

Worked Example 5

Mixed lubrication load sharing

The engineering question

The external load is shared between lubricant support and direct rough-surface contact. At every load-sharing iteration, the actual 50 nm surface grid is solved by the retained FFT-BEM contact algorithm; this example does not replace the surface with statistical asperity parameters.

What the model represents

This example uses the production model selected by the supplied input. The governing theory and assumptions are described in the TriboSolver Manual; here the emphasis is on setting up, reproducing and interpreting one complete calculation.

Input or control	Reproducible value
Simulation type	Mixed Lubrication
Normal load	5 N
Speeds	v1 = 1 m/s; v2 = 0 m/s
Lubricant	Viscosity 0.040 Pa.s; pressure-viscosity 1.25e-8 1/Pa
Domain and grid	200 x 200 um; 64 x 64; periodic
Macrogeometry	Point contact; body-1 Rx = Ry = 5 mm
Microgeometry	Generated PSD surface, Sq = 50 nm; seed 161803

Supplied input: **mixed-lubrication.tribo.json**

SHA-256: 32cffc8f0d70749c2619339747e7d063ee28e2eb521d695685691f325d532d81

Set up and run the story

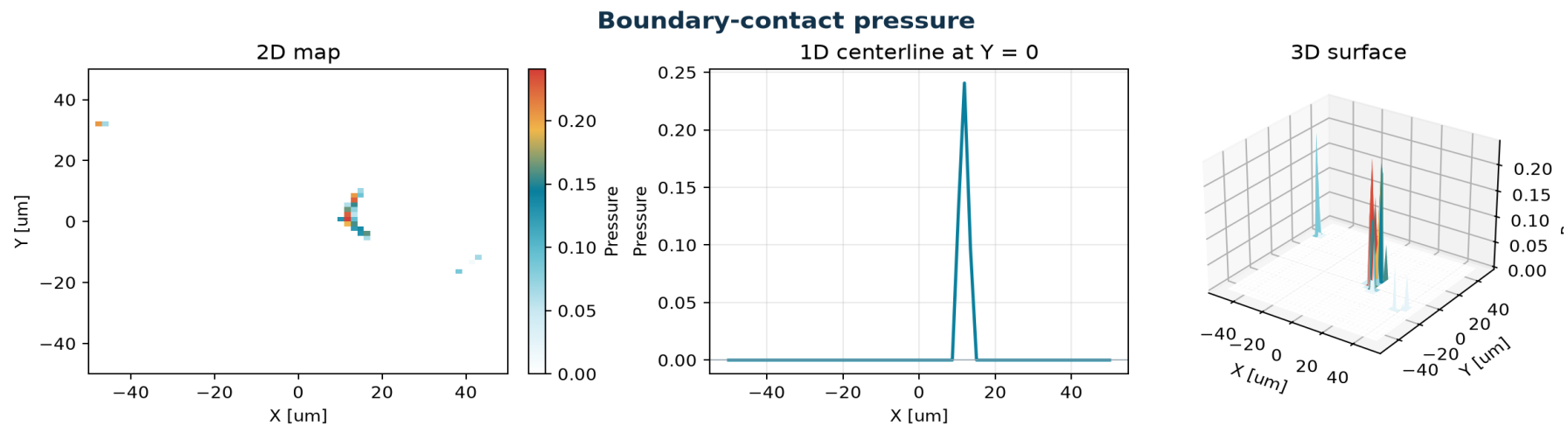
Step	Tab	What to do and why
1	Simulation Type	Choose Mixed Lubrication. Flat macrogeometry is disabled.
2	Solid Material Model	Use the supplied steel properties.
3	Lubricant Model	Enter 0.040 Pa.s viscosity and 1.25e-8 1/Pa pressure-viscosity coefficient.
4	Contact Conditions	Set Load = 5 N, body-1 speed = 1 m/s and body-2 speed = 0. Keep Include Friction checked with COF 0.50.
5	Contact Grid	Set a 200 x 200 um domain, 64 x 64 points and periodic boundaries.
6	Macro/Micro Geometry	Use Point Contact with 5 mm body-1 radii. Keep Micro Geometry enabled and generate the supplied 50 nm Sq surface.
7	Run	Run until the load-sharing residual satisfies the outer tolerance.

Run checkpoint

Do not interpret a field until the status reports success. Compare the summary below with your run; it was read from the retained result set created from this exact input.

iterations 11 | load error 0.000527724 | coefficient of friction 0.0344779 | BEM grid 64 x 64

Calculated result



Reproduced calculation: iterations 11 | load error 0.000527724 | coefficient of friction 0.0344779 | BEM grid 64 x 64

The pressure map is the direct FFT-BEM solid-contact contribution on the generated 50 nm surface. Interpret it together with the hydrodynamic and boundary-contact load fields; their sum must reproduce the prescribed load. The central film-thickness output is the final value after the load-sharing balance, not the initial estimate.

Selected calculated scalar outputs

Output	Value	Unit
Calculated contact load	0.03121	N
Hydrodynamic load share	4.969	N
Boundary-contact load share	0.03121	N
hcl	110	nm
Coefficient of friction	0.03448	1
Friction force	0.1568	N
Contact area	2.539e-10	m^2
Rigid body motion	0	um

How to explore and explain the result

In 1D, start with the default center cross-section. Choose X or Y only when the engineering question requires a different direction, then move the location control. The grid and cursor readout give the plotted value and its unit. In 2D, use the colorbar to locate high and low regions and read the numerical X/Y axes. In 3D, rotate the same matrix to understand peak prominence and orientation; the X, Y and Z directions are references, not a different calculation.

View	Question it answers	Reading rule
1D	What happens along one selected line?	Start at the center; use the grid and cursor value to quantify peaks, widths and gradients.
2D	Where are high, low or active regions?	Read the colorbar and X/Y units; compare runs only with their numerical scales visible.
3D	How prominent and oriented are the features?	Rotate for shape and orientation; use 1D/2D or export for exact values.

What to report

State the input filename and hash, simulation type, material and geometry, grid and surface definition, prescribed load, solver status, iteration or balance measure, selected output name and unit, and the engineering meaning of the plotted pattern.

A useful engineering explanation states the prescribed load and geometry, identifies the active physical mechanism, checks convergence or force balance, and only then interprets the spatial field. Keep the supplied input and retained result together so a colleague can reproduce every number and plot.

Retained result: mixed-lubrication-results.tribo-results.json
SHA-256: c6863a8b3d2ed00b11ec0821b7bbb6a4681937c4975251218a2c8026d53e96ed