

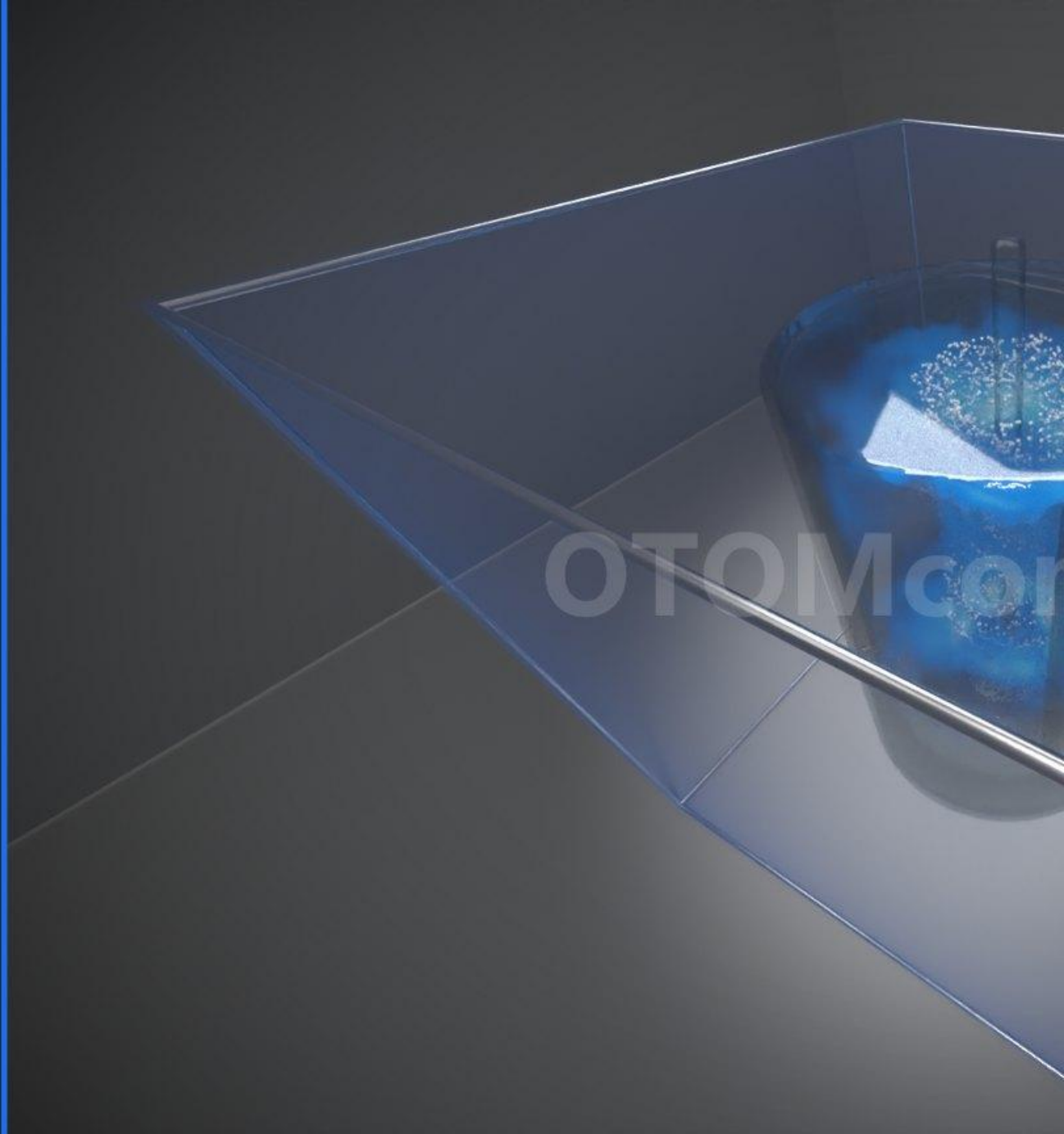
OTOM CFD

Demo Gallery

28 ready-to-run scenes: 2D and 3D, incompressible and supersonic, heat, rotating machinery, bubbles and building ventilation.

Every picture is a Blender (Cycles) render of a run recorded in the app with "Record for Offline Render"; pictures marked "click to play" open the rendered clip.

October 2026



How to open a demo

1 Open the DEMO tab

Left sidebar → DEMO (play icon). Every scene in the Demo folder is listed; one click loads the complete setup — geometry, solver settings, view — and switches to the 2D or 3D tab.

2 Or take a Guided Tour

At the top of the DEMO tab: five short lessons (shock waves, vortex shedding, drag you can trust, 3D vortices, heat and ventilation) that load the demos in order and explain what to look at.

3 Check before you trust

The Setup Check button (top right) lists anything in the scene that would make a number wrong, with one-click fixes. The Truth tab compares Cd, Cl and Strouhal with textbook values.

Validation status is stated on each slide: VALIDATED = compared with a reference and within the stated error; SHOWCASE = demonstrates a feature, numbers not validated.

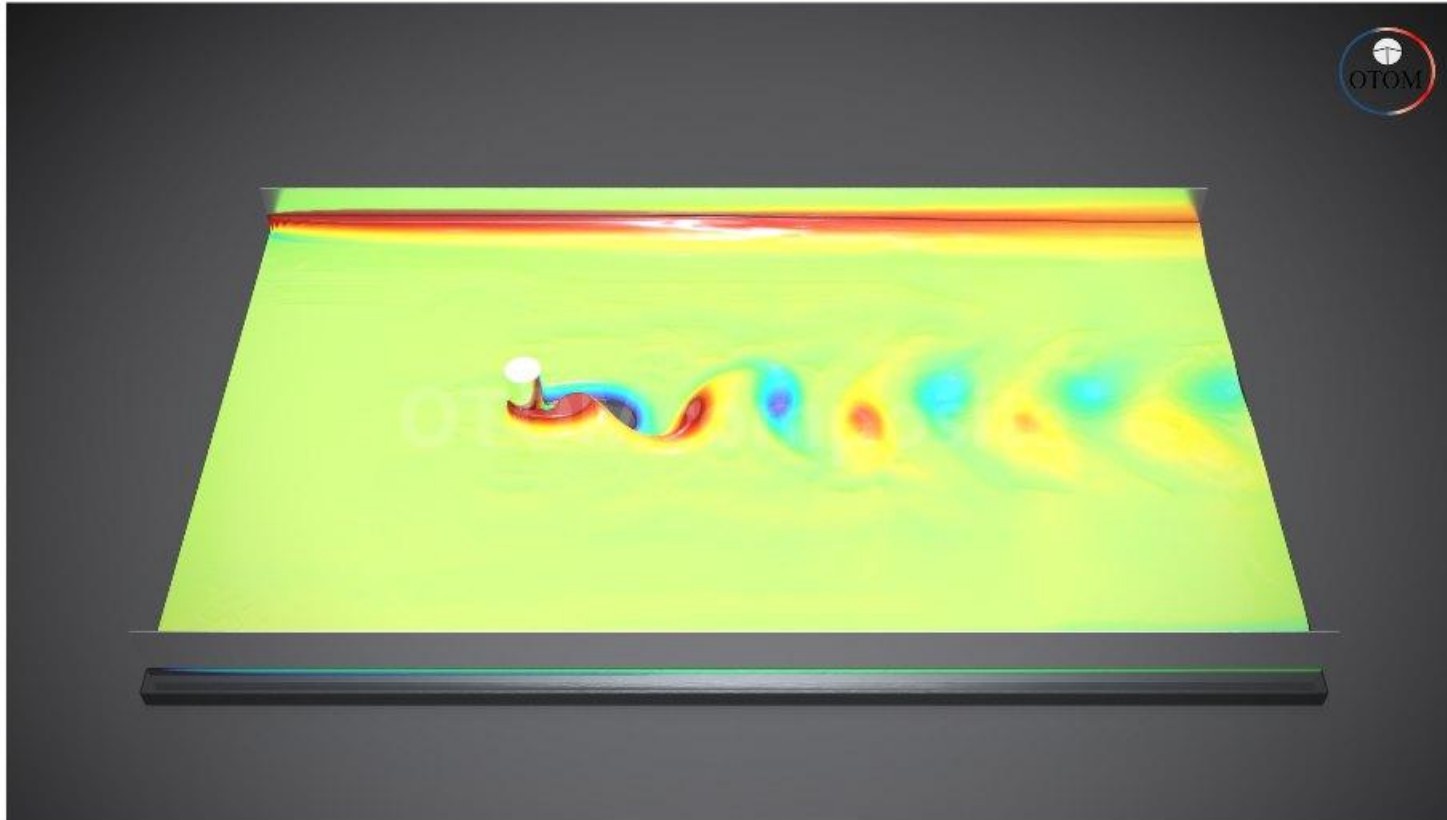
2D Flows

Vortex shedding, creeping flow, painted, drawn and photo-based geometry.

Kármán Vortex Street (Re 200) · Honey Flow: Creeping Flow at Re 5 · Aerofoil Wake (NACA 0012) · Cylinder Wake with Glowing Tracers · Spinning Hexagon · Logo in the Wind · Hand-drawn Pipe (Control Volume) · Greenhouse (Top View) · Car Side View (from a Photo)

Kármán Vortex Street (Re 200)

VALIDATED



Vorticity in Turbo colours (red/orange = one spin direction, blue = the other; green = no spin). Blender (Cycles) render of the recorded run.

What you see

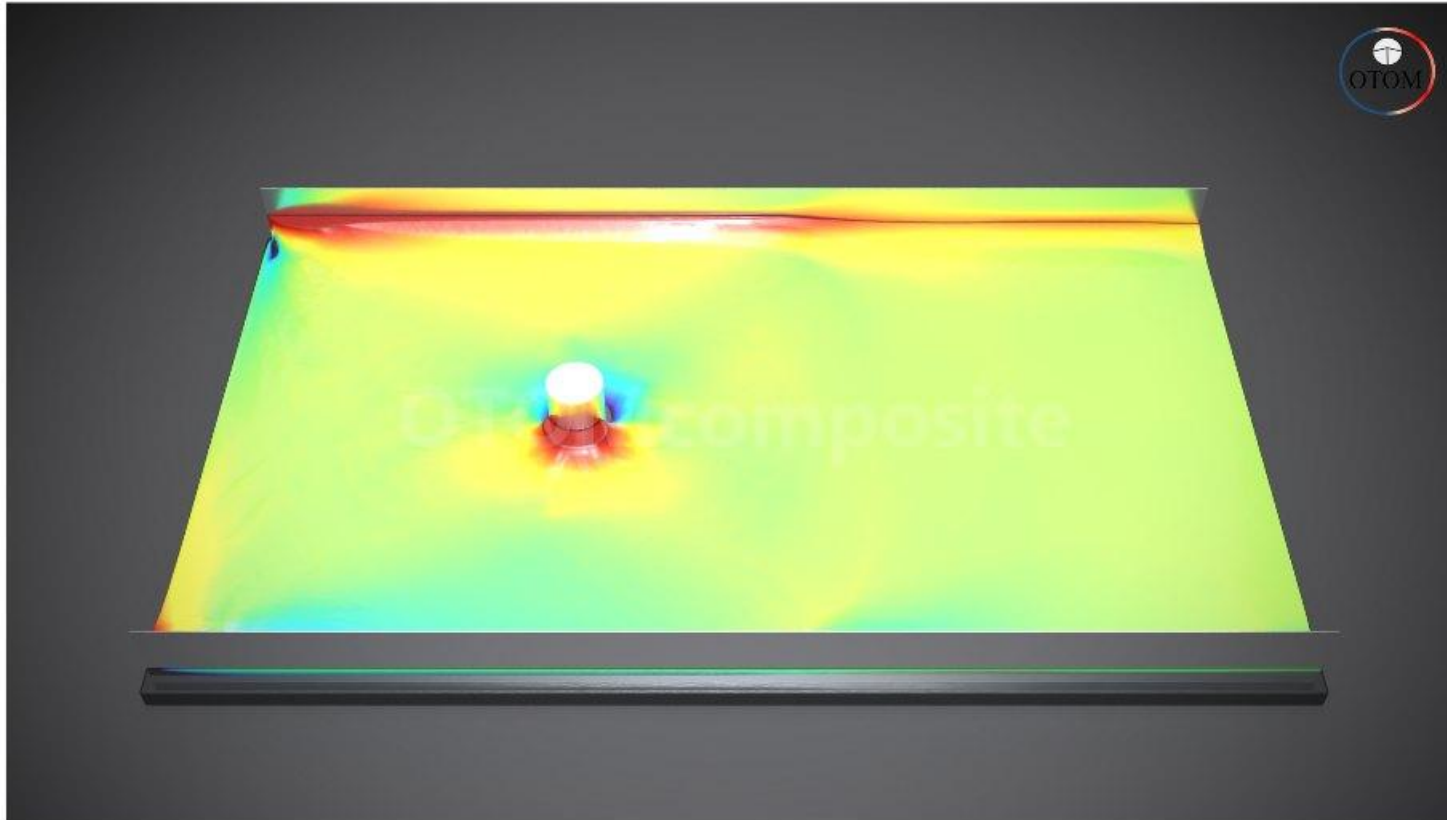
- A circular cylinder sheds vortices alternately from its top and bottom: the classic von Kármán street.
- The street forms within about 20 s and then repeats at a steady rhythm.

Physics & setup

- 2D incompressible, 910×512 grid, cylinder ≈ 31 cells across.
- $Re = 200$ (inlet 10, $v 1.536$), LES and vorticity confinement off, Live Analysis on.

Result

Mean $C_d \approx 0.9$ – 1.0 against ≈ 1.3 for an unconfined cylinder: the 2D solver is known to read 20–30% low once the wake sheds. Shedding pattern and lift oscillation are correct.



Vorticity in Turbo colours with automatic range; tracer beads show the motion. Blender (Cycles) render of the recorded run.

What you see

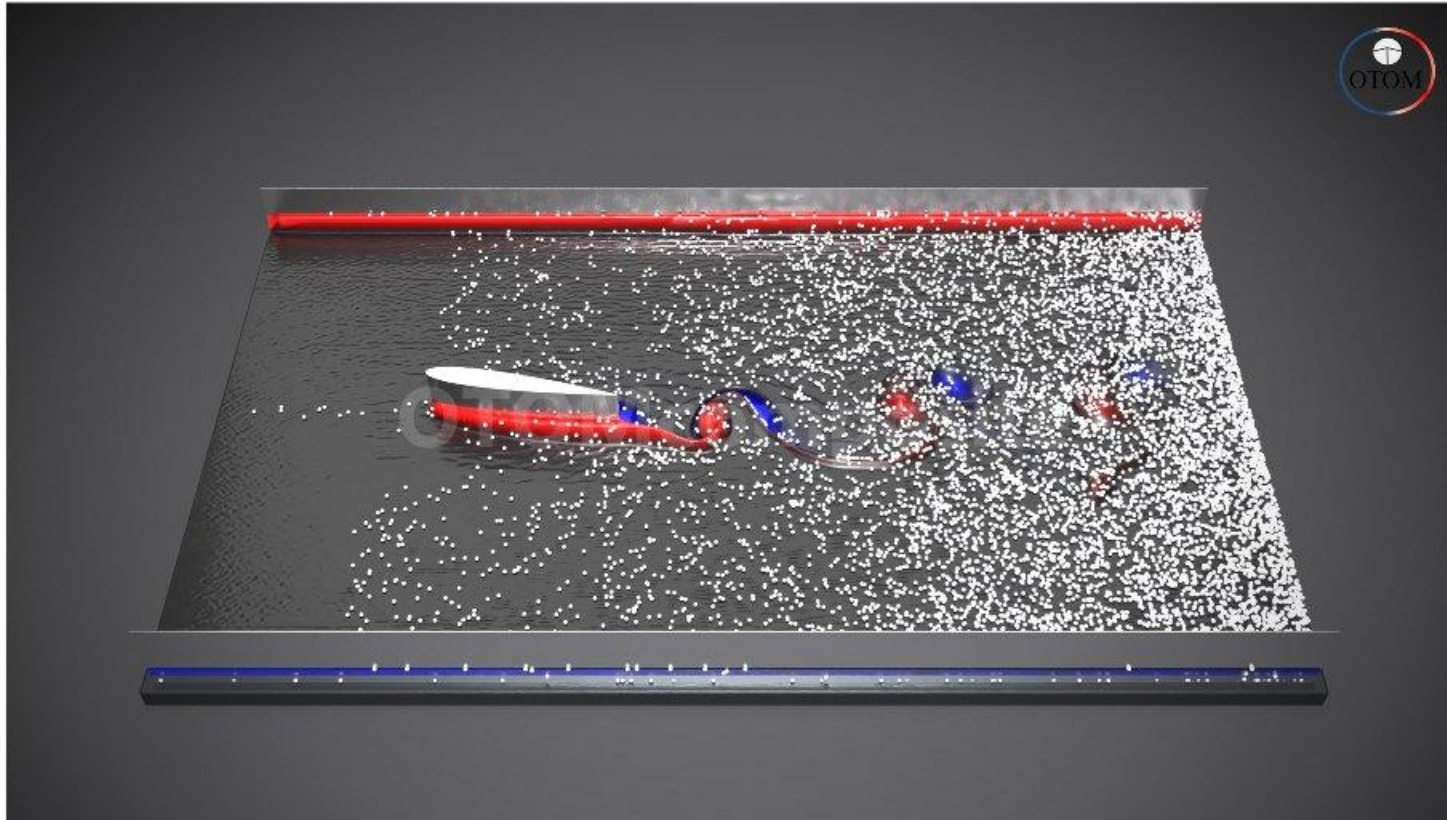
- A very viscous fluid creeps round the cylinder: no separation, no wake vortices.
- The pattern in front and behind is almost a mirror image — the signature of viscosity-dominated flow.

Physics & setup

- 2D incompressible, viscosity 5, inlet 0.5, 4 physics steps (diffusion sub-stepped automatically).
- $Re \approx 5$, Live Analysis on.

Result

$Cd \approx 7.0$ against ≈ 4.4 for an unconfined cylinder: the channel walls ($\approx 10\%$ blockage) raise the drag strongly at low Re . Qualitative behaviour is correct.



Vorticity (red / blue = opposite spin) on a dark backdrop. Blender (Cycles) render of the recorded run.

What you see

- A NACA 0012 aerofoil at incidence: the flow separates and rolls up into a train of large wake vortices.
- Thin red/blue shear layers leave the upper and lower surfaces.

Physics & setup

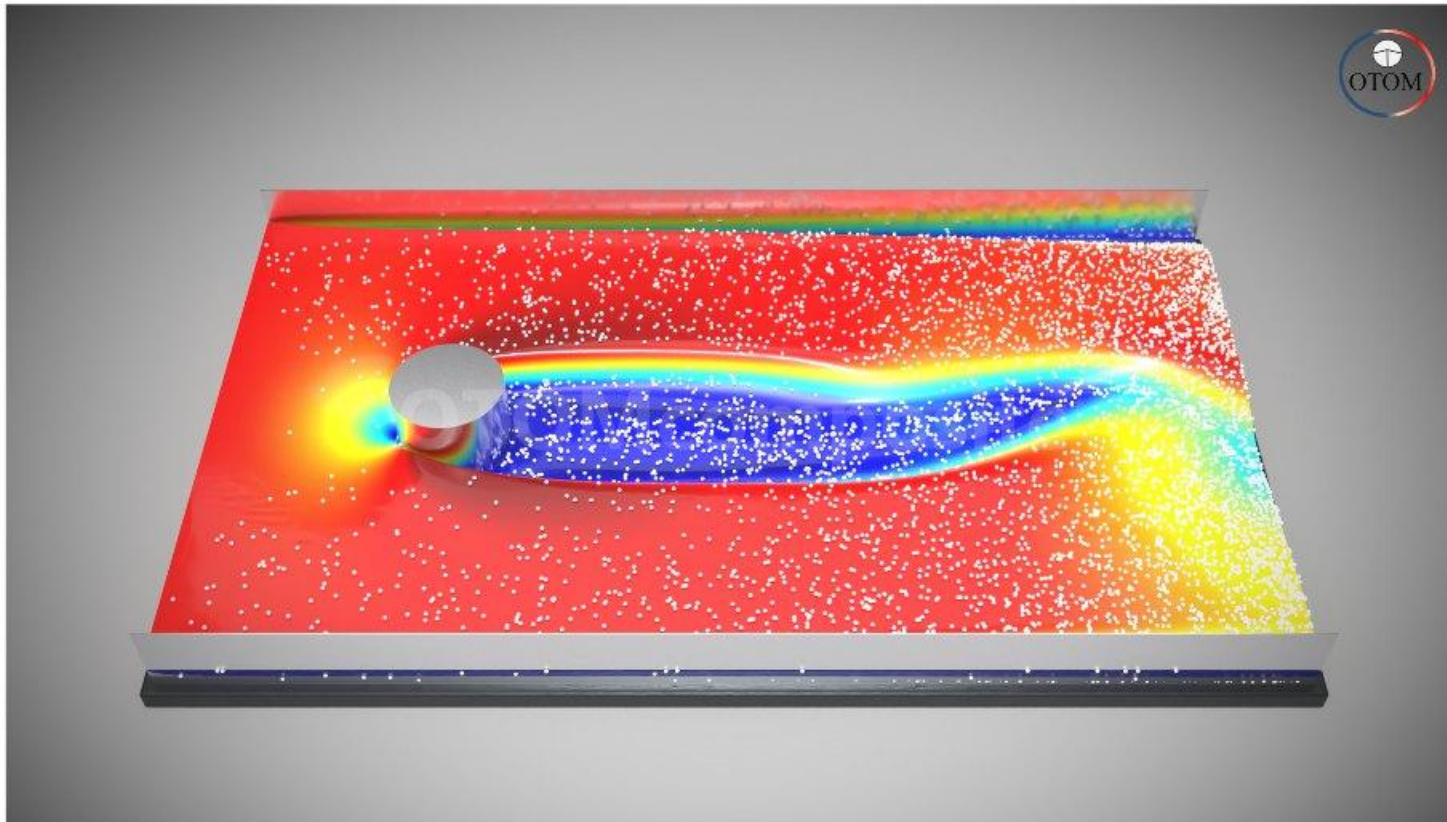
- 2D incompressible, 910×512 , inlet 30, viscosity 0.01 — a high-Reynolds (lattice) case.
- LES turbulence model on.

Result

Feature showcase of separated aerofoil flow. Forces at this Reynolds number and grid are not validated.

Cylinder Wake with Glowing Tracers

SHOWCASE



Velocity magnitude (Jet colour map), glowing particles, streamlines and force arrows on the body. Blender (Cycles) render of the recorded run — click to play.

What you see

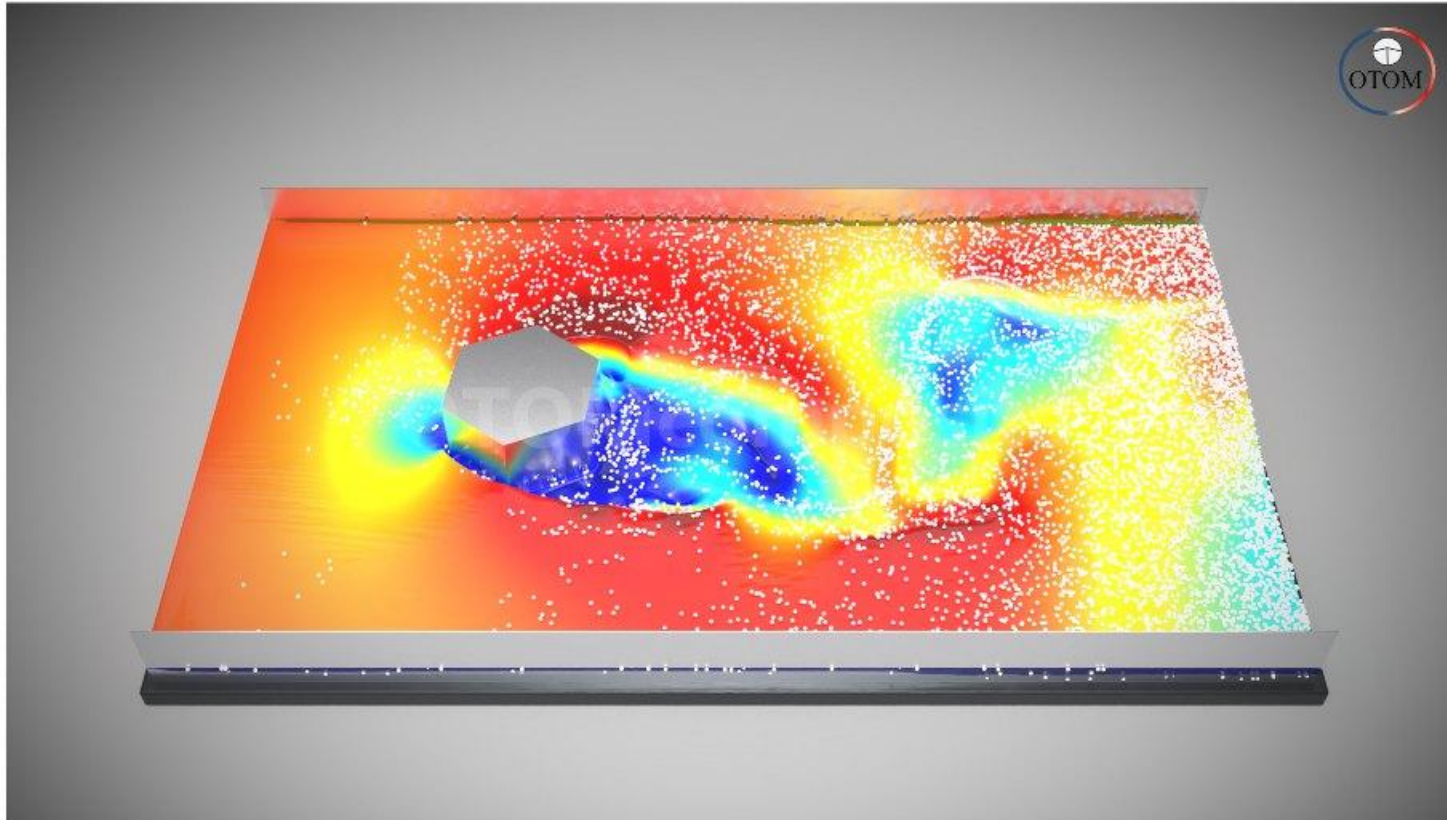
- A long recirculation bubble (dark blue) behind the cylinder, starting to meander downstream.
- Glowing particles and arrows on the surface show the pressure force; the tag reads the live Cd.

Physics & setup

- 2D incompressible, inlet 60, viscosity 5.25, Live Analysis on.
- Particle Glow, comet trails and Force Vectors display.

Result

Visual showcase (dark theme with glow). Live Cd $\approx 0.81 \pm 0.19$ at capture.



Flow speed (Jet colours: blue = slow, red = fast) with tracer beads. Blender (Cycles) render of the recorded run.

What you see

- A hexagonal prism turning slowly in a cross-flow; its corners shed small vortices and pressure waves.

Physics & setup

- 2D incompressible, inlet 30, viscosity 0.01, hexagon spin $-0.48^\circ/\text{frame}$.
- Moving-wall boundary condition on the spinning body.

Result

Showcase of a rotating body in a free stream.



Vorticity (red / blue = opposite spin) around the letters, on a dark backdrop. Blender (Cycles) render of the recorded run.

What you see

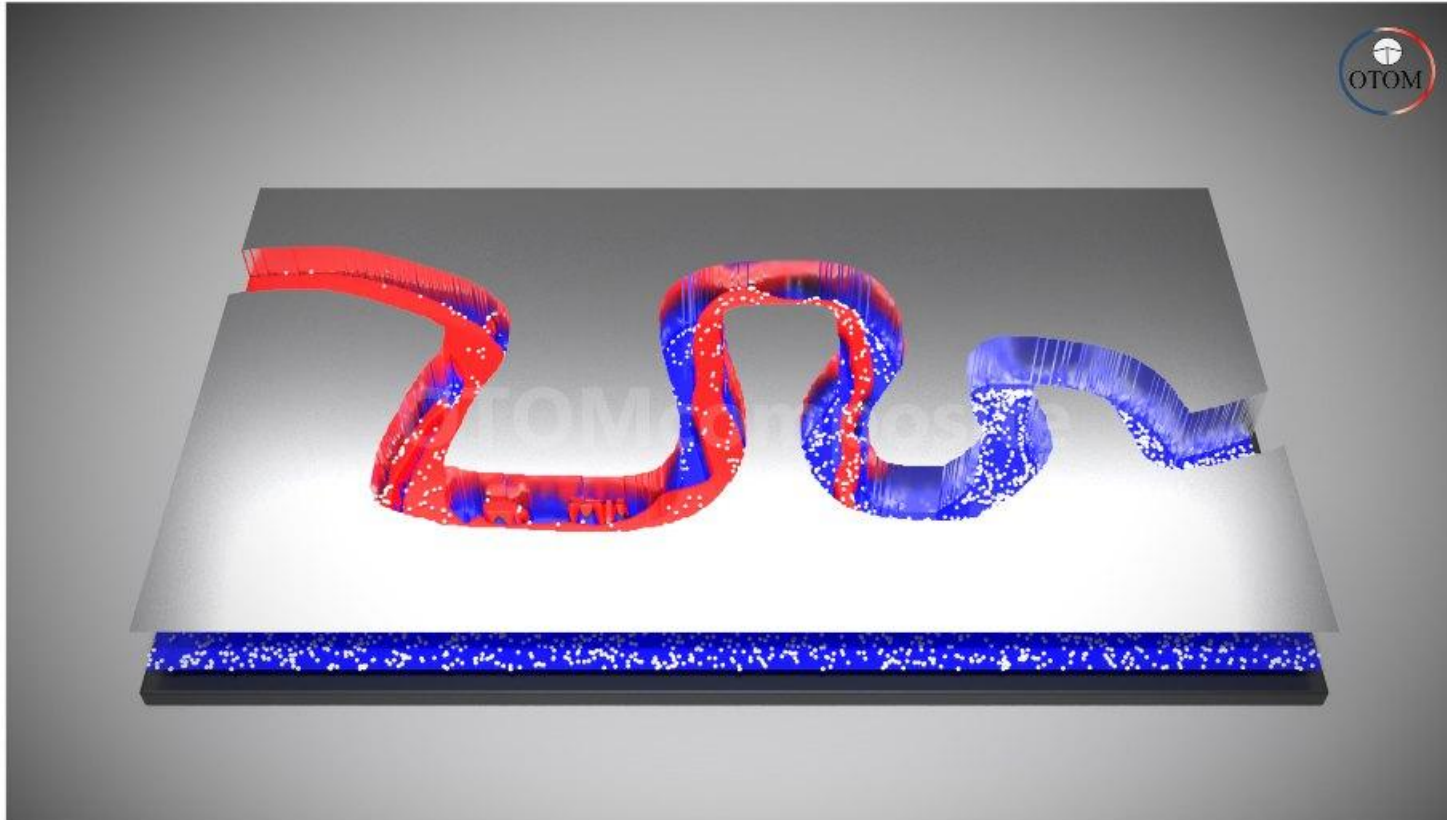
- The word OTOM painted as a solid obstacle; every letter sheds its own vortices.
- Red and blue mark the two spin directions of the shear layers peeling off the letters.

Physics & setup

- 2D incompressible, inlet 10, viscosity 0.3, LES on.
- Obstacle drawn on the paint canvas (any text, drawing or photo can be the body).

Result

Showcase of painted geometry: any shape becomes a body in the flow.



Velocity magnitude inside a hand-drawn channel. Blender (Cycles) render of the recorded run — click to play.

What you see

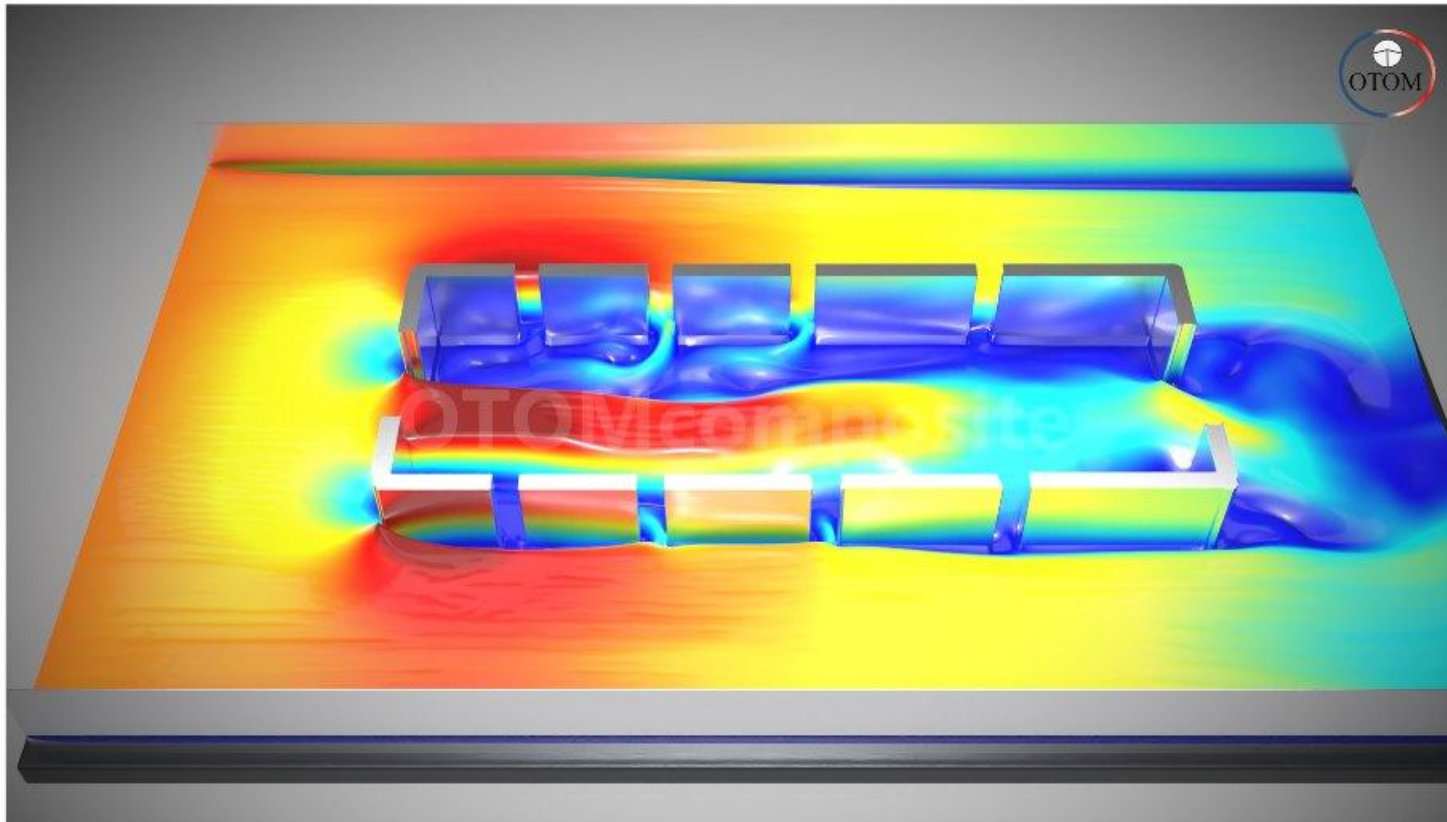
- A pipe of any shape drawn with the brush: everything outside the drawing is wall.
- The flow speeds up in narrow sections and separates at sharp bends.

Physics & setup

- 2D incompressible, Control Volume Mode: painted fluid region, green inlet, blue outlet.

Result

Showcase of Control Volume Mode for ducts and internal flows.



Velocity magnitude (blue = slow, red = fast) with streamline arrows. Blender (Cycles) render of the recorded run — click to play.

What you see

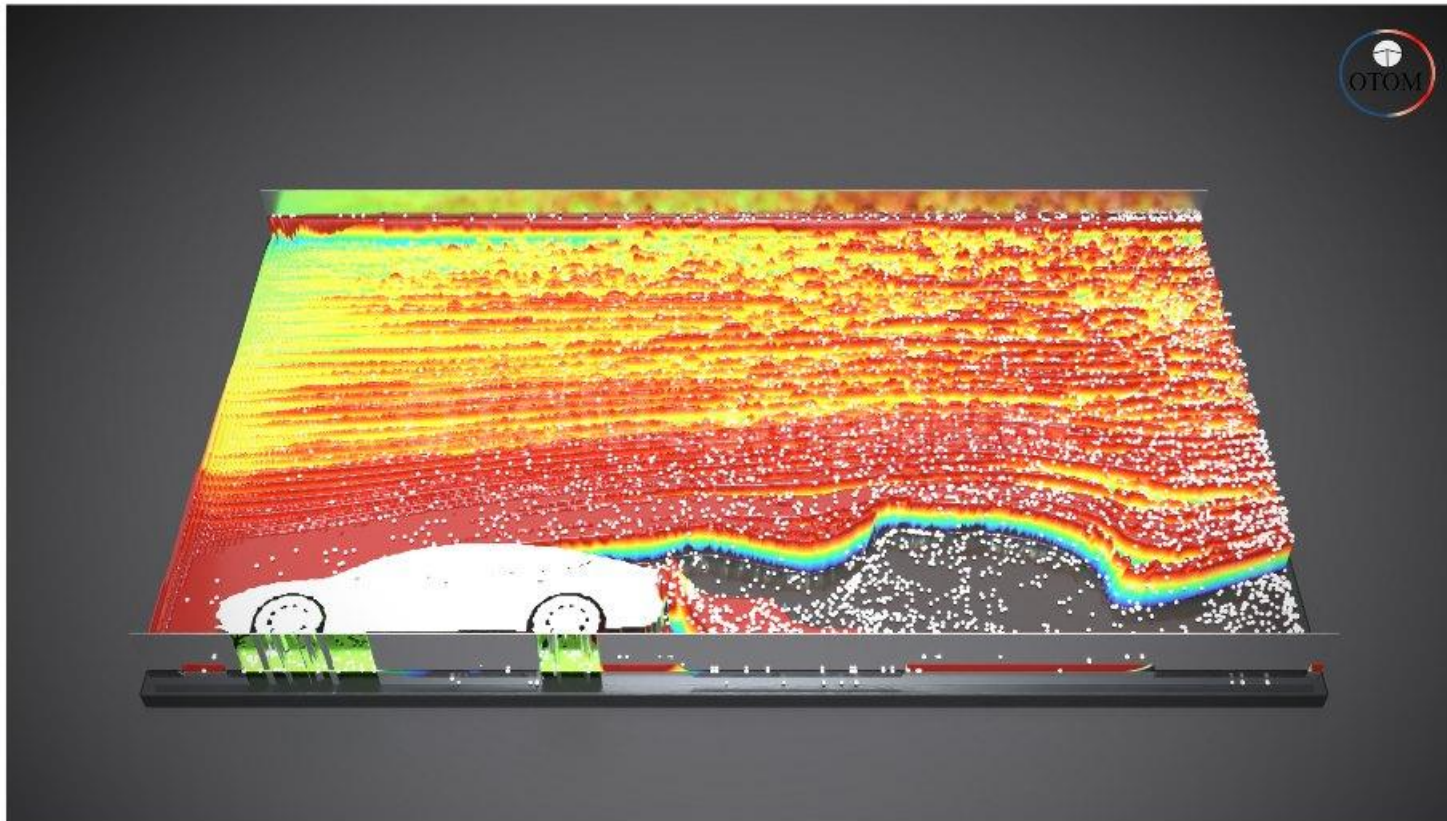
- Two greenhouse blocks seen from above, with gaps (vents) in their walls.
- Inside, the air is slow (blue) and enters through the vents; it speeds up in the gap between the blocks and around their corners (red).

Physics & setup

- 2D incompressible, inlet 8.7, viscosity 1.13, painted geometry.

Result

Showcase for agricultural / building airflow layouts.



Vorticity in Turbo colours around a car silhouette taken from a photo. Blender (Cycles) render of the recorded run.

What you see

- A side-view photo of a car becomes the solid body; the road is the bottom wall.
- Flow separates at the rear and rolls into a large wake; the boundary layer on the road peels off behind the car.

Physics & setup

- 2D incompressible, inlet 108, viscosity 0.01 — a high-Reynolds lattice case with LES.
- Body from an uploaded image (silhouette); the new AI Cut-out can do this from any photo.

Result

Showcase of picture-based geometry. A 2D side view has no flow round the sides of the car, so drag is not comparable with a real car.

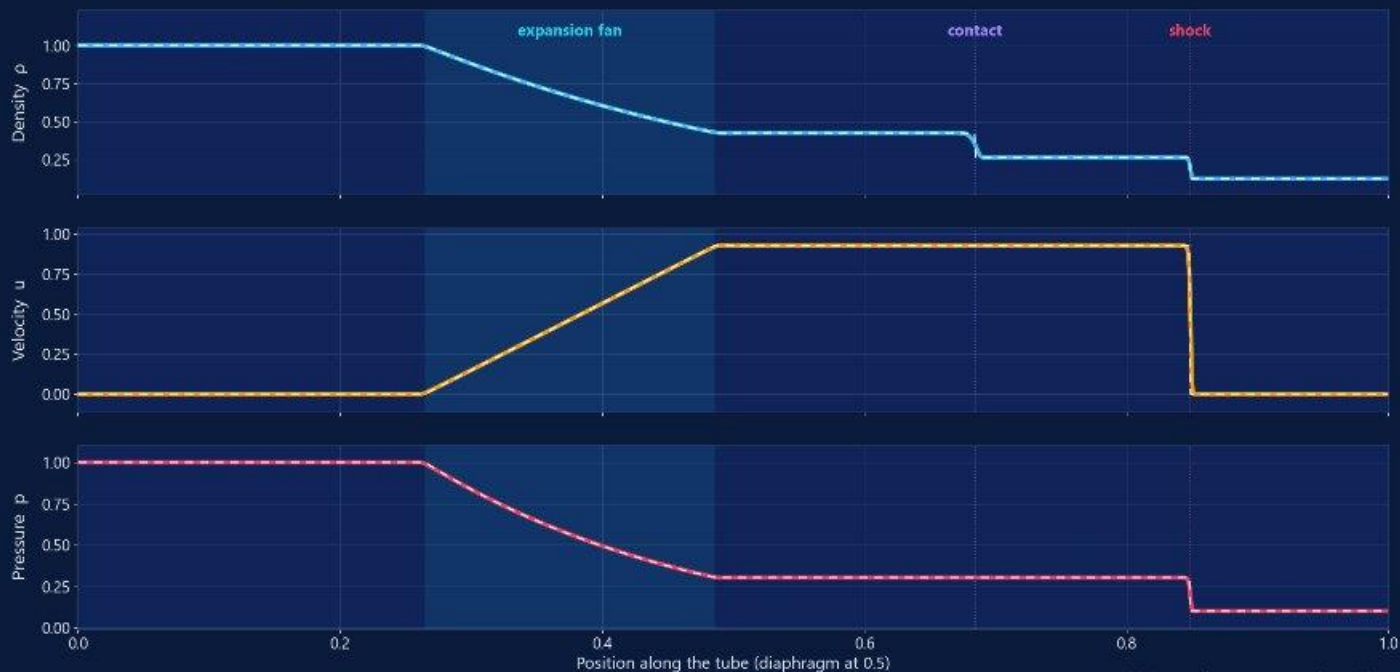
2D Shocks & Supersonic Flow

The compressible Euler solver, checked against exact and oblique-shock theory.

Sod Shock Tube · Supersonic Wedge, Mach 2 · Bow Shock on a Cylinder, Mach 2 · Car Side View, Compressible Solver

Sod shock tube: OTOM CFD vs the exact solution

2D compressible Euler solver (HLLC, MUSCL, Van Leer limiter), 910 cells, centre line at $t = 181$. Coloured: simulation. White dashed: exact Riemann solution.



Density, velocity and pressure along the tube from the OTOM CFD solver (colour) against the exact Riemann solution (white dashed).

What you see

- High-pressure gas (left) expands into low-pressure gas (right) after a diaphragm is removed.
- Three waves form: an expansion fan running left, a contact surface and a shock running right; the simulation lies on the exact solution, with each jump spread over a few cells.

Physics & setup

- 2D compressible Euler solver (HLLC fluxes, MUSCL reconstruction, Van Leer limiter), 910 cells along the tube.
- Classic Sod initial state: $p_1 / 0.125$, $p_1 / 0.1$.

Result

The Truth tab reports the same comparison live: density error, shock position and how many cells each jump is smeared over.



Colour Schlieren on a dark backdrop: the red region is the compressed flow behind the oblique shocks. Blender (Cycles) render of the recorded run.

What you see

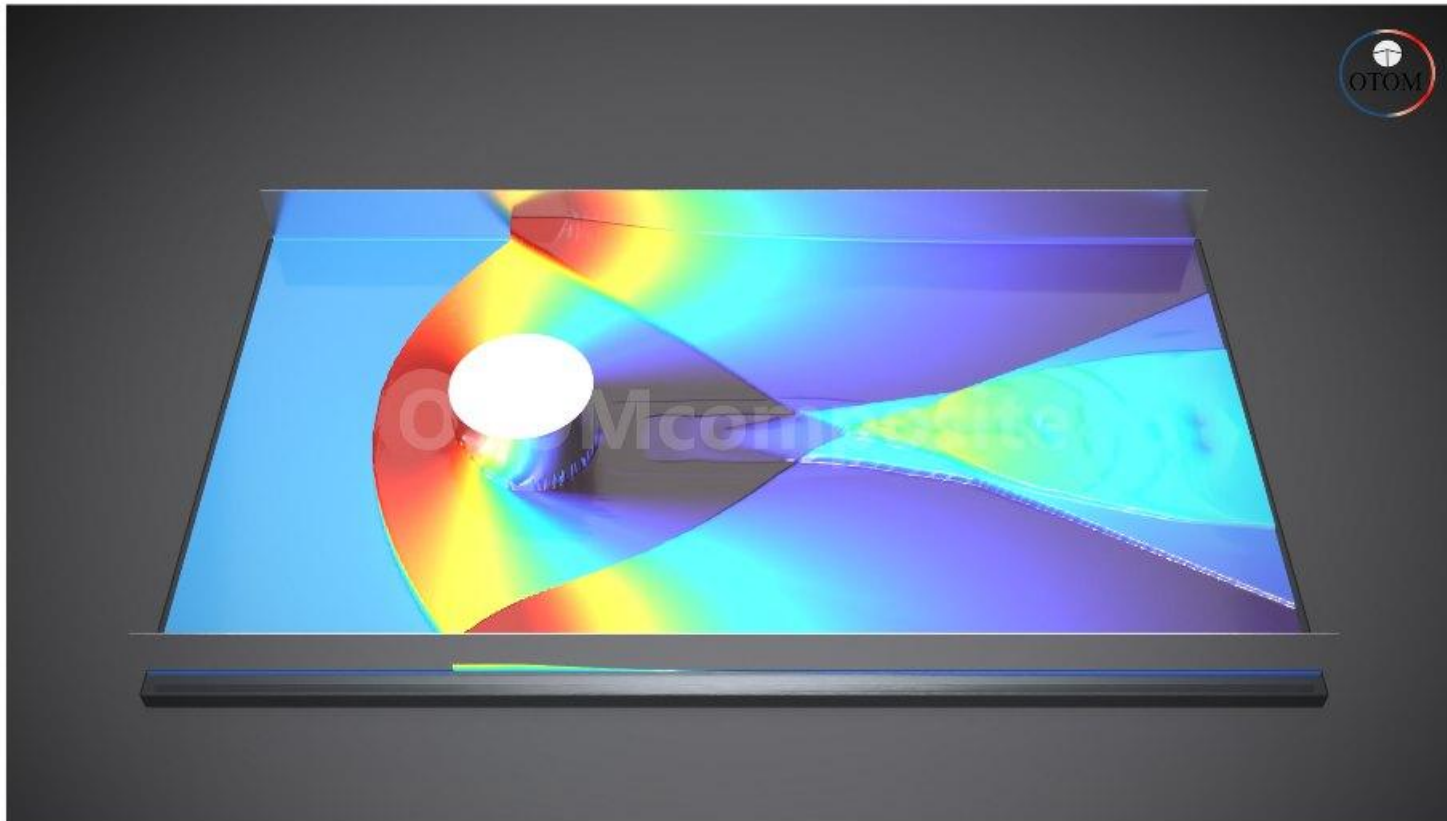
- Mach 2 flow meets a wedge: an oblique shock starts at the tip; expansion fans at the shoulders.
- Shocks reflect from the tunnel walls further downstream.

Physics & setup

- 2D compressible Euler, Mach 2, wedge half-angle 16.7° .

Result

Oblique-shock theory gives 47.8° for this wedge; the shock near the tip settles at $\approx 47\text{--}50^\circ$. At Mach 3 (Guided Tour) it flattens to $\approx 37^\circ$ vs 34.0° theory.



Pressure in Turbo colours (blue = low, red = high), colour range fitted to the field. Blender (Cycles) render of the recorded run.

What you see

- A blunt body in Mach 2 flow: a curved bow shock stands off in front of it, with the highest pressure (red) just ahead of the body.
- Expansion fans round the shoulders (blue) and a pair of trailing shocks closing the wake.

Physics & setup

- 2D compressible Euler (HLLC fluxes), inlet Mach 2, slip walls.

Result

Showcase of a detached bow shock and the full supersonic wave pattern around a blunt body.



Flow speed in Turbo colours (blue = slow, red = fast), colour range fitted to the field. Blender (Cycles) render of the recorded run.

What you see

- The car-photo scene run with the compressible Euler solver at Mach 0.27.
- The air slows in front of the car and over its nose, speeds up over the roof, and leaves a slower wake behind it.

Physics & setup

- 2D compressible Euler at Mach 0.27.

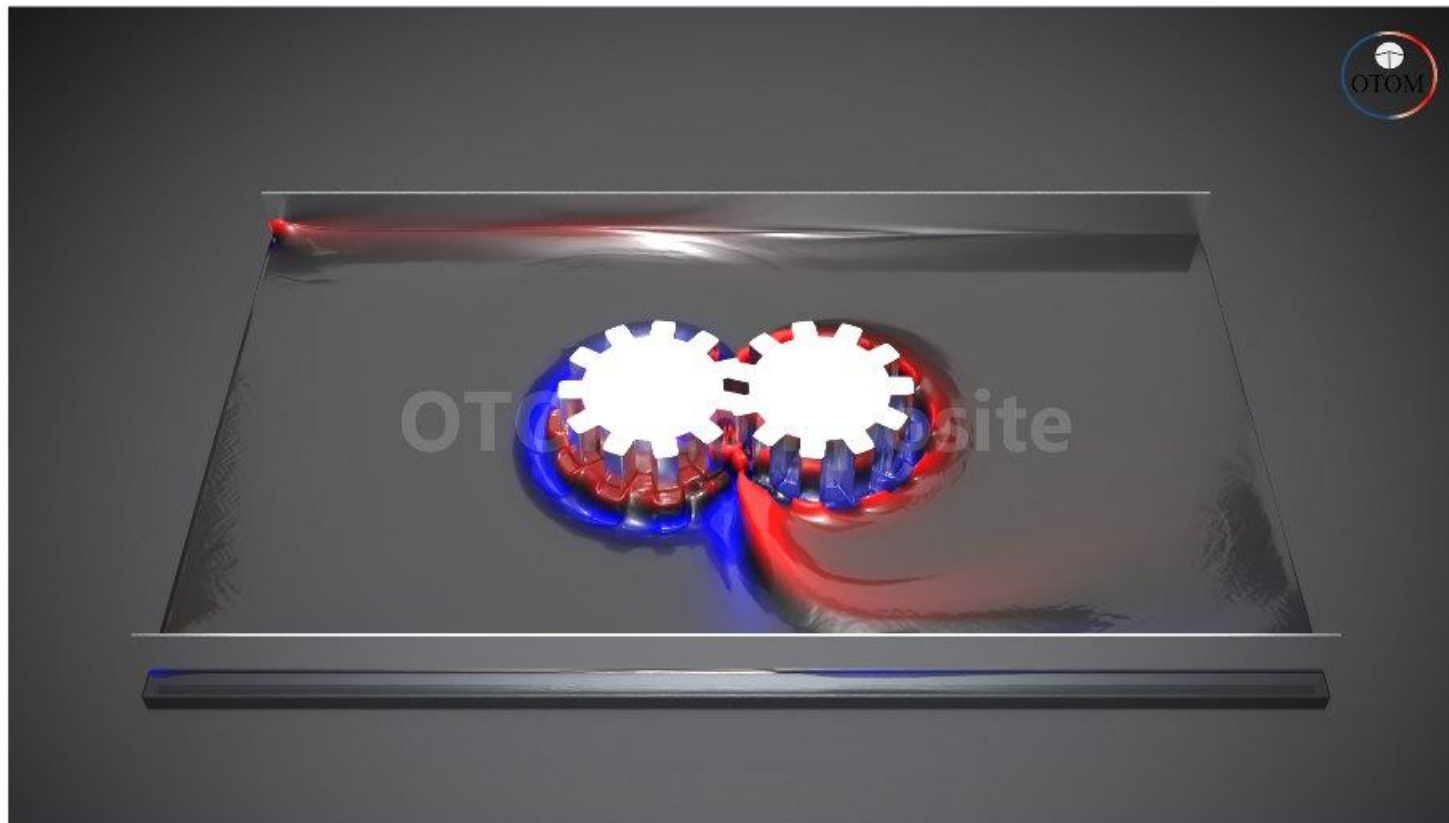
Result

At this low Mach number the incompressible engine is the better choice (the Setup Check says so); shown to compare the two engines on the same body.

2D Rotating Machinery

Gear pumps with the Parametric Study gear model.

Oil Gear Pump · Gear Pump in a Real Housing · Three-Gear Train



Vorticity with comet trails. Blender (Cycles) render of the recorded run.

What you see

- Two meshing gears carry oil round the housing from the inlet to the outlet.
- Trapped pockets between the teeth and the casing move with the gears.

Physics & setup

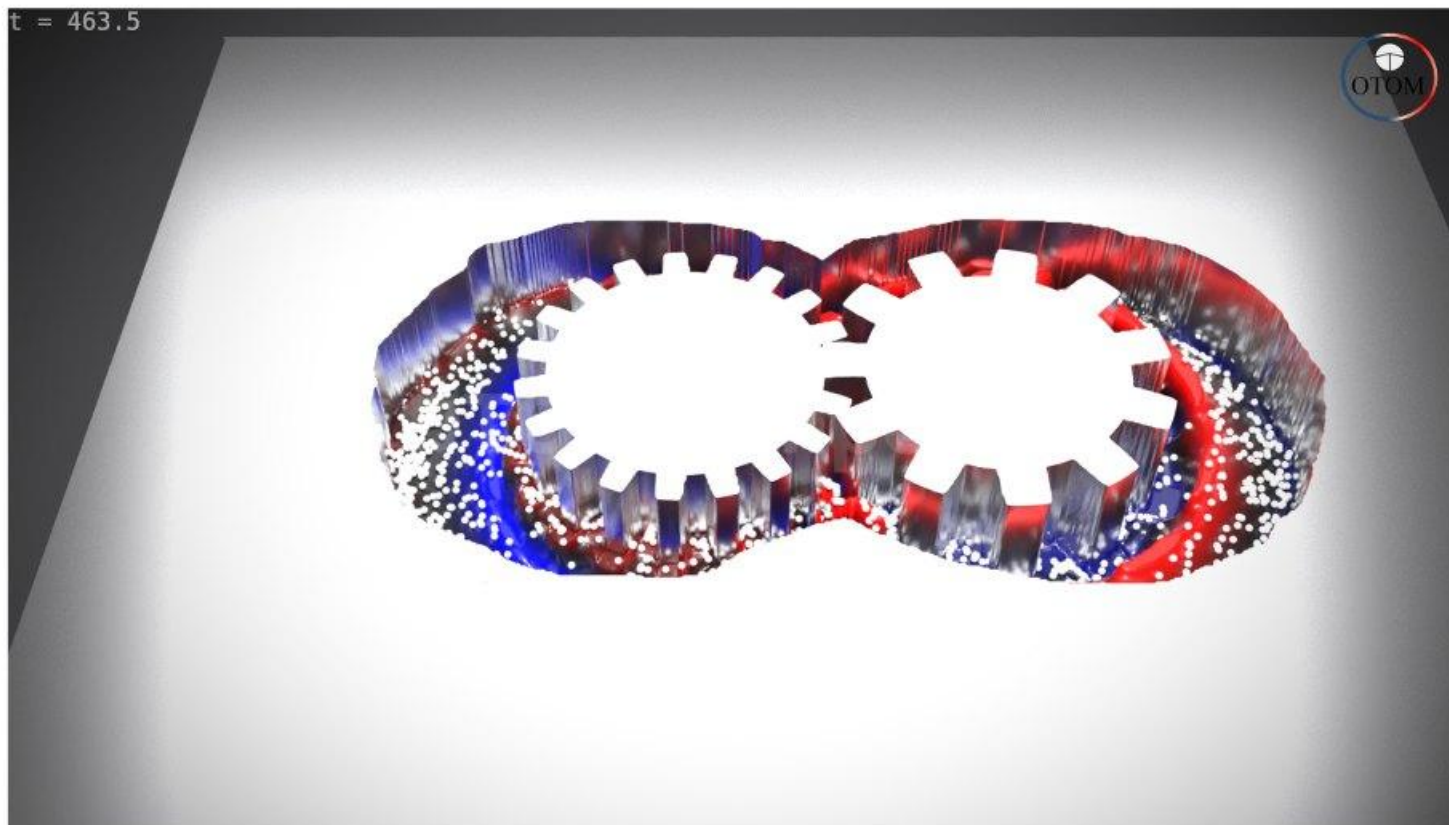
- 2D incompressible, very viscous (ν 8), Parametric Study: two meshing gears with gear contact.

Result

Showcase of the Study tab gear model (real 2D torque on each gear).

Gear Pump in a Real Housing

SHOWCASE



Vorticity over a photo of the pump housing; trails and arrows. Blender (Cycles) render of the recorded run — click to play.

What you see

- A two-gear pump drawn inside a photo of a real housing: the photo outline is the solid casing.
- Oil swirls round the gear rims; the gears counter-rotate.

Physics & setup

- 2D incompressible, ν 6.23, gears spinning $\pm 1.2^\circ$ /frame, painted housing from an image.

Result

Showcase of image-based geometry combined with the gear study.



Pressure field with arrows over a housing photo. Blender (Cycles) render of the recorded run — click to play.

What you see

- Three meshing gears of different sizes; pressure builds where the teeth close and drops where they open.

Physics & setup

- 2D incompressible, v 6.23, three gears with different speeds.

Result

Showcase of multi-gear meshing.

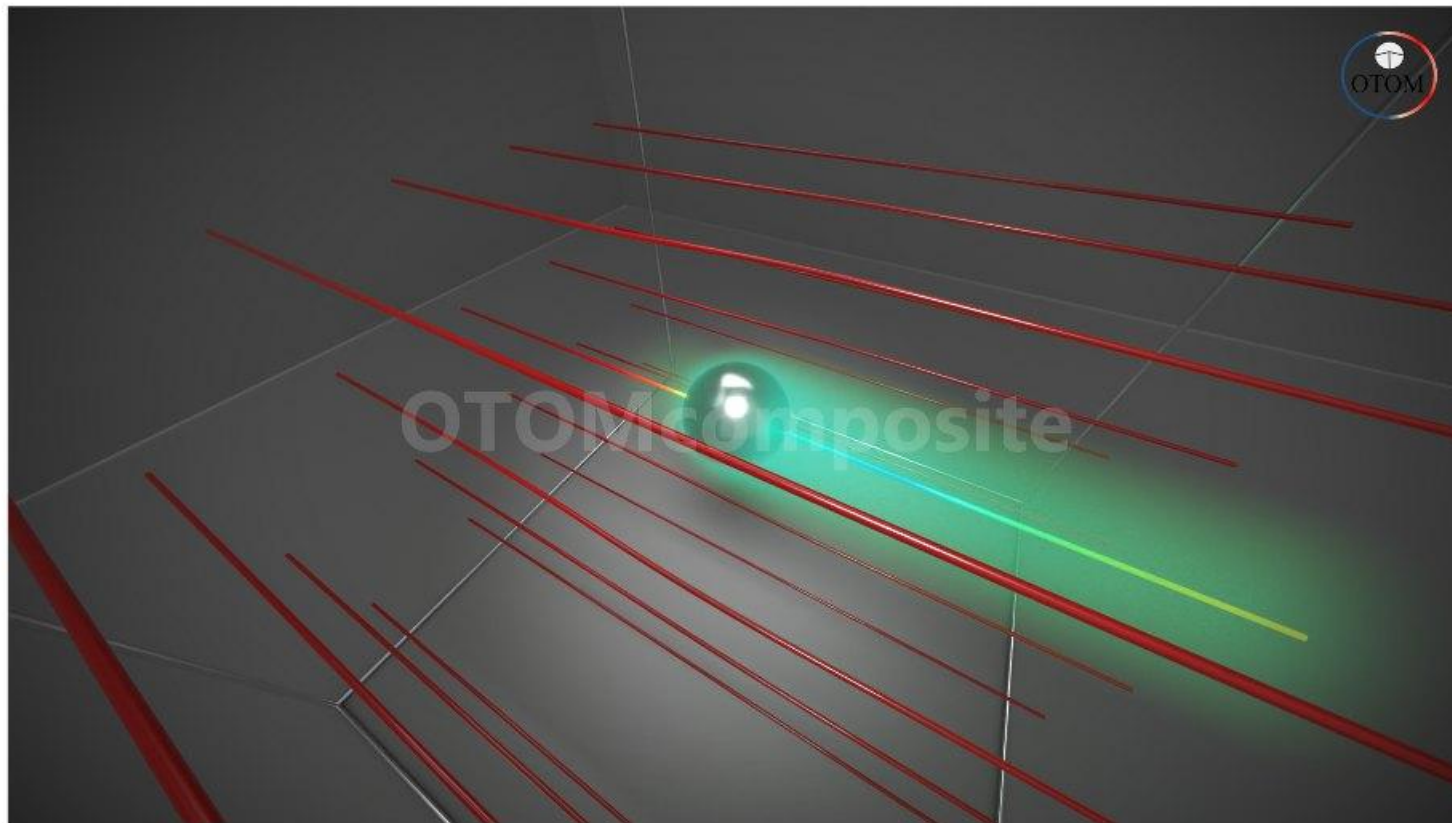
3D Aerodynamics

Drag, wings, propellers and rotors in a 3D wind tunnel.

Sphere Drag at $Re\ 100$ · Car Body in a Wind Tunnel (25° Rear Slant) · 3D Wing · Swept Wing, Lambda-2 Vortices · Propeller · Propeller Start-up, Slow Motion · Quadcopter Downwash

Sphere Drag at Re 100

VALIDATED



Streamline tubes (red) pass the sphere; the green glow is the slow wake behind it. Blender (Cycles) render of the recorded run — click to play.

What you see

- A sphere in a 3D wind tunnel with a steady ring vortex in its wake (the wake is steady below $Re \approx 210$).

Physics & setup

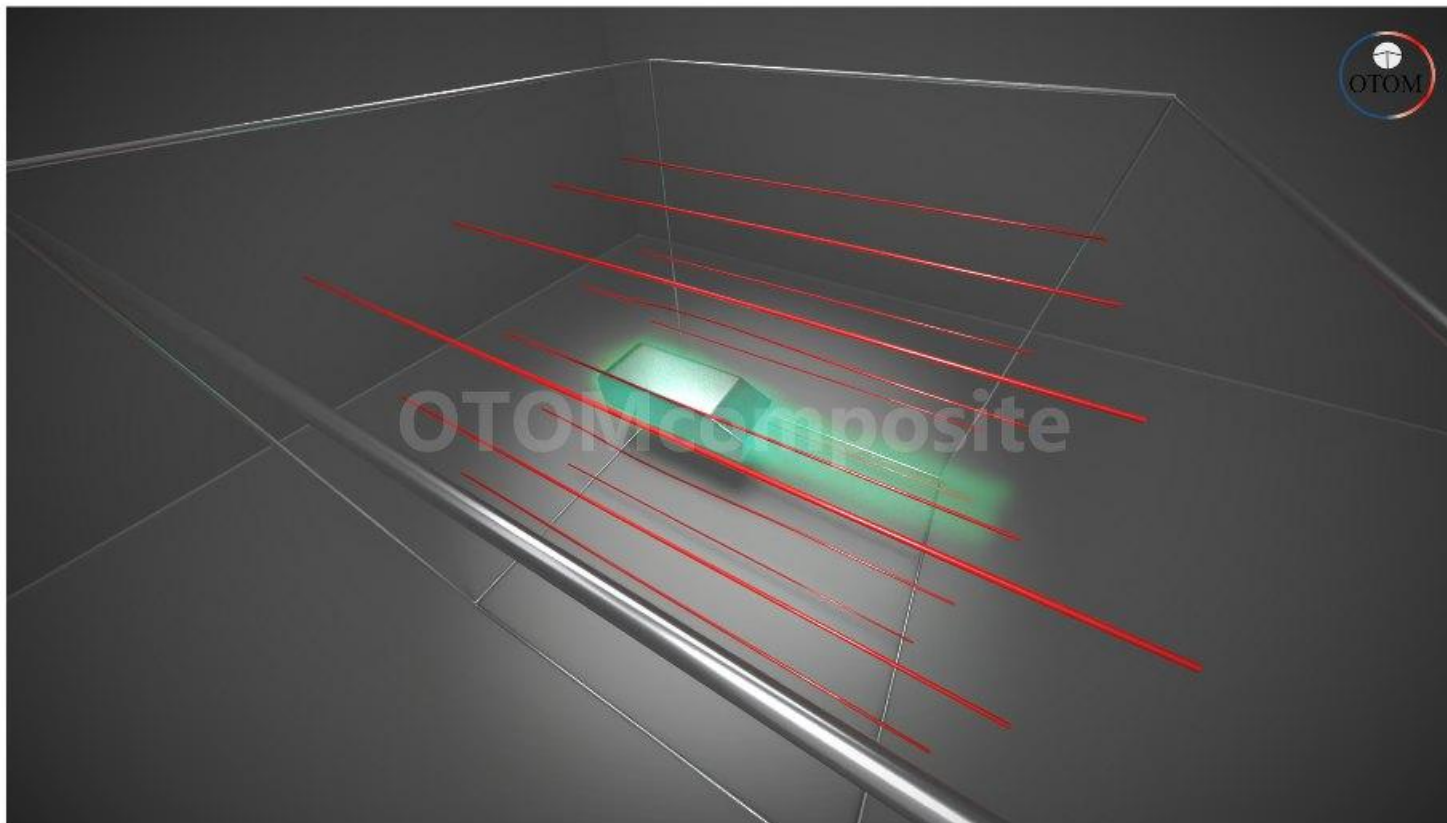
- 3D incompressible, 128^3 grid, domain ± 2 , sphere ≈ 16 cells across.
- Multigrid pressure, immersed-boundary ghost cells, Live Analysis.

Result

$Cd \approx 1.11$ against 1.09 (Schiller–Naumann) — within about 3%.

Car Body in a Wind Tunnel (25° Rear Slant)

SHOWCASE



Streamline tubes pass over a simplified car body; the soft glow behind it is the wake. Blender (Cycles) render of the recorded run.

What you see

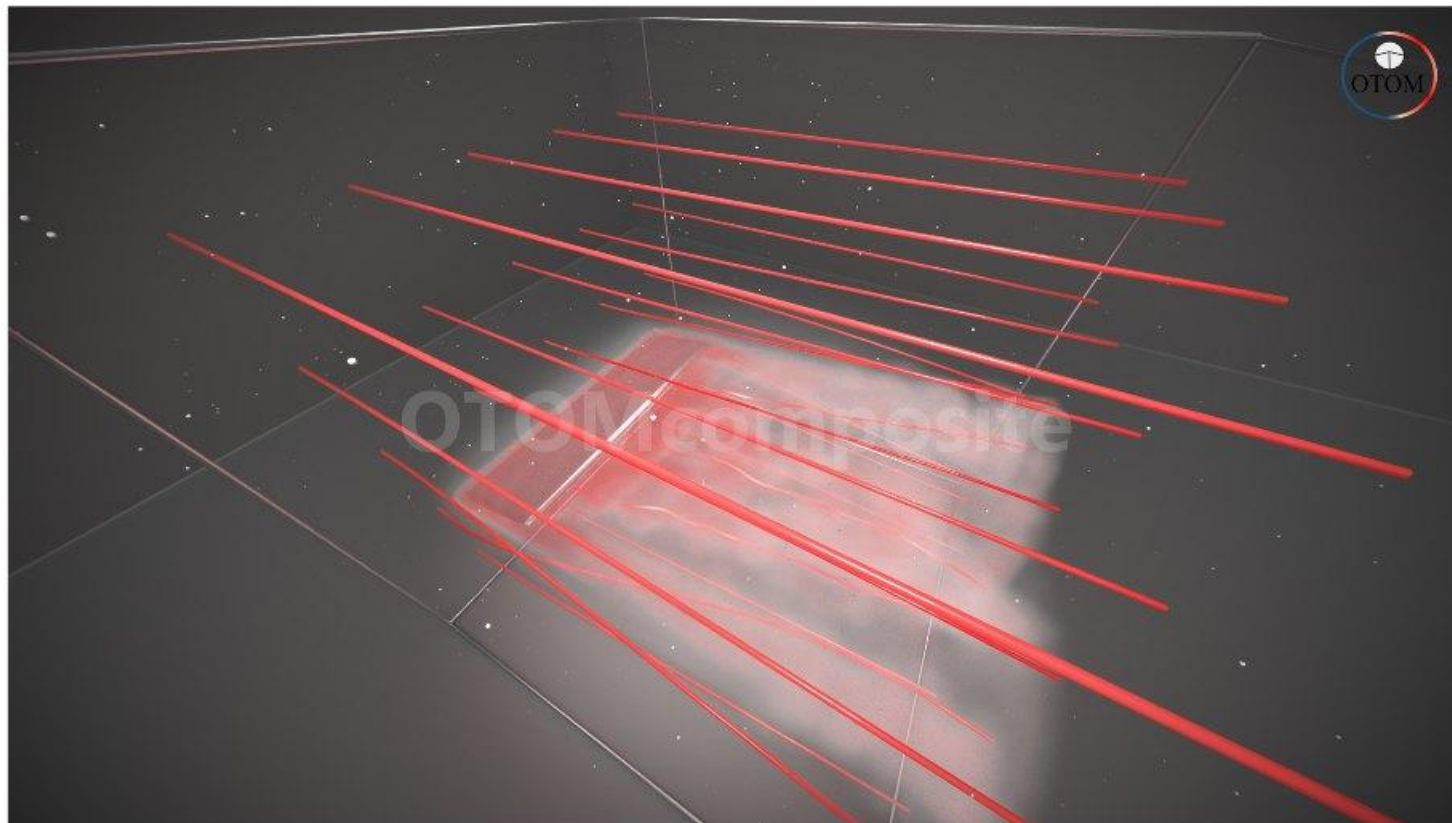
- A simplified car body with a 25° slanted rear window — the standard reference shape of automotive aerodynamics — imported as a mesh.
- The flow separates at the rear edges and leaves a turbulent wake behind the slant.

Physics & setup

- 3D incompressible, 128^3 , WALE LES, Wind Noise proxy on.
- Body ≈ 13 cells tall — far too coarse for its thin boundary layers.

Result

$C_d \approx 0.94$ against ≈ 0.29 measured in wind tunnels for this shape: NOT validated (coarse grid, low Re). Shown for the workflow: mesh import, surface pressure, wind noise.



Dark theme: the wing (red), streak lines and the faint vorticity of its wake. Blender (Cycles) render of the recorded run — click to play.

What you see

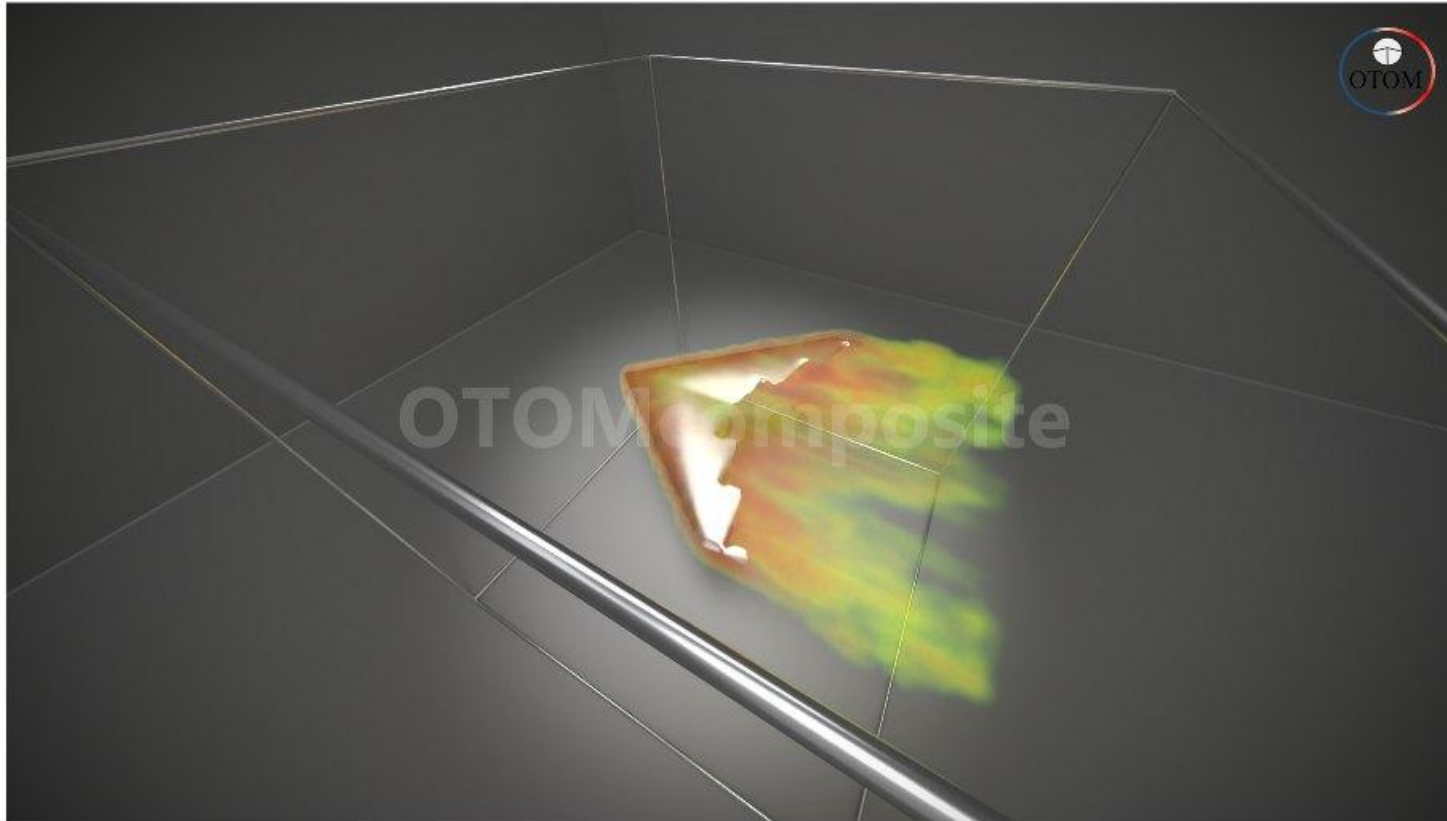
- A finite wing in a 3D wind tunnel at high resolution (256^3).
- Streak lines pass over and under the wing; the soft cloud behind it is the vorticity shed into the wake.

Physics & setup

- 3D incompressible, 256^3 grid, inlet 9.

Result

Showcase of a high-resolution 3D wing.



Rendered as a vorticity cloud (Jet colours); in the app the demo shows Lambda-2 surfaces. Blender (Cycles) render of the recorded run.

What you see

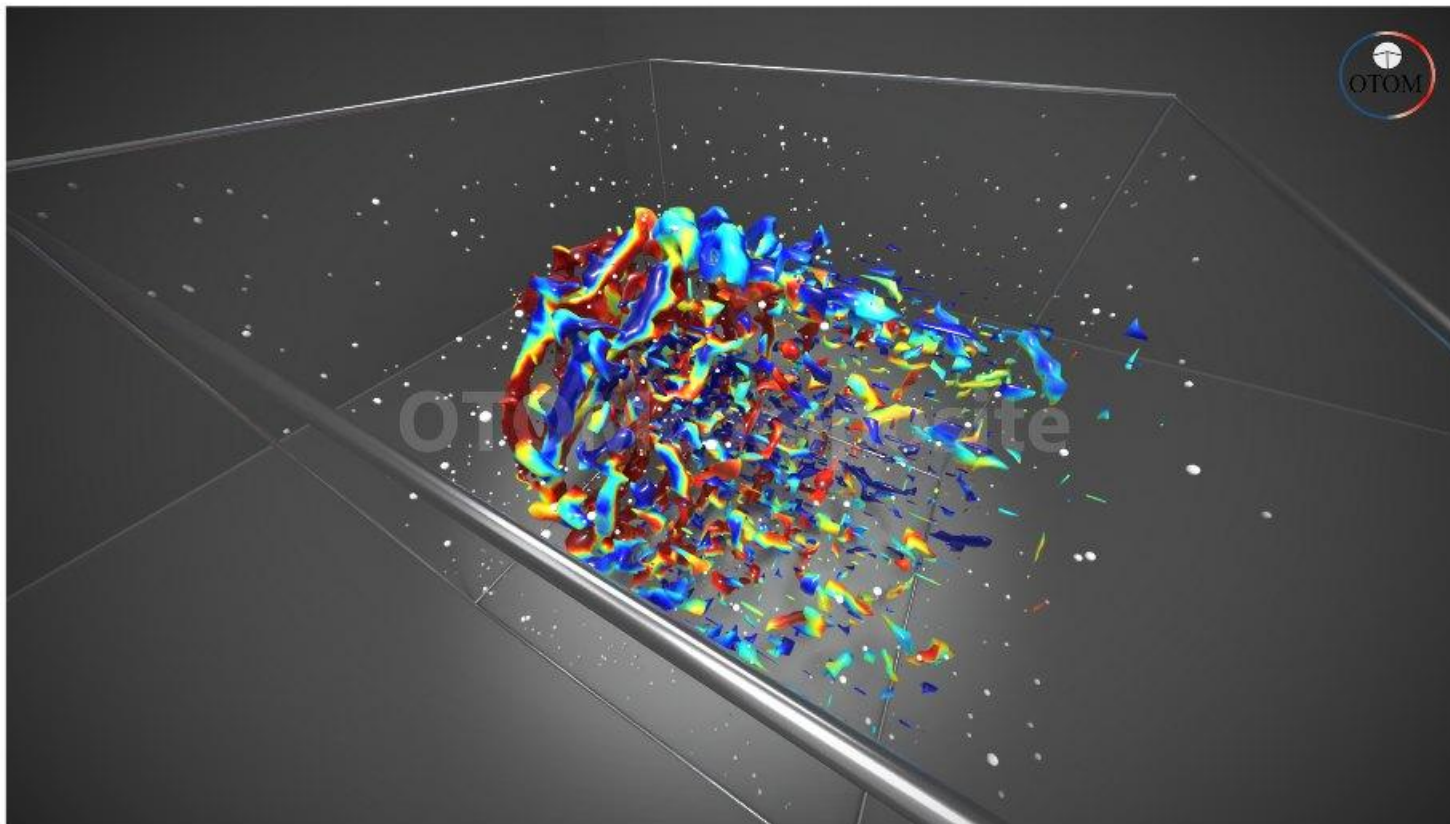
- A tapered wing swept back 45° at 8° incidence.
- The Lambda-2 surfaces show the vortex sheet shed from the wing; at this grid the tip vortex is not resolved as a separate tube.

Physics & setup

- 3D incompressible, 128^3 , NACA 0012 section, half-span 0.6, taper 0.3.

Result

Showcase of the Lambda-2 vortex criterion as a real mesh.



Lambda-2 isosurfaces around a spinning propeller. Blender (Cycles) render of the recorded run — [click to play](#).

What you see

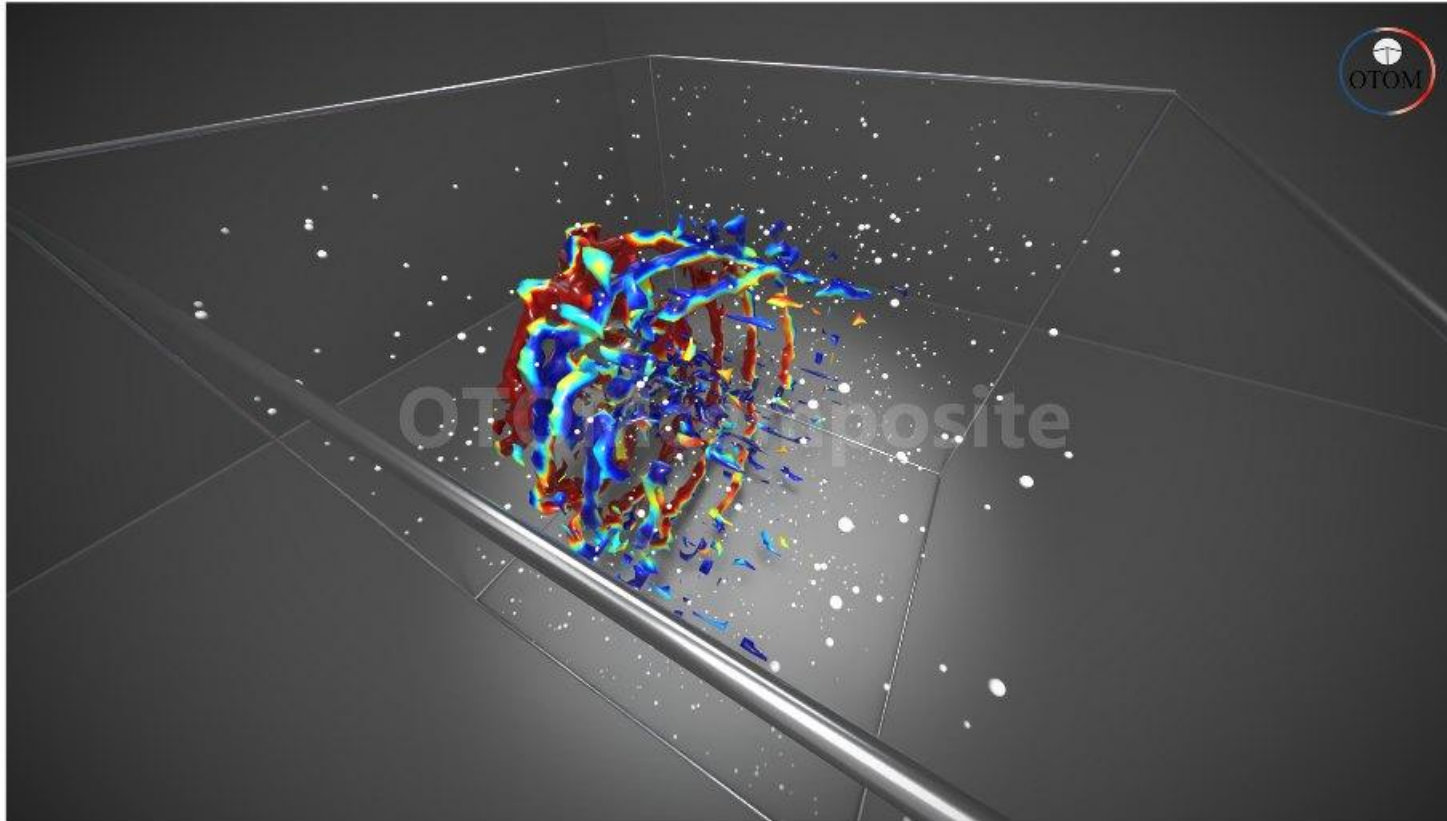
- A spinning propeller in an axial flow; its blade-tip vortices wrap into a helix downstream.

Physics & setup

- 3D incompressible, 128^3 , analytic propeller shape spinning in the flow (moving-wall boundary).

Result

Showcase of rotating-blade vortex structures.



Same propeller, played at one quarter speed. Blender (Cycles) render of the recorded run — click to play.

What you see

- The start-up of the propeller flow, slowed down so each step can be followed.

Physics & setup

- Spin rate and time step both divided by 4: the physics is unchanged, only slower on screen.

Result

Showcase of the slow-motion technique.



Surface pressure on the airframe, rotor zones (cyan arrows), speed volume and streak lines. Blender (Cycles) render of the recorded run — click to play.

What you see

- An imported quadcopter with four actuator-disk rotors (cyan arrows mark the rotors).
- The rotor jets merge into one fast downwash column (orange); streak lines show the air drawn in from all around.

Physics & setup

- 3D incompressible, 128^3 , multi-part mesh import, four Disk fans (momentum sources).

Result

Showcase of actuator-disk rotors; rotor thrust is modelled, blades are not resolved.

3D Vortex Visualisation

Q-criterion and Lambda-2 surfaces as real meshes.

Colliding Jets, Q-Criterion



Q-criterion vortex-core surfaces (Jet colours). Blender (Cycles) render of the recorded run.

What you see

- Two opposed jets meet in a closed box and break up into turbulent eddies.
- The surfaces mark vortex cores: where the fluid spins more than it is stretched.

Physics & setup

- 3D incompressible, 128^3 , two Disk fans of power 12 facing each other, sealed domain.

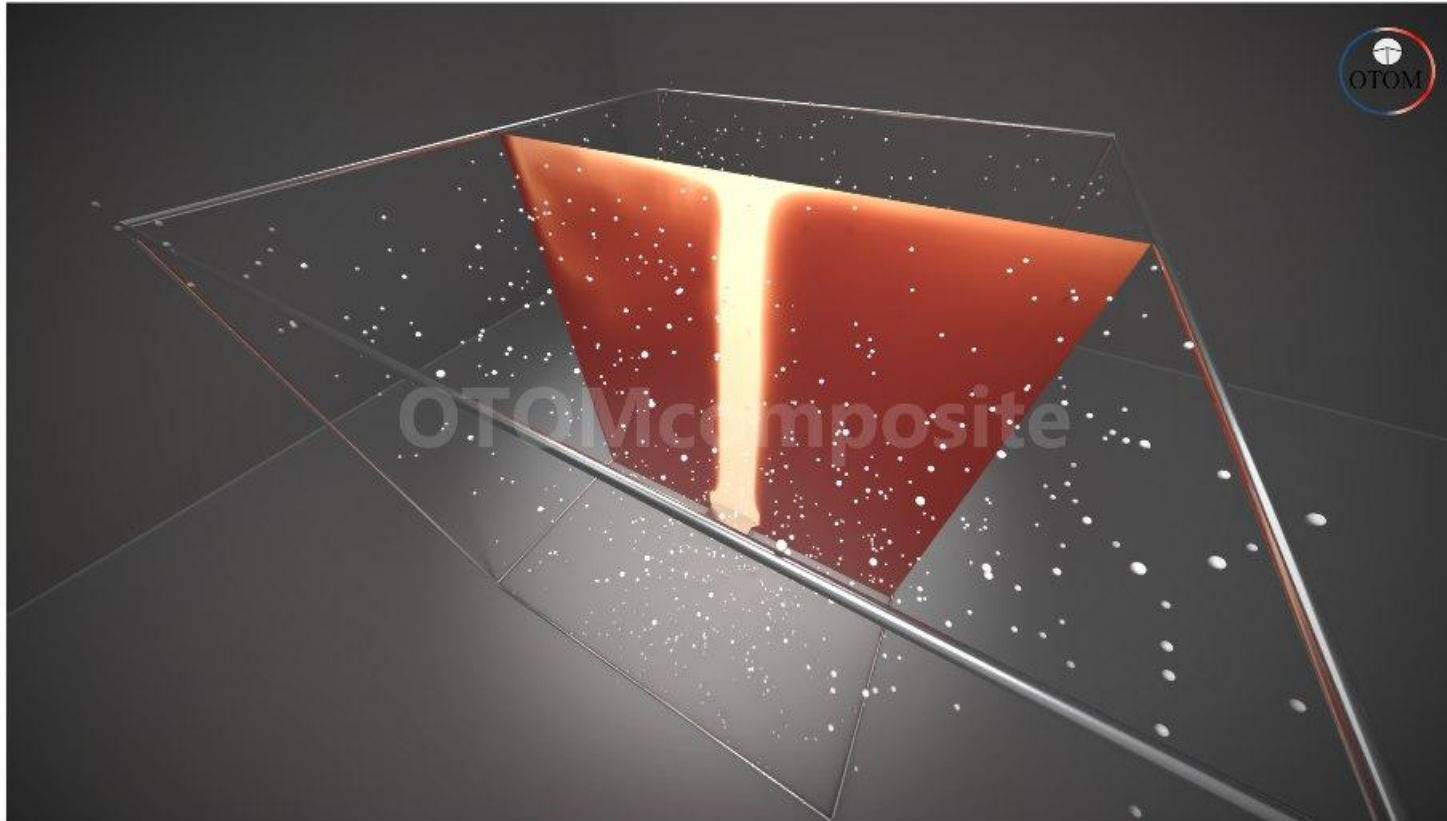
Result

Showcase of the Q-criterion vortex view.

3D Heat & Ventilation

Boussinesq buoyancy, heat sources and fans.

Hot Plume in a Room · Data Centre Hot Aisle



Temperature on a vertical slice (Magma colours: dark = ambient, bright = warm), tracer beads. Blender (Cycles) render of the recorded run.

What you see

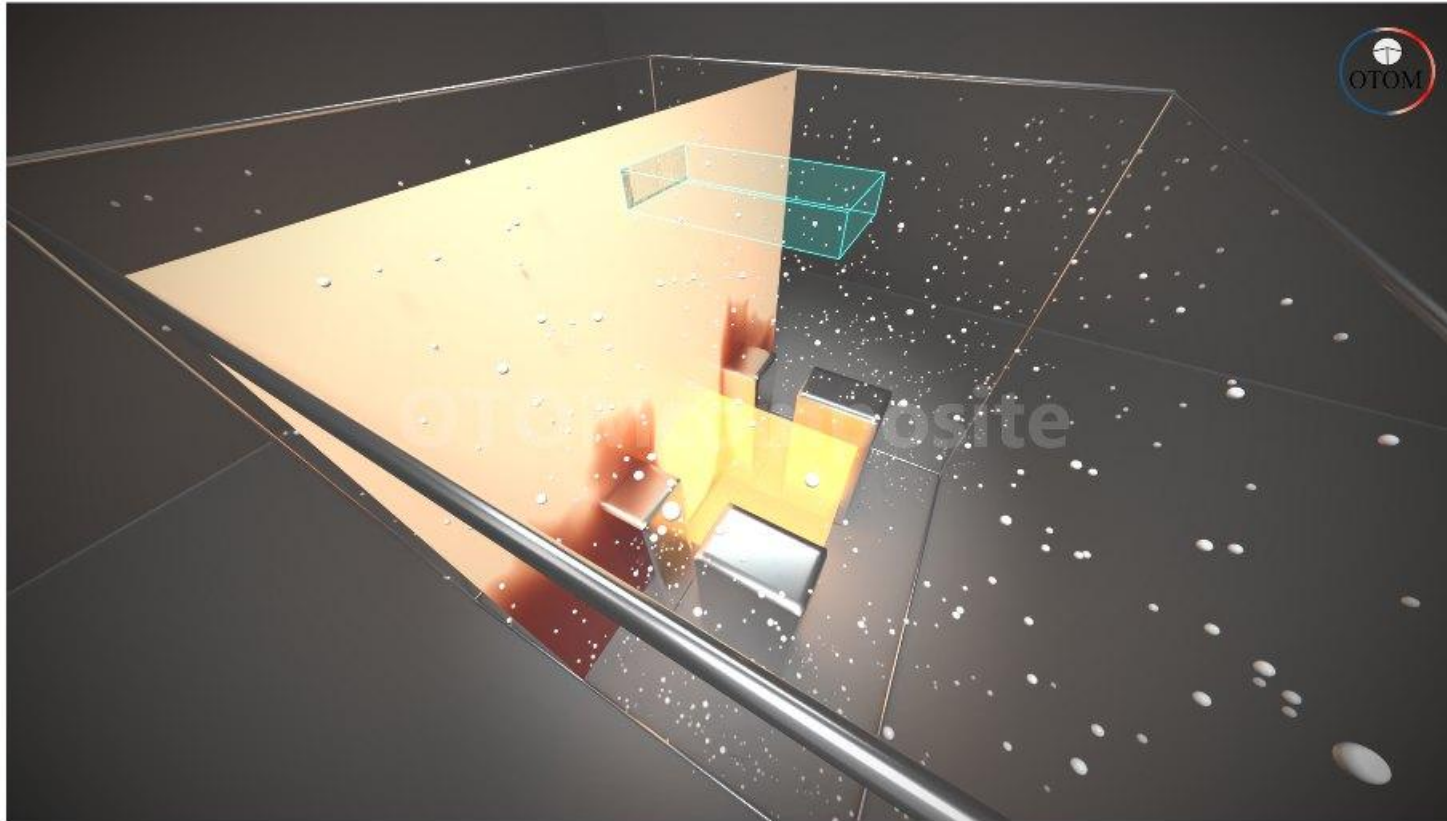
- A heated block on the floor sends a warm plume to the ceiling while slow ventilation crosses the room.

Physics & setup

- 3D incompressible with Boussinesq buoyancy; heat zone held at fixed temperature; inlet 0.8, open outlet.

Result

Showcase of the temperature / buoyancy model.



Temperature on a slice between the racks (Magma colours: bright = warm), tracer beads. Blender (Cycles) render of the recorded run.

What you see

- Four server racks either side of a hot aisle; their heat is a heat source in the aisle and a ceiling fan extracts it.
- Warm pockets the airflow misses are where real servers would overheat.

Physics & setup

- 3D incompressible, Boussinesq buoyancy with a heat-flux zone, one Box fan, supply air at the inlet.

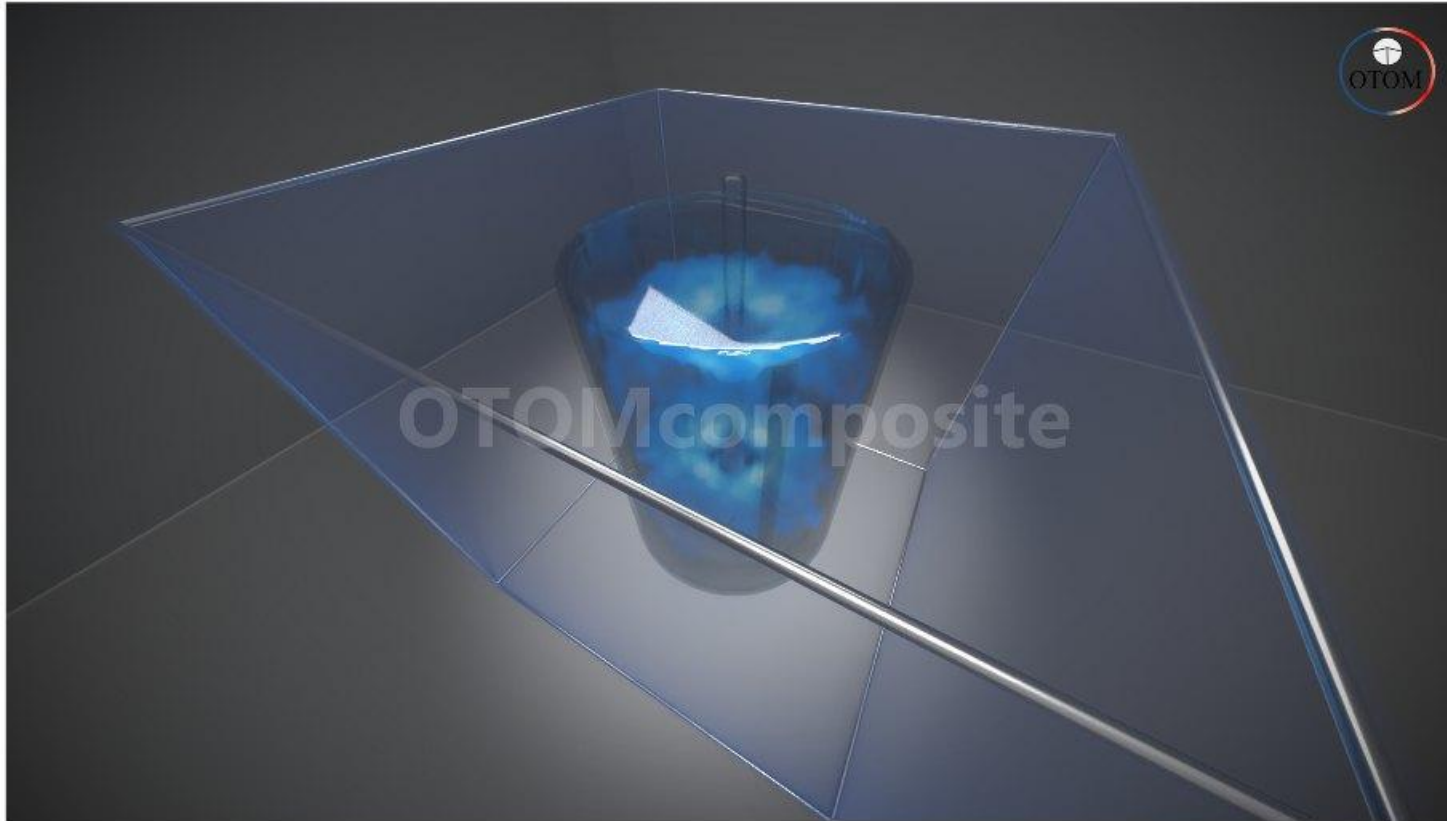
Result

Teaching scene for hot-aisle containment.

3D Process Equipment

Stirred vessels — now with gas sparging.

Stirred Tank Reactor · Stirred Tank with Gas Sparger (new)



Velocity inside a glass vessel with two impellers. Blender (Cycles) render of the recorded run — click to play.

What you see

- A sealed vessel with a shaft and two spinning impellers; the liquid is set swirling.

Physics & setup

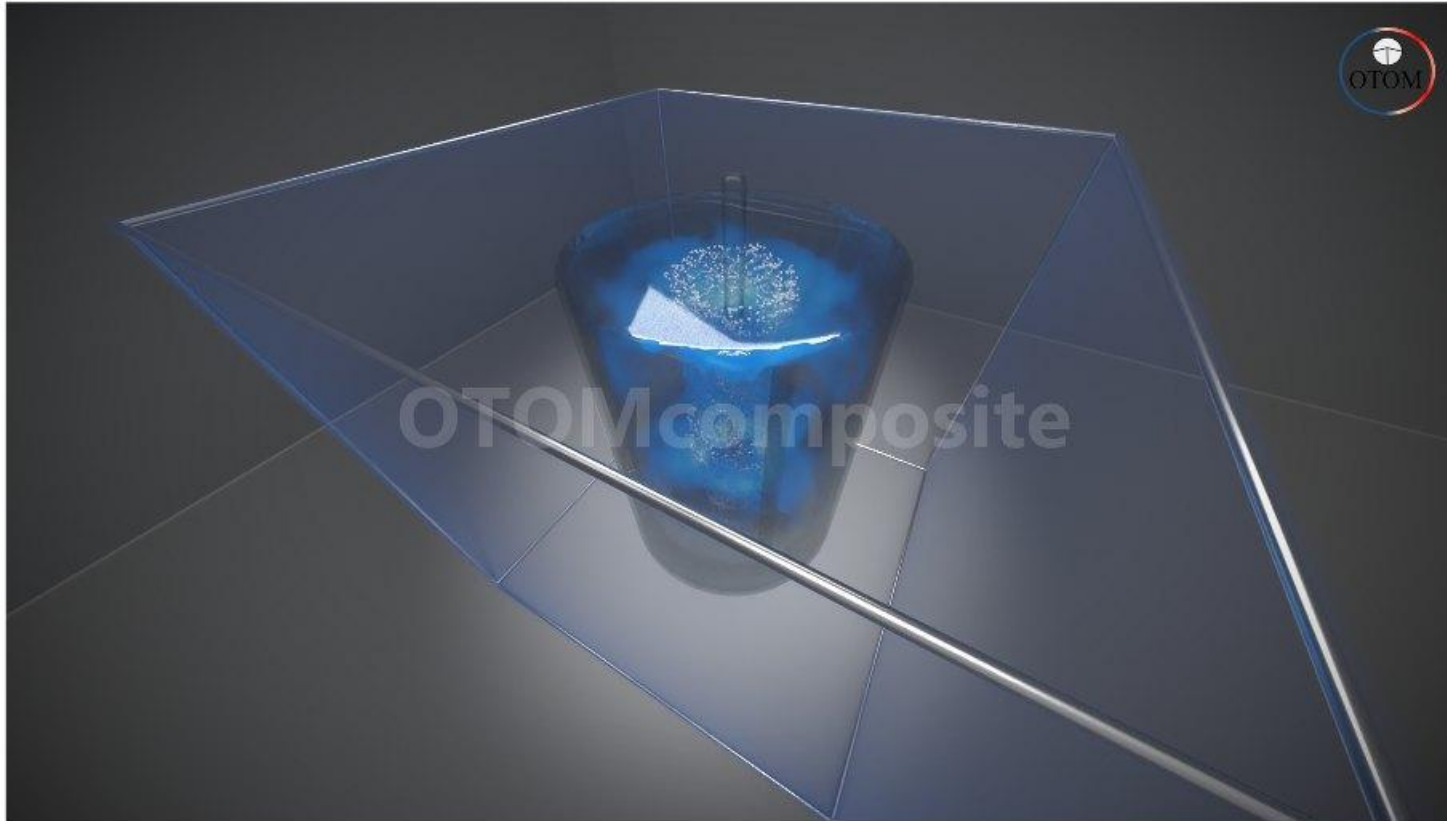
- 3D incompressible, 128^3 , imported vessel + shaft + two impellers, sealed domain.

Result

Showcase of rotating machinery in a closed vessel.

Stirred Tank with Gas Sparger (new)

SHOWCASE



Bubbles (white) rising from a ring sparger; liquid speed in blue. Blender (Cycles) render of the recorded run — click to play.

What you see

- Gas bubbles released at a ring sparger under the lower impeller rise, are swirled by the impellers and burst at the liquid surface.
- The bubbles push the liquid up: a rising plume with return flow down the walls.

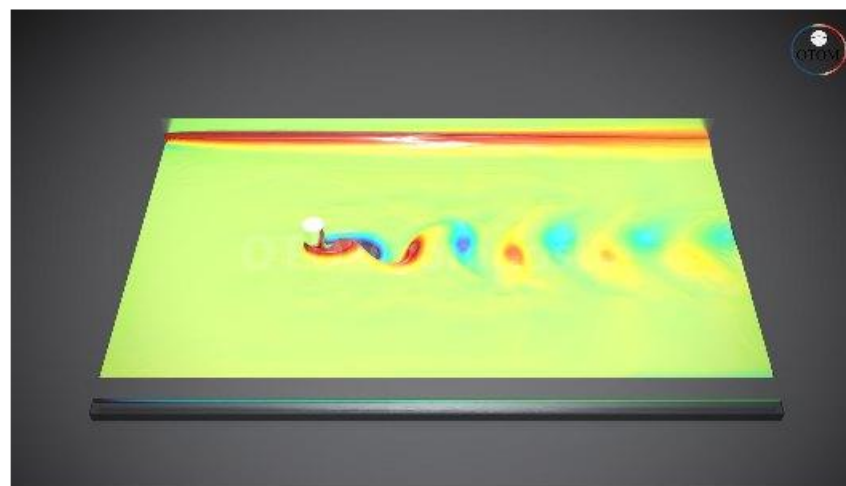
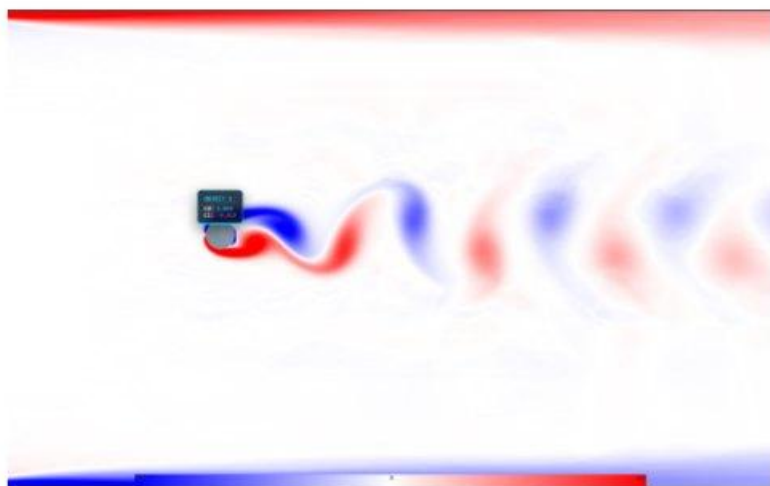
Physics & setup

- Bubble parcels with a rise (slip) speed, two-way coupled through the local gas fraction.
- Calibrated so the plume moves about as fast as the bubbles rise (bubble-column behaviour).

Result

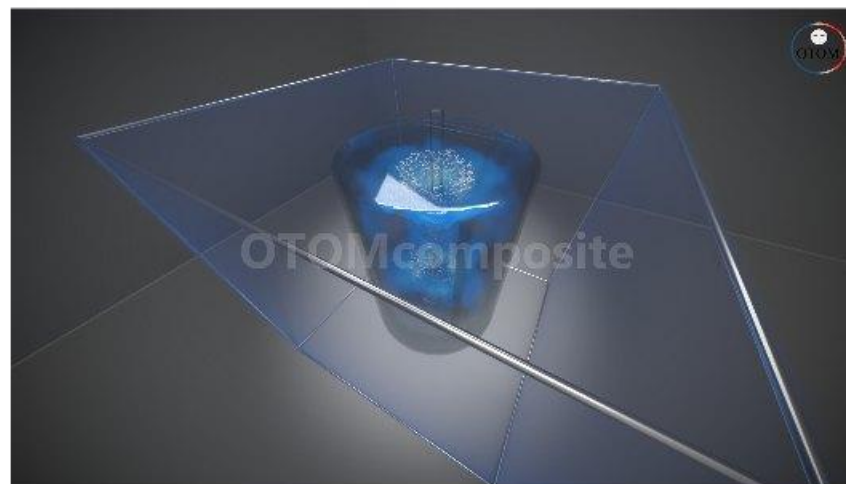
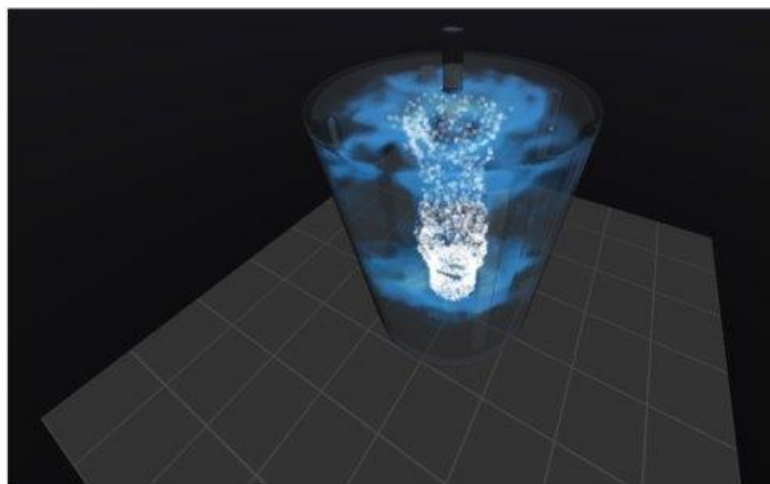
Qualitative. Not modelled: bubble break-up/merging, size distribution, gas dissolving, a free surface. In a still tank the bubbles alone drive a plume up to $\approx 1.8\times$ their rise speed.

From the live app to a Blender render



Kármán street (2D)

Left: the live WebGPU view. Right: the same run, recorded with Performance → Record for Offline Render and rendered in Blender (Cycles, path-traced, metal obstacles, studio lighting).



Sparged stirred tank (3D)

Left: the live WebGPU view. Right: the same run, recorded with Performance → Record for Offline Render and rendered in Blender (Cycles, path-traced, metal obstacles, studio lighting).

What the numbers mean

Demo	Status	Measured vs reference
Kármán Vortex Street (Re 200)	VALIDATED	$C_d \approx 0.9\text{--}1.0$ vs ≈ 1.3 (known 20–30% low bias in shedding flow)
Honey Flow: Creeping Flow at Re 5	PARTLY	$C_d \approx 7.0$ vs ≈ 4.4 unconfined (channel blockage raises it)
Sod Shock Tube	VALIDATED	Density, velocity and pressure profiles vs the exact Riemann solution (Truth tab)
Supersonic Wedge, Mach 2	VALIDATED	Shock angle $\approx 47\text{--}50^\circ$ vs 47.8° oblique-shock theory
Sphere Drag at Re 100	VALIDATED	$C_d \approx 1.11$ vs 1.09 Schiller–Naumann ($\approx 3\%$)
Car Body in a Wind Tunnel (25° Rear Slant)	SHOWCASE	$C_d \approx 0.94$ vs ≈ 0.29 wind tunnel — NOT validated (grid too coarse)

Absolute values from a browser-sized grid are approximate: comparisons between runs of the same setup are more reliable than any single number. The Setup Check and the report trust level say when a result should not be quoted.