

Worked Example 9

Iterative Archard wear

The engineering question

The contact state is solved, wear depth is accumulated for each body, the surfaces are updated and the cycle repeats. The example demonstrates how to compare the initial and final contact states and how to read accumulated wear volume histories.

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	Wear
Normal load	1 N
Friction	COF = 0.15
Iterations	10
Wear coefficients	Body 1: 1e-4; Body 2: 2e-4
Time step	0.1 s per body
Surface motion	Surface 2, single pixel
Surface/grid	Sq 20 nm, seed 271828; 64 x 64

Supplied input: `wear.tribo.json`
SHA-256: f43ade3944f6ea1af54ad5aa836b2848f637d86049dcf289aa6e6dd62411028f

Set up and run the story

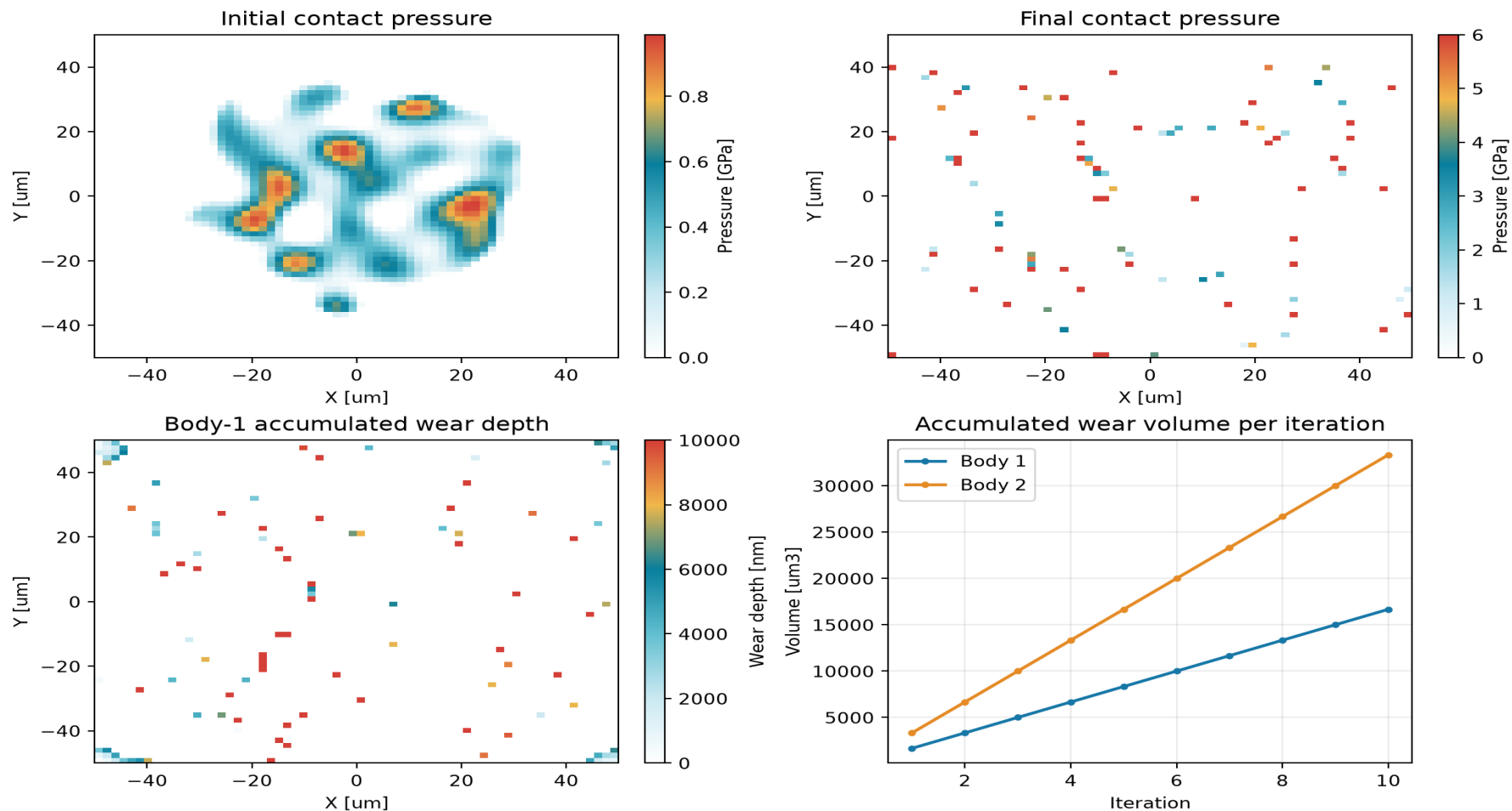
Step	Tab	What to do and why
1	Simulation Type	Choose Wear.
2	Solid Material Model	Enter elastic properties and body-specific hardness.
3	Contact Conditions	Set Load = 1 N and Include Friction with COF 0.15.
4	Contact Grid/Macro Geometry	Use 64 x 64 Point Contact.
5	Micro Geometry	Generate the supplied 20 nm RMS surface.
6	Wear	Set 10 iterations, the two wear coefficients, 0.1 s time steps and Surface 2, single pixel motion.
7	Run	Watch completed and remaining iterations in the progress status. Do not close the application until Results appears.

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 10 | maximum depth 10000 nm

Calculated result



Reproduced calculation: iterations 10 | maximum depth 10000 nm

The calculation completed all 10 iterations and reached a maximum wear depth of 10,000 nm. Compare Initial contact pressure with final Contact pressure to see redistribution, and Initial surfaces with final Surface 1/2 to see material removal. Accumulated wear volume per iteration is the most direct history for comparing the two bodies; its slope indicates how quickly the wear rate is changing.

Selected calculated scalar outputs

Output	Value	Unit
Calculated contact load	1	N
Contact area	2.197e-10	m^2
Rigid body motion	0.2915	um
Average contact pressure	4.551	GPa
Nominal contact area	1.000e-08	m^2
Applied nominal pressure	0.1	GPa

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: wear-results.tribo-results.json
SHA-256: f30bc31b0eb30120c66e9f73737f04d640030dd74f2ecb806b6fb5c2983d5df9