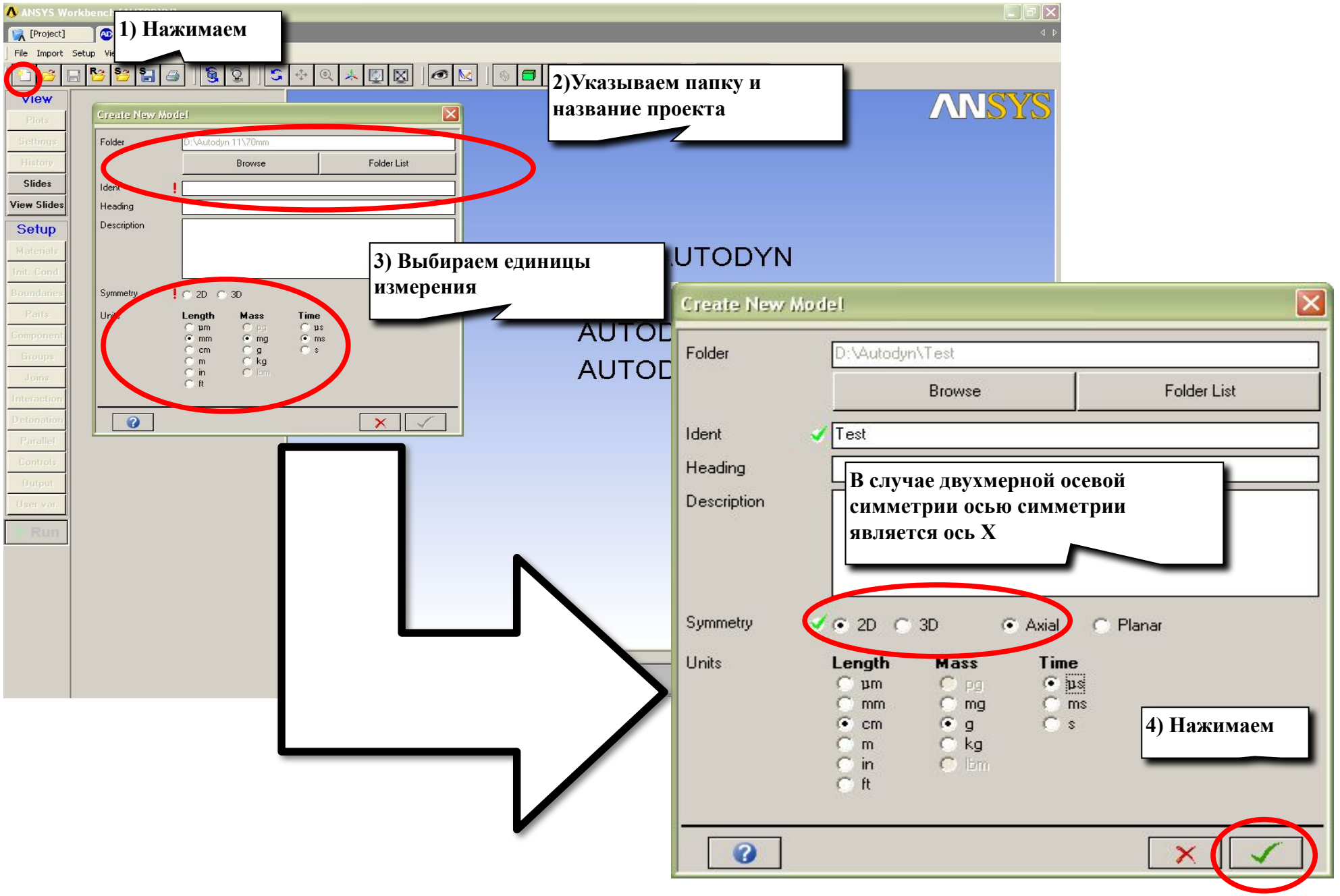
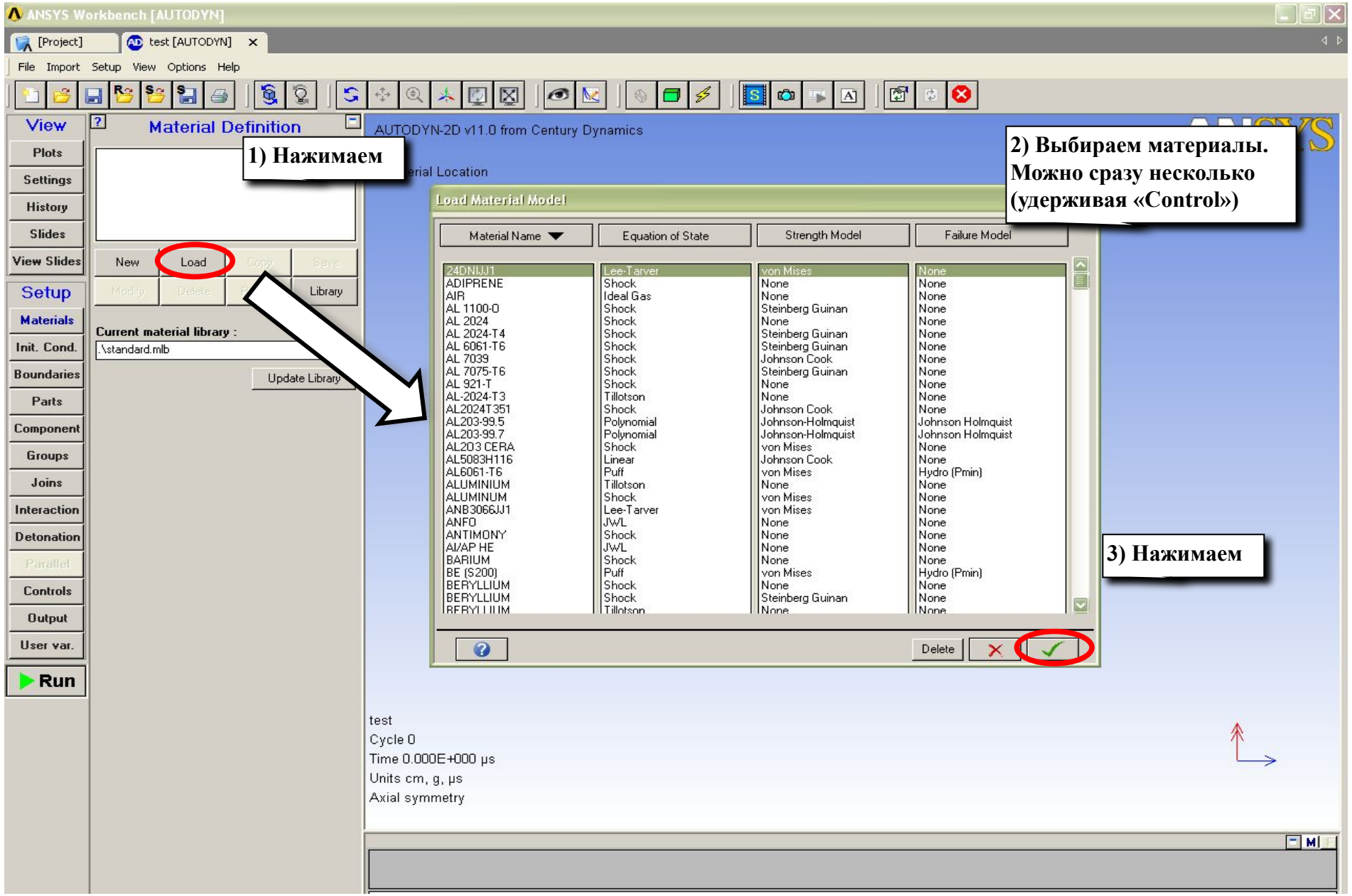
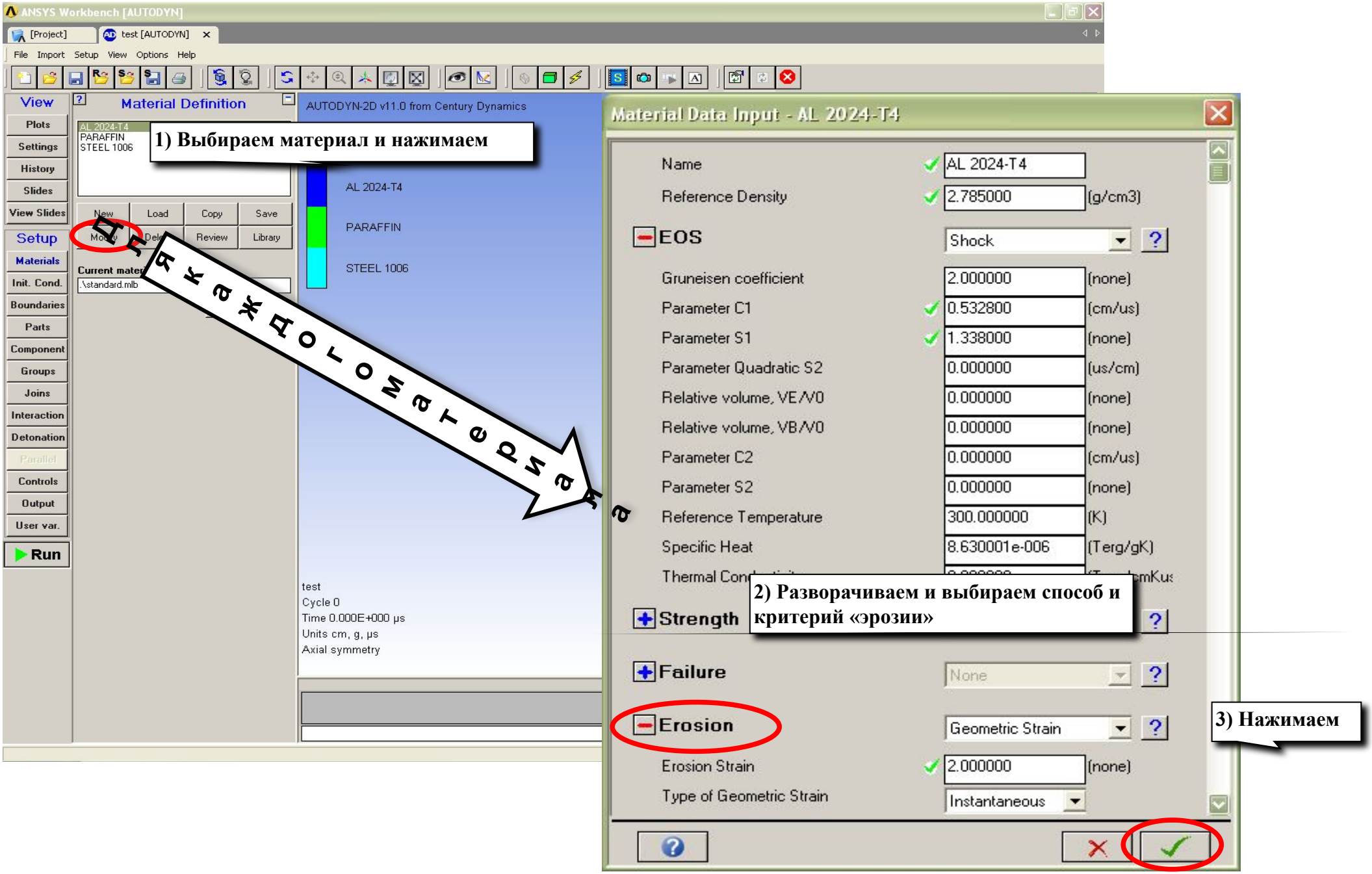
1. Создаем новый проект



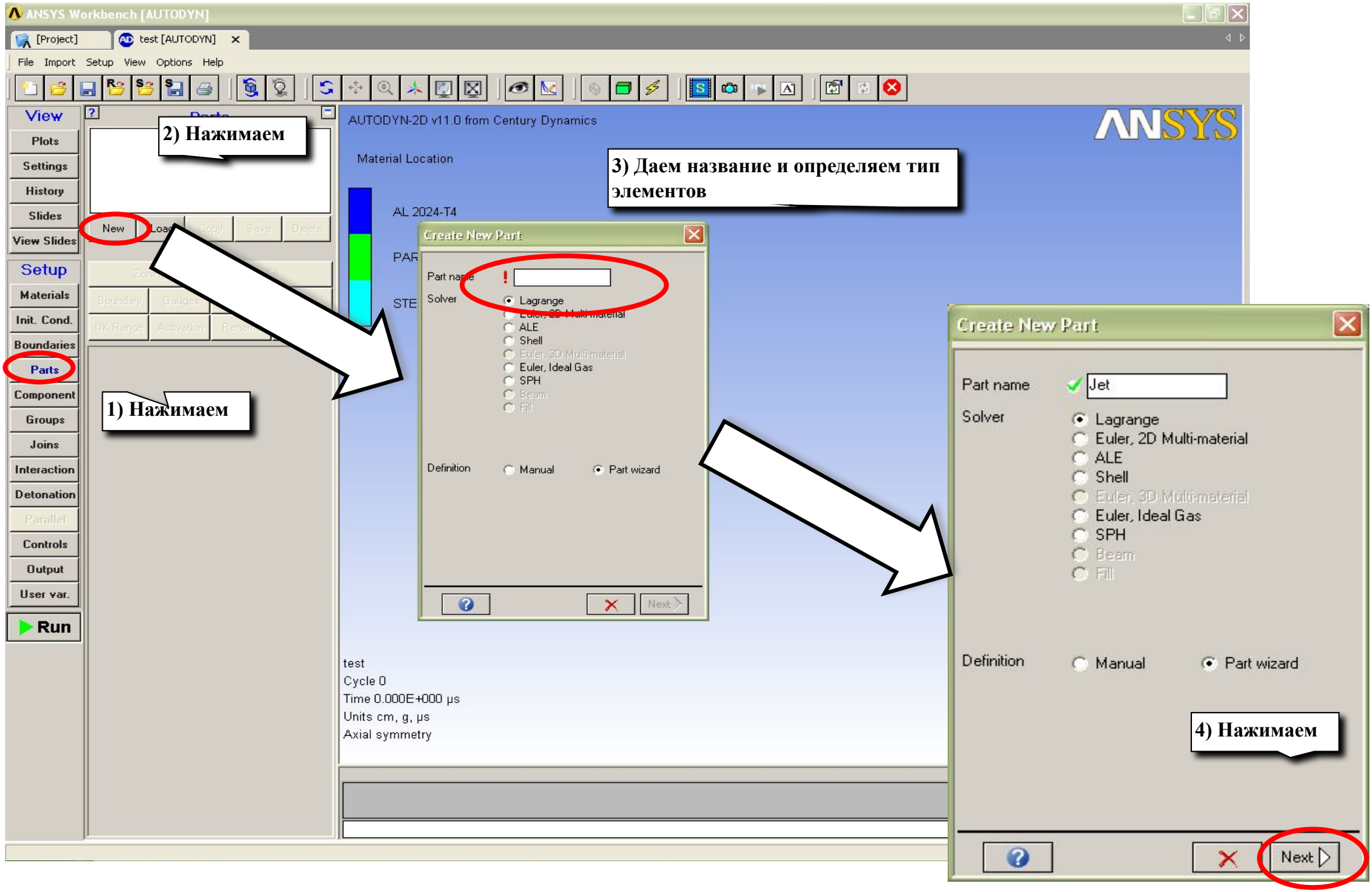
2. Определяем материалы

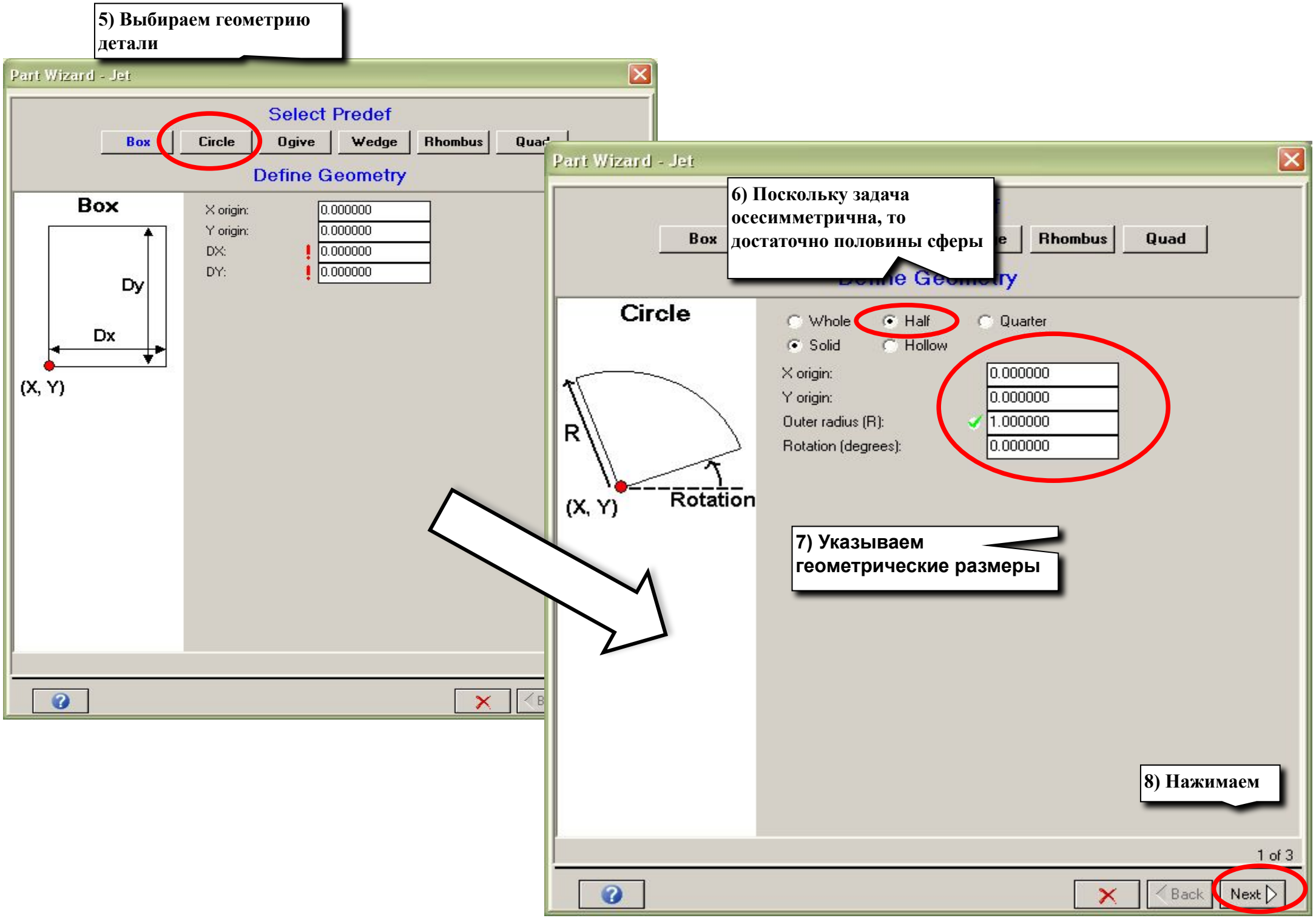


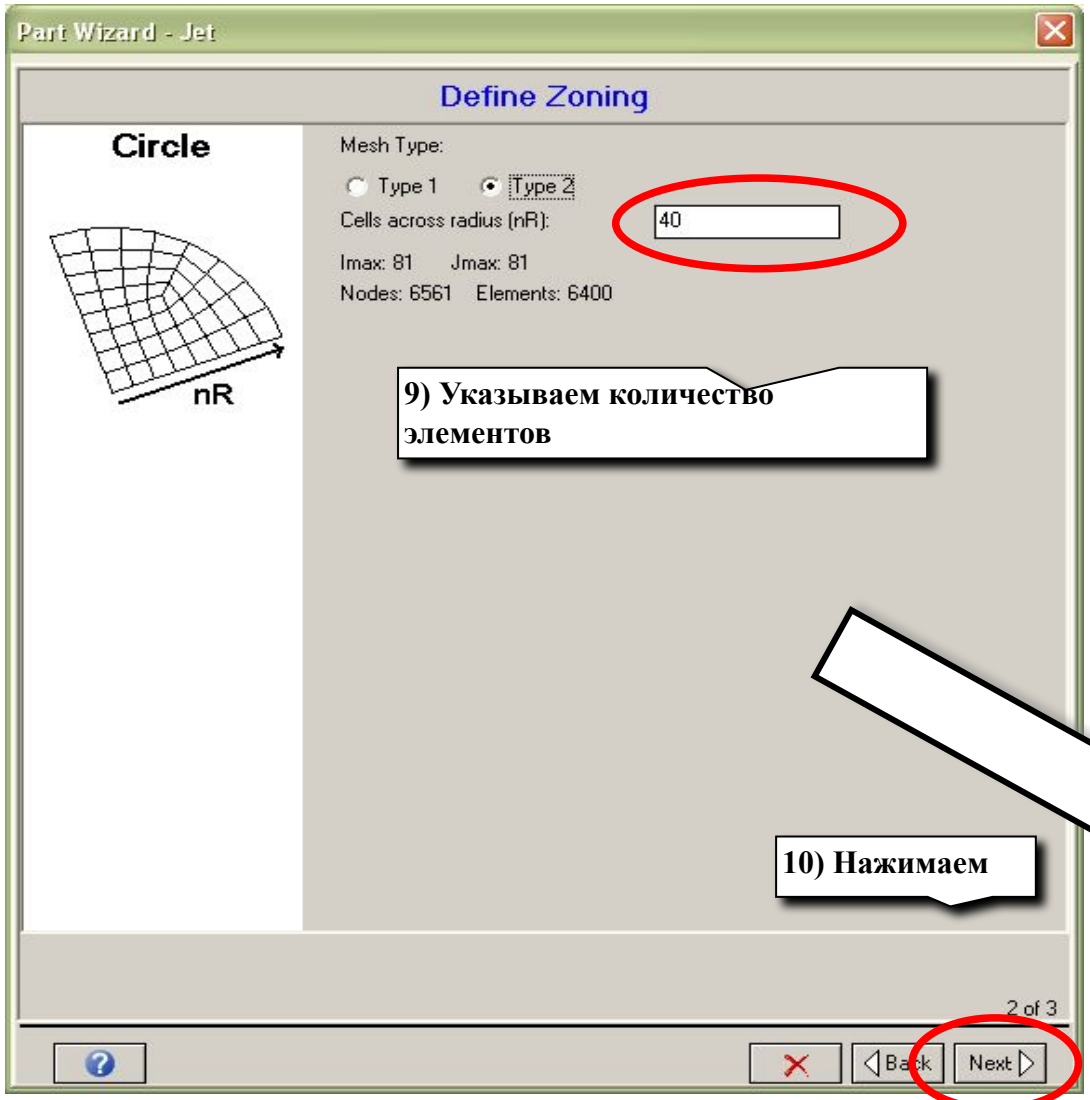
3. Редактируем свойства материалов



4. Определяем геометрию

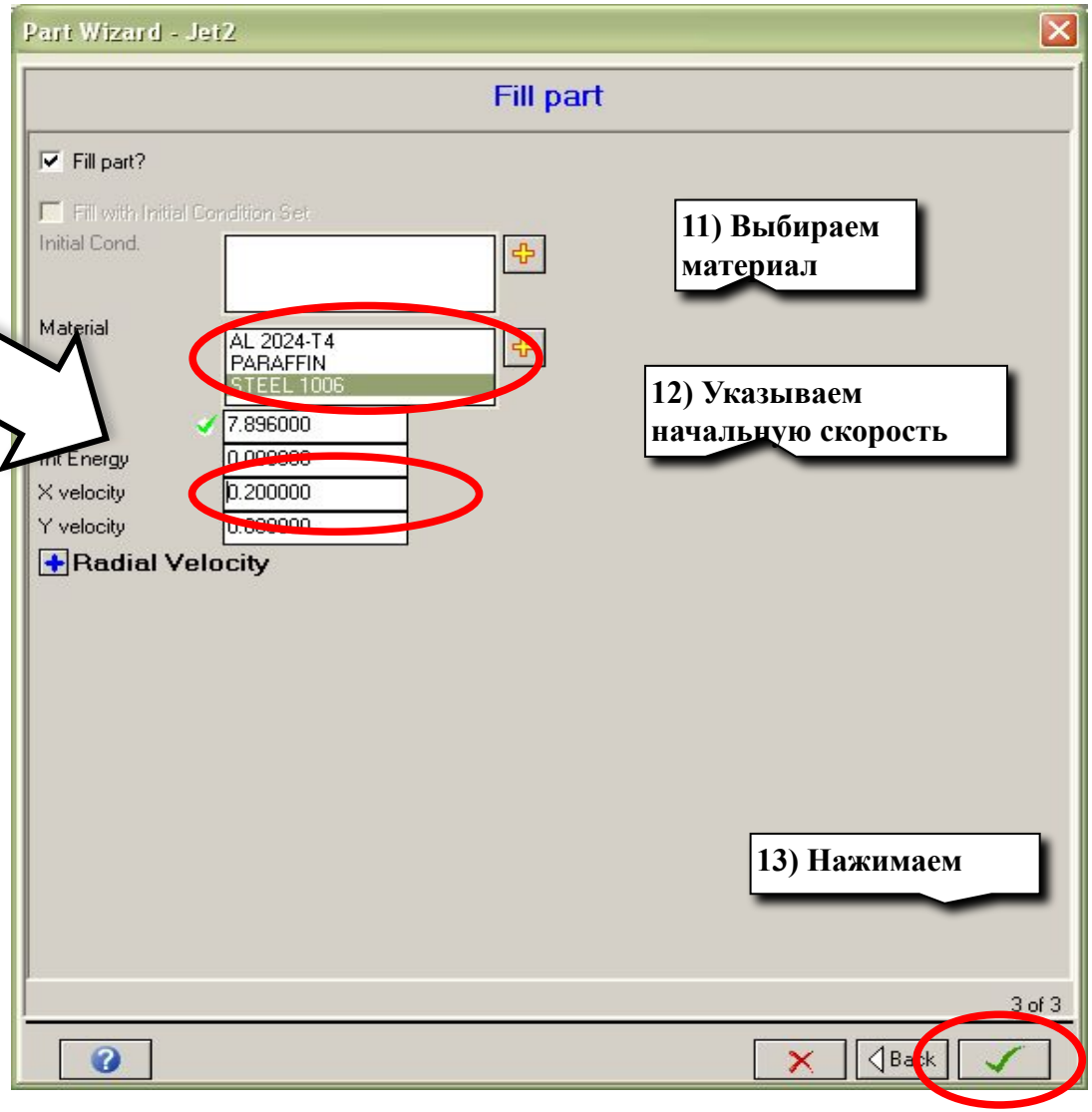



5) Выбираем геометрию детали
Part Wizard - Jet
Select Predef
Box
Circle
Ogive
Wedge
Rhombus
Define Geometry
Box
X origin:
Y origin:
DX:
DY:
0.000000
Dy
Dx
(X, Y)
6) Поскольку задача осесимметрична, то достаточно половины сферы
Circle
Whole
Half
Quarter
Solid
Hollow
X origin:
Y origin:
Outer radius (R):
Rotation (degrees):
1.000000
R
(X, Y)
Rotation
7) Указываем геометрические размеры
8) Нажимаем
1 of 3
Back
Next



9) Указываем количество элементов

10) Нажимаем

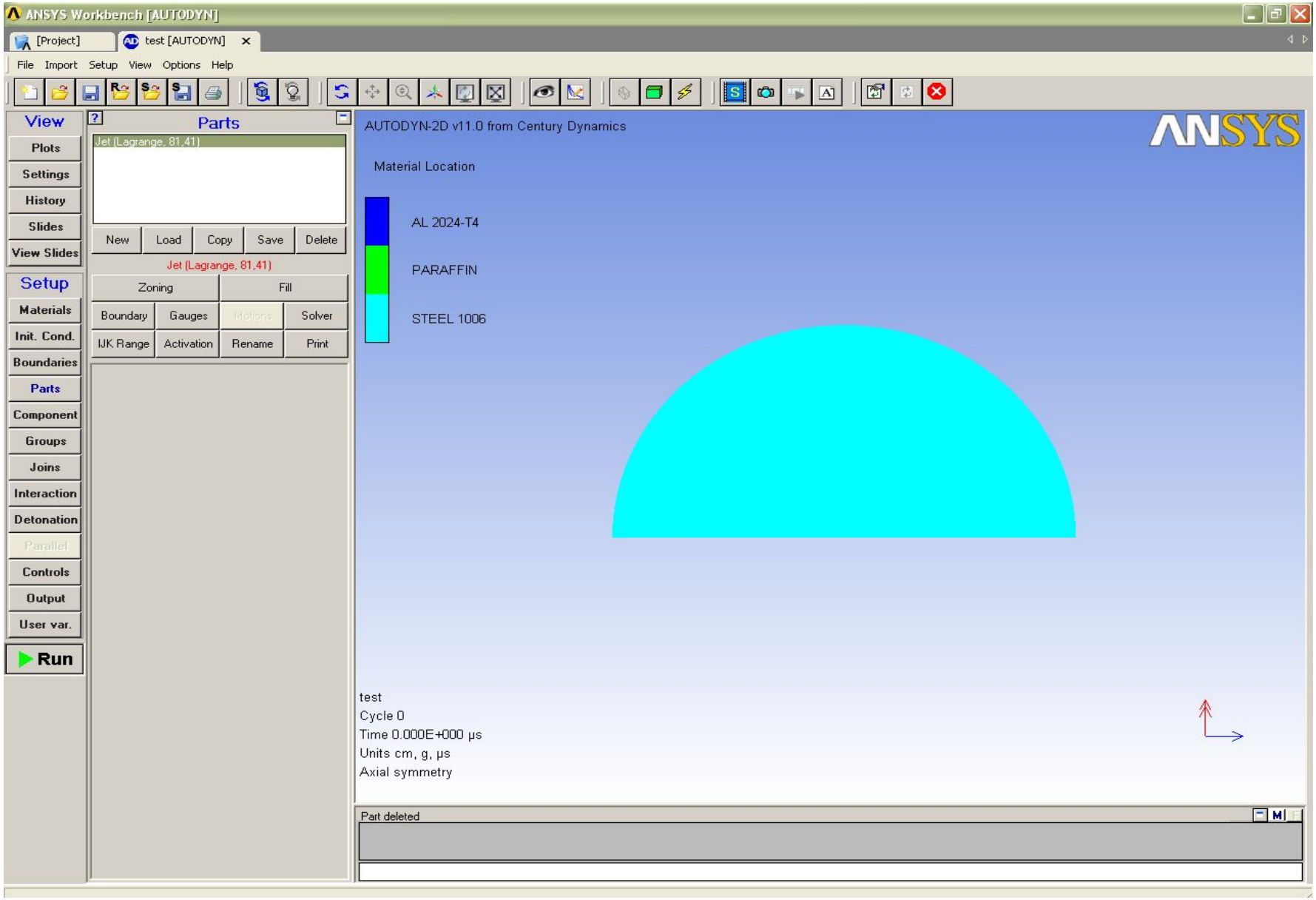


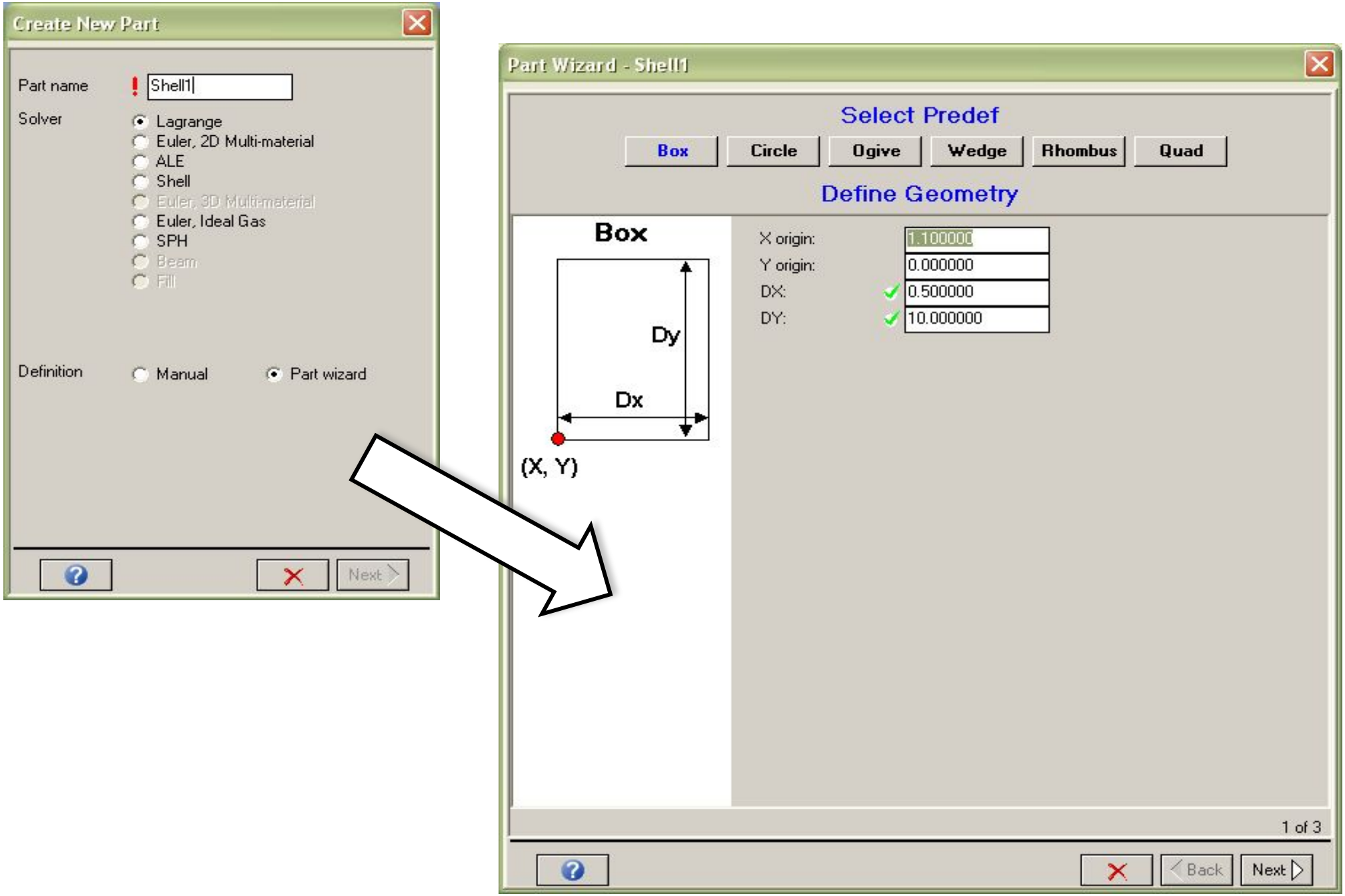
11) Выбираем материал

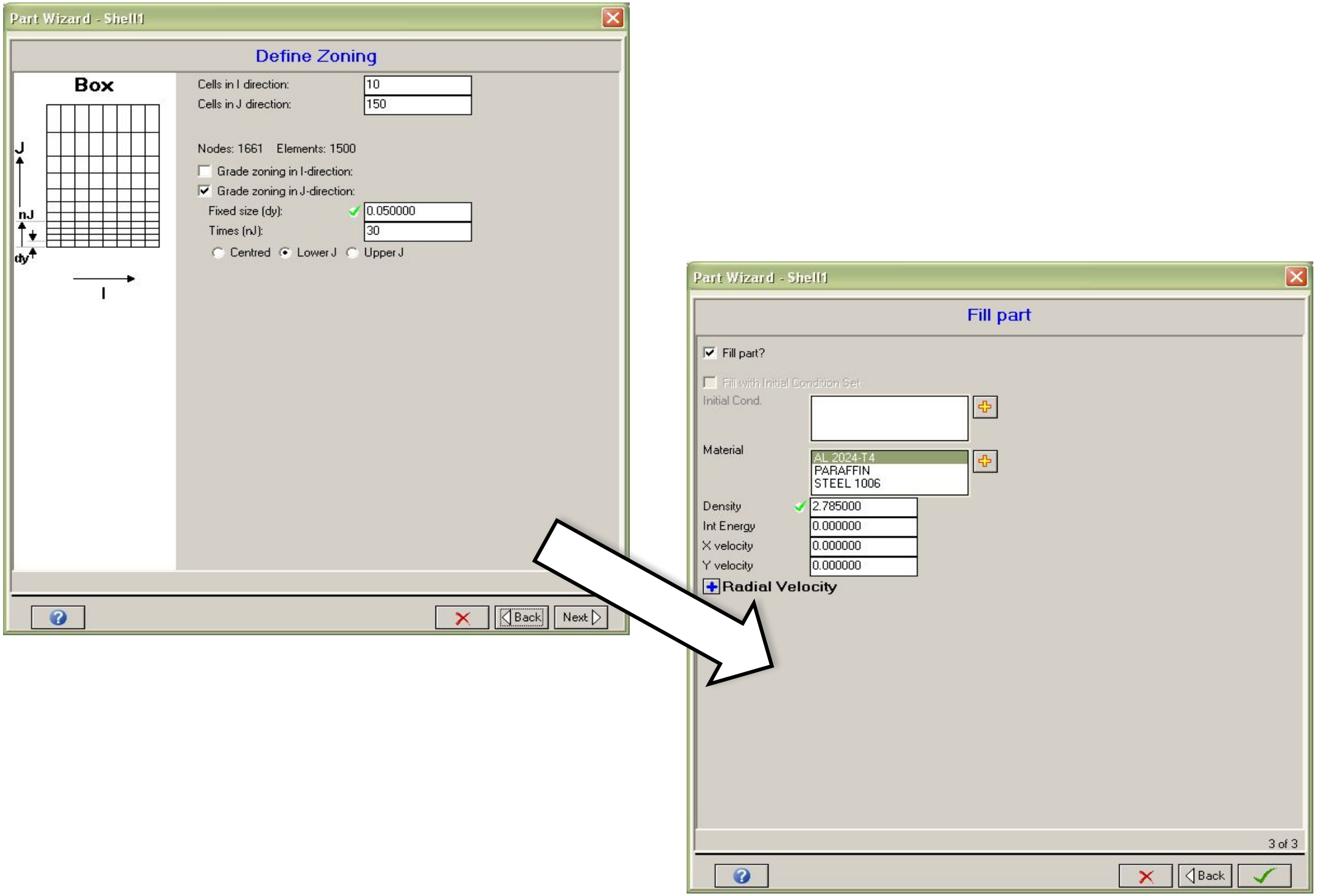
12) Указываем начальную скорость

13) Нажимаем

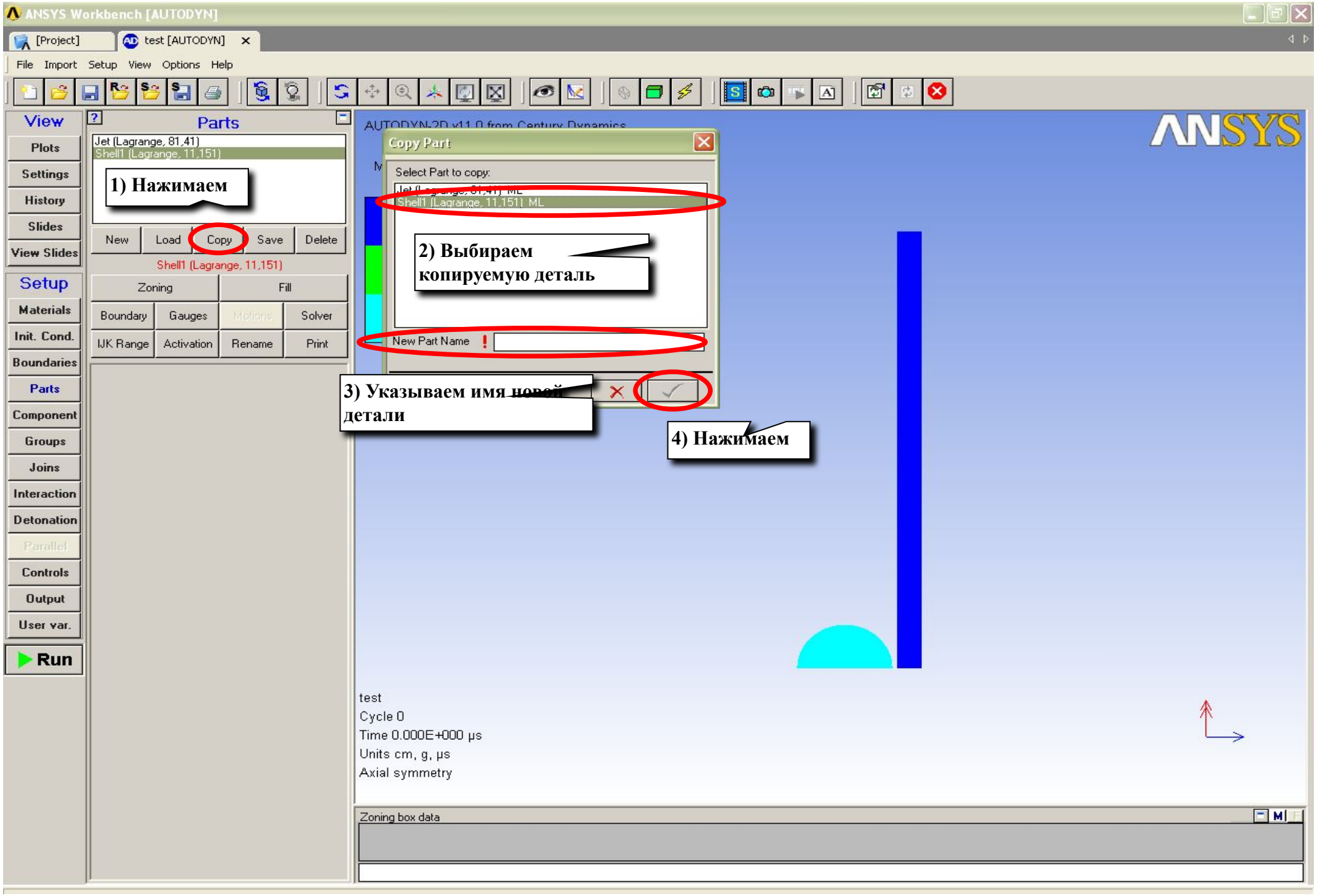
4. Первая деталь готова. По аналогии создаем остальные.



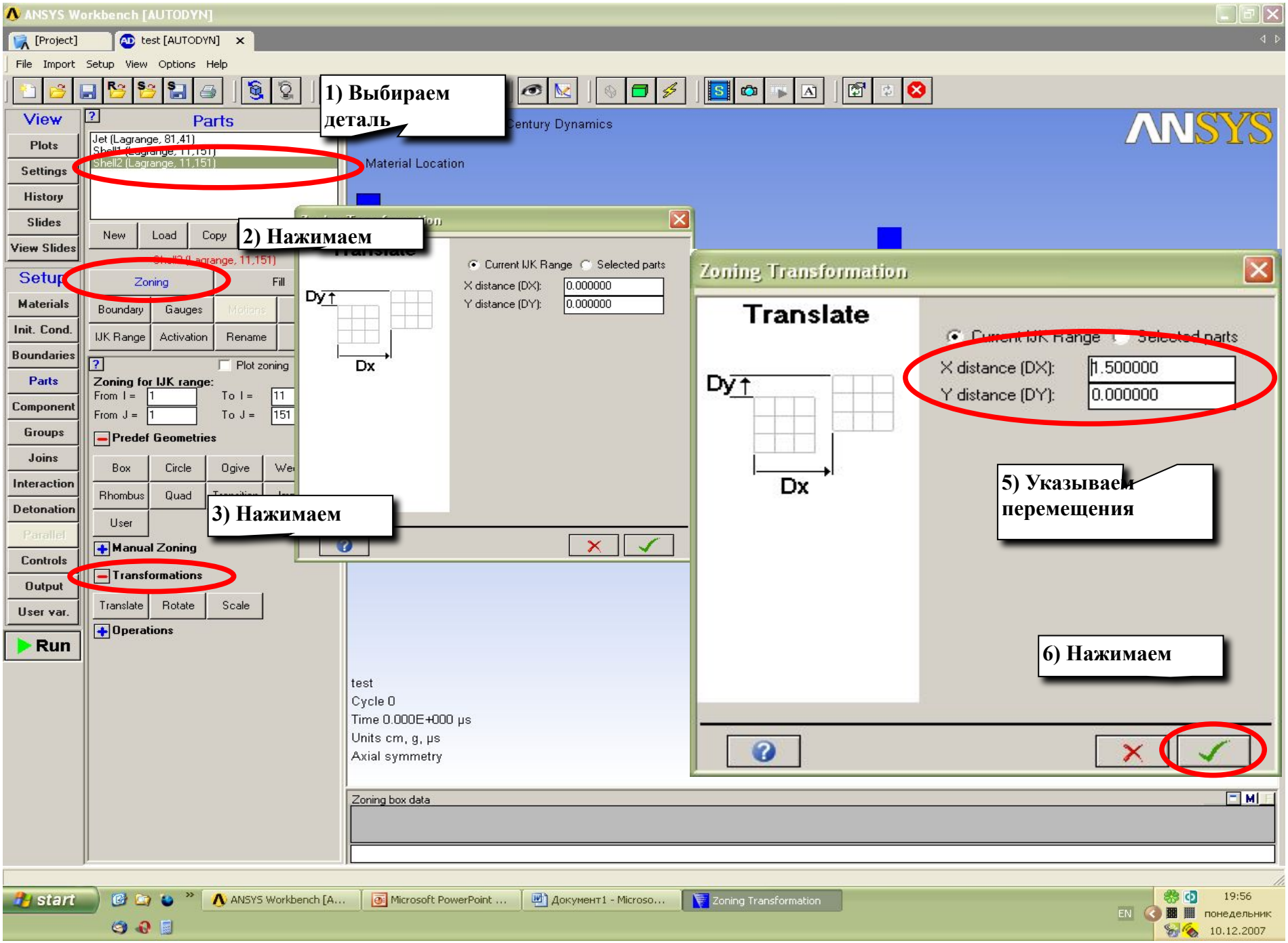

Create New Part
Part name
Shell1
Solver
Lagrange
Euler, 2D Multi-material
ALE
Shell
Euler, 3D Multi-material
Euler, Ideal Gas
SPH
Beam
Fill
Definition
Manual
Part wizard
Next
Part Wizard - Shell1
Select Predef
Box
Circle
Ogive
Wedge
Rhombus
Quad
Define Geometry
Box
Dy
Dx
(X, Y)
X origin:
1.100000
Y origin:
0.000000
DX:
0.500000
DY:
10.000000
1 of 3
Back
Next


Part Wizard - Shell1
Define Zoning
Box
J
nJ
dy
I
Cells in I direction:
10
Cells in J direction:
150
Nodes: 1661 Elements: 1500
Grade zoning in I-direction:
Grade zoning in J-direction:
Fixed size (dy):
0.050000
Times (nJ):
30
Centred
Lower J
Upper J
Back
Next
Part Wizard - Shell1
Fill part
Fill part?
Fill with Initial Condition Set
Initial Cond.
Material
AL 2024-T4
PARAFFIN
STEEL 1006
Density
2.785000
Int Energy
0.000000
X velocity
0.000000
Y velocity
0.000000
Radial Velocity
3 of 3
Back

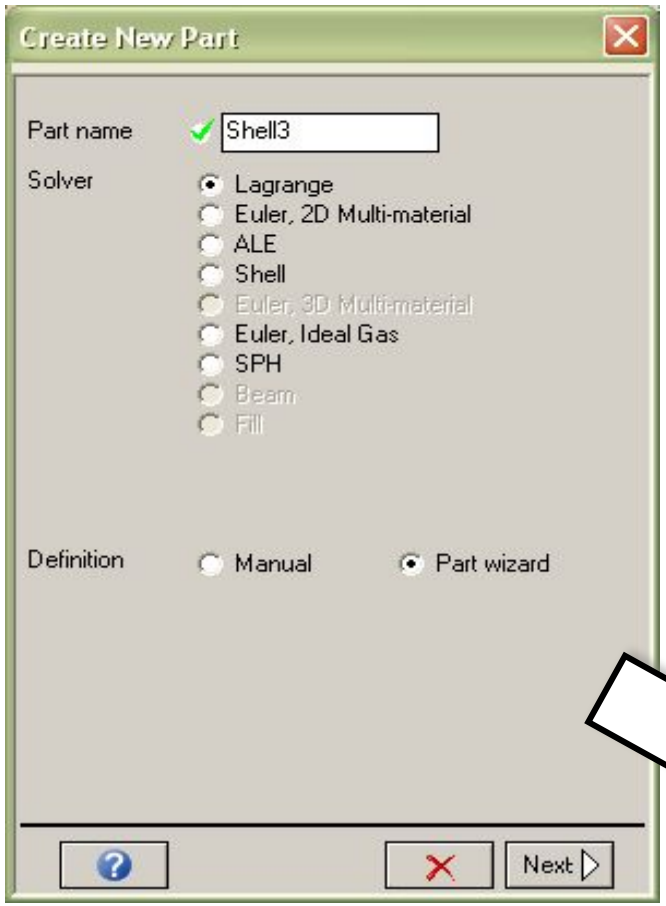
Одну из деталей получим копированием существующей

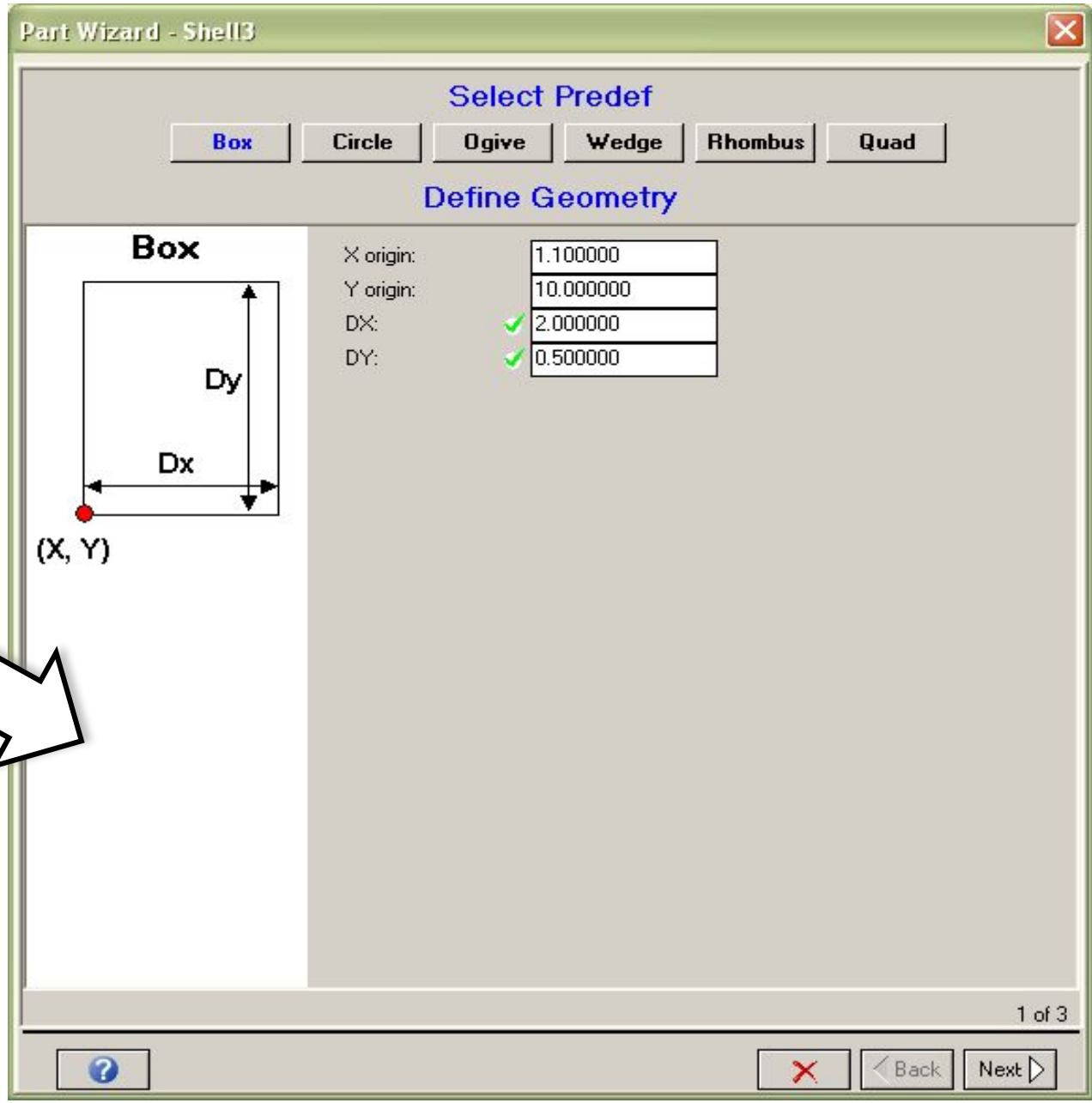


После копирования новая деталь расположена там же где исходная, поэтому перемещаем ее в нужное место

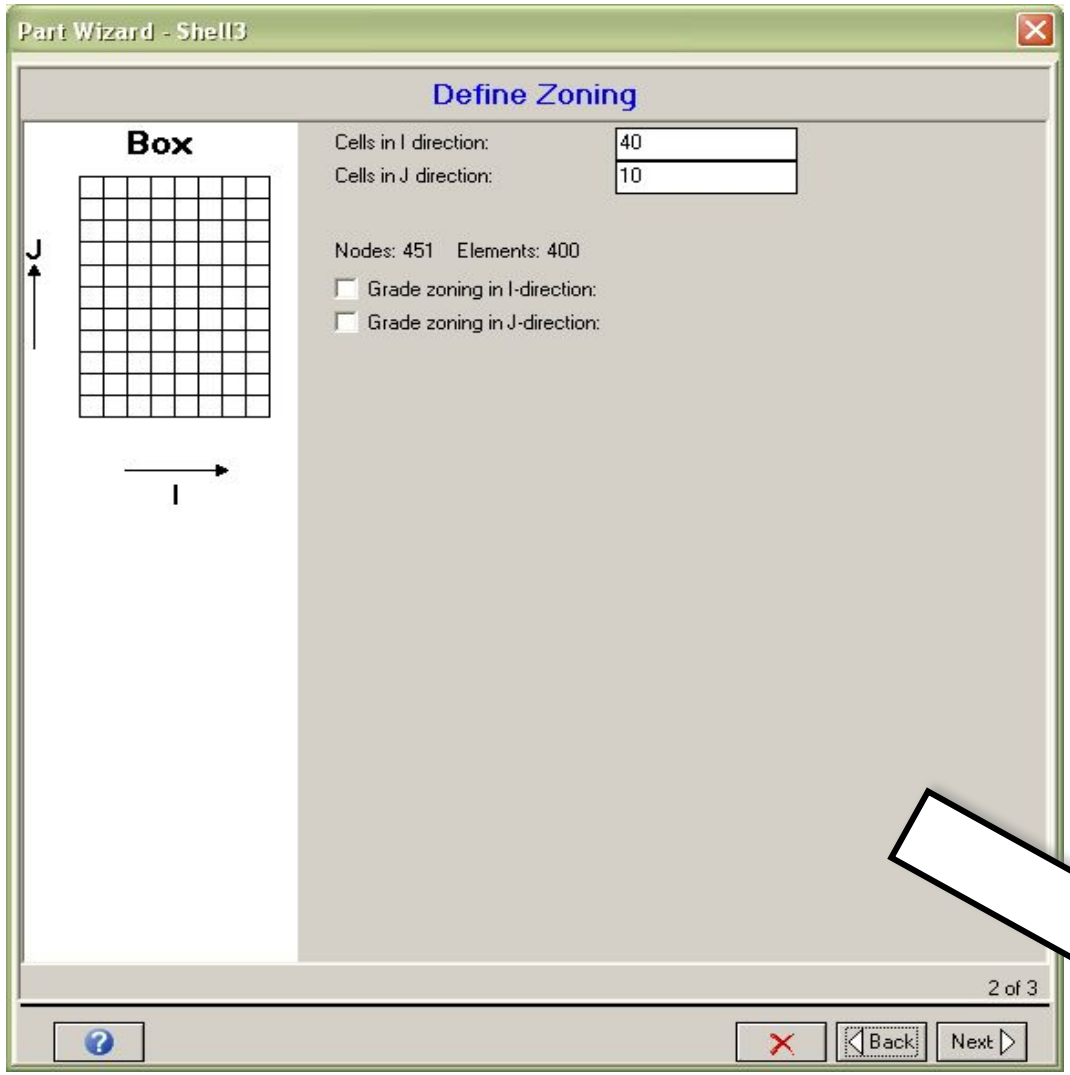


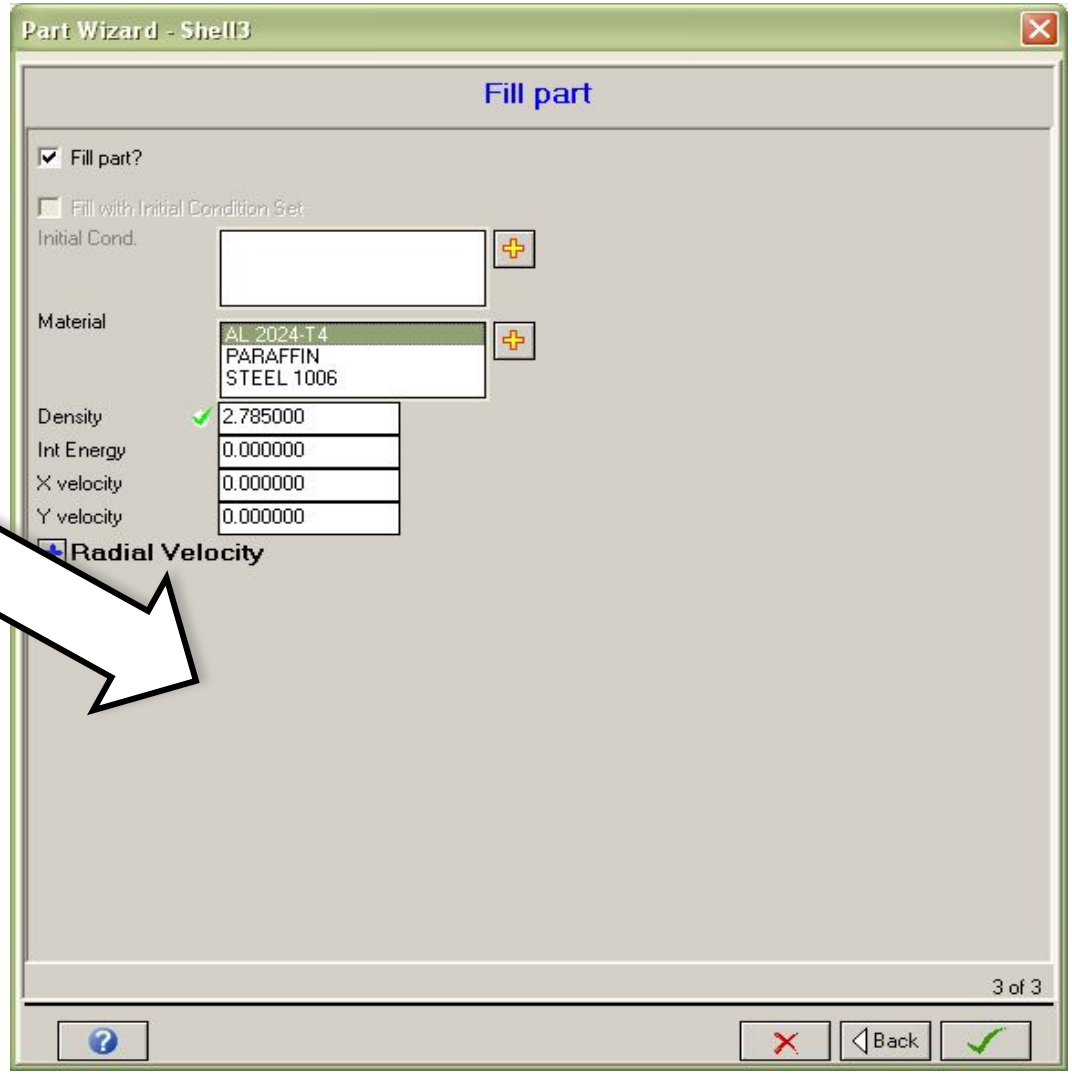
Продолжаем создавать детали

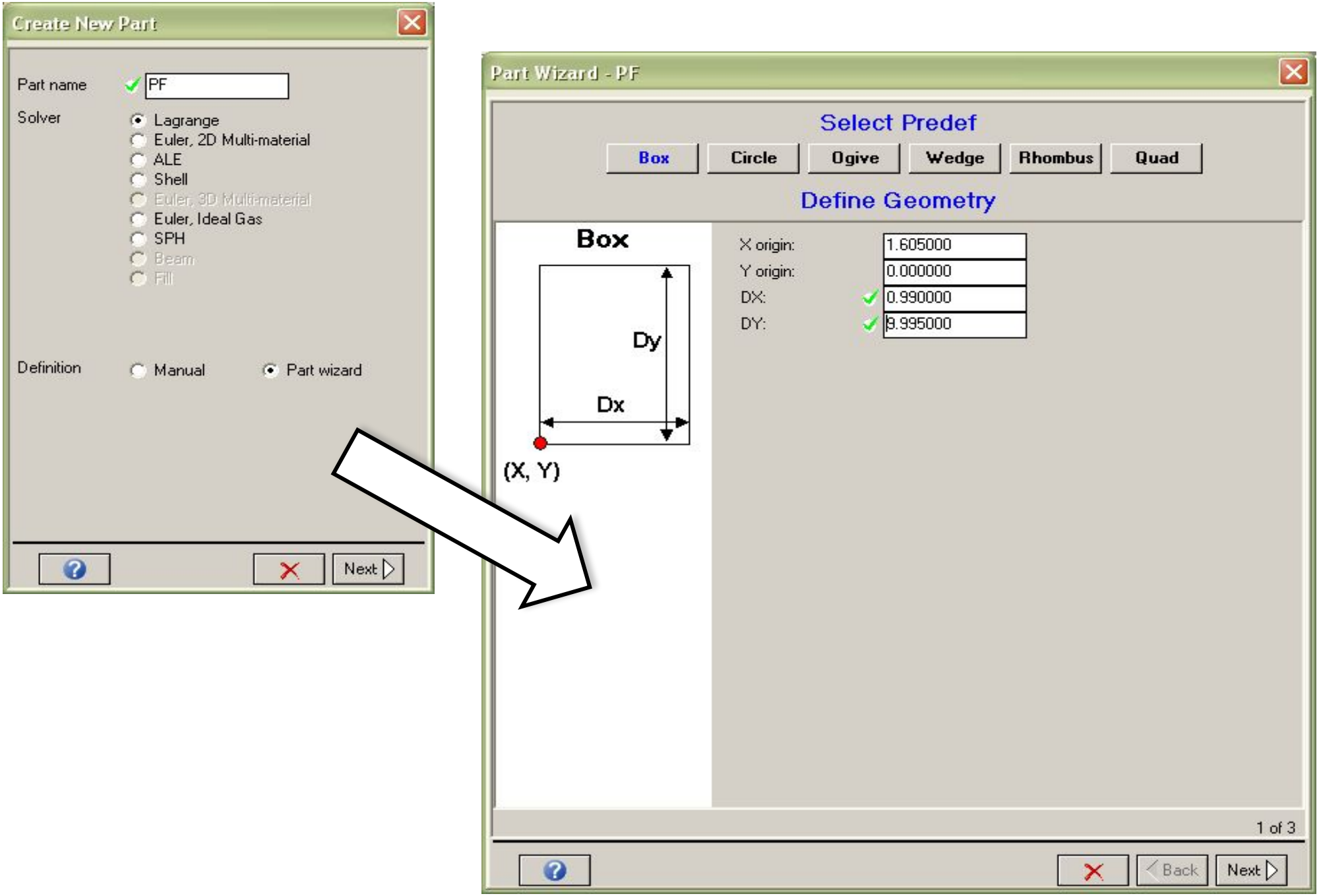


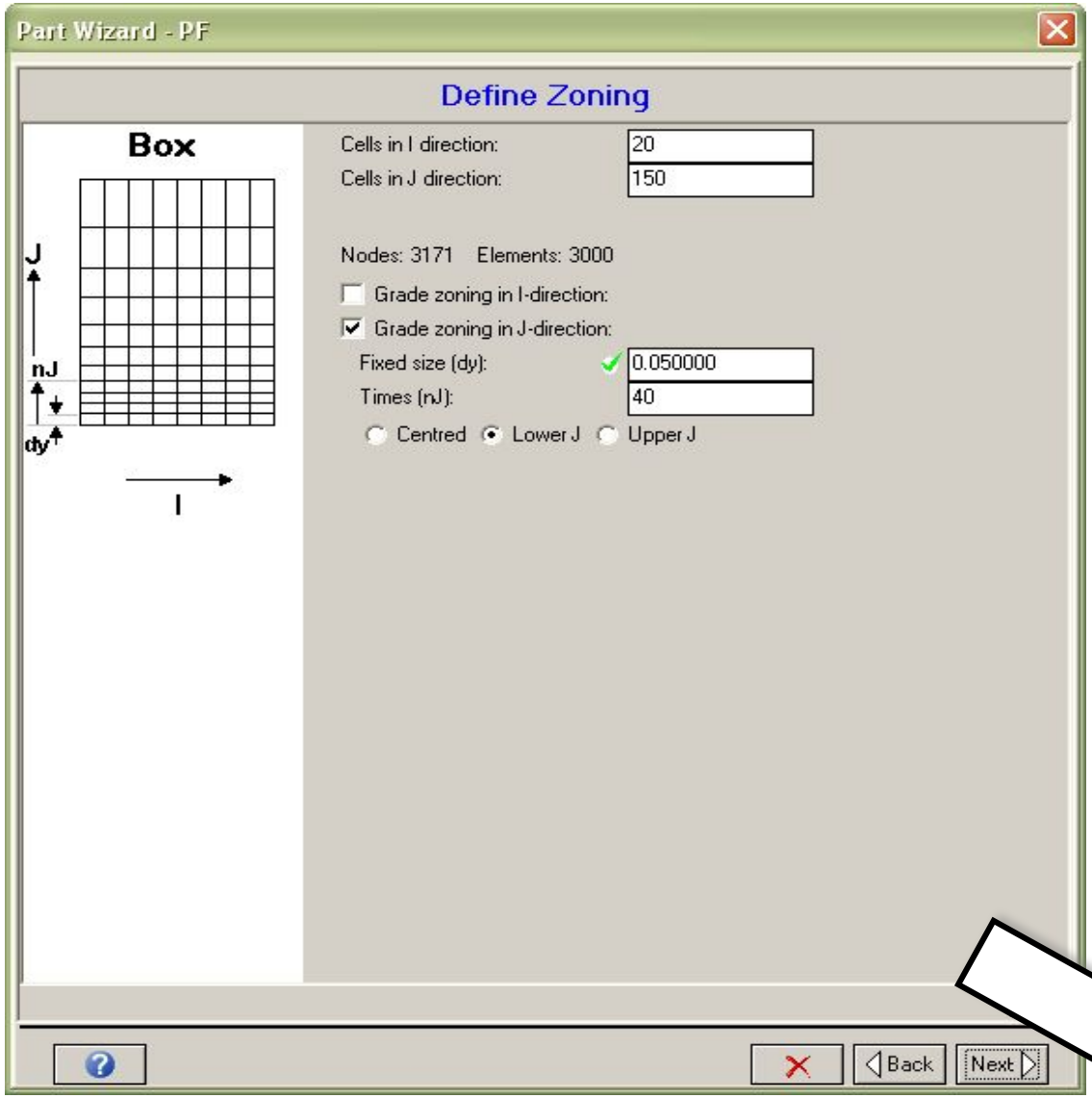


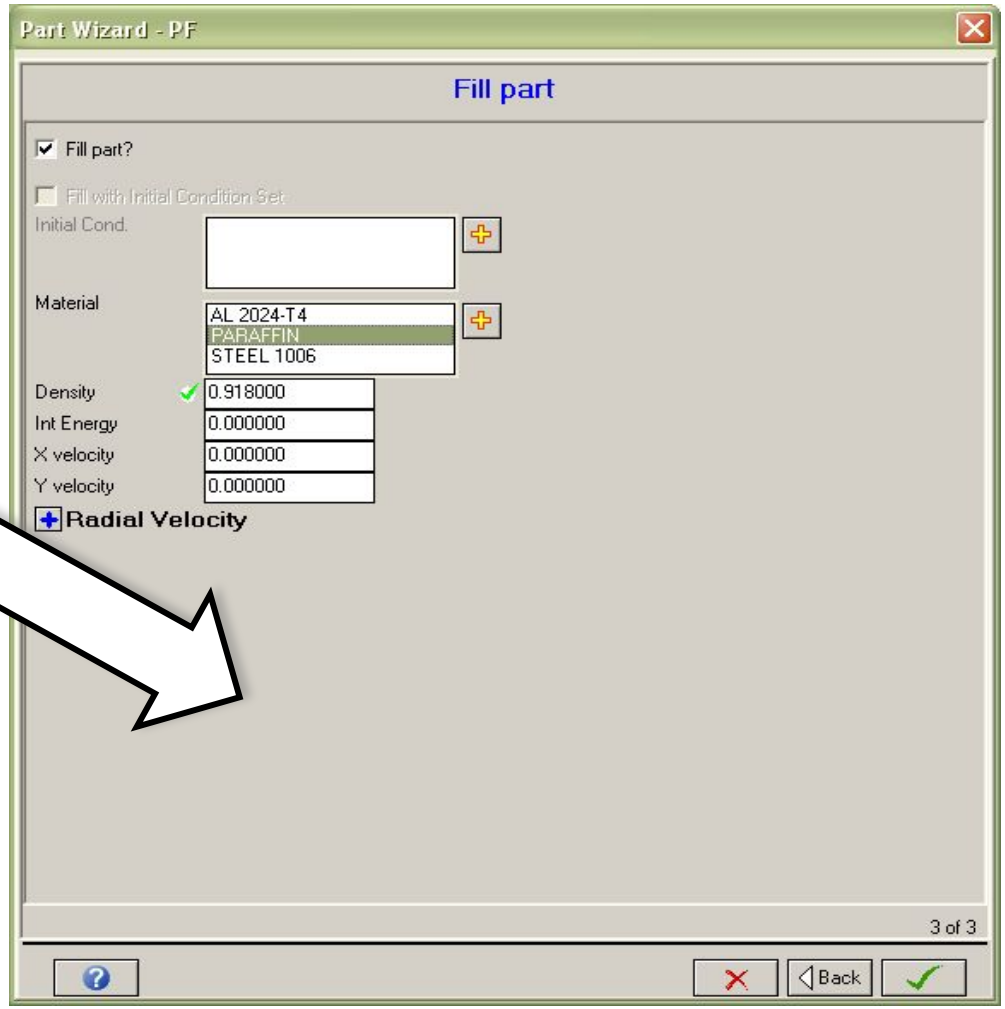
При создании не связанных (не «склеенных») деталей между ними необходимо оставлять зазоры размером 0,1…0,5 размера ячейки (для осуществления алгоритма взаимодействия поверхностей).


Part Wizard - Shell3
Define Zoning
Box
J
I
Cells in I direction:
40
Cells in J direction:
10
Nodes: 451 Elements: 400
Grade zoning in I-direction:
Grade zoning in J-direction:
2 of 3
Back
Next

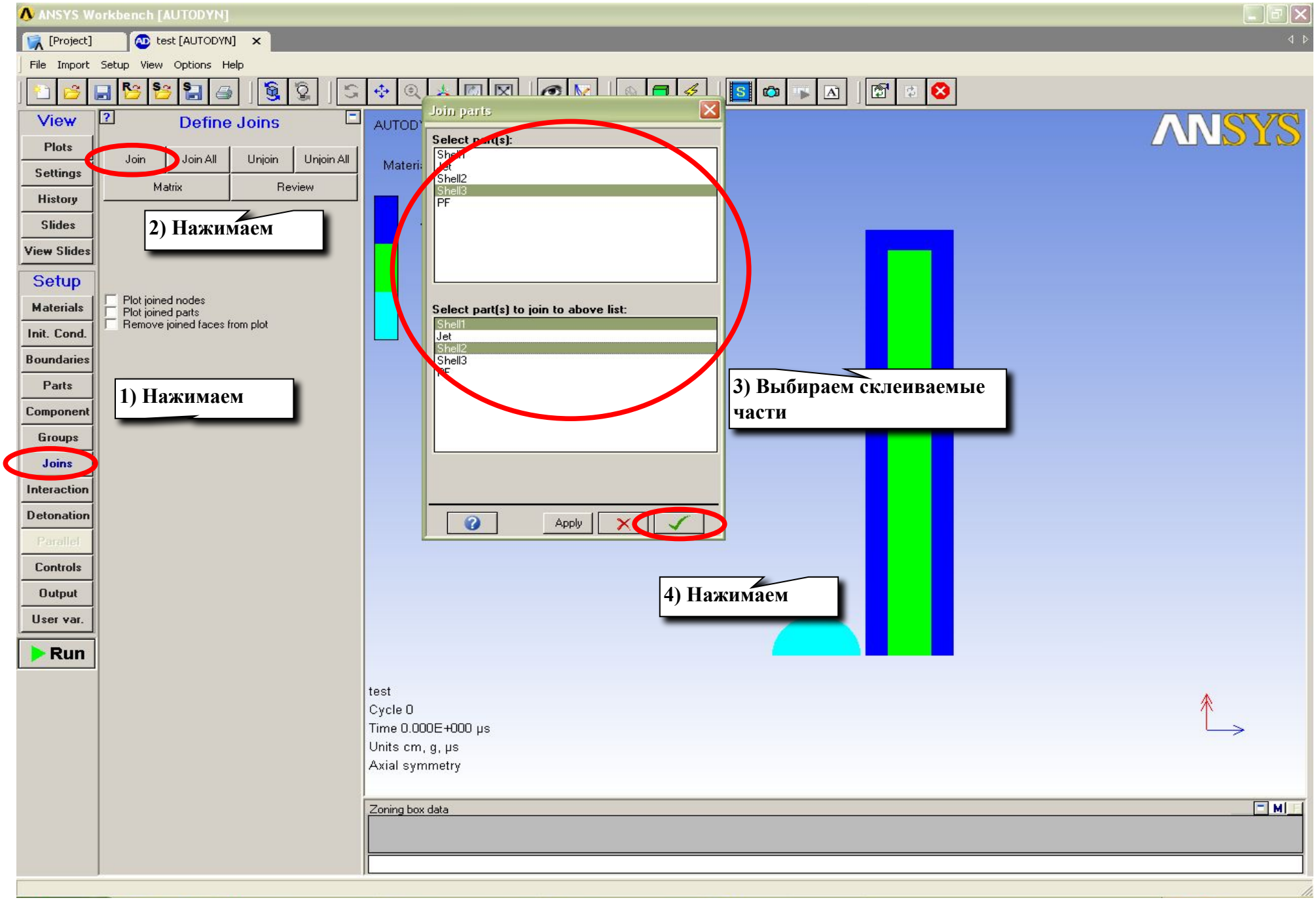

Part Wizard - Shell3
Fill part
Fill part?
Fill with Initial Condition Set
Initial Cond.
Material
AL 2024-T4
PARAFFIN
STEEL 1006
Density
2.785000
Int Energy
0.000000
X velocity
0.000000
Y velocity
0.000000
Radial Velocity
3 of 3
Back


Create New Part
Part name
PF
Solver
Lagrange
Euler, 2D Multi-material
ALE
Shell
Euler, 3D Multi-material
Euler, Ideal Gas
SPH
Beam
Fill
Definition
Manual
Part wizard
Next
Part Wizard - PF
Select Predef
Box
Circle
Ogive
Wedge
Rhombus
Quad
Define Geometry
Box
Dy
Dx
(X, Y)
X origin:
1.605000
Y origin:
0.000000
DX:
0.990000
DY:
9.995000
1 of 3
Back
Next

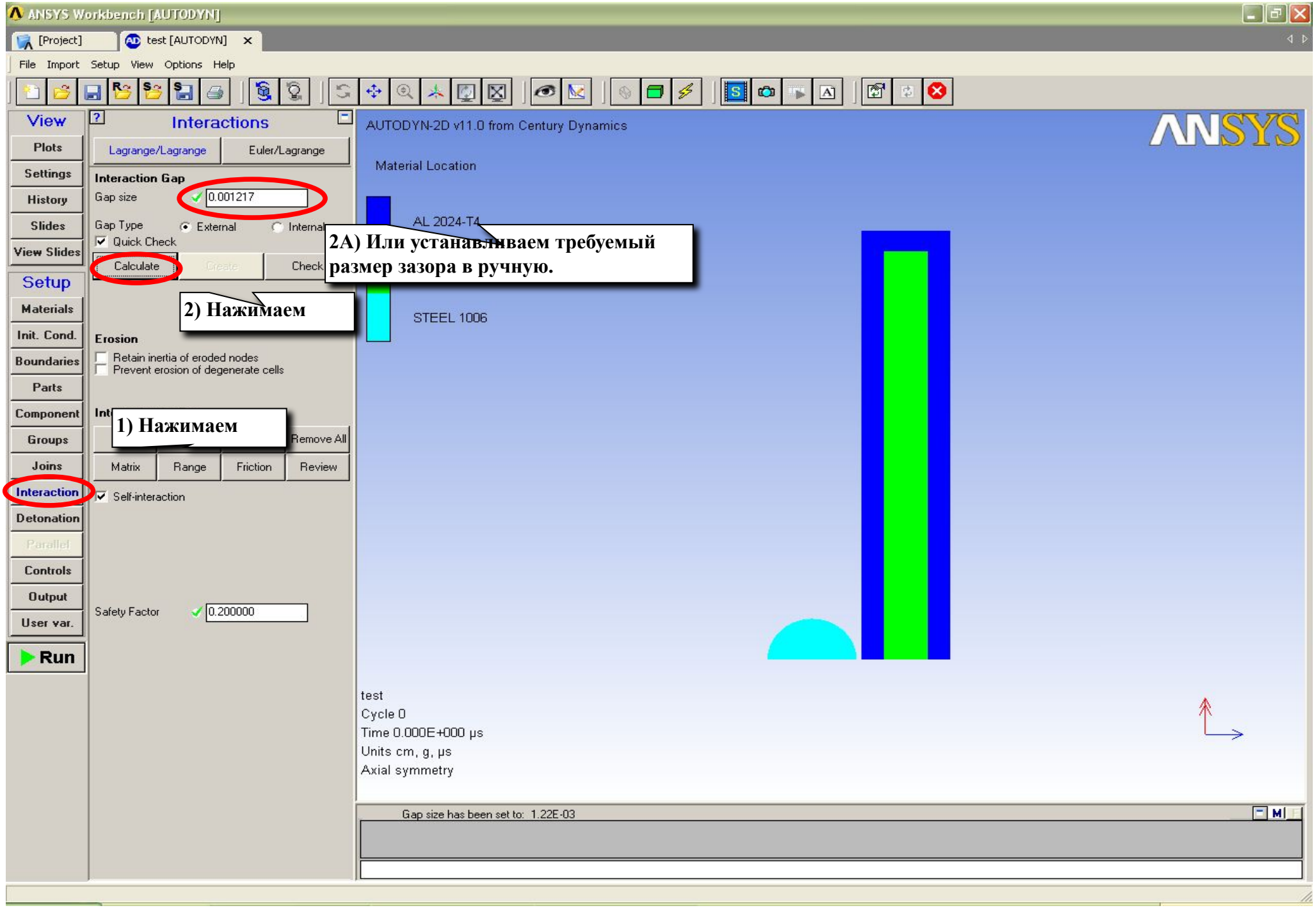

Part Wizard - PF
Define Zoning
Box
J
nJ
dy
I
Cells in I direction:
20
Cells in J direction:
150
Nodes: 3171 Elements: 3000
Grade zoning in I-direction:
Grade zoning in J-direction:
Fixed size (dy):
0.050000
Times (nJ):
40
Centred
Lower J
Upper J
Back
Next


Part Wizard - PF
Fill part
Fill part?
Fill with Initial Condition Set
Initial Cond.
Material
AL 2024-T4
PARAFFIN
STEEL 1006
Density
0.918000
Int Energy
0.000000
X velocity
0.000000
Y velocity
0.000000
Radial Velocity
3 of 3
Back

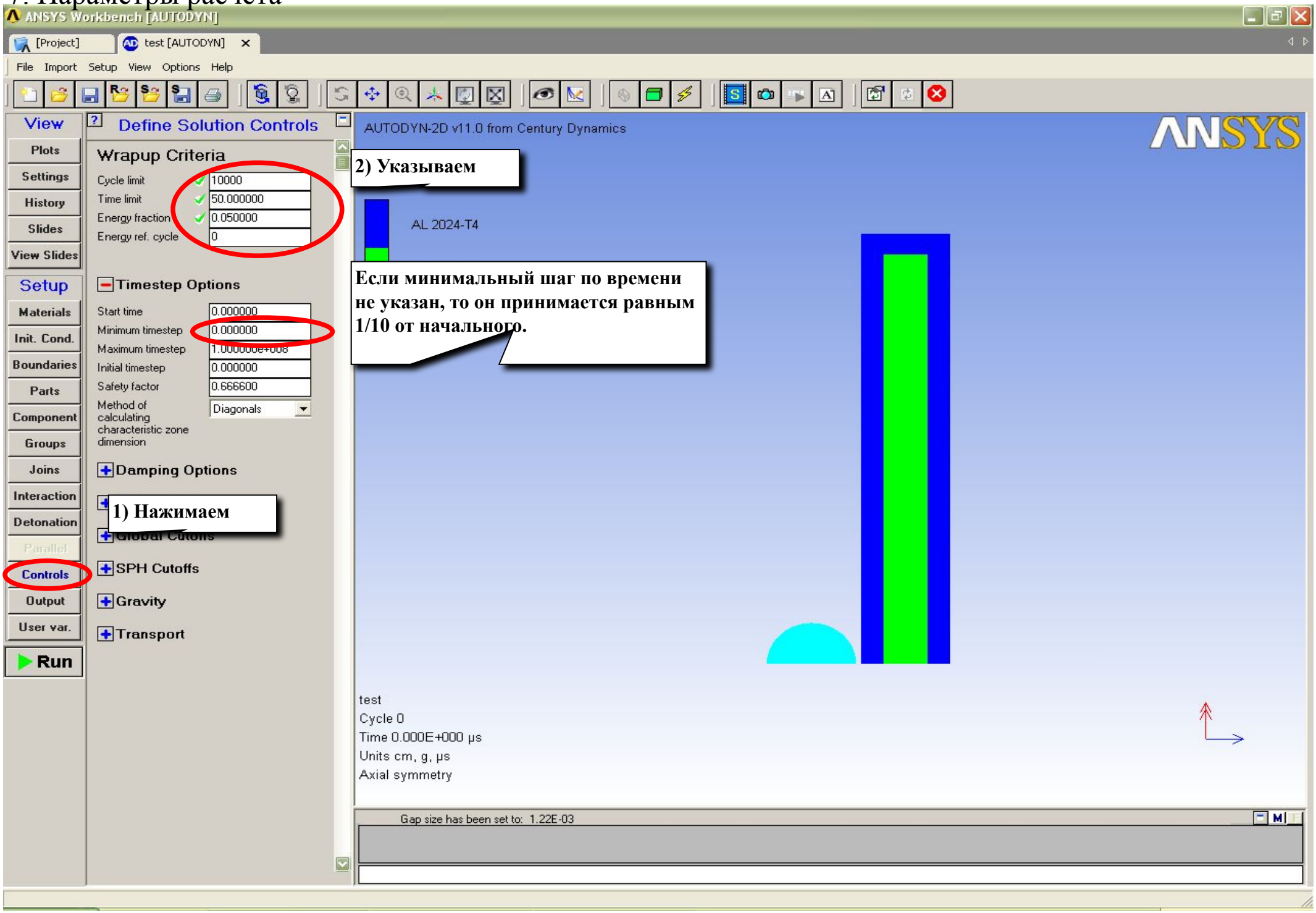
5. Склеиваем части, образующие единую деталь



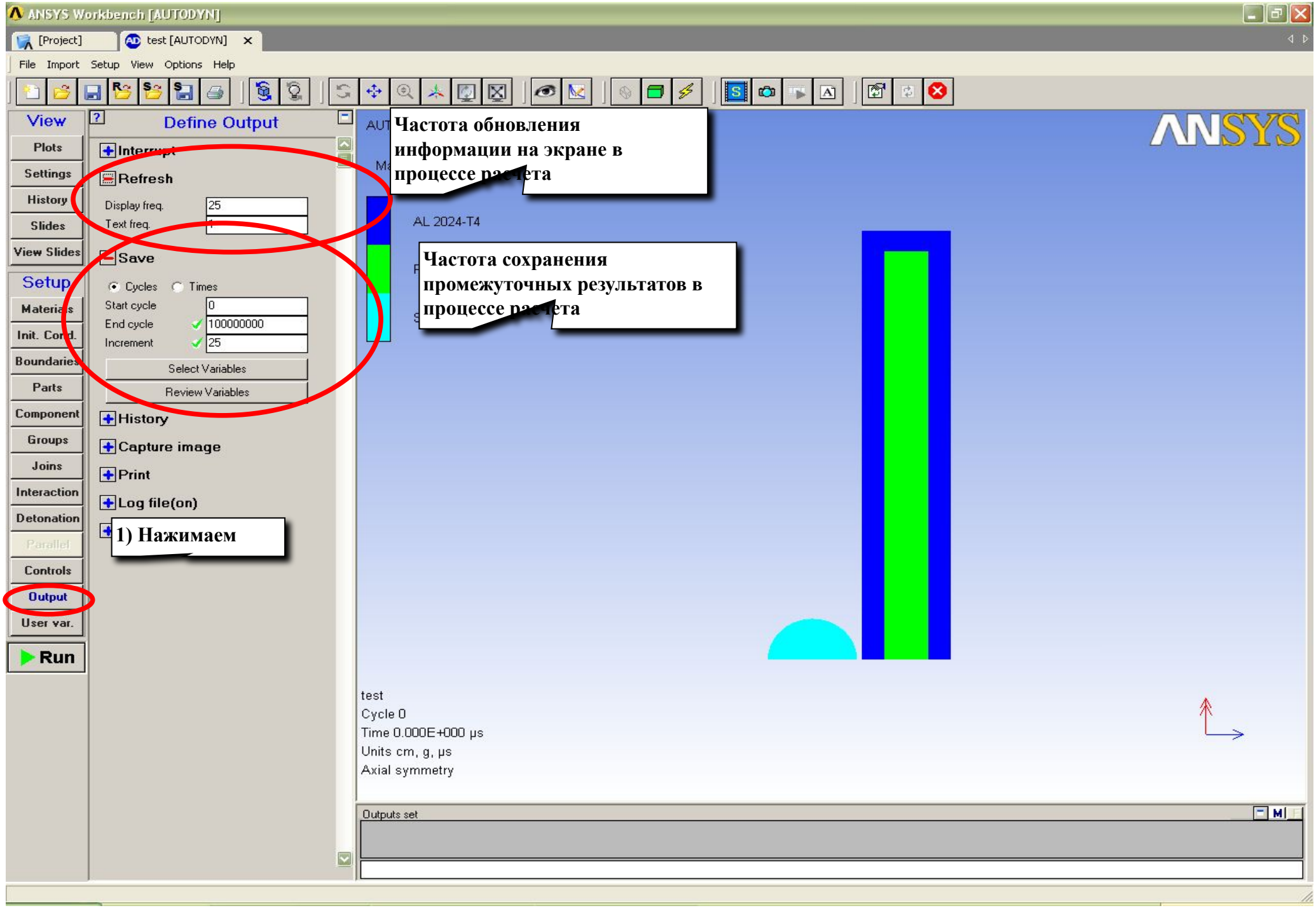
6. Определяем параметры взаимодействия



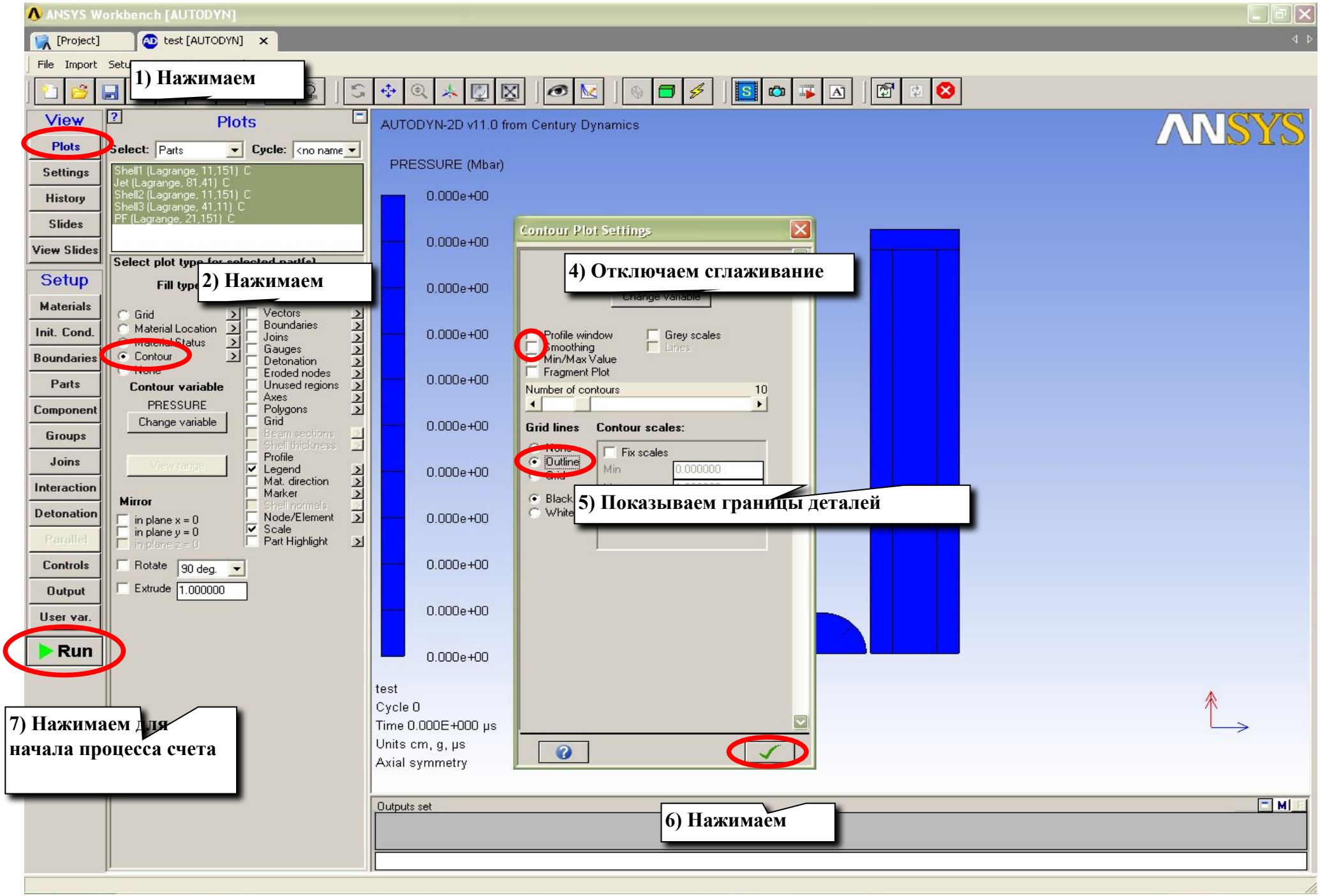
7. Параметры расчета

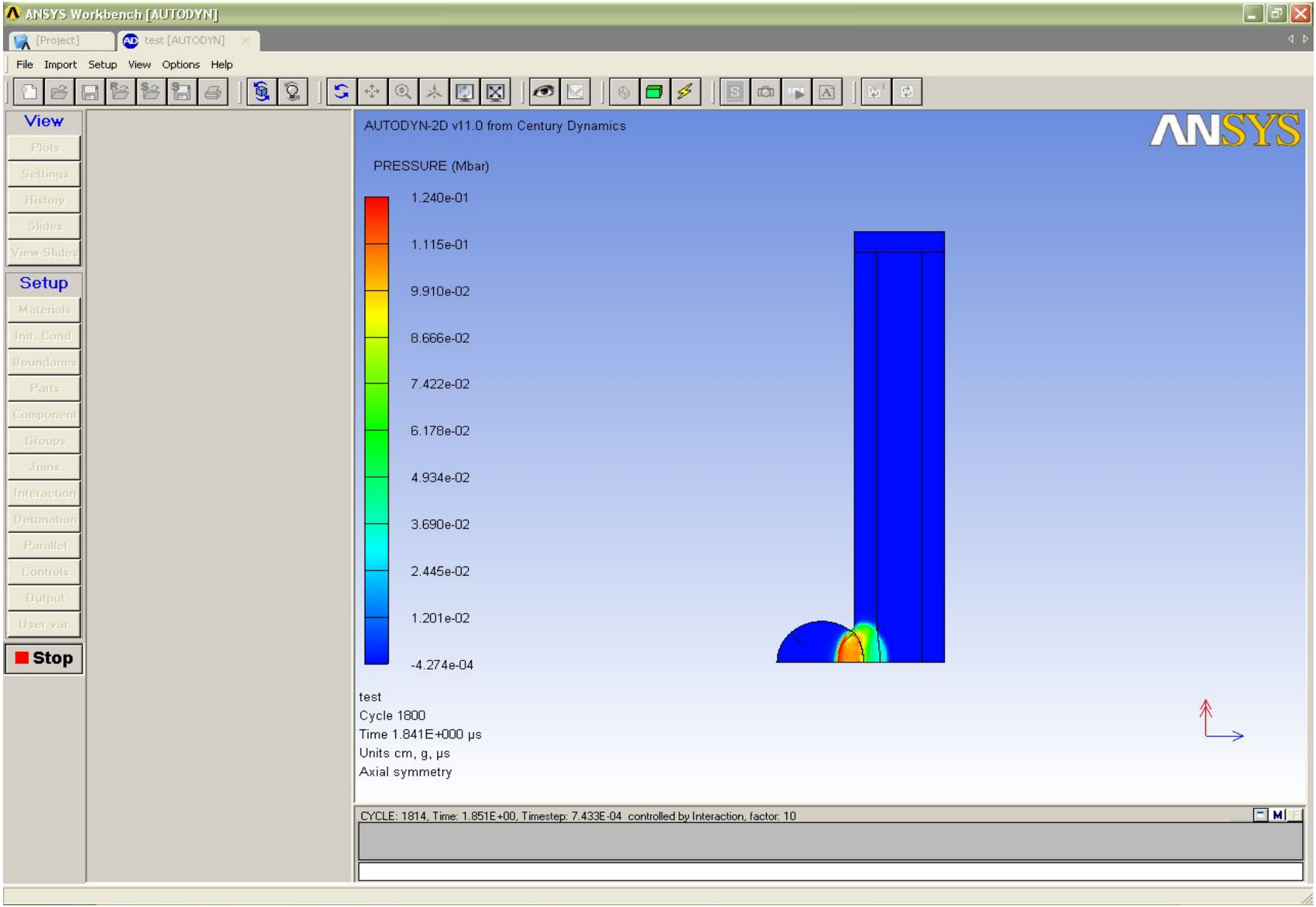


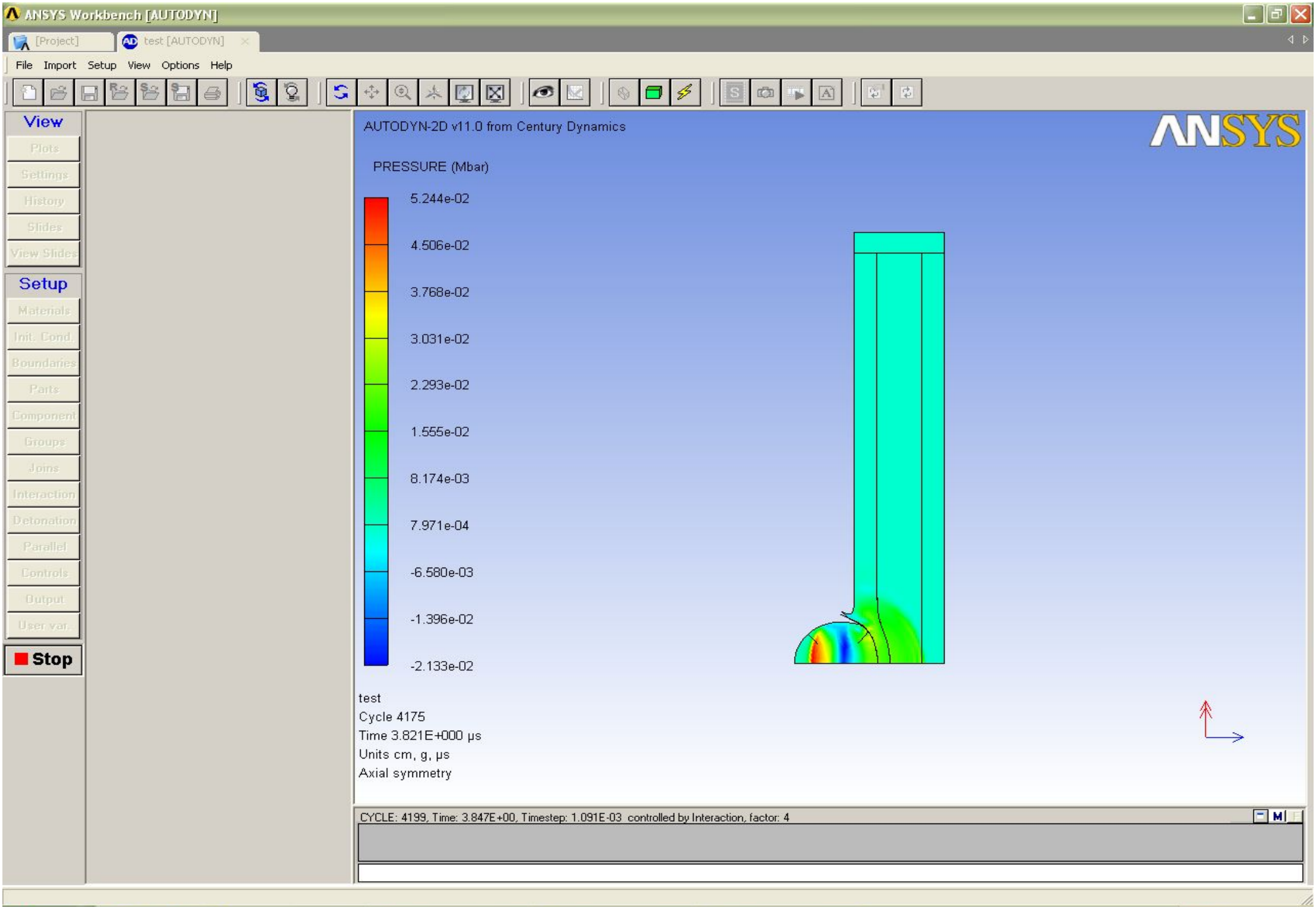
7. Результаты

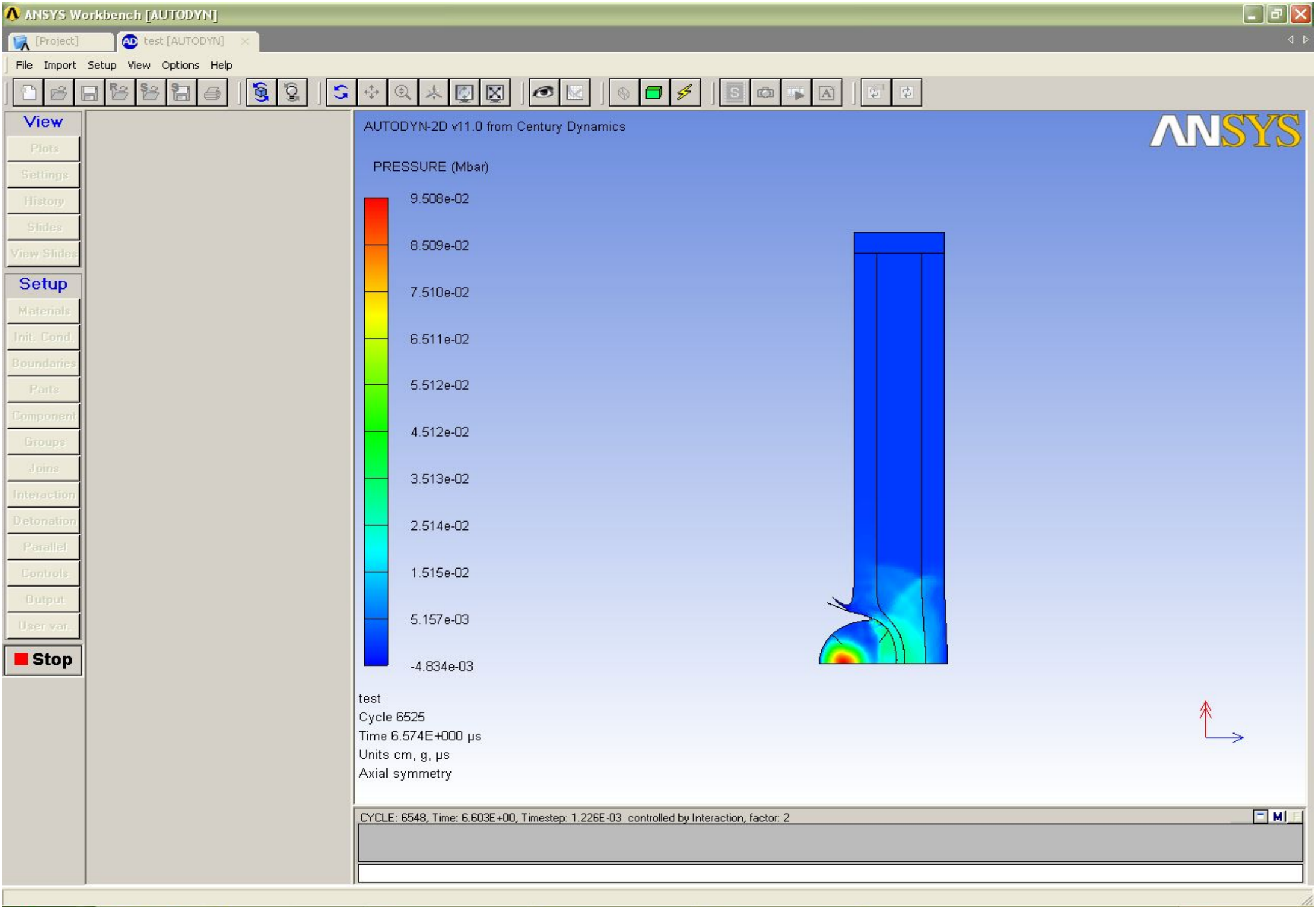


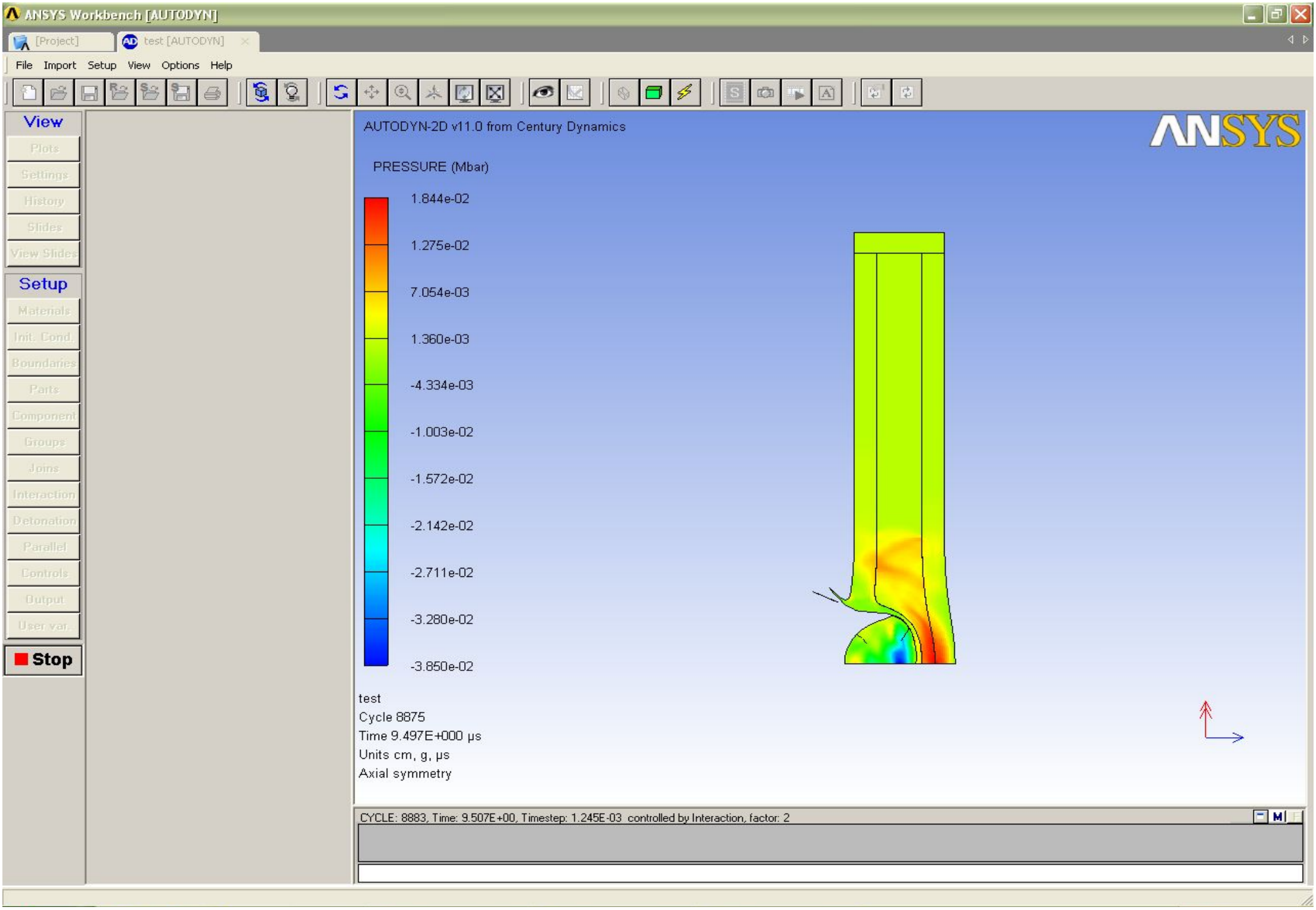
8. Изменение представления данных

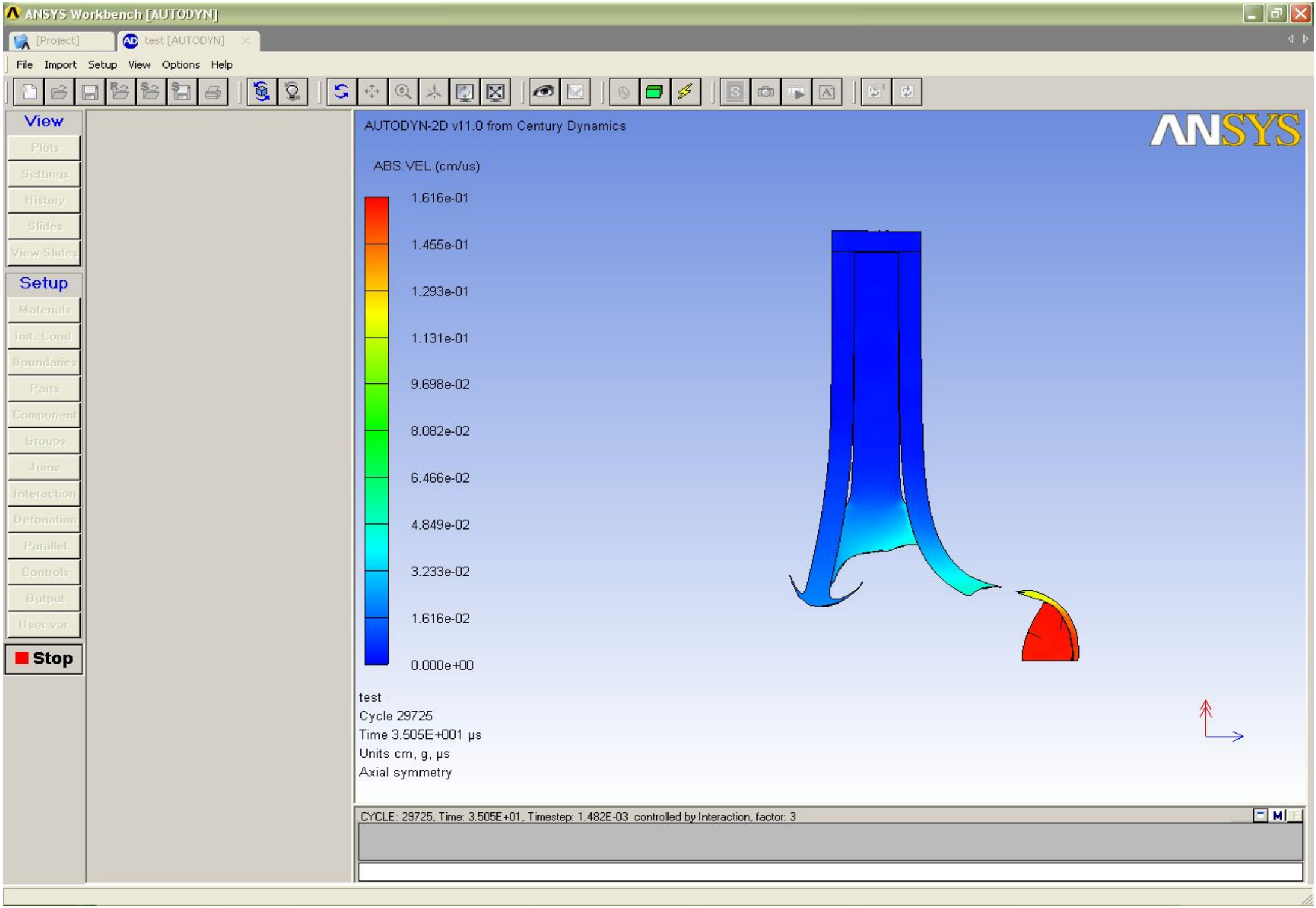



ANSYS Workbench [AUTODYN]
[Project]
test [AUTODYN]
File Import Setup View Options Help
View
Plots
Settings
History
Slides
View Slides
Setup
Materials
Init. Cond.
Boundaries
Parts
Component
Groups
Joins
Interaction
Detonation
Parallel
Controls
Output
User var.
Stop
AUTODYN-2D v11.0 from Century Dynamics
ANSYS
PRESSURE (Mbar)
1.240e-01
1.115e-01
9.910e-02
8.666e-02
7.422e-02
6.178e-02
4.934e-02
3.690e-02
2.445e-02
1.201e-02
-4.274e-04
test
Cycle 1800
Time 1.841E+000 µs
Units cm, g, µs
Axial symmetry
CYCLE: 1814, Time: 1.851E+00, Timestep: 7.433E-04 controlled by Interaction, factor: 10

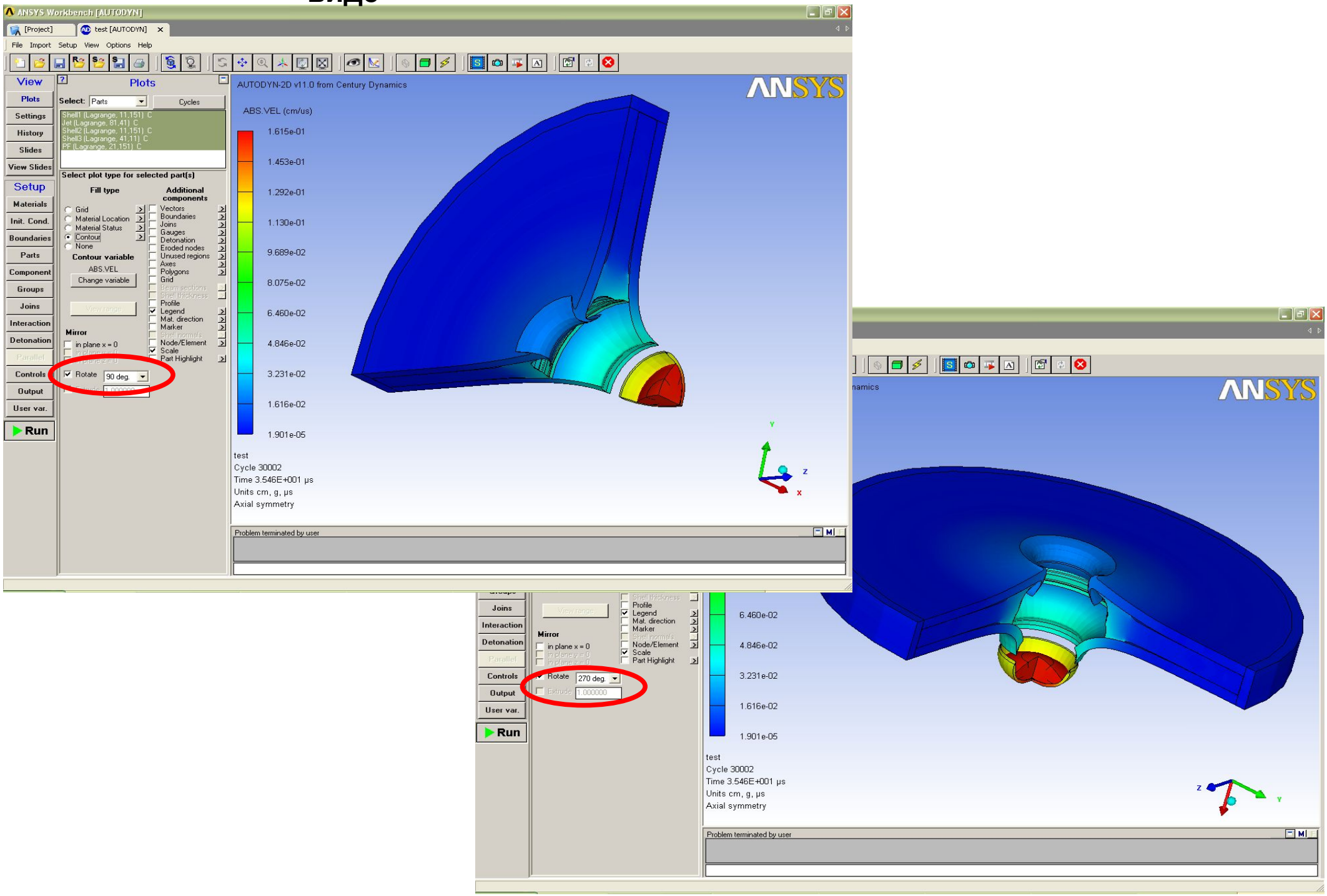

ANSYS Workbench [AUTODYN]
[Project]
test [AUTODYN]
File Import Setup View Options Help
View
Plots
Settings
History
Slides
View Slides
Setup
Materials
Init. Cond.
Boundaries
Parts
Component
Groups
Joins
Interaction
Detonation
Parallel
Controls
Output
User var.
Stop
AUTODYN-2D v11.0 from Century Dynamics
ANSYS
PRESSURE (Mbar)
5.244e-02
4.506e-02
3.768e-02
3.031e-02
2.293e-02
1.555e-02
8.174e-03
7.971e-04
-6.580e-03
-1.396e-02
-2.133e-02
test
Cycle 4175
Time 3.821E+000 µs
Units cm, g, µs
Axial symmetry
CYCLE: 4199, Time: 3.847E+00, Timestep: 1.091E-03 controlled by Interaction, factor: 4

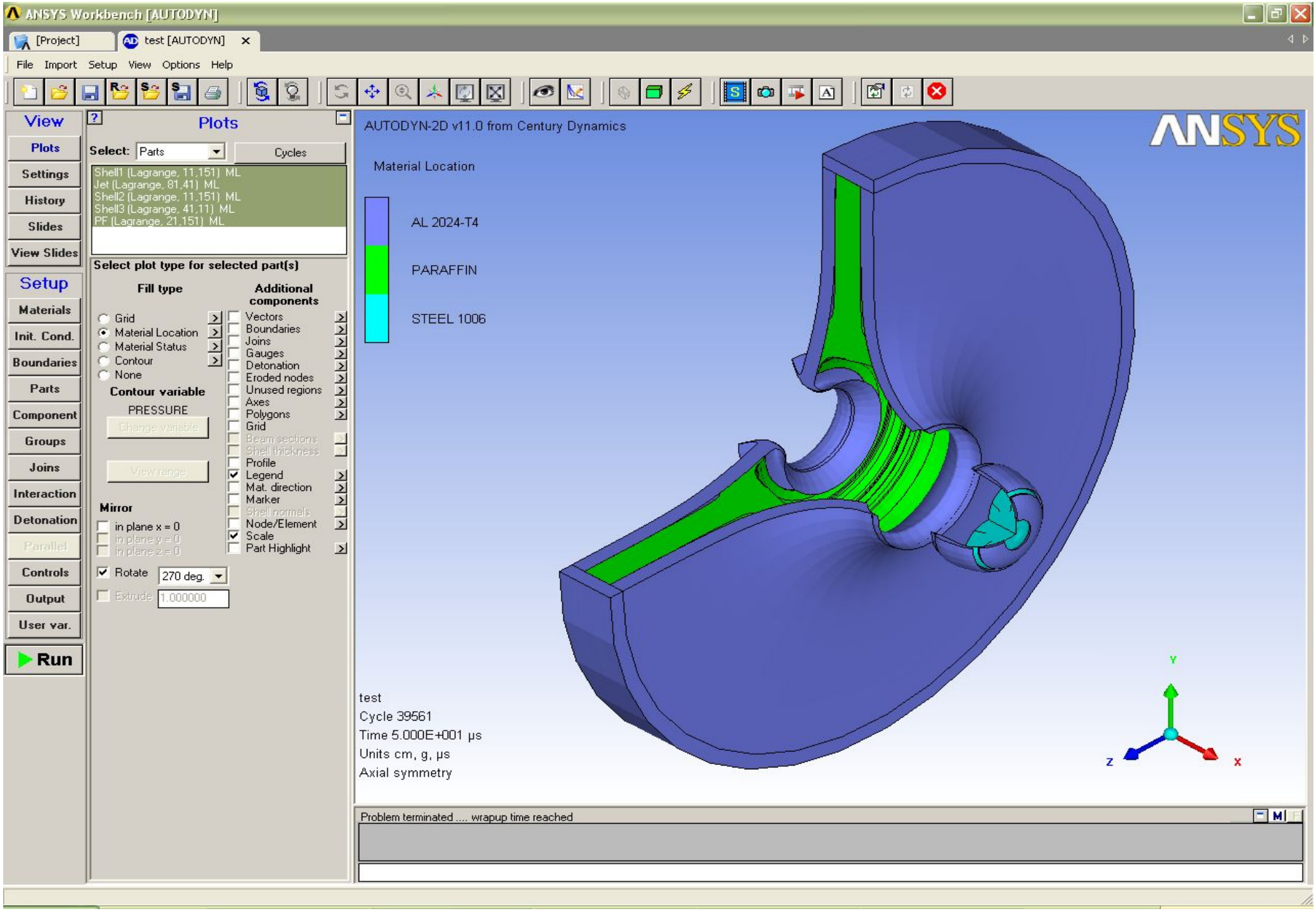

ANSYS Workbench [AUTODYN]
[Project]
test [AUTODYN]
File Import Setup View Options Help
View
Plots
Settings
History
Slides
View Slides
Setup
Materials
Init. Cond.
Boundaries
Parts
Component
Groups
Joins
Interaction
Detonation
Parallel
Controls
Output
User var.
Stop
AUTODYN-2D v11.0 from Century Dynamics
ANSYS
PRESSURE (Mbar)
9.508e-02
8.509e-02
7.510e-02
6.511e-02
5.512e-02
4.512e-02
3.513e-02
2.514e-02
1.515e-02
5.157e-03
-4.834e-03
test
Cycle 6525
Time 6.574E+000 µs
Units cm, g, µs
Axial symmetry
CYCLE: 6548, Time: 6.603E+00, Timestep: 1.226E-03 controlled by Interaction, factor: 2


ANSYS Workbench [AUTODYN]
[Project]
test [AUTODYN]
File Import Setup View Options Help
View
Plots
Settings
History
Slides
View Slides
Setup
Materials
Init. Cond.
Boundaries
Parts
Component
Groups
Joins
Interaction
Detonation
Parallel
Controls
Output
User var.
Stop
AUTODYN-2D v11.0 from Century Dynamics
ANSYS
PRESSURE (Mbar)
1.844e-02
1.275e-02
7.054e-03
1.360e-03
-4.334e-03
-1.003e-02
-1.572e-02
-2.142e-02
-2.711e-02
-3.280e-02
-3.850e-02
test
Cycle 8875
Time 9.497E+000 µs
Units cm, g, µs
Axial symmetry
CYCLE: 8883, Time: 9.507E+00, Timestep: 1.245E-03 controlled by Interaction, factor: 2


ANSYS Workbench [AUTODYN]
[Project]
test [AUTODYN]
File Import Setup View Options Help
View
Plots
Settings
History
Slides
View Slides
Setup
Materials
Init. Cond.
Boundaries
Parts
Component
Groups
Joins
Interaction
Detonation
Parallel
Controls
Output
User var.
Stop
AUTODYN-2D v11.0 from Century Dynamics
ANSYS
ABS.VEL (cm/us)
1.616e-01
1.455e-01
1.293e-01
1.131e-01
9.698e-02
8.082e-02
6.466e-02
4.849e-02
3.233e-02
1.616e-02
0.000e+00
test
Cycle 29725
Time 3.505E+001 µs
Units cm, g, µs
Axial symmetry
CYCLE: 29725, Time: 3.505E+01, Timestep: 1.482E-03 controlled by Interaction, factor: 3

Представление в «объемном» виде




ANSYS Workbench [AUTODYN]
[Project]
test [AUTODYN]
File Import Setup View Options Help
View
Plots
Settings
History
Slides
View Slides
Setup
Materials
Init. Cond.
Boundaries
Parts
Component
Groups
Joins
Interaction
Detonation
Parallel
Controls
Output
User var.
Run
Plots
Select: Parts
Cycles
Shell1 (Lagrange, 11,151) ML
Jet (Lagrange, 81,41) ML
Shell2 (Lagrange, 11,151) ML
Shell3 (Lagrange, 41,11) ML
PF (Lagrange, 21,151) ML
Select plot type for selected part(s)
Fill type
Grid
Material Location
Material Status
Contour
None
Contour variable
PRESSURE
Change variable
View range
Mirror
in plane x = 0
in plane y = 0
in plane z = 0
Rotate
270 deg.
Extrude
1.000000
Additional components
Vectors
Boundaries
Joins
Gauges
Detonation
Eroded nodes
Unused regions
Axes
Polygons
Grid
Beam sections
Shell thickness
Profile
Legend
Mat. direction
Marker
Shell normals
Node/Element
Scale
Part Highlight
AUTODYN-2D v11.0 from Century Dynamics
ANSYS
Material Location
AL 2024-T4
PARAFFIN
STEEL 1006
test
Cycle 39561
Time 5.000E+001 µs
Units cm, g, µs
Axial symmetry
Y
Z
X
Problem terminated .... wrapup time reached