Nonlinear problems in FEM – Contact nonlinearities

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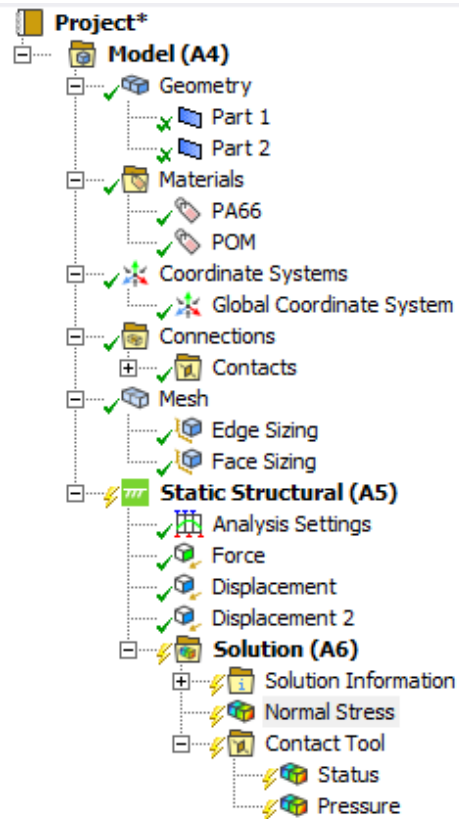
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Case 1: Static 2D plane-stress contact case

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Case 1: Static 2D plane-stress contact case

- Cylinders thickness: 10 mm

- Use various linear and nonlinear contact algorithms and compare the results

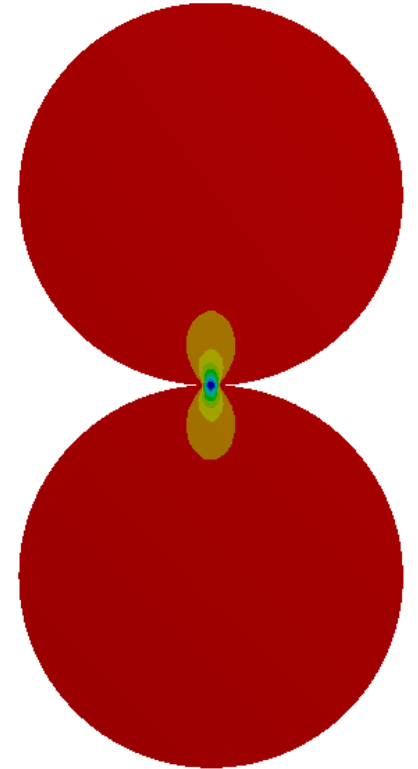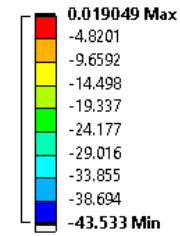A: Twin_cylinder
Static Structural
Time: 1. s
29. 06. 2021 09:25

A Force: 100. N
B Displacement
C Displacement 2
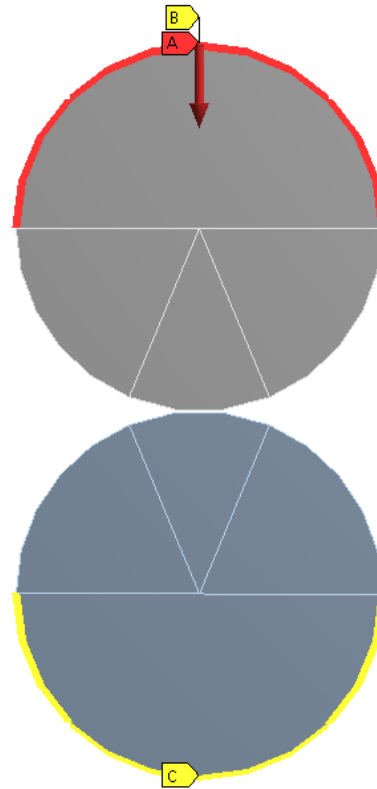
A: Twin_cylinder
Normal Stress
Type: Normal Stress(Y Axis)
Unit: MPa
Global Coordinate System
Time: 1
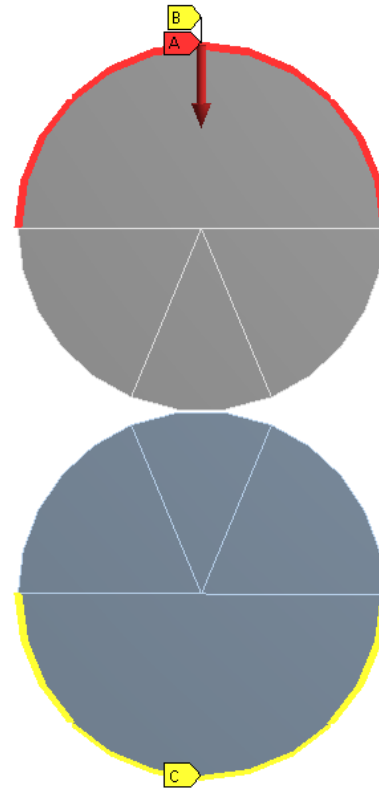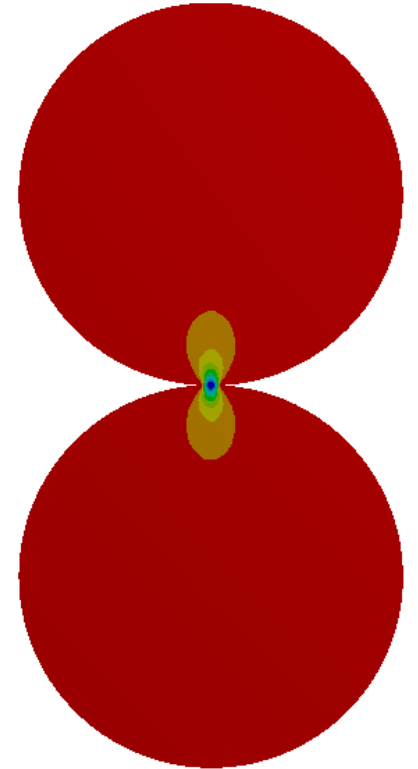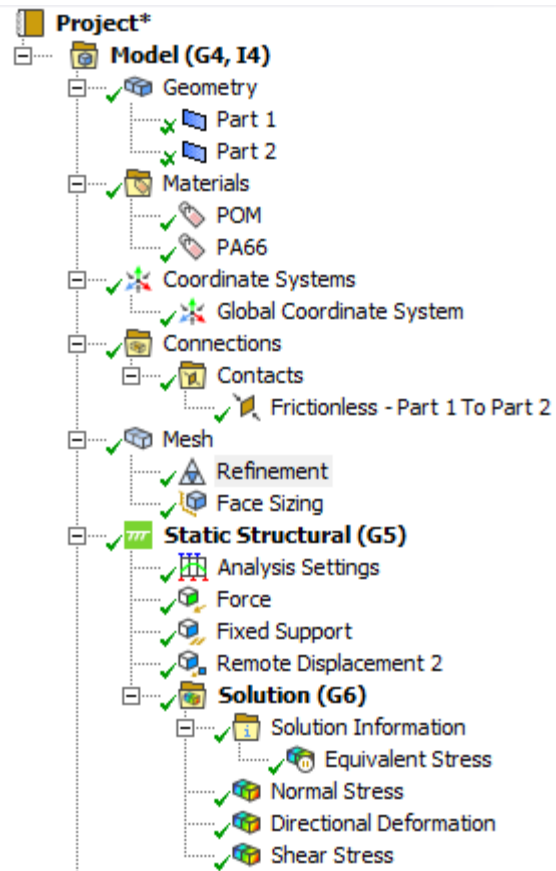Deformation Scale Factor: 1.0 (True Scale)
29. 06. 2021 09:26

0.019049 Max
-4.8201
-9.6592
-14.498
-19.337
-24.177
-29.016
-33.855
-38.694
-43.533 Min

Contact nonlinearities

Case 2: Moving cylinder on plate - 2D plane stress case

Project*
Model (G4, I4)
  Geometry
    Part 1
    Part 2
  Materials
    POM
    PA66
  Coordinate Systems
    Global Coordinate System
  Connections
    Contacts
      Frictionless - Part 1 To Part 2
  Mesh
    Refinement
    Face Sizing
  Static Structural (G5)
    Analysis Settings
    Force
    Fixed Support
    Remote Displacement 2
    Solution (G6)
      Solution Information
        Equivalent Stress
      Normal Stress
      Directional Deformation
      Shear Stress

G: Cylinder_on_plate_T1_frictionless_finer_mesh
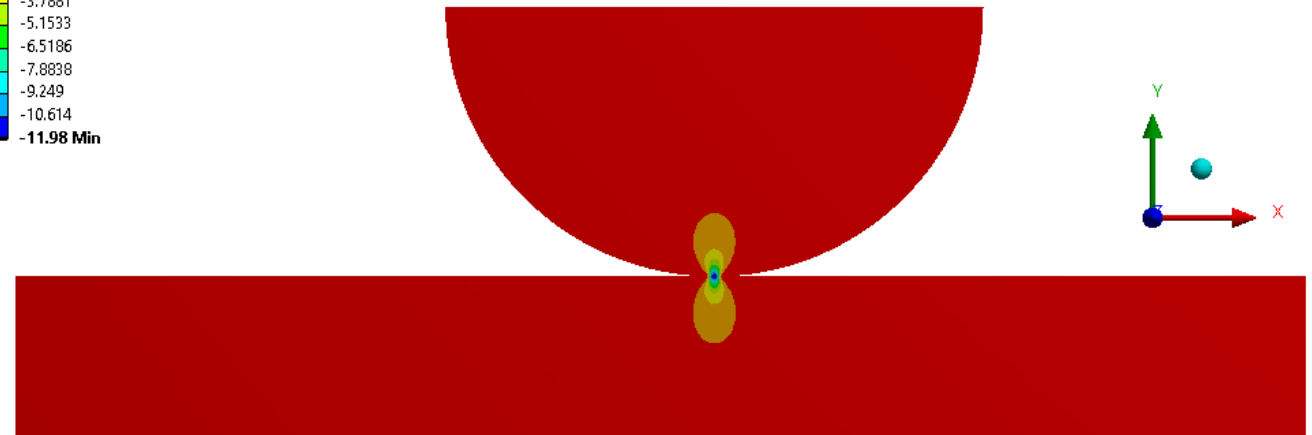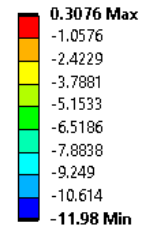Static Structural
Time: 1. s
29. 06. 2021 09:58

A Force: 100. N
B Remote Displacement 2
C Fixed Support
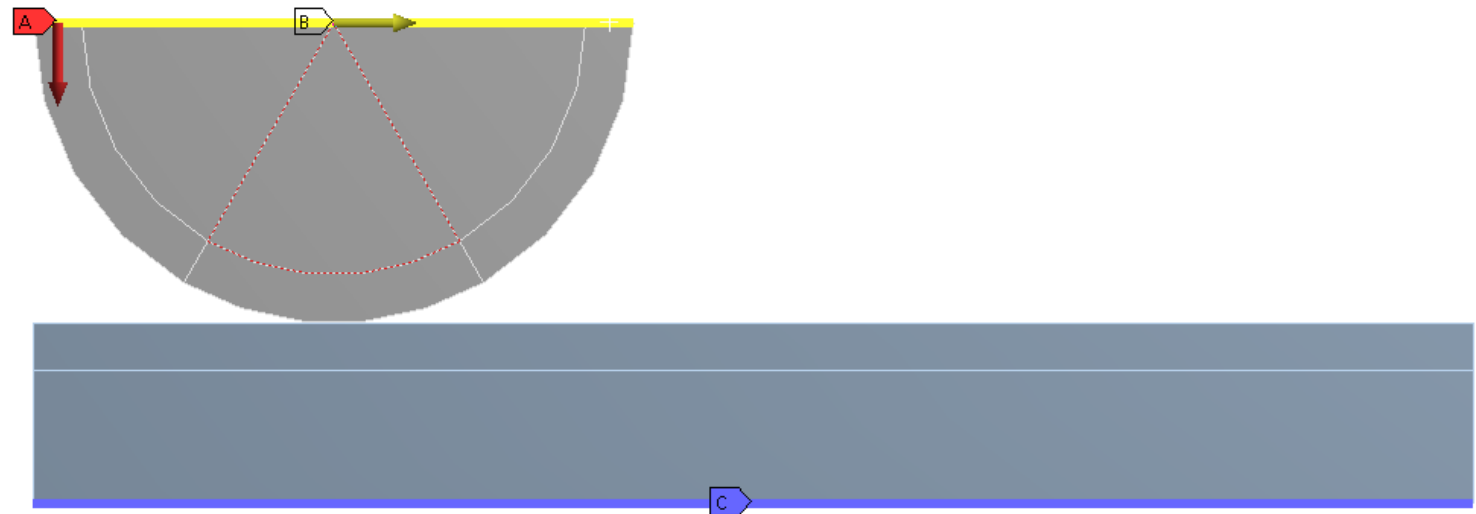
Case 2: Moving cylinder on plate - 2D plane stress case

- Body thickness: 10 mm

- Analysis time: 1 s

- Translation in the *x*-direction: 40 mm

- Force rises linearly from F_y = 0 to F_y = -100 N

- Evaluate the normal contact stress in th *y*-direction

G: Cylinder_on_plate_T1_frictionless_finer_mesh
Normal Stress
Type: Normal Stress(Y Axis)
Unit: MPa
Global Coordinate System
Time: 1
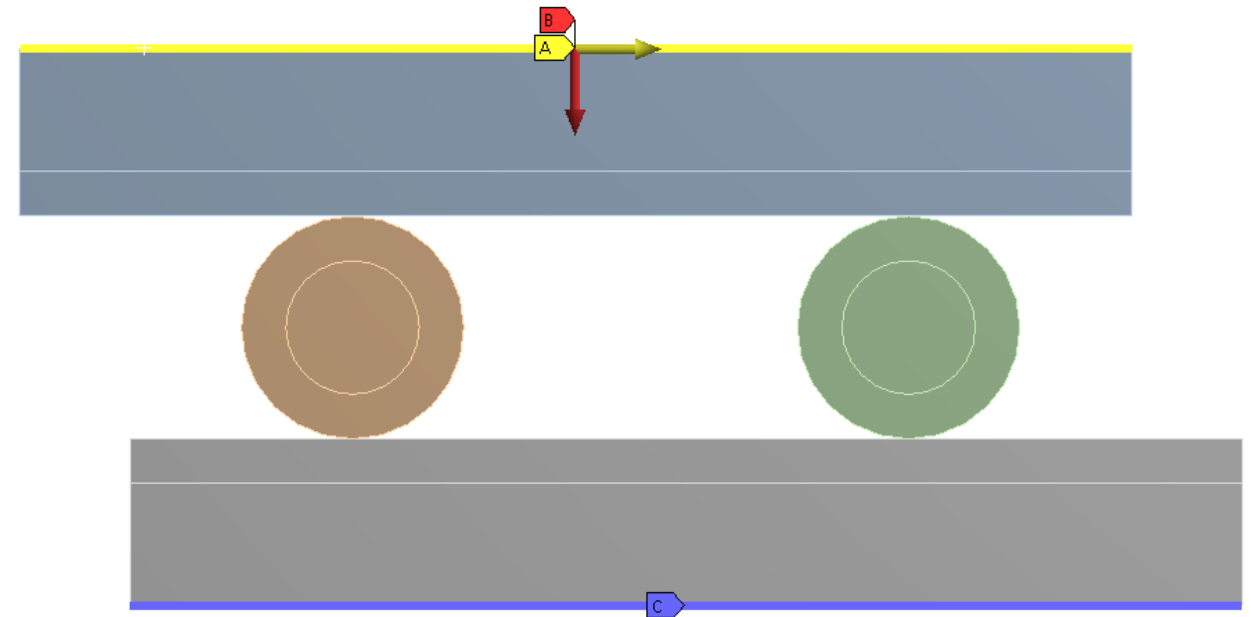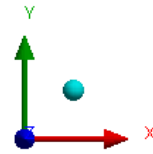Deformation Scale Factor: 1.0 (True Scale)
29. 06. 2021 10:00

0.3076 Max
-1.0576
-2.4229
-3.7881
-5.1533
-6.5186
-7.8838
-9.249
-10.614
-11.98 Min

Contact nonlinearities

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Individual case: Linear roller

- Use static structural analysis method

- Body thickness: 100 mm

- Analysis time: 2 s

- Translation in the x-direction: 10 mm

- Use frictional contact with $\mu = 0.5$

- Use boundary conditions and load as shown in the figure

- Force rises linearly from $F_y = 0$ (at $t = 0$ s) to $F_y = -150$ N (at $t = 2$ s)

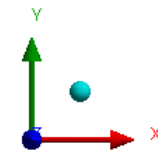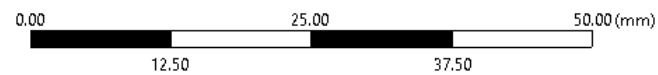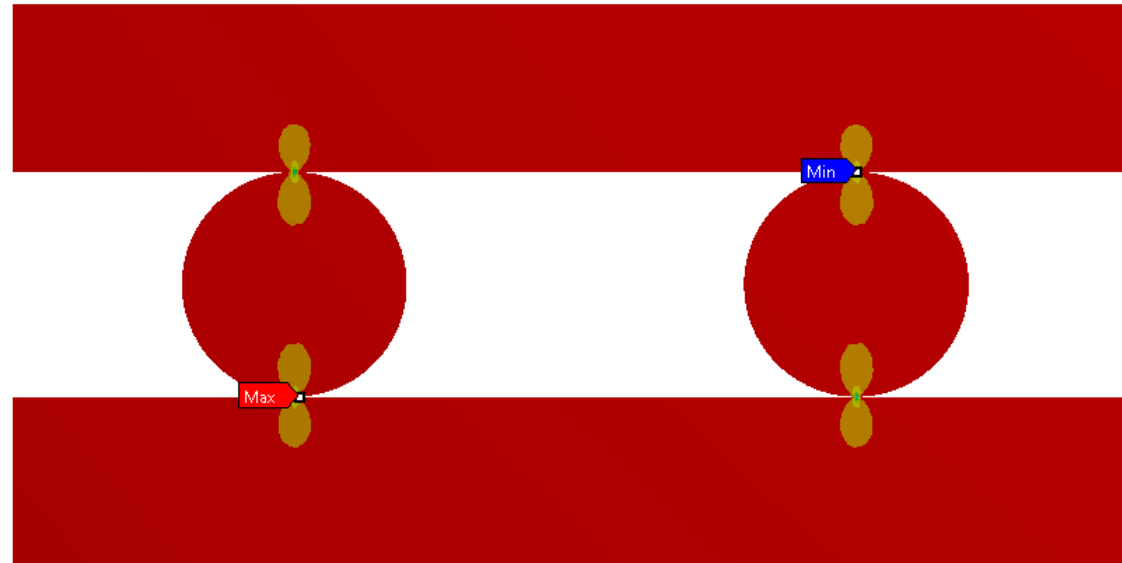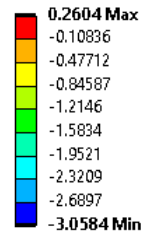- Evaluate the normal contact stress in th y-direction

B: Static Structural
Static Structural 2
Time: 2. s
29. 06. 2021 10:37

A Remote Displacement
B Remote Force: 150. N
C Fixed Support

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Contact nonlinearities

Individual case: Linear roller

Thank you for your attention!

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