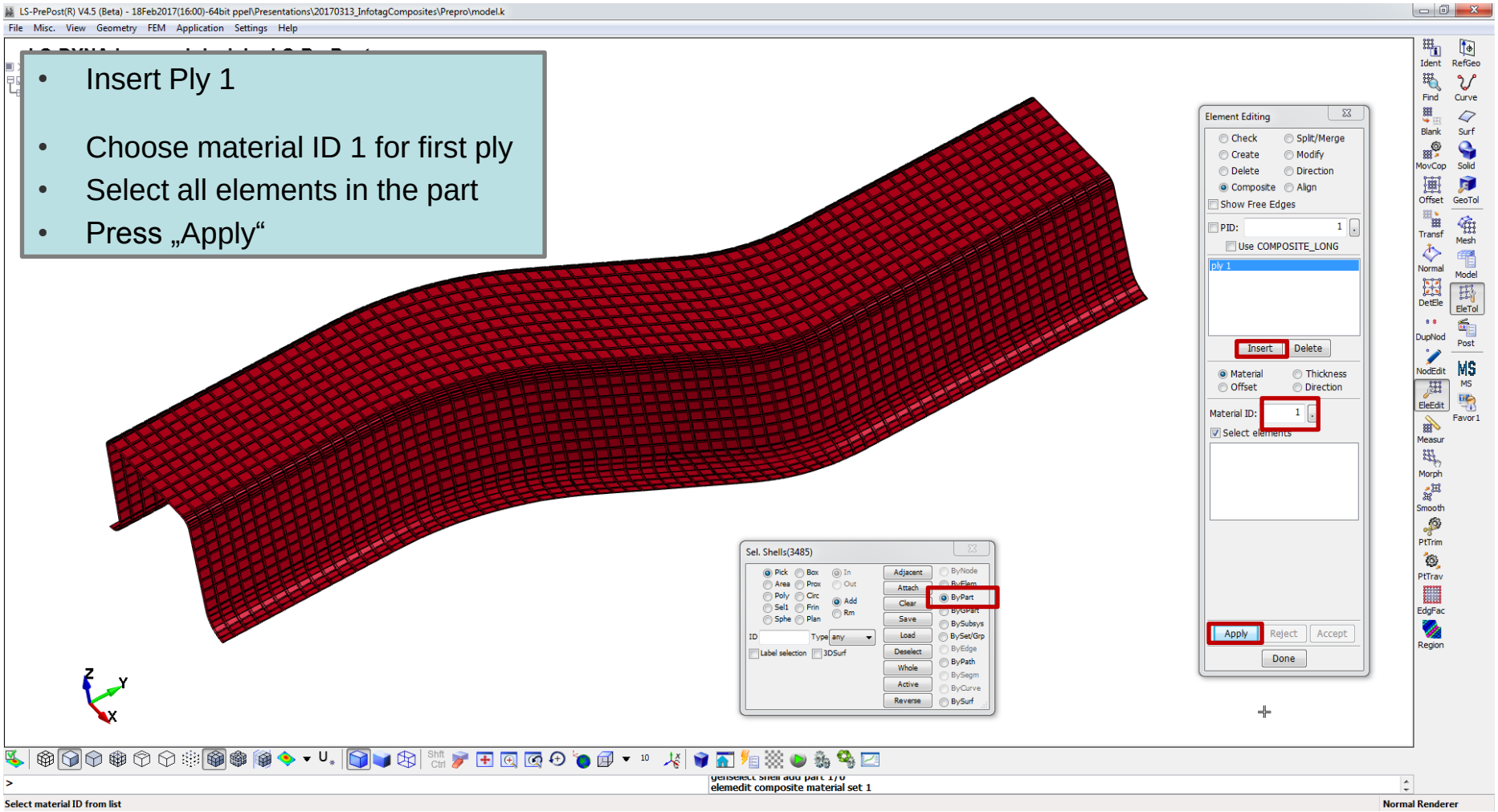


Composite Module

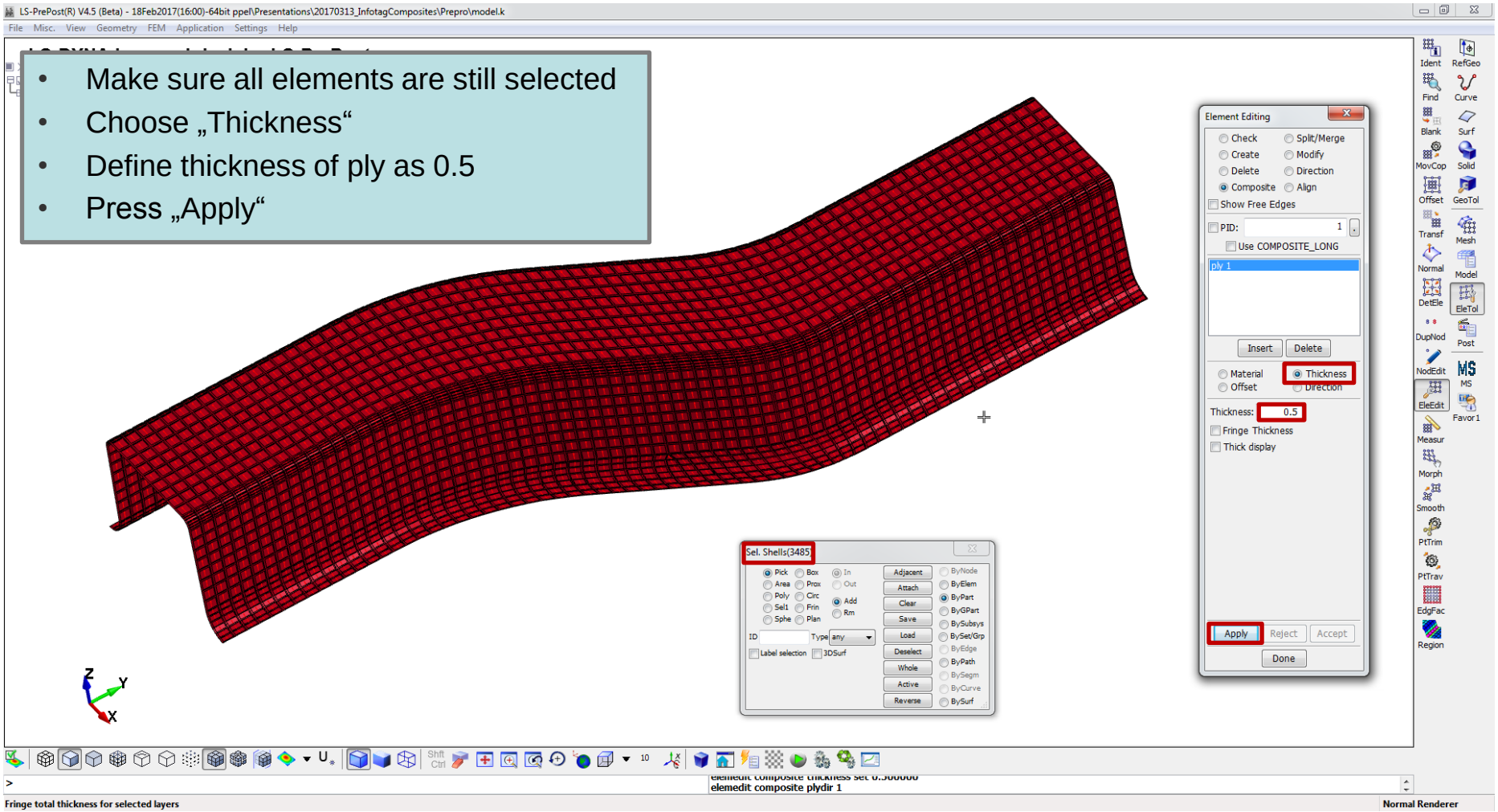


Material assignment (1st ply)

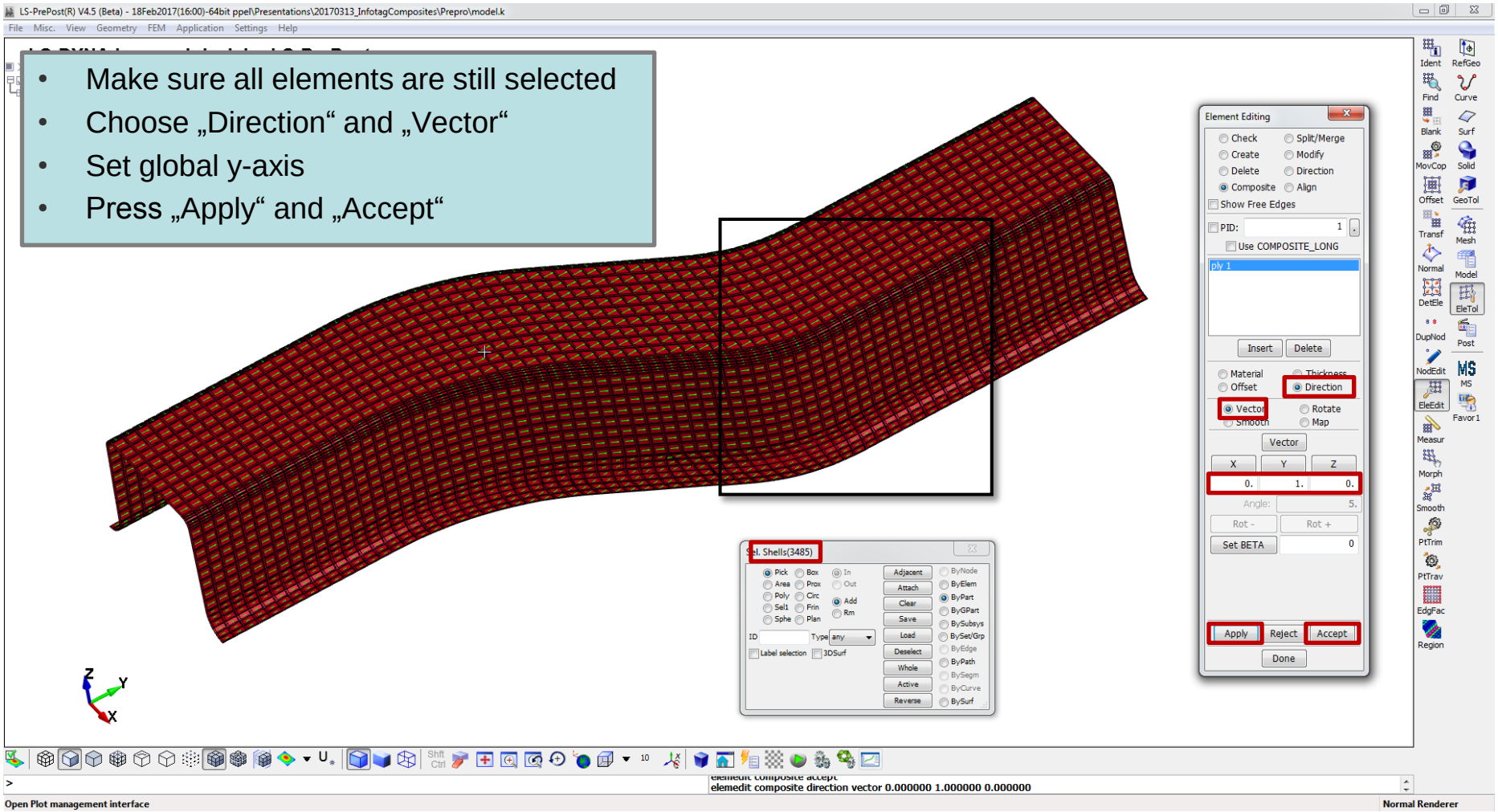
- Insert Ply 1
- Choose material ID 1 for first ply
- Select all elements in the part
- Press „Apply“



Ply thickness (1st ply)

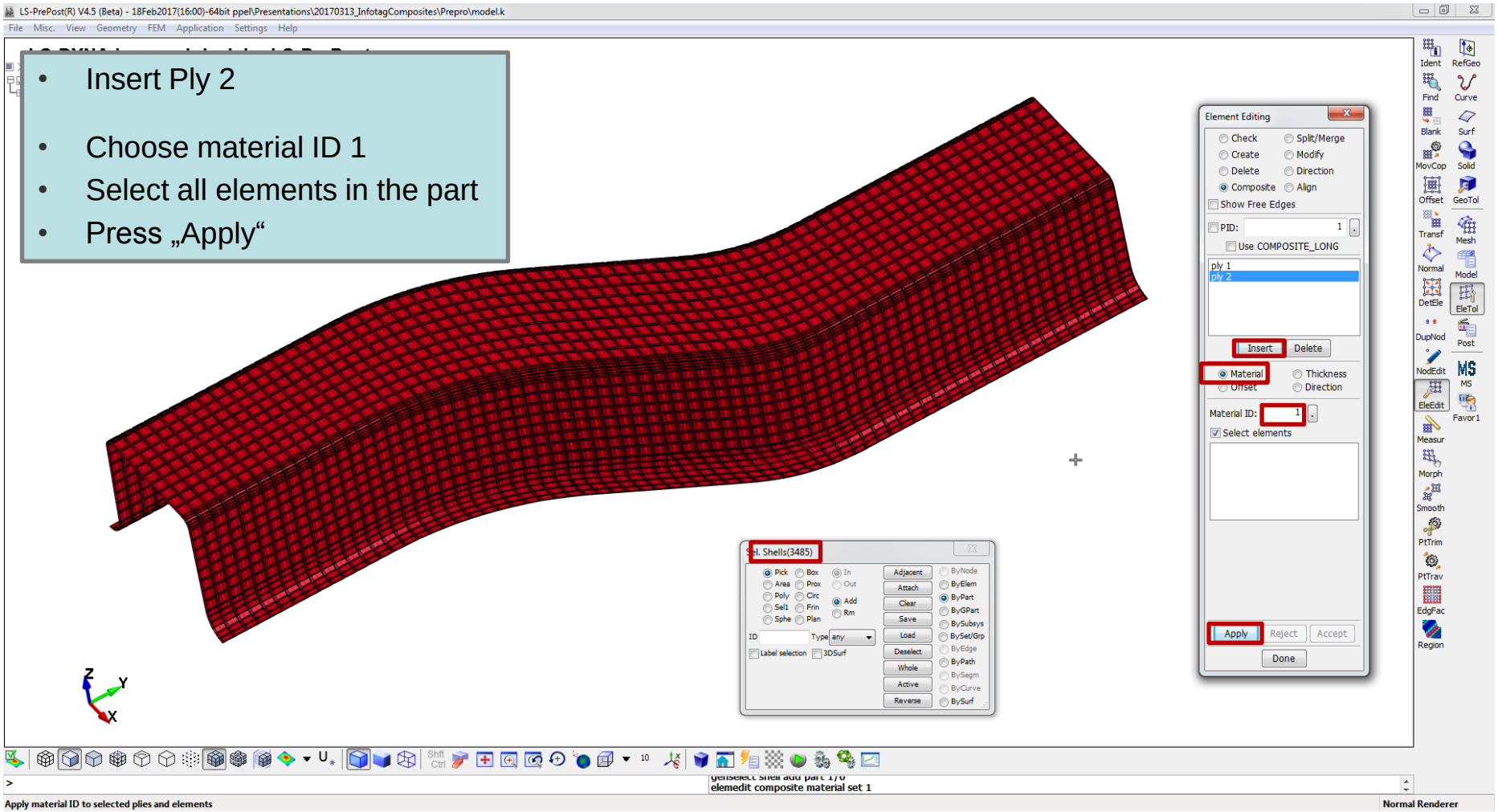


Ply orientation (1st ply: global y-axis)



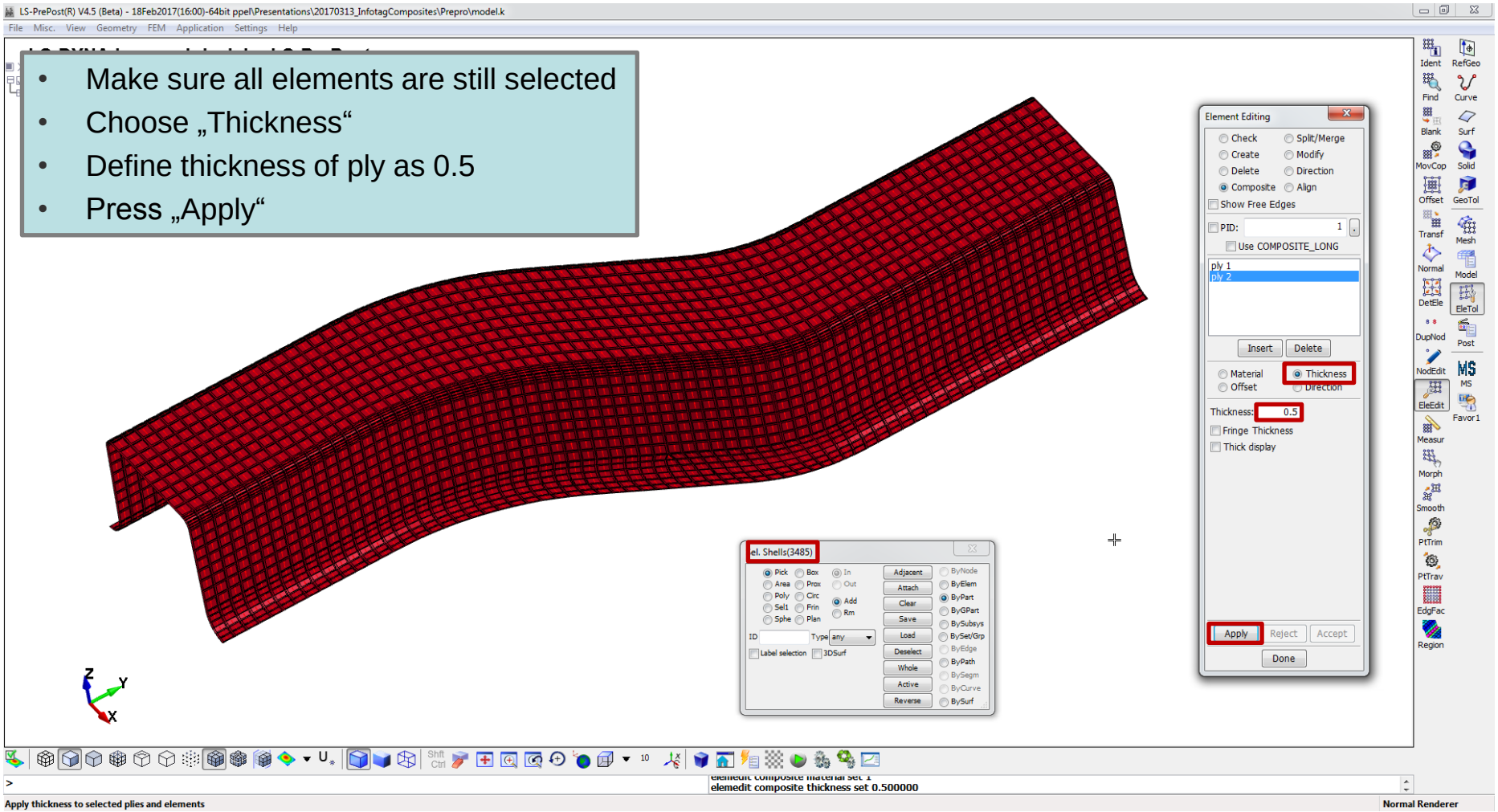
Material definition (2nd ply)

- Insert Ply 2
- Choose material ID 1
- Select all elements in the part
- Press „Apply“

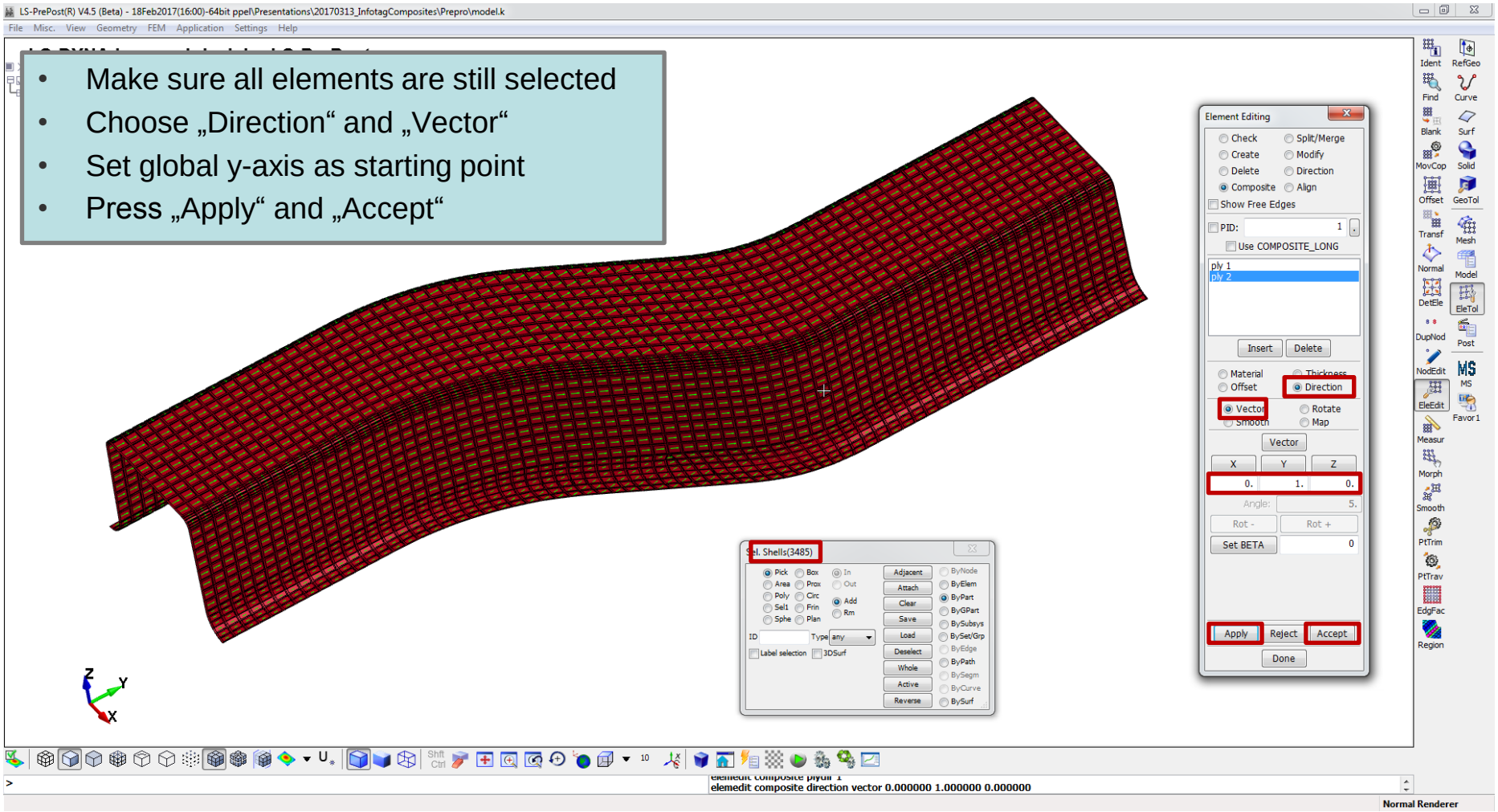


Ply thickness (2nd ply)

- Make sure all elements are still selected
- Choose „Thickness“
- Define thickness of ply as 0.5
- Press „Apply“

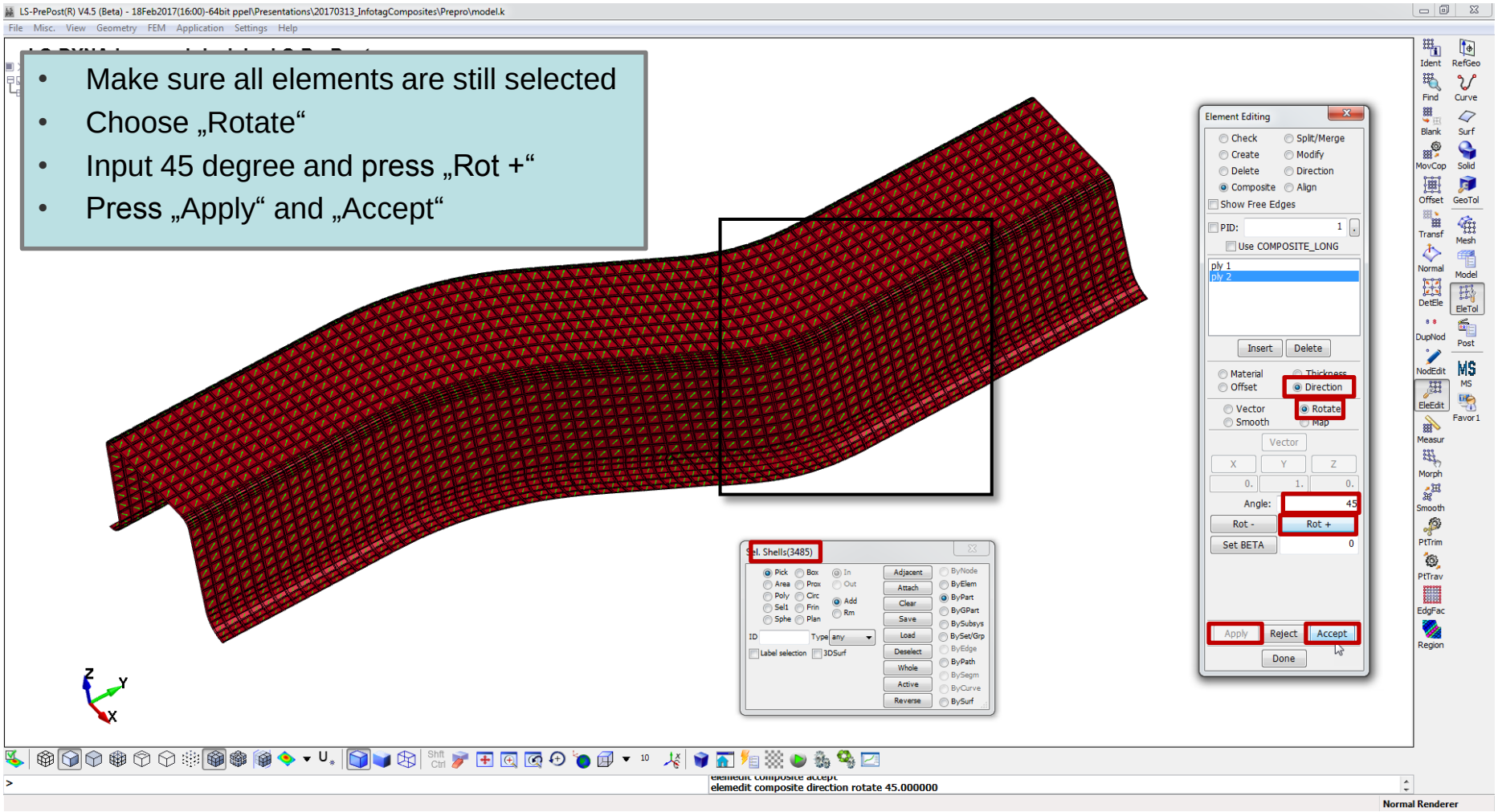


Ply orientation (2nd ply: 45° wrt 1st ply)

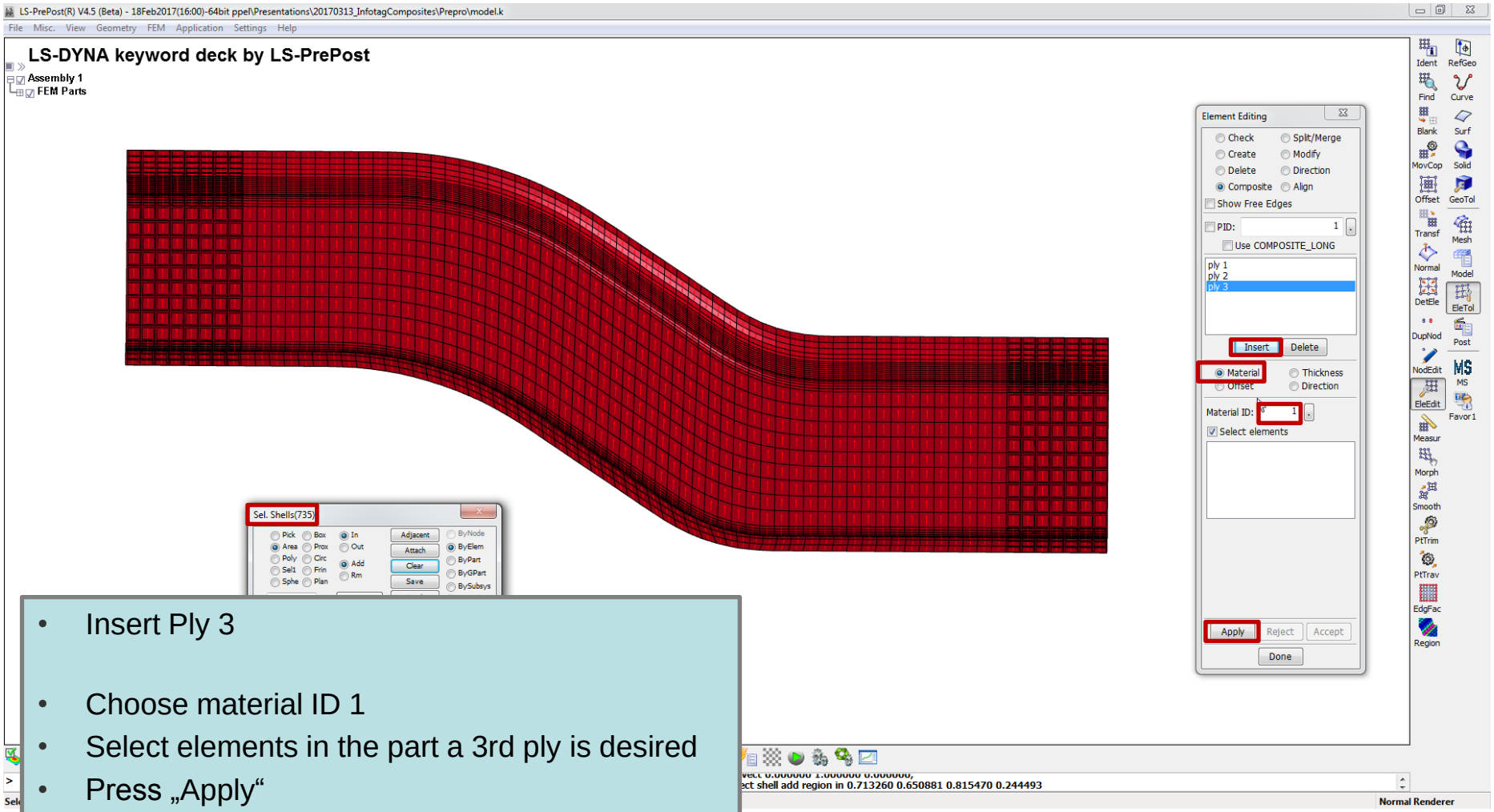


Ply orientation (2nd ply: 45° wrt 1st ply)

- Make sure all elements are still selected
- Choose „Rotate“
- Input 45 degree and press „Rot +“
- Press „Apply“ and „Accept“

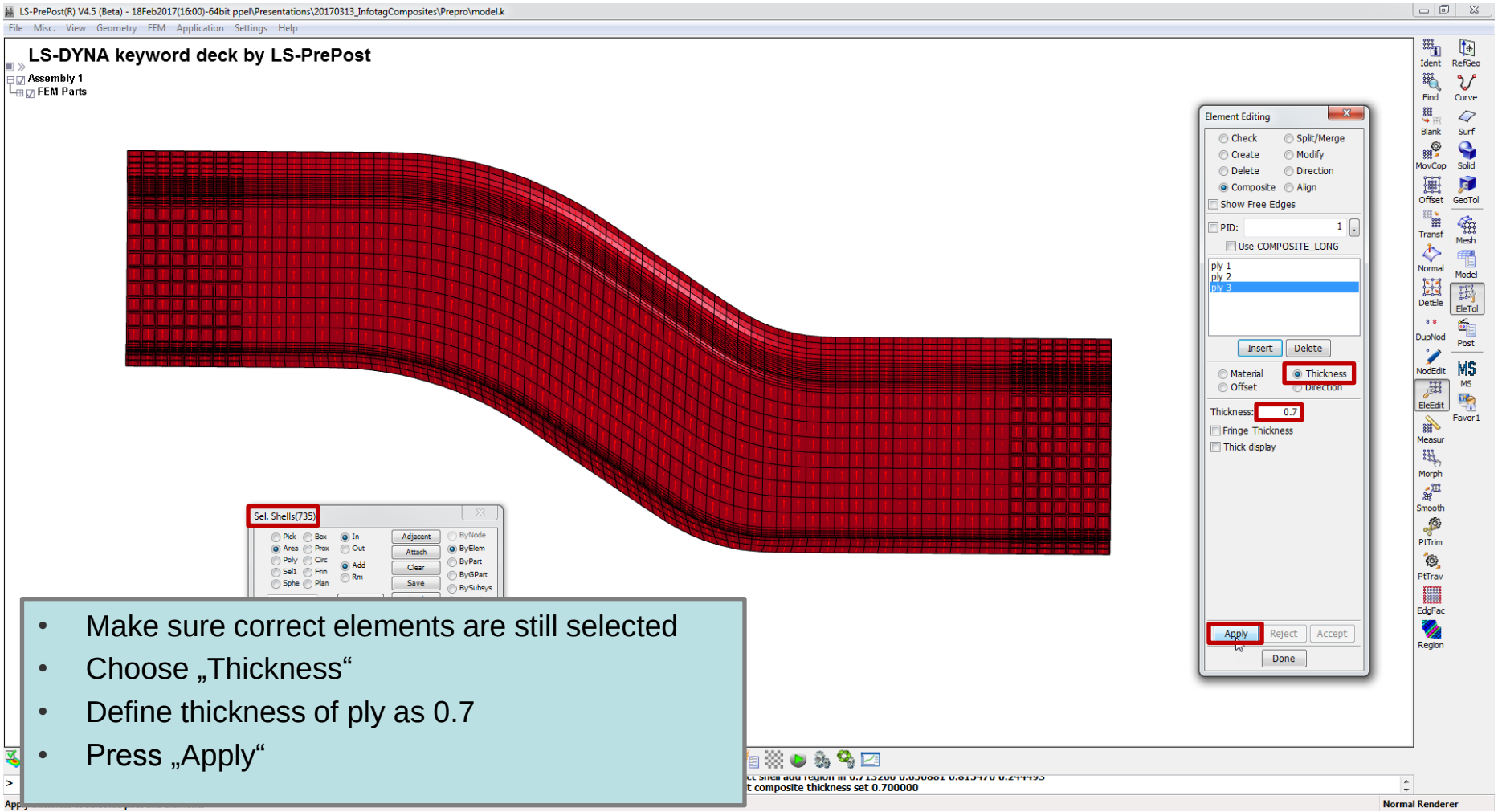


Material definition (3rd ply)



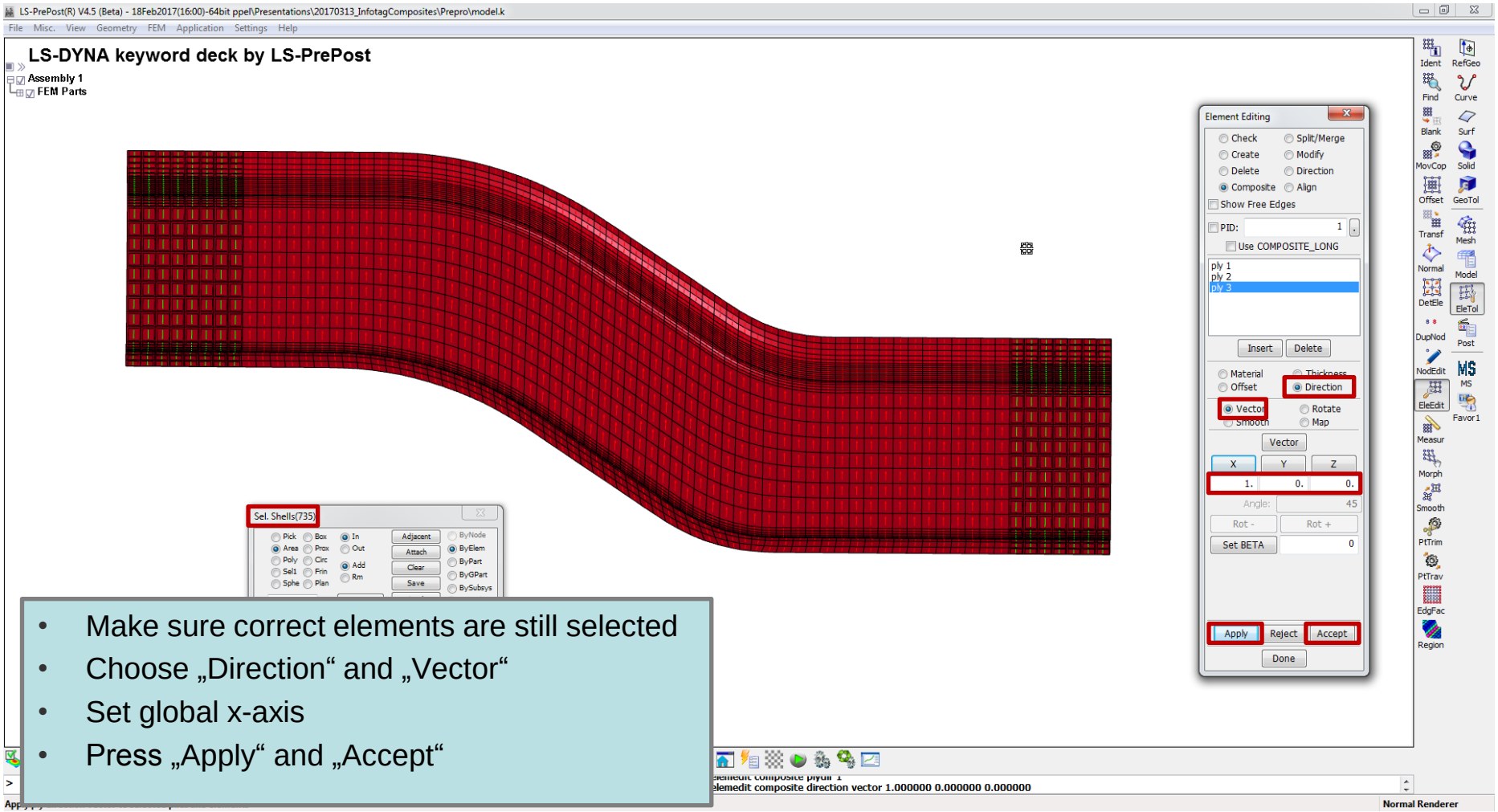
- Insert Ply 3
- Choose material ID 1
- Select elements in the part a 3rd ply is desired
- Press „Apply“

Ply thickness (3rd ply)



- Make sure correct elements are still selected
- Choose „Thickness“
- Define thickness of ply as 0.7
- Press „Apply“

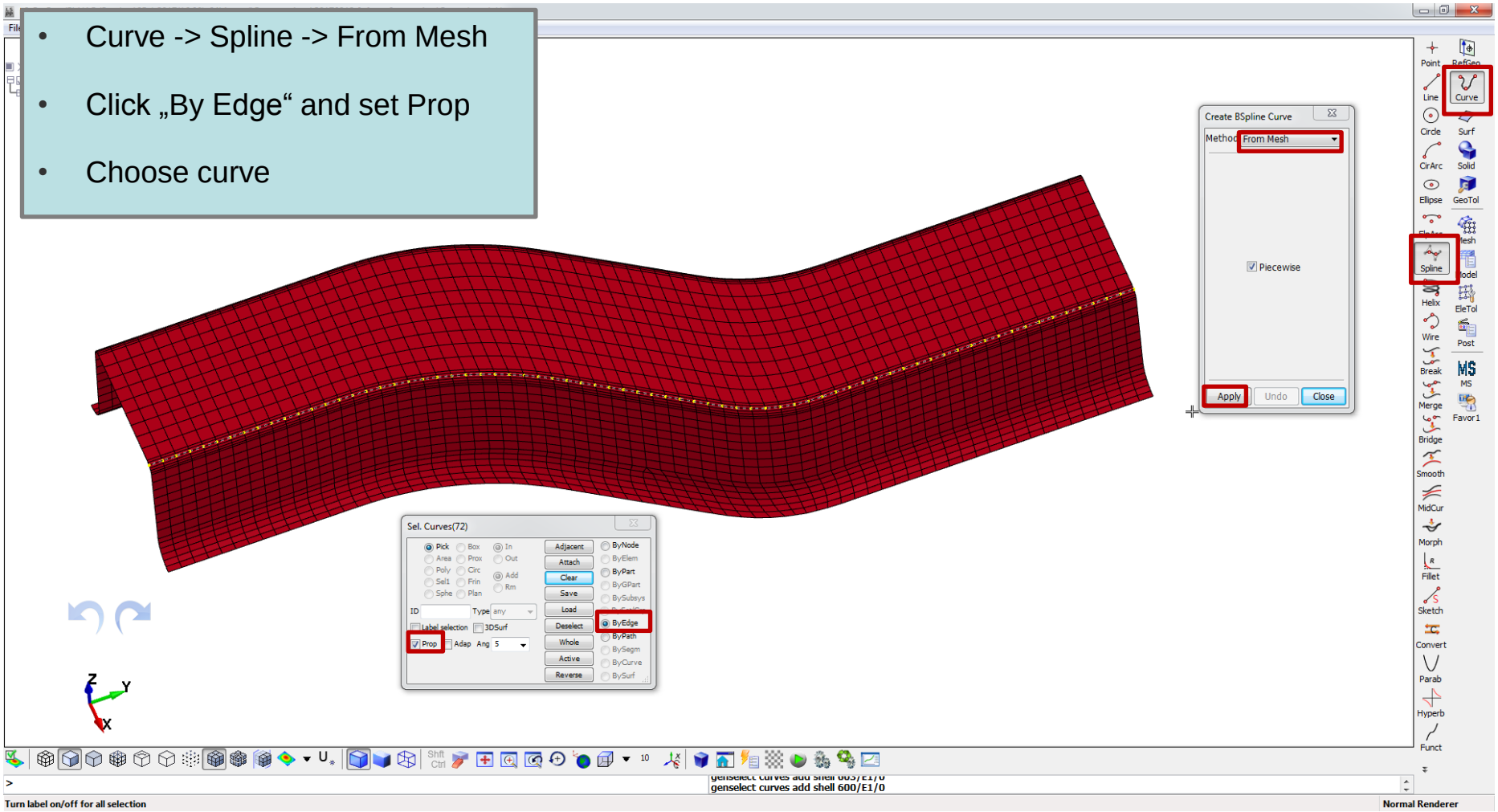
Ply orientation (3rd ply: global x-axis)



- Make sure correct elements are still selected
- Choose „Direction“ and „Vector“
- Set global x-axis
- Press „Apply“ and „Accept“

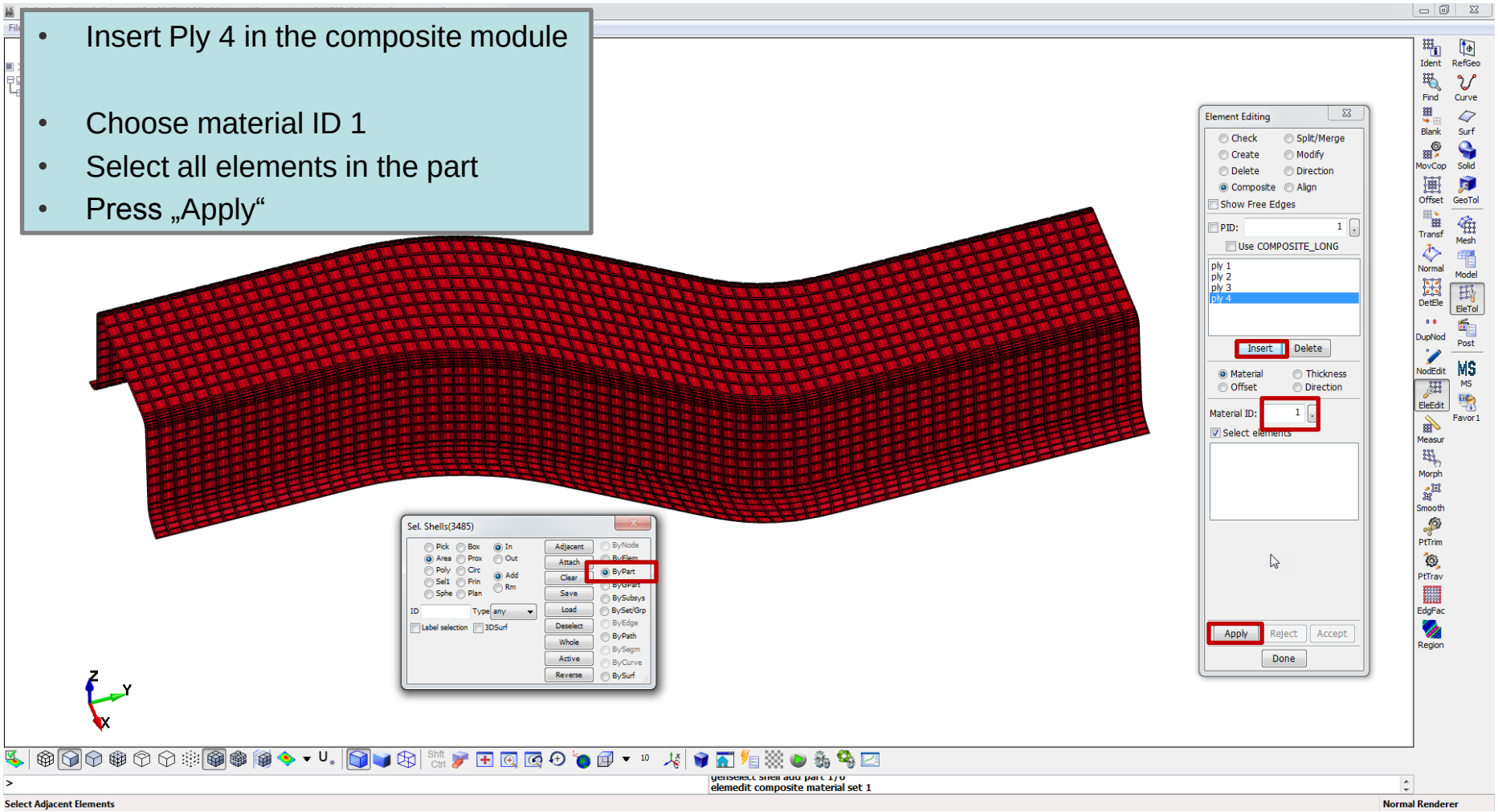
Define curve for orientation of 4th ply

- Curve -> Spline -> From Mesh
- Click „By Edge“ and set Prop
- Choose curve



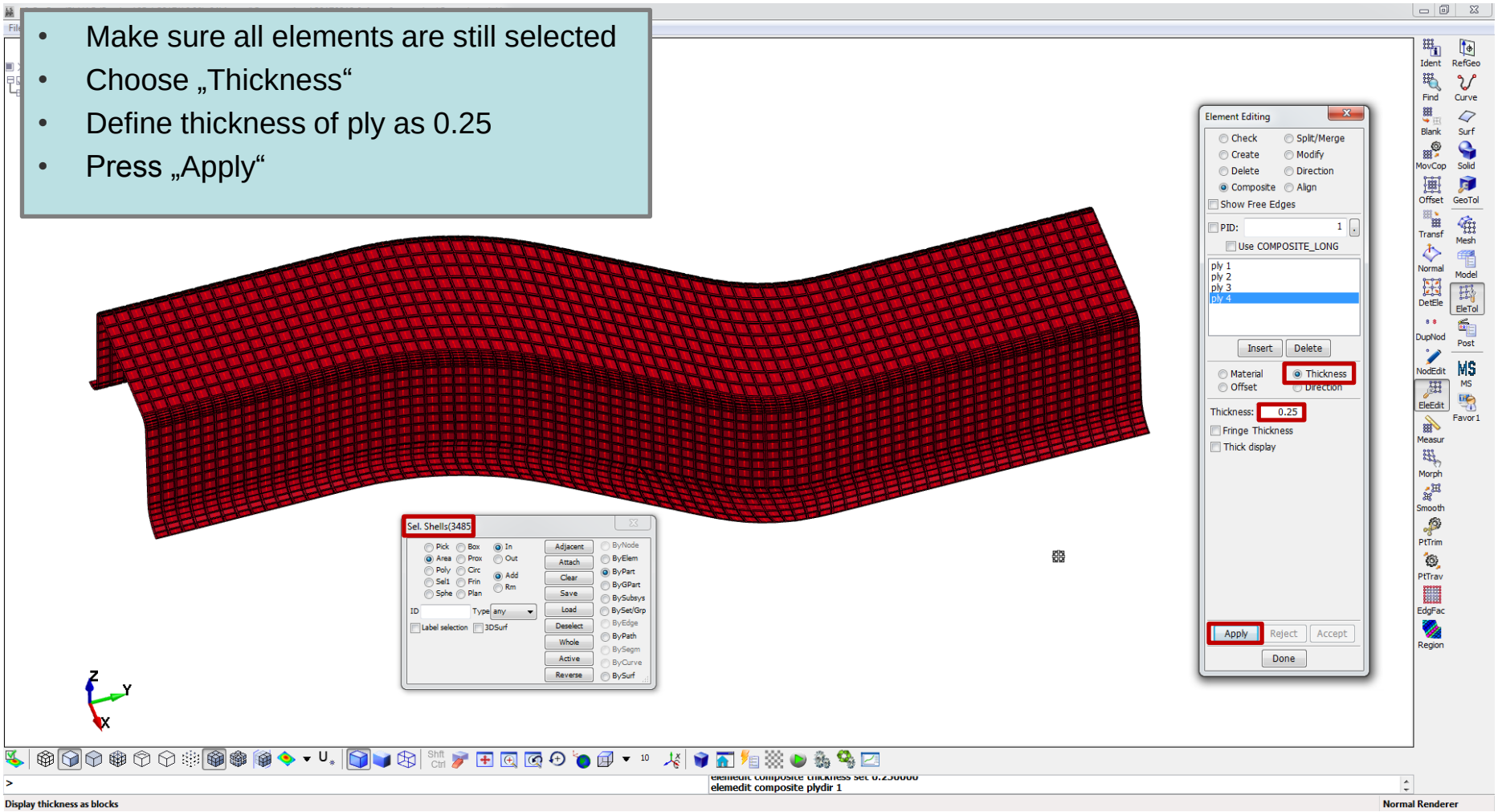
Material definition (4th ply)

- Insert Ply 4 in the composite module
- Choose material ID 1
- Select all elements in the part
- Press „Apply“

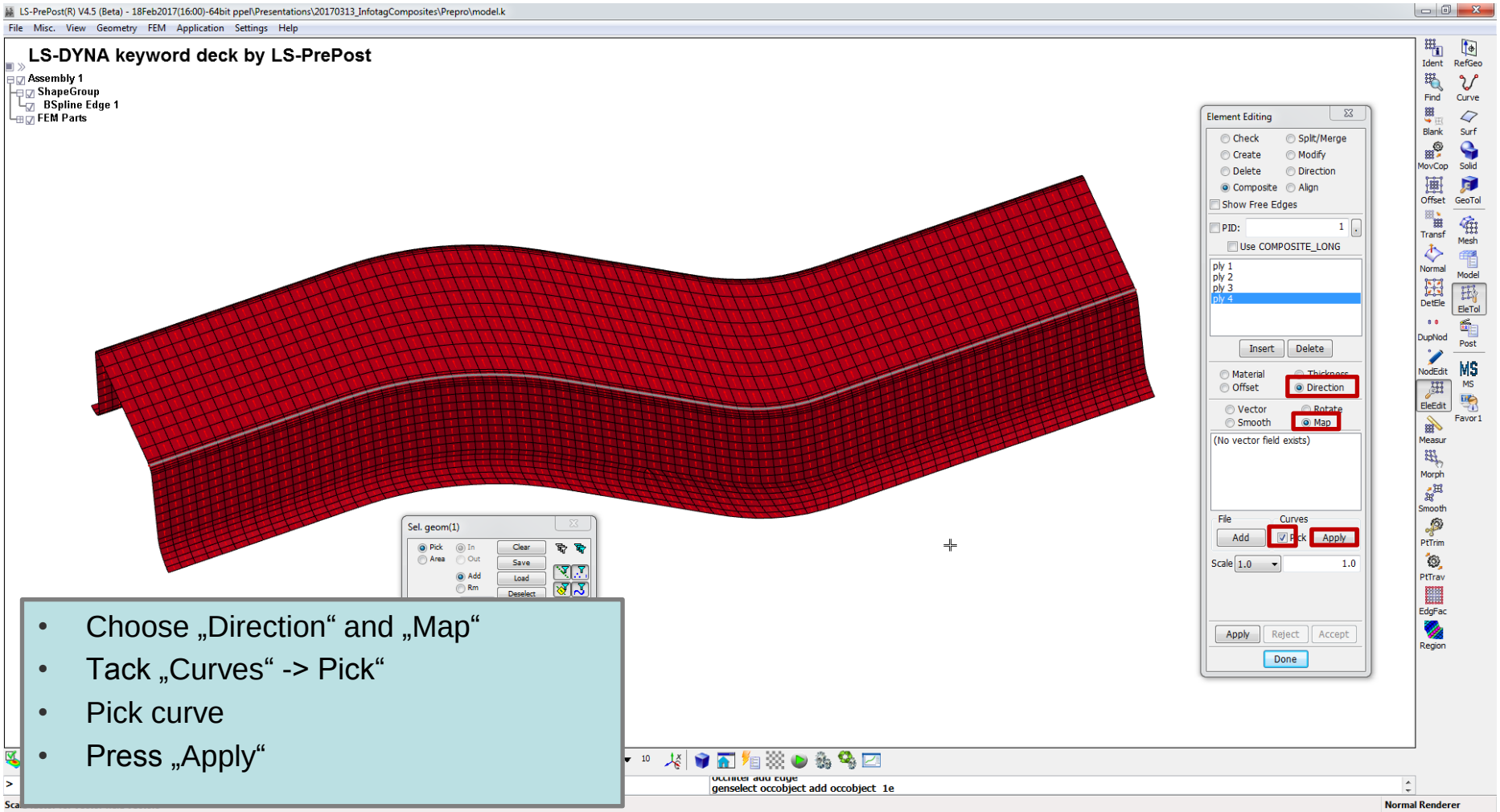


Ply thickness (4th ply)

- Make sure all elements are still selected
- Choose „Thickness“
- Define thickness of ply as 0.25
- Press „Apply“



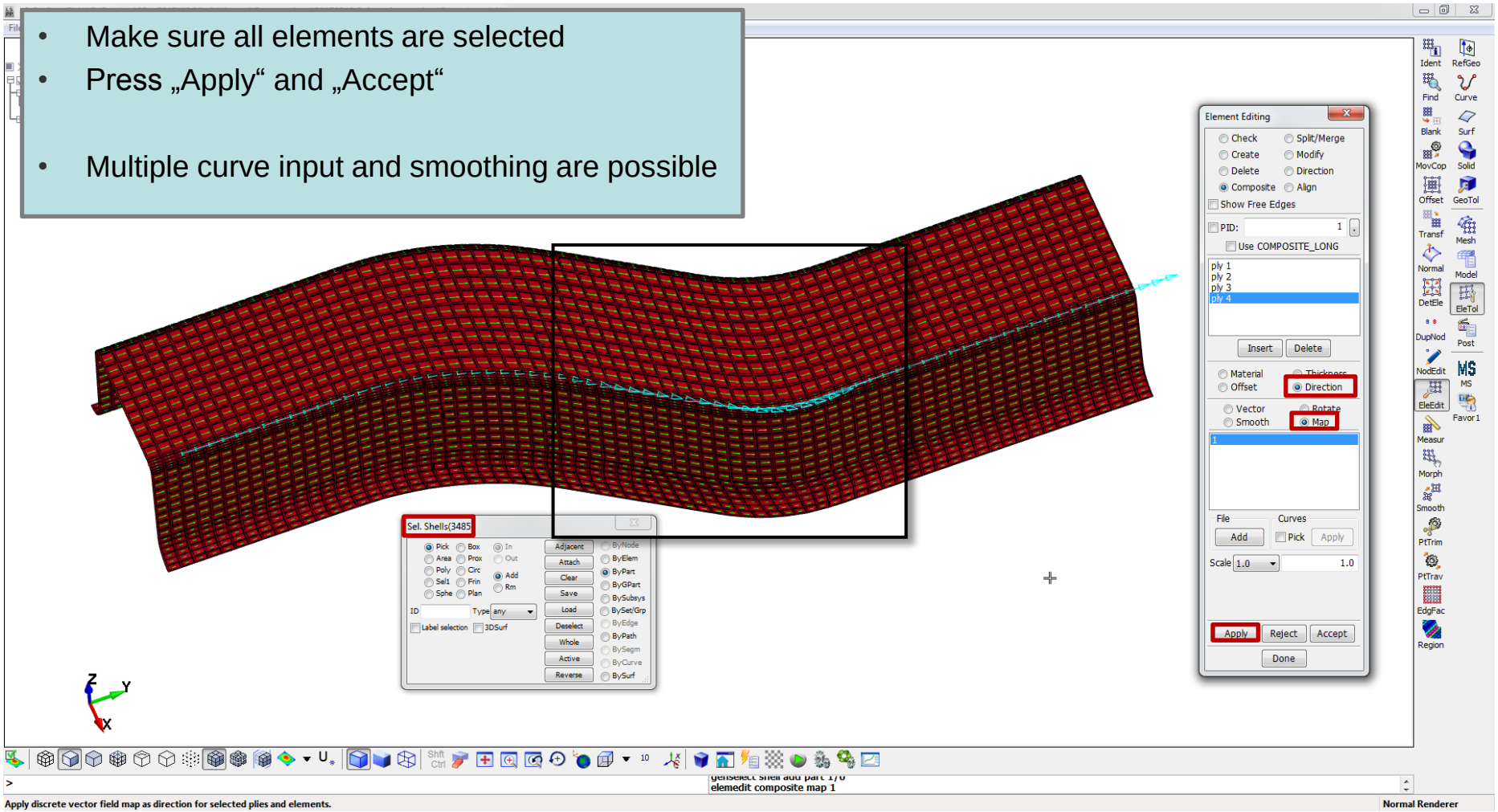
Ply orientation (4th ply: along curve)



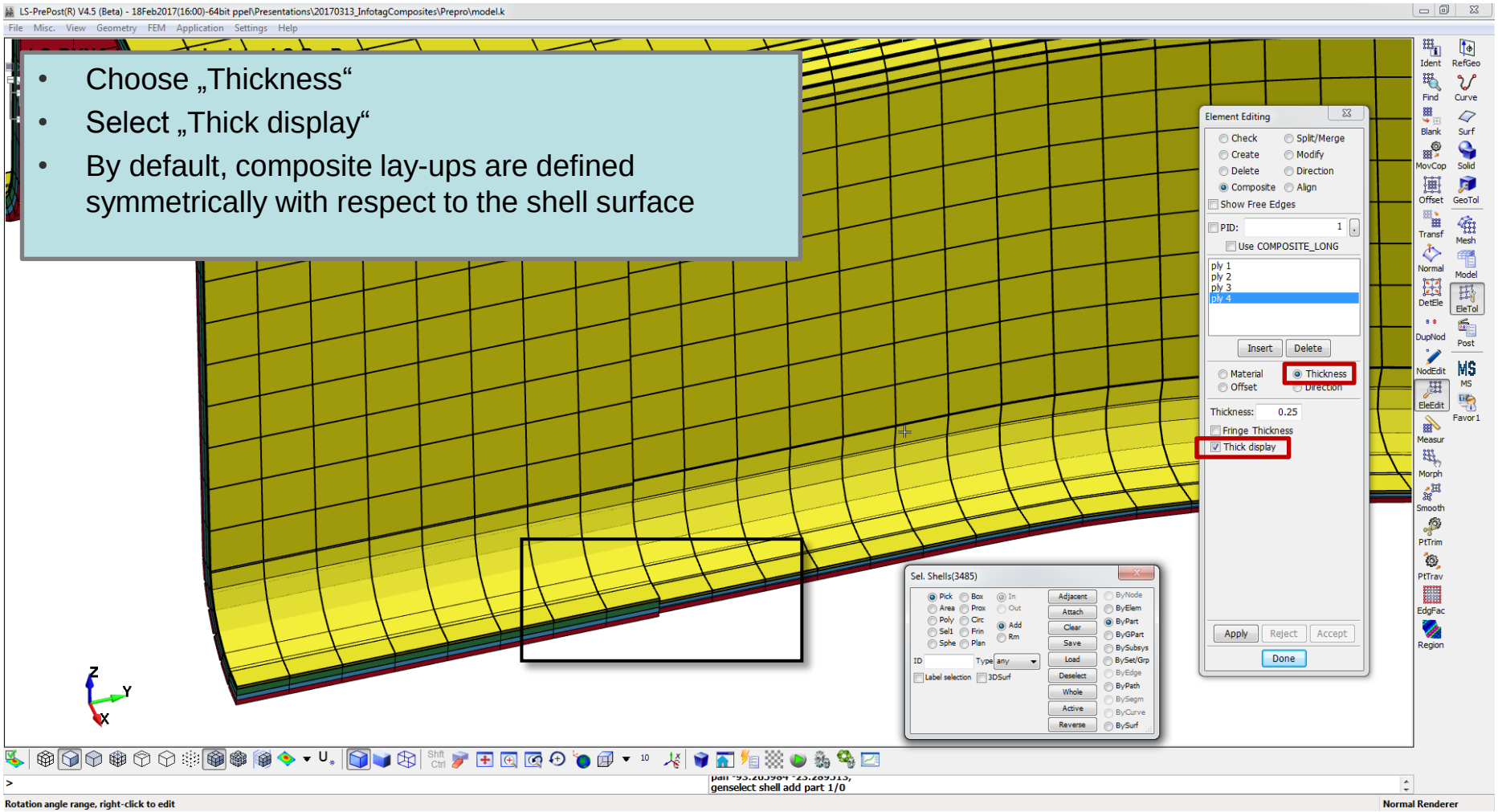
- Choose „Direction“ and „Map“
- Tack „Curves“ -> Pick“
- Pick curve
- Press „Apply“

Ply orientation (4th ply: along curve)

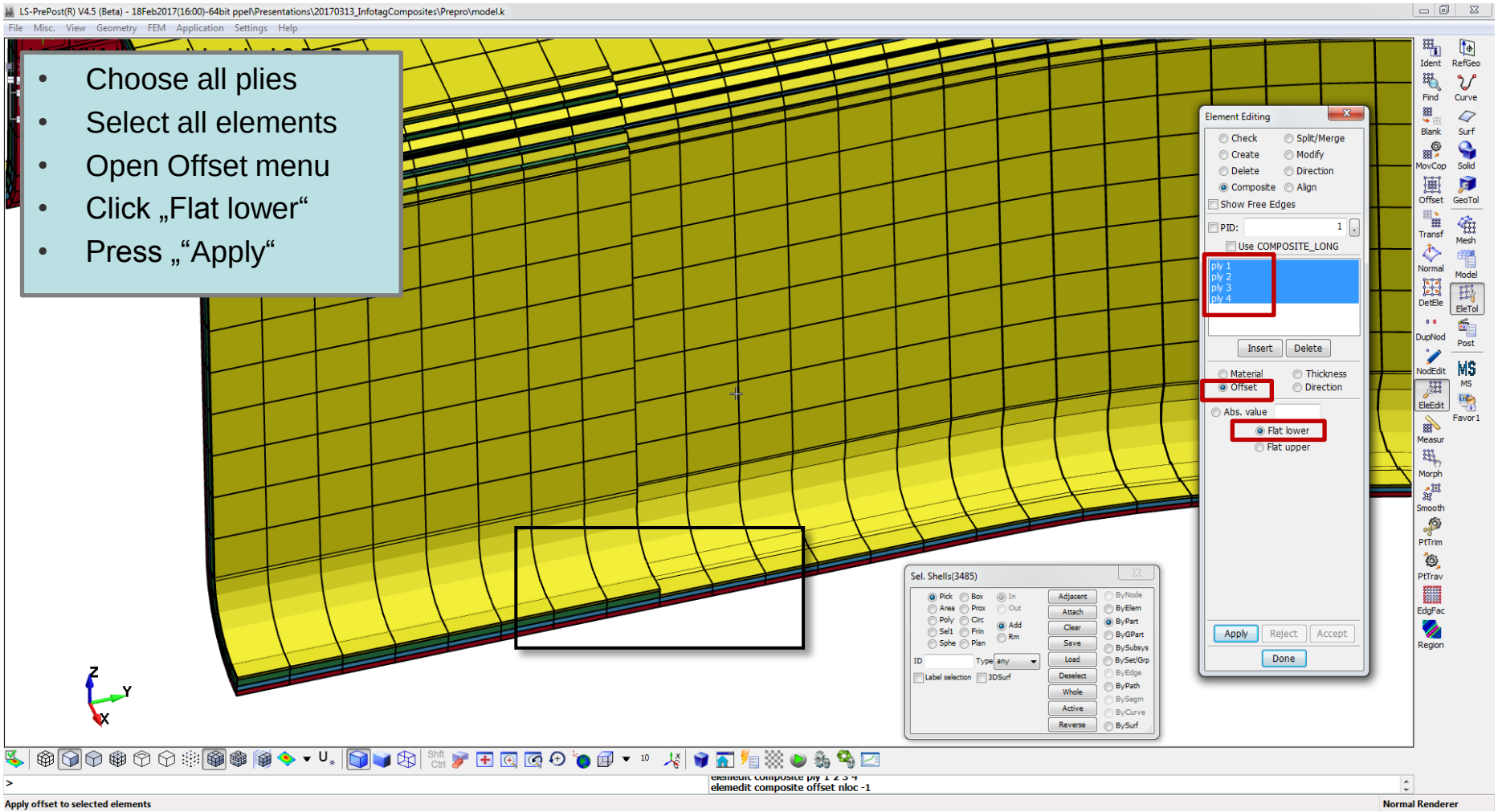
- Make sure all elements are selected
- Press „Apply“ and „Accept“
- Multiple curve input and smoothing are possible



Check composite lay-up



Align lay-up to lower surface



Keyword

- **By saving the keyword file, LS-PrePost will generate a list of *ELEMENT_SHELL_COMPOSITE_OFFSET**

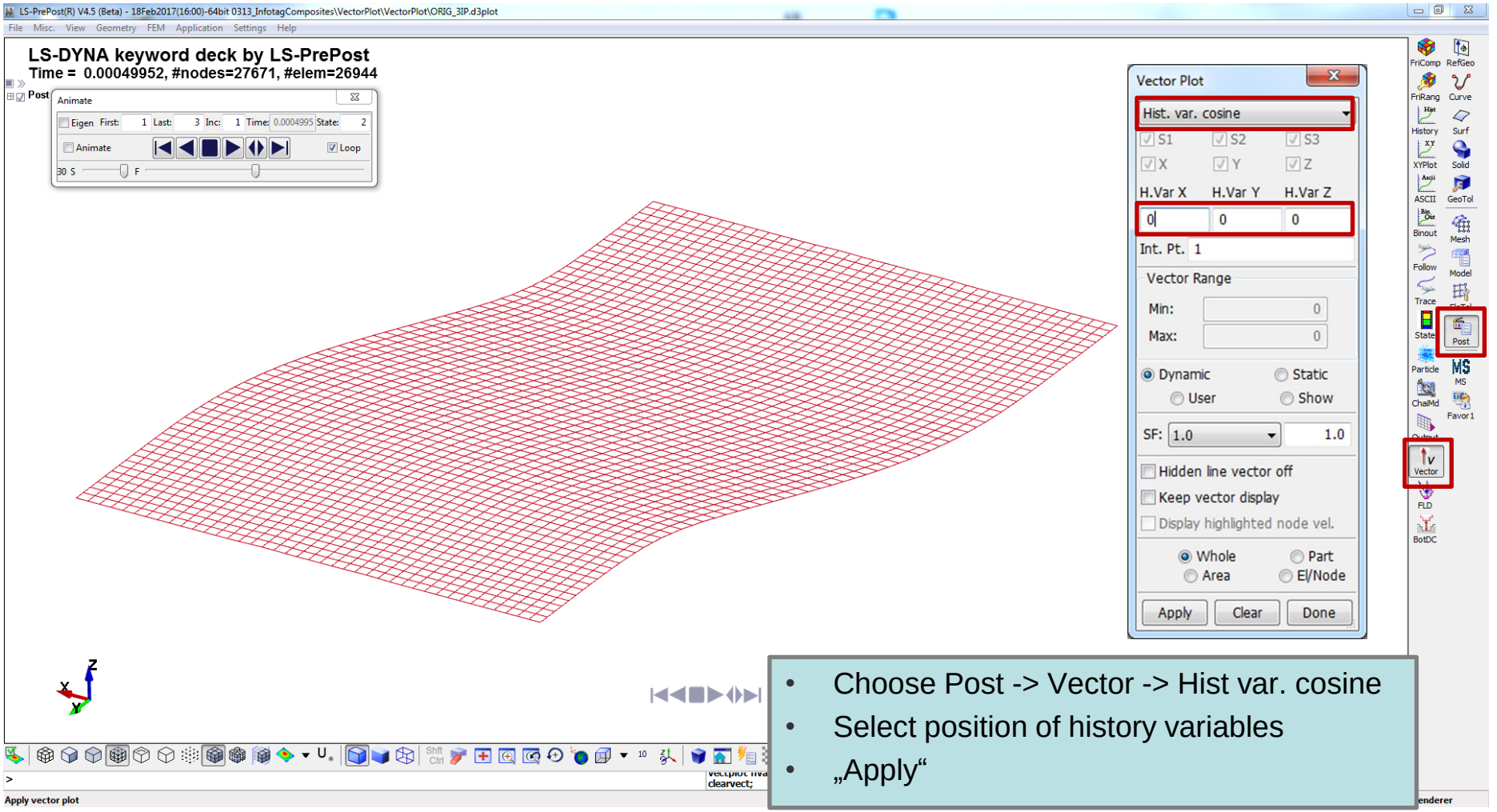
```
$#   eid     pid      n1      n2      n3      n4      n5      n6      n7      n8
       1       1      78     156      80      79       0       0       0       0
$#        offset
          0.975
$#    mid1    thick1        b1    unused      mid2    thick2        b2
          1       0.5 -90.69652                    1       0.5 -45.69652
          1       0.7  179.3045                    1      0.25 -90.67136
...
         17       1       62     172     171      63       0       0       0       0
          0.625
          1       0.5 -100.2107                    1       0.5 -55.21067
          0       0.0       0.0                    1      0.25 -106.1234
```

- **LS-DYNA interpretation of „zero“ integration points**
  - integration points are not considered during calculation
  - zero data are written to d3plot for integration points

- **Integration point number in Post-Processing consequently coincides with Ply-Id defined in the composite module**

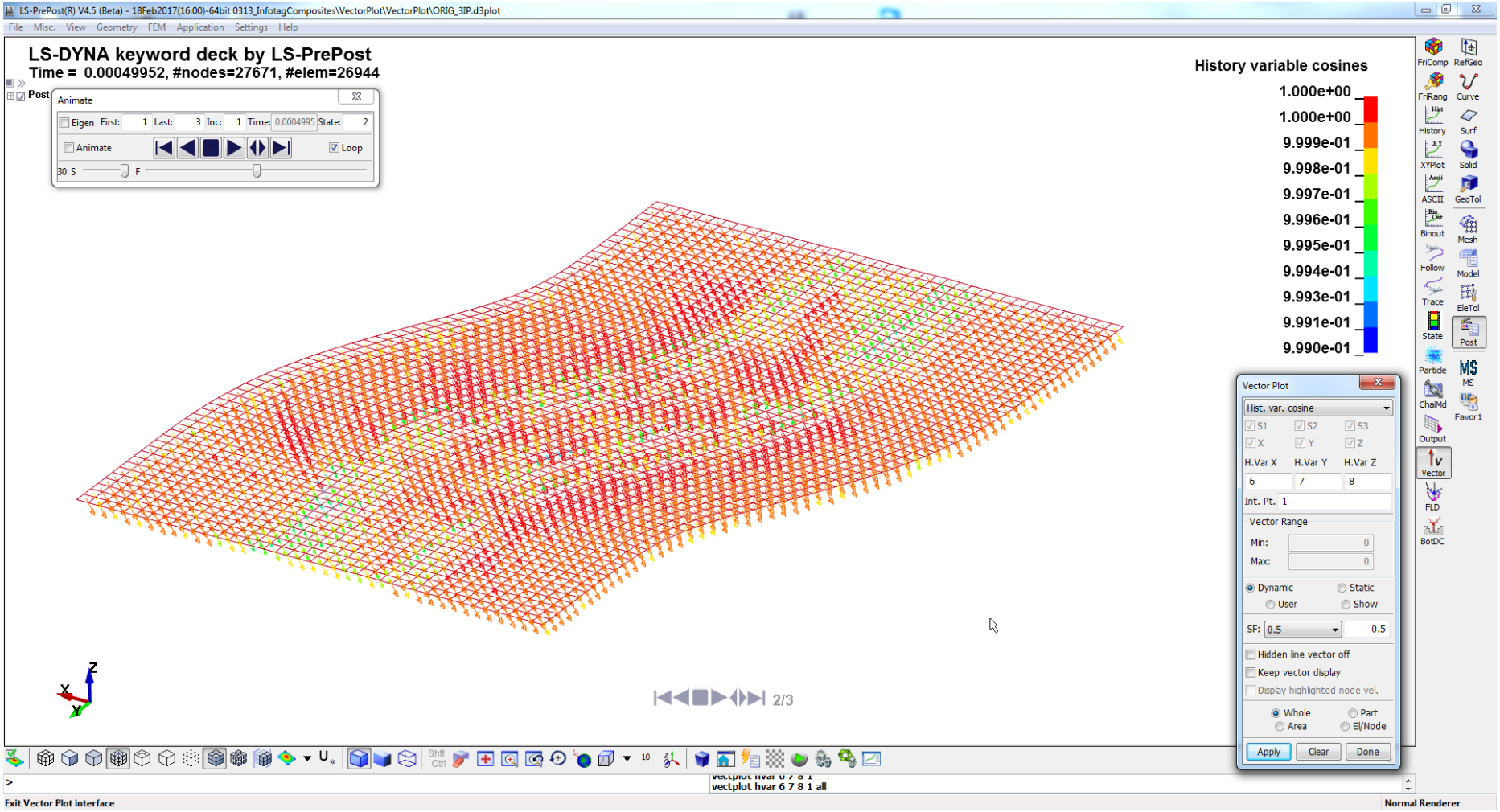
Post-Processing

Visualization of fiber orientations

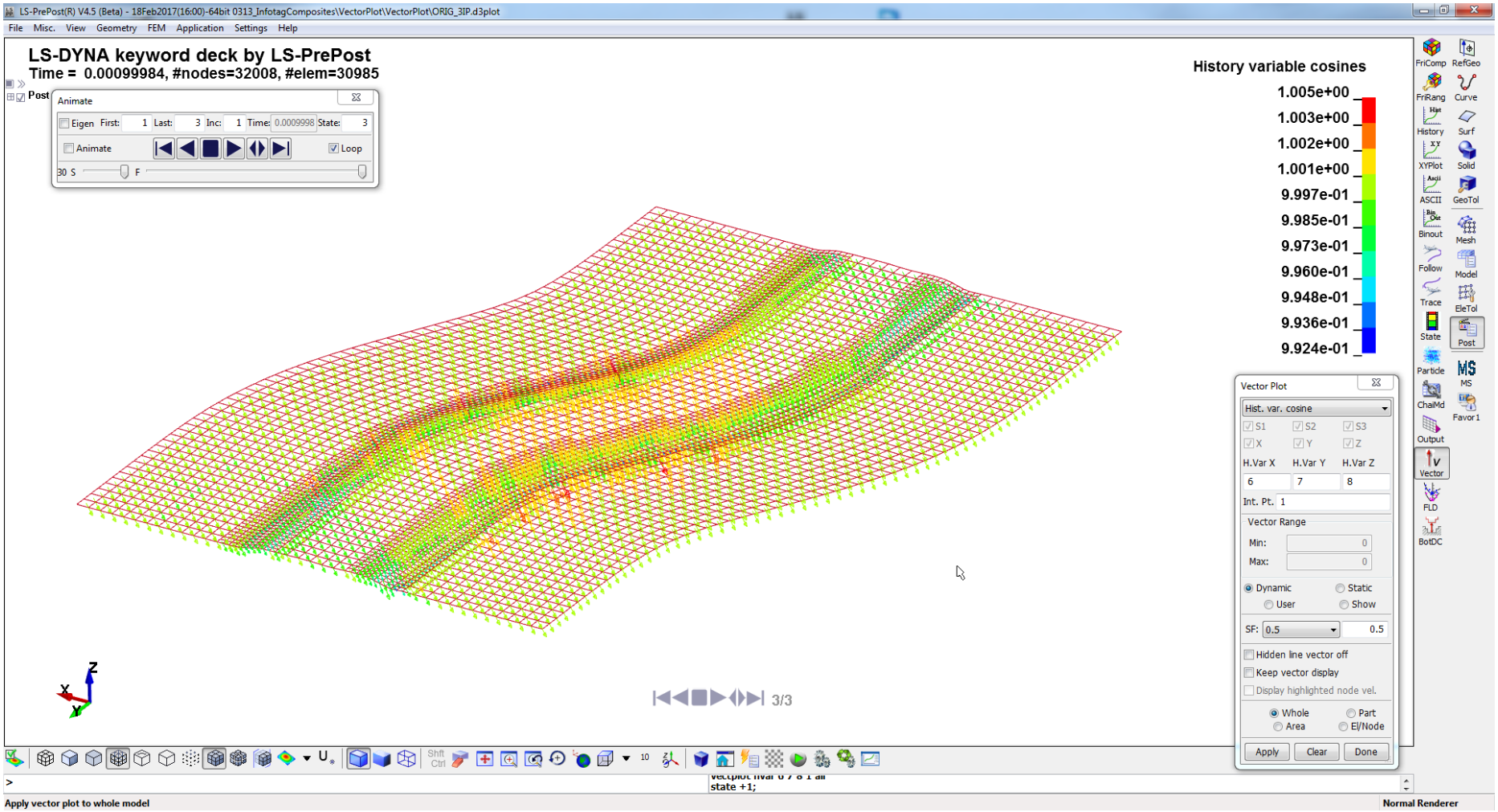


- Choose Post -> Vector -> Hist var. cosine
- Select position of history variables
- „Apply“

Visualization of fiber orientations

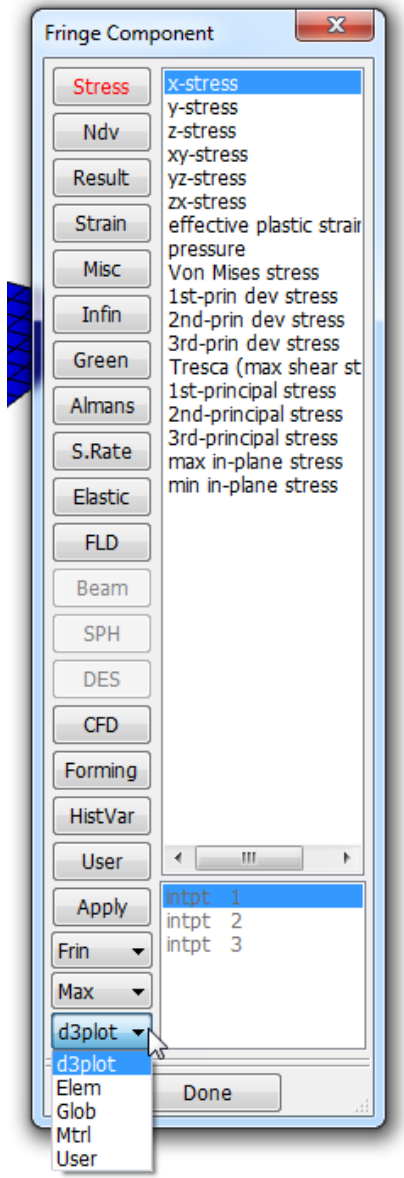


Visualization of fiber orientations



Stress output

- For fringe plot, new option for stress and strain output for non-isotropic materials can be used
- To be reasonably defined, keyword has to be loaded into LS-PrePost



Outlook

Application based input

- **New feature: Application explorer**
- **Model generation without explicit keyword definition**
- **Implemented for ICFD solver in LS-PrePost 4.5**
- **Further application in preparation:**
  - implicit
  - thermal
  - …
- **We are open for suggestions!**

Thank you

for your attention!