JoseCast Analyzer — User Guide

From a CAD model to a casting defect prediction, step by step.

This guide walks you through one complete analysis using the sample part that ships with the program. You do not need any simulation experience. Follow the numbered steps; every picture shows exactly where to click (red frame and number).

> **What JoseCast Analyzer does:** You give it the 3D model of your casting *with its gating and feeding system*. It simulates how the metal fills the sand mould and how it solidifies, then shows you where defects such as shrinkage porosity, trapped air or cold shuts are likely to appear — before you make the pattern.

Contents

1. Before you start
2. The screen at a glance
3. Your first analysis (sample part)
4. Reading the results
5. Saving and opening results
6. Long runs: closing the program while it calculates
7. Preparing your own model
8. Scope and limits
9. Quick troubleshooting

1. Before you start

Computer requirements

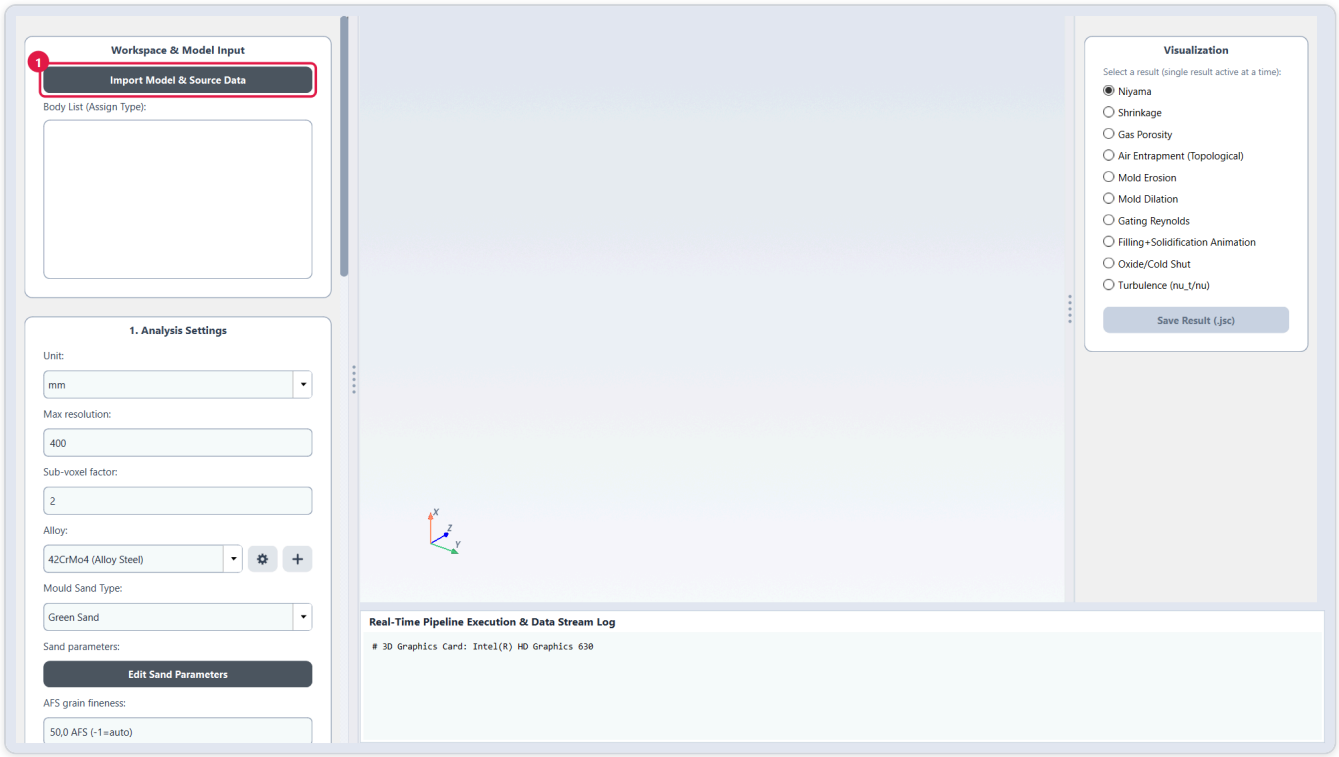
	Minimum
Operating system	Windows 10 (version 1809 or newer) or Windows 11, 64-bit
Processor	A processor with **AVX2** support (almost every Intel/AMD processor made after 2015)
Graphics	Any graphics card or integrated graphics with OpenGL support
Disk	A few GB of free space for each analysis while it runs

Install the program with the setup file (or from Microsoft Store) and start **JoseCast Analyzer** from the Start menu.

Sample parts. The installation folder contains a folder called **Sample Parts**. This guide uses **Model_Knuckle_Sprue.stp** — a steering-knuckle casting with its complete gating and feeding system.

How long does it take? Preparing the model takes a few minutes. The calculation itself depends on the part size and the resolution: a real part like the sample can take **several hours**. This is normal — the program solves the real physics of filling and solidification. You can close the window while it runs (see section 6).

2. The screen at a glance



- **Left panel** — everything you set, from top to bottom in the order you need it: model and body types, analysis settings, casting parameters, gravity direction, and the **Motor** section with the action buttons.
- **Centre** — the 3D view. Rotate with the left mouse button, move with the middle button, zoom with the mouse wheel.
- **Right panel** — the list of results. It becomes active after an analysis.
- **Bottom** — the log. It tells you what the program is doing and warns you if something needs attention.

> Tip: the left panel is long — scroll it down to reach sections 2, 3 and 4.

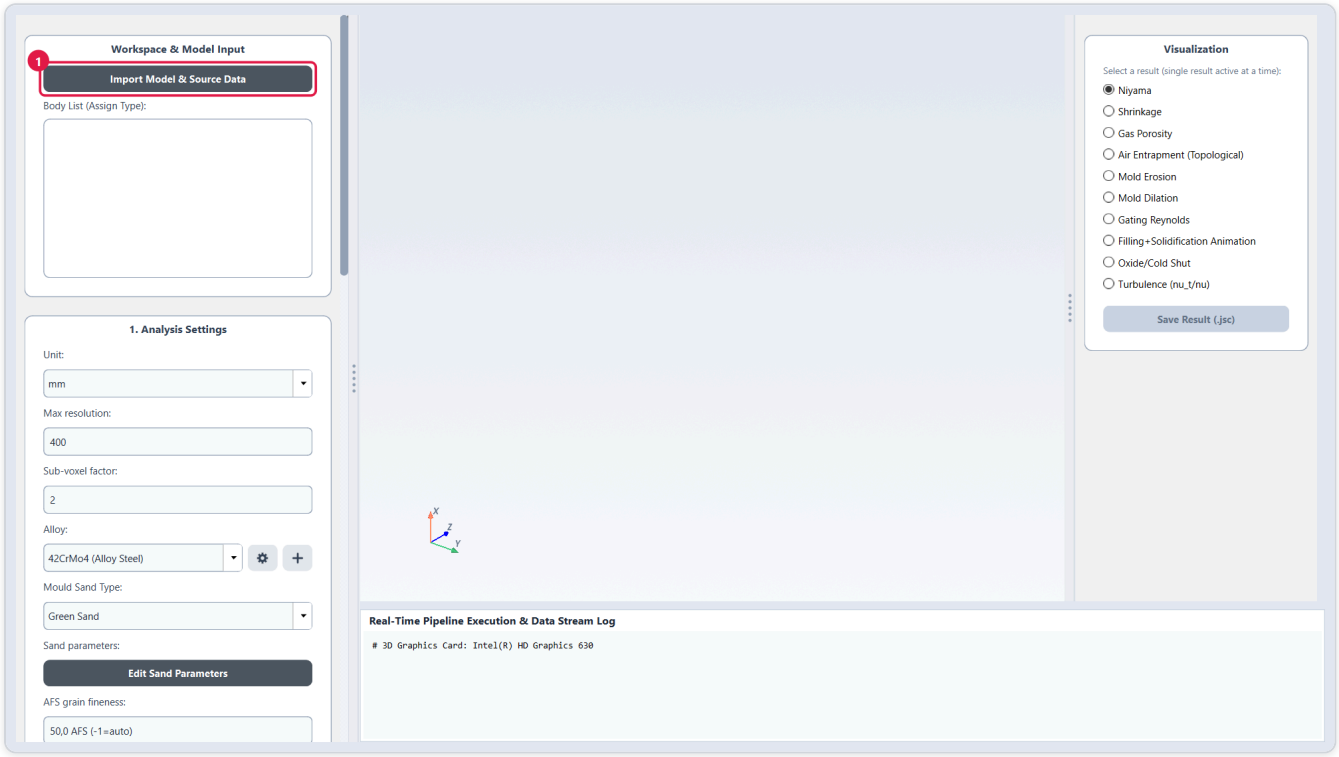
3. Your first analysis (sample part)

The whole workflow is always the same **8 steps**:

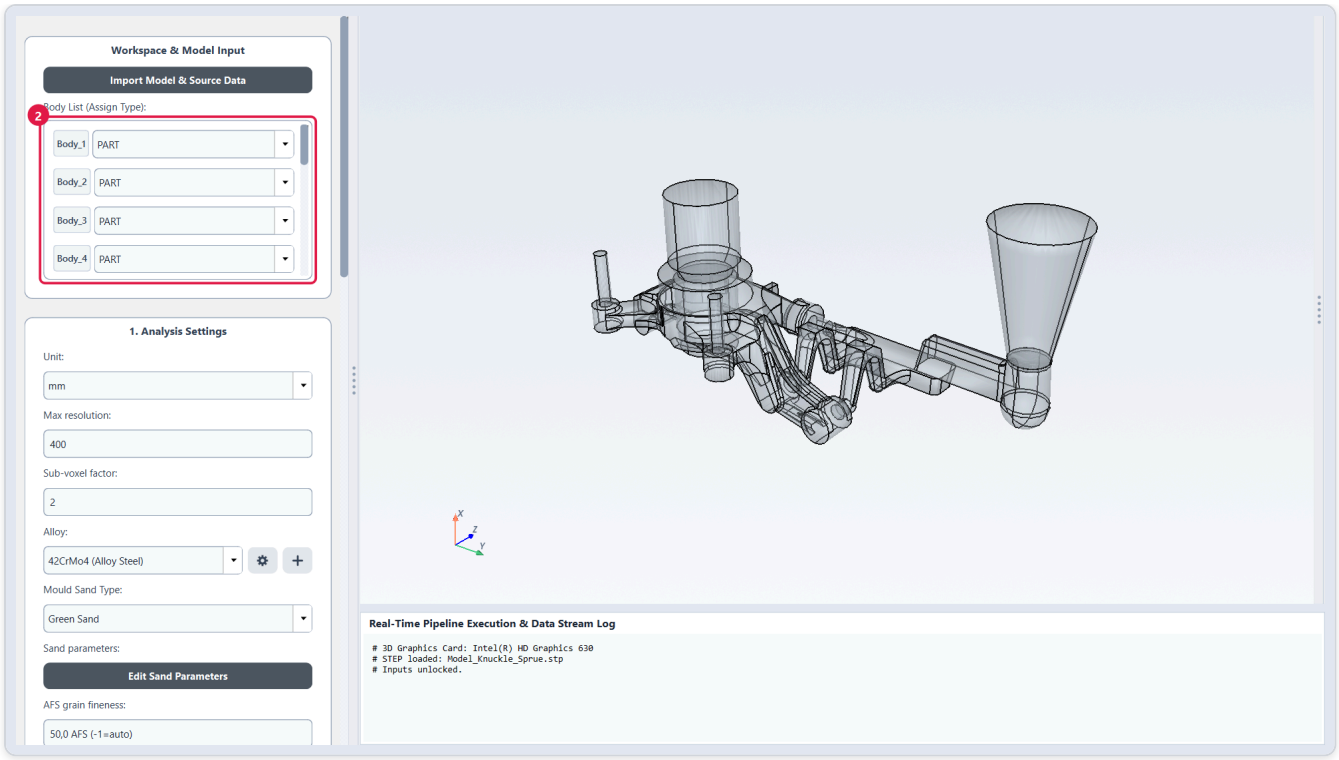
Import → Assign body types → Choose alloy and sand → Casting parameters → Gravity → Mould box → Voxelize → Calculate

Step 1 — Import the model

Click **Import Model & Source Data (1)** and choose `Sample Parts\Model_Knuckle_Sprue.stp`.



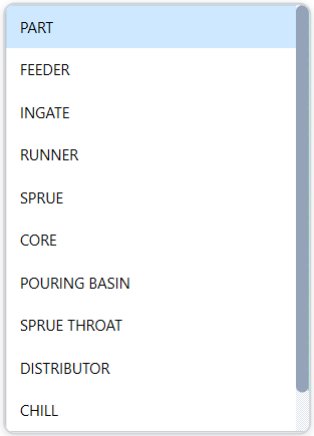
The model appears in the 3D view and each solid body of the file is listed under **Body List (2)**. The sample has 11 bodies (Body_1 … Body_11). At first every body is marked **PART**.



> Accepted file: **STEP** (`.stp` / `.step`). Every component (part, feeders, runners, sprue …) must be a **separate solid body** in the file.

Step 2 — Tell the program what each body is

The program needs to know which body is the casting and which bodies are the gating and feeding system. Open the drop-down list next to each body name **(1)** and choose its type.



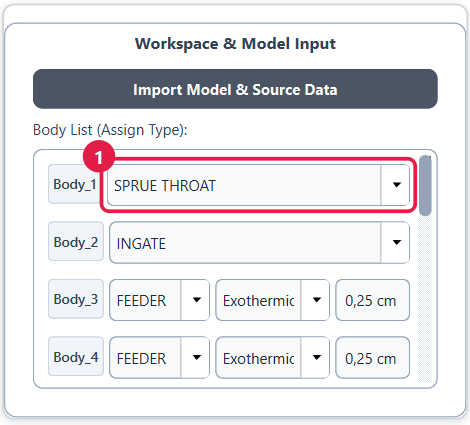
Body types in plain words

Type	What it is
PART	The casting itself — the piece you want to produce.
FEEDER	A riser. A metal reservoir that feeds the part while it shrinks.
SPRUE	The vertical channel the metal is poured into.
SPRUE THROAT	The narrow bottom end of the sprue.
POURING BASIN	The cup on top of the sprue where the ladle pours.
RUNNER	The horizontal channel that carries metal to the gates.
DISTRIBUTOR	A runner branch that divides the flow.
INGATE	The short channel where the metal enters the part.
CORE	A sand core that forms an inner cavity (no metal inside).
CHILL	A metal insert placed in the mould to cool a region faster.

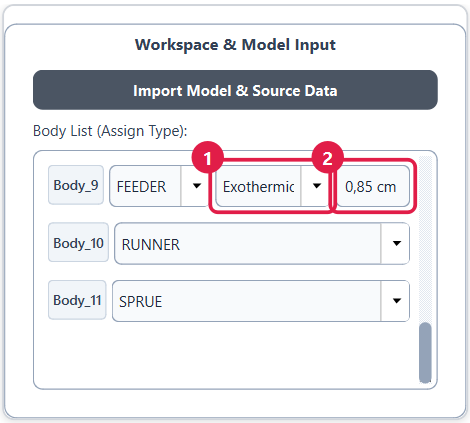
To find out which body is which, click a body in the list — it is highlighted in the 3D view.

For the sample part, set:

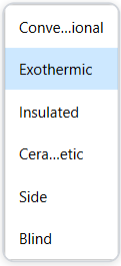
Body	Type
Body_1	SPRUE THROAT
Body_2, Body_5, Body_7	INGATE
Body_3, Body_4, Body_9	FEEDER
Body_6	PART
Body_8	CORE
Body_10	RUNNER
Body_11	SPRUE



Feeders have two extra boxes: the feeder type **(1)** and the feeder modulus **(2)**.



Feeder types: **Conventional** (plain sand feeder), **Exothermic** (sleeve that generates heat), **Insulated** (sleeve that keeps heat in), **Ceramic/Magnetic**, **Side** and **Blind** feeders.



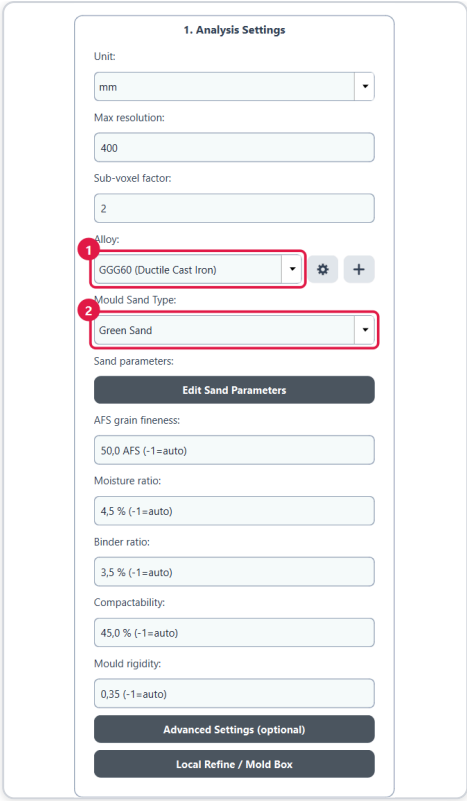
For the sample: all three feeders are **Exothermic**; modulus **0.25 cm** for Body_3 and Body_4, **0.85 cm** for Body_9. (Use the value given by your sleeve supplier for your own parts.)

A **CORE** body also gets a sand-type box. For the sample, choose **Silica Sand** for Body_8.

Step 3 — Choose the alloy and the mould sand

In **1. Analysis Settings**, choose the **Alloy (1)** and the **Mould Sand Type (2)**.

For the sample: **GGG60 (Ductile Cast Iron)** and **Green Sand**.



Leave the other fields (resolution, sand parameters …) at their default values for your first analyses. **Max resolution 400** is a good balance between detail and run time.

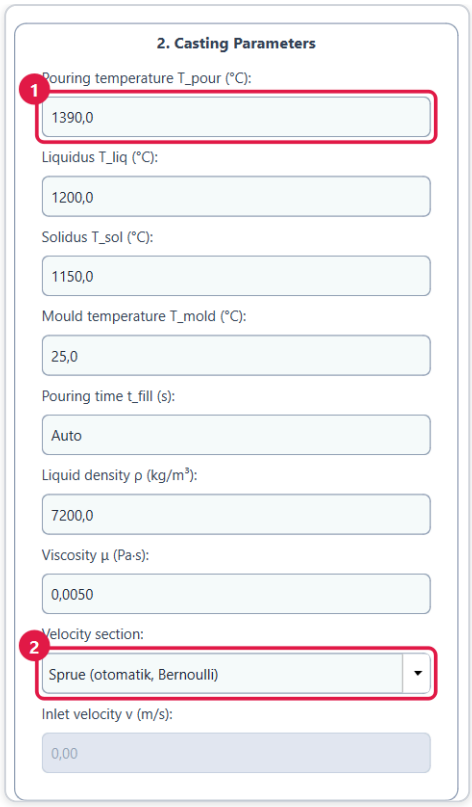
Available alloys: carbon and cast steels (C35, C45, C60, GP240GH, G20Mn5), alloy steels (16MnCr5, 20MnCr5, 42CrMo4, 100Cr6), manganese steels, stainless steels (AISI 304, 316), ductile irons (GGG40/50/60, Ni-Resist), compacted graphite iron (GJV-450), grey irons (GJL200/250/300) and white irons (Ni-Hard 1/2/4).

Available sands: Green, Silica, Chromite, Zircon, Furan resin, Phenolic resin, Water glass and Shell (Croning).

Step 4 — Casting parameters

In **2. Casting Parameters**:

- **Pouring temperature (1)** — the temperature of the metal entering the mould. It is filled in automatically from the alloy; change it to your real practice. Sample: **1390 °C**.
- **Velocity section (2)** — where the program calculates the metal inlet speed. Choose the sprue option (automatic, from the sprue height). The program then calculates the speed itself.

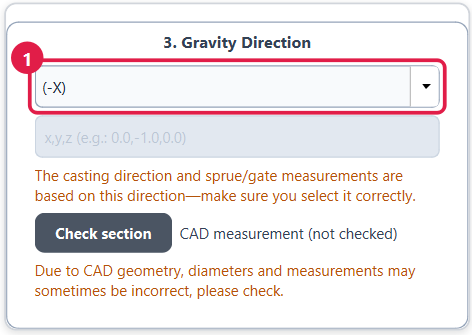


The other values (liquidus, solidus, density …) come from the alloy — leave them as they are. **Pouring time** on *Auto* lets the program calculate it.

Step 5 — Gravity direction (very important)

Choose the direction in which gravity acts on your model **(1)**, i.e. which way is "down" in the mould. This depends on how the model was drawn in CAD.

For the sample: **(-X)**. In the 3D view the sprue funnel must then point **upwards**.

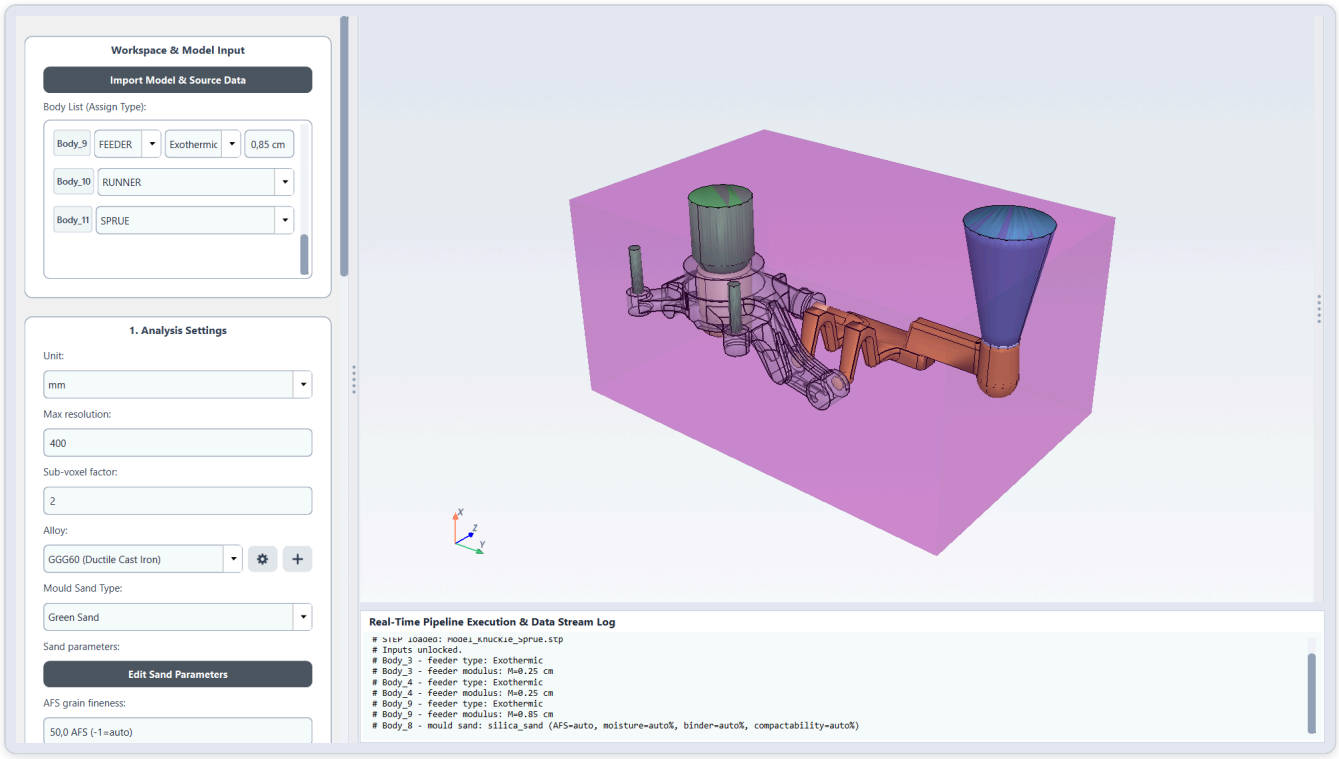


> ⚠ A wrong gravity direction gives a completely wrong result (the metal would "fall" sideways). If your CAD model is drawn with Z up, choose **(-Z)**.

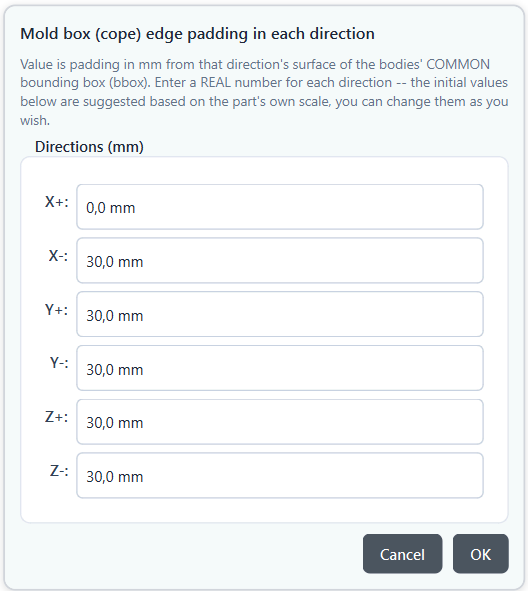
Click **Check section** to let the program measure the sprue and gate sections on the CAD model; check that the values look right.

Step 6 — Mould box

At the bottom of section 1, click **Local Refine / Mold Box**. A box appears around the model in the 3D view — this is the sand mould. A dialog lets you set how much sand surrounds the model in each direction (in mm).



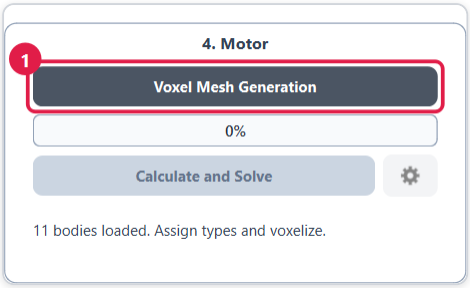
For the sample: **0 mm** on **X+** (the top of the mould, where the sprue opens) and **30 mm** on all other sides. Click **OK**.



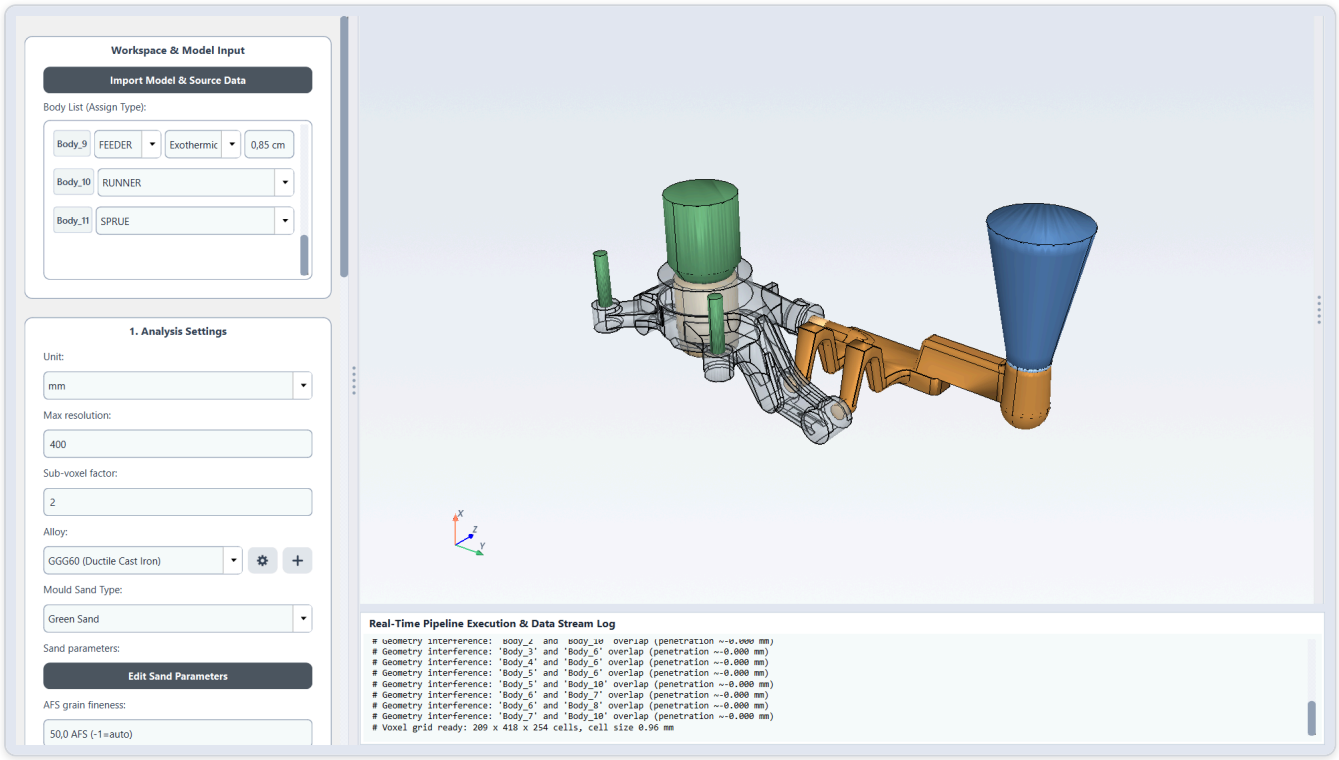
> Why 0 on the top? The sprue and the open feeders must reach the top surface of the mould, as in a real flask.

Step 7 — Voxelize

In **4. Motor**, click **Voxel Mesh Generation (1)**. The program converts the CAD model into a fine 3D grid of small cubes (voxels) that it can calculate on. This takes from a few seconds to a few minutes.

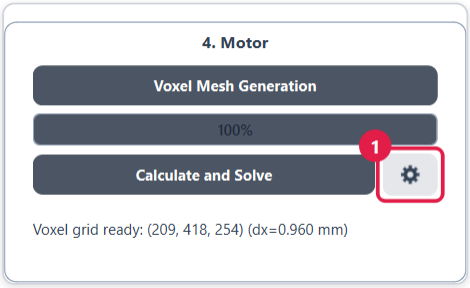


When the bar reaches 100 %, the bodies are shown in colour by type (part, feeders, runners, sprue) and the log shows the grid size.



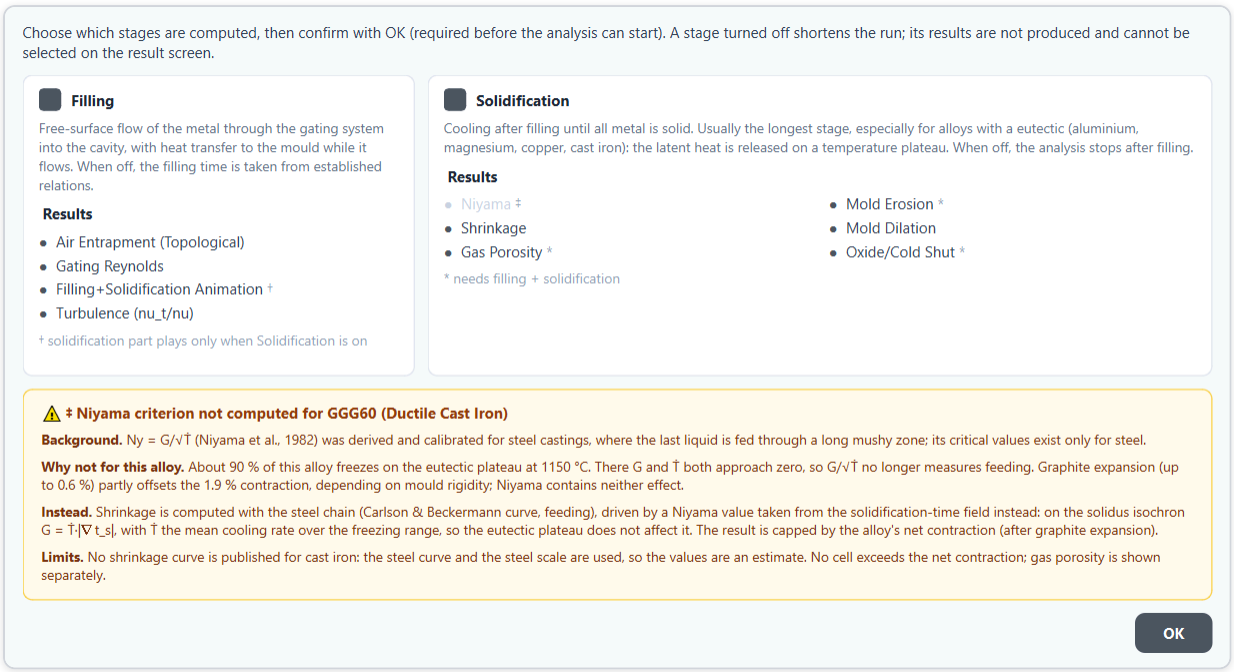
Step 8 — (Optional) choose what to calculate

The gear button next to **Calculate and Solve (1)** opens **Simulation Stages**.

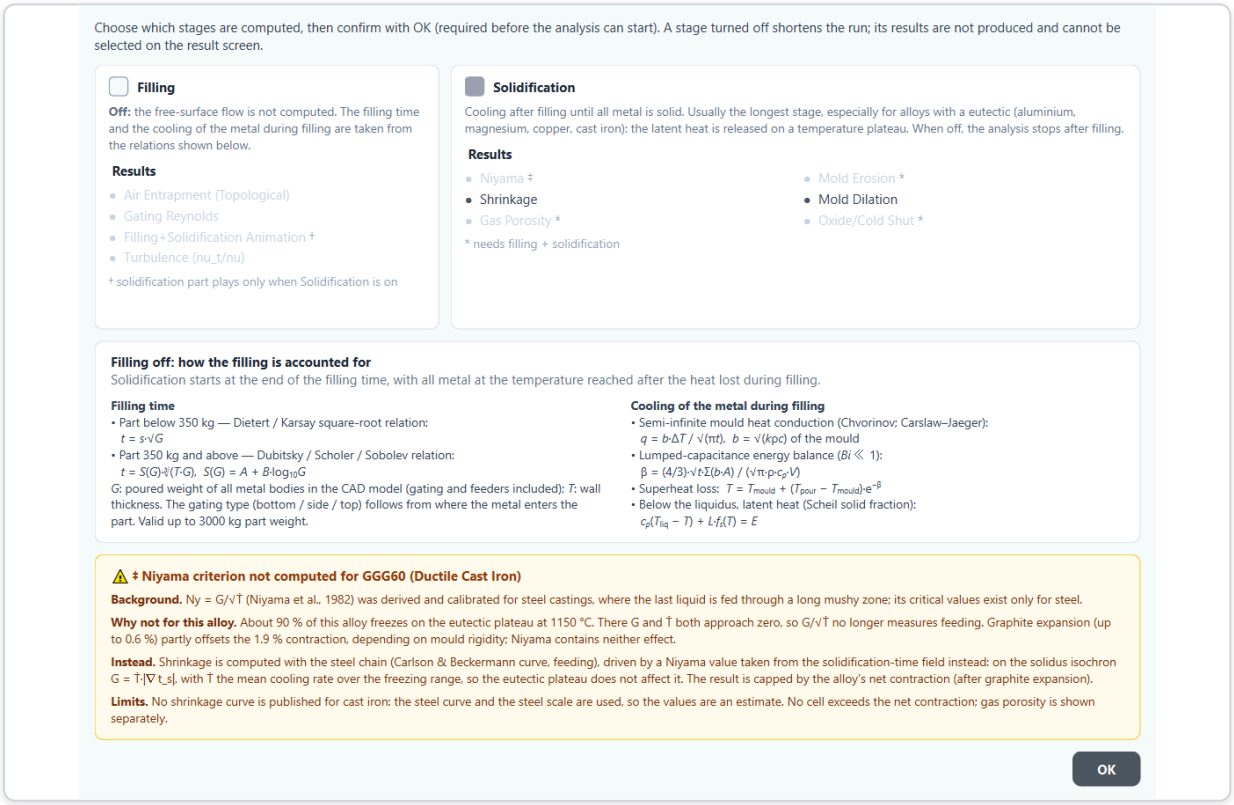


- **Filling** — the flow of the metal through the gating system into the mould.
- **Solidification** — the cooling and solidification after filling.

Each stage lists the results it produces. Keep both stages on for a complete analysis.



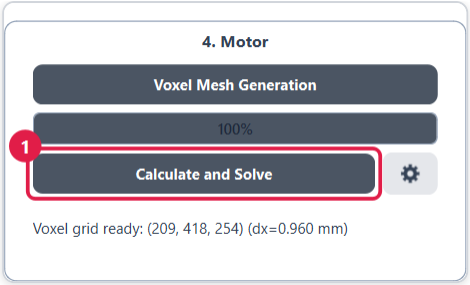
Filling off (quick check): If you only want to check feeding and shrinkage, switch **Filling** off. The program then does not simulate the flow: it estimates the filling time and the temperature of the metal at the end of filling, and starts solidification from there. The run is much shorter, but flow results (air entrapment, cold shuts, turbulence …) are not produced.



Click **OK** to confirm.

Step 9 — Calculate

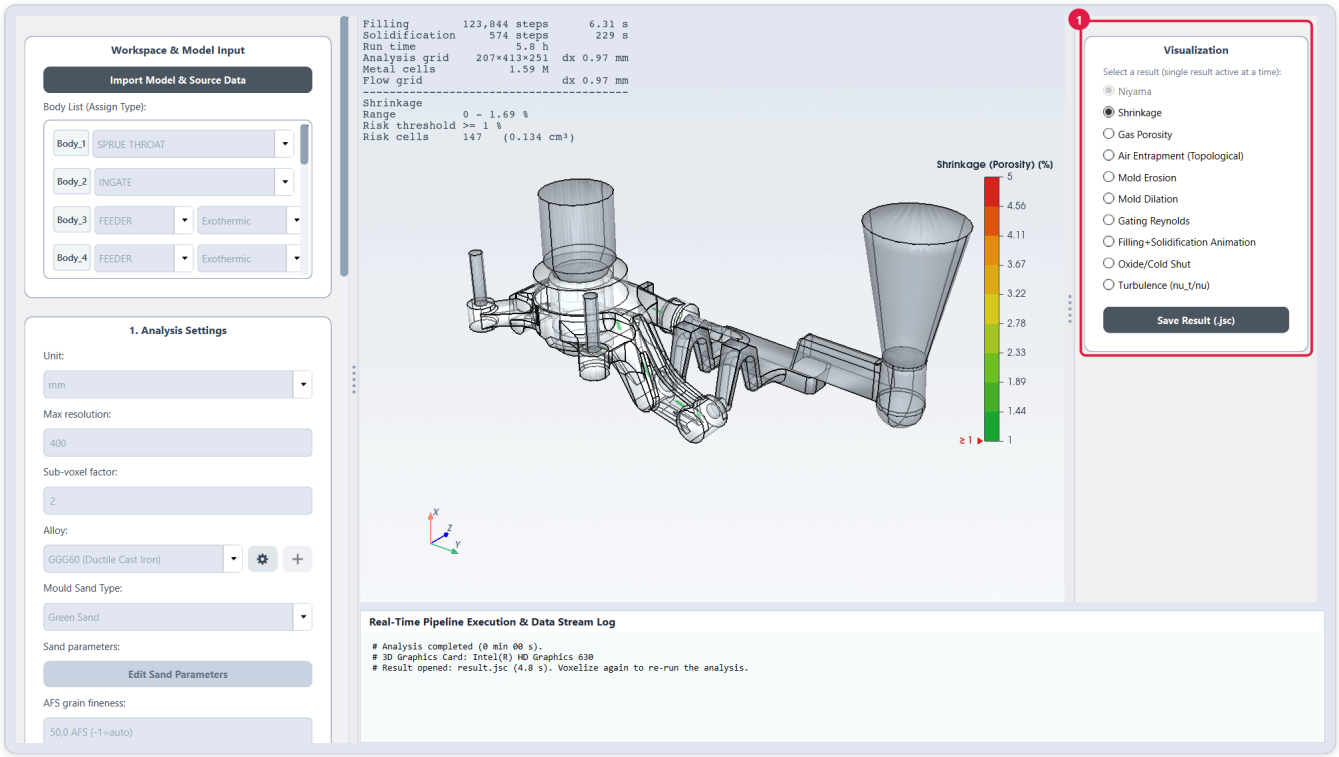
Click **Calculate and Solve (1)**.



The progress bar shows the current stage (filling or solidification) and the percentage. The log keeps you informed. The same button becomes **Stop** while the analysis is running.

When the analysis is finished, the right panel opens and the result appears automatically.

4. Reading the results



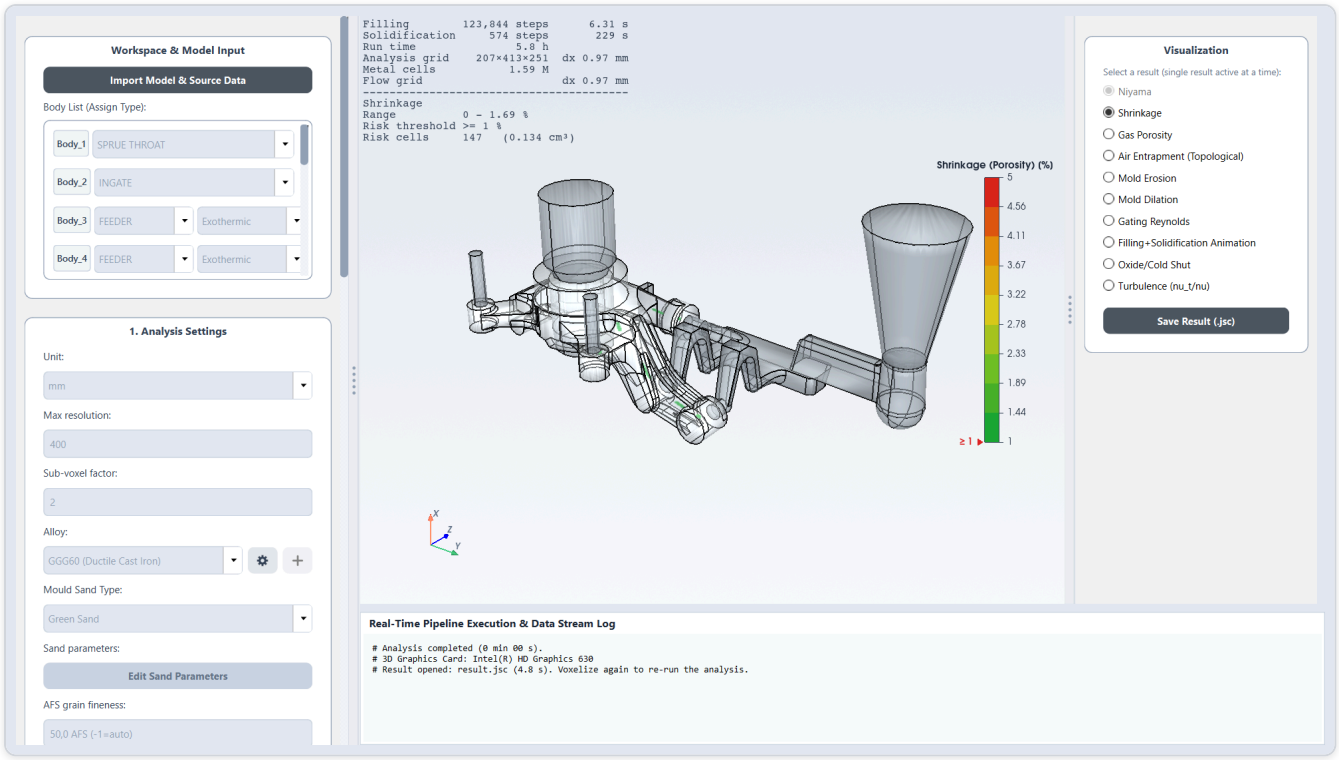
Choose a result in the **Visualization** list on the right **(1)**. Only one result is shown at a time.

On every result screen:

- **Top-left text** — a summary of the run: filling time, solidification time, grid size, and for the selected result its range, its risk threshold and how many cells exceed the threshold.
- **Colour bar (right)** — the scale. The small red arrow and the "≥" value mark the **risk threshold**.
- **3D view** — only the regions at or above the threshold are coloured; the rest of the casting is shown transparent so you can see inside.
- **Bottom slider** — move the threshold yourself to see weaker or only the strongest risks.

> **How to read colours:** green = just above the threshold, yellow/orange = stronger, red = strongest.
> **No colour = no risk at the threshold.**

Shrinkage (porosity)

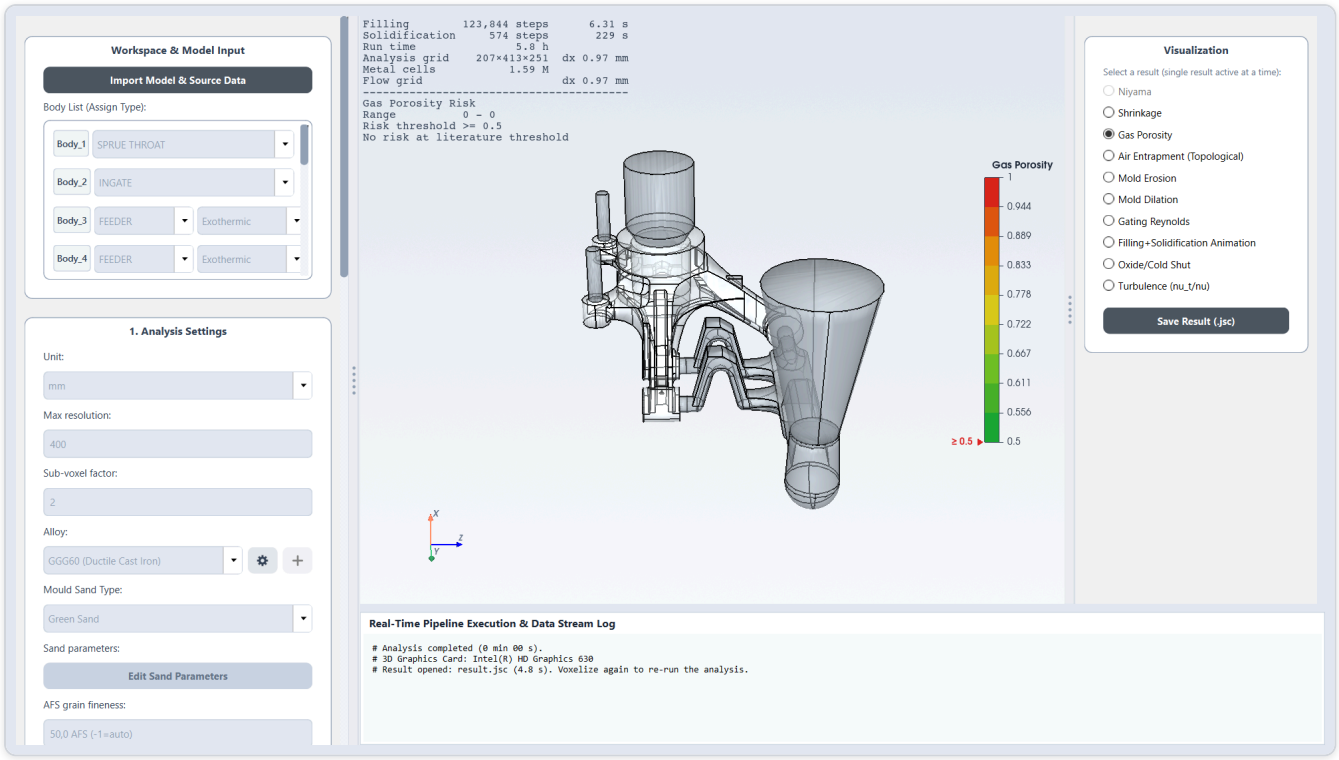


What it shows: where the metal shrinks during solidification and cannot be fed with liquid metal — the most common internal defect (shrinkage cavities and porosity).

What to do if you see risk inside the part: move or enlarge the feeder near that region, increase the feeder modulus, add a chill, or change the gating so the region solidifies earlier. Risk inside the **feeders** is good — that is where shrinkage should end up.

In the sample, risk is limited to a very small volume (147 cells, 0.134 cm^3).

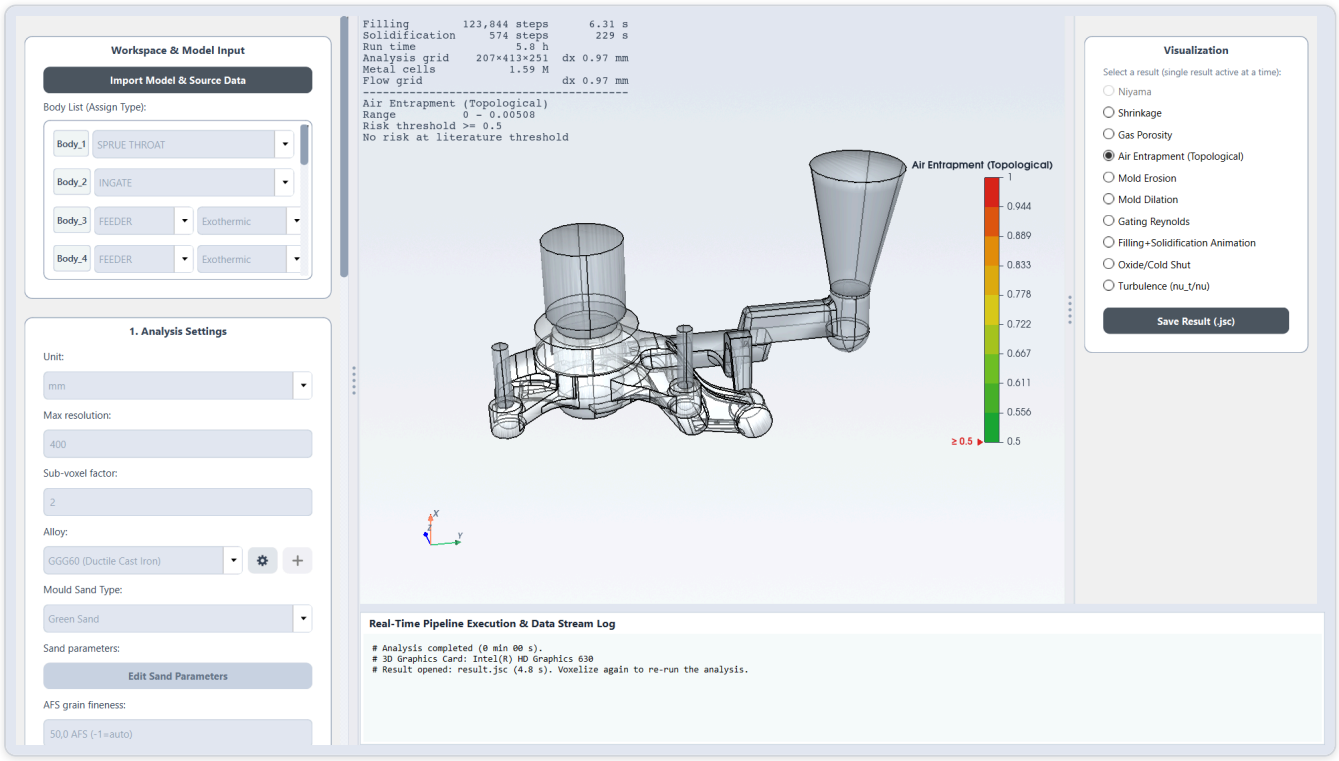
Gas porosity



What it shows: where gas from the metal or the mould can form bubbles that the metal pressure cannot hold back. In the sample: no risk at the threshold.

What to do: better venting, lower sand moisture, a higher metallostatic head over the region.

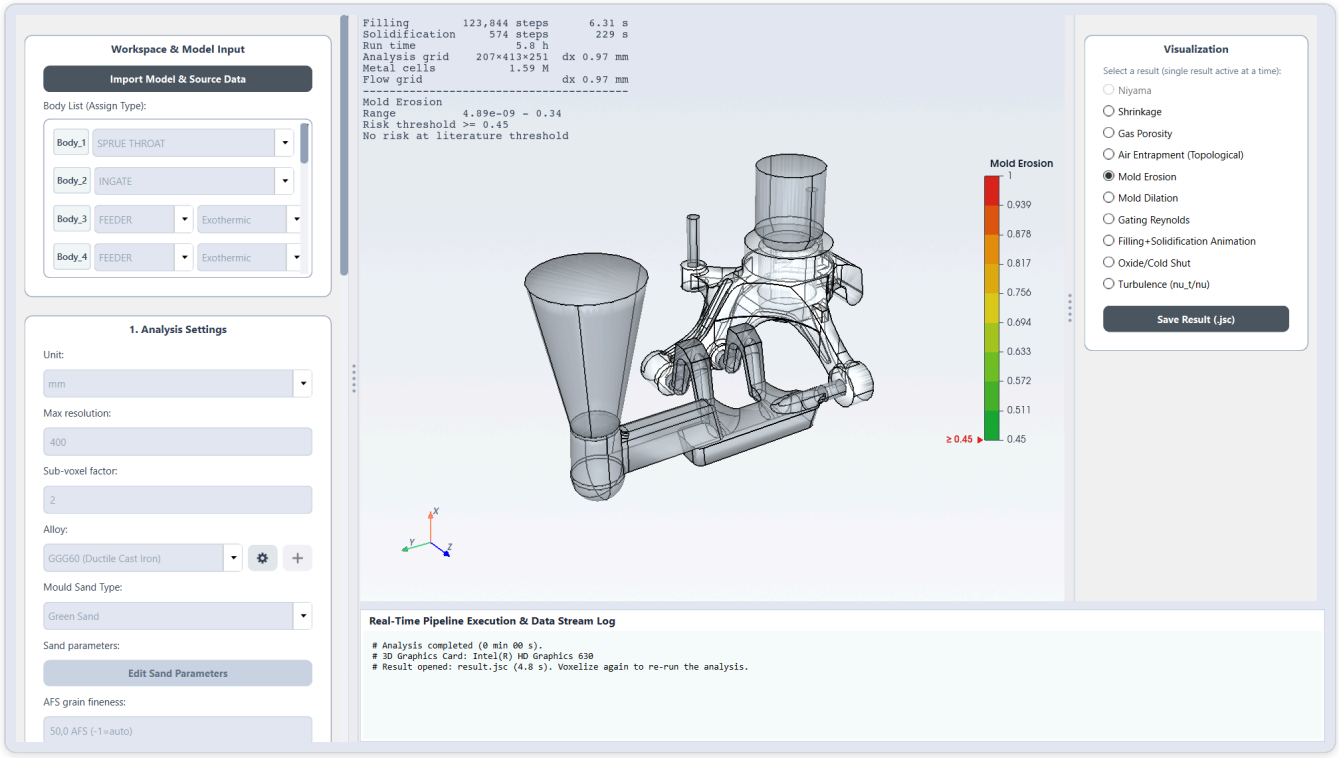
Air entrapment



What it shows: pockets where the air in the mould is closed in by the rising metal and has no way to escape — they can leave blowholes or misruns.

What to do: add a vent or a feeder at the highest point of the pocket, or change the filling order with the gating.

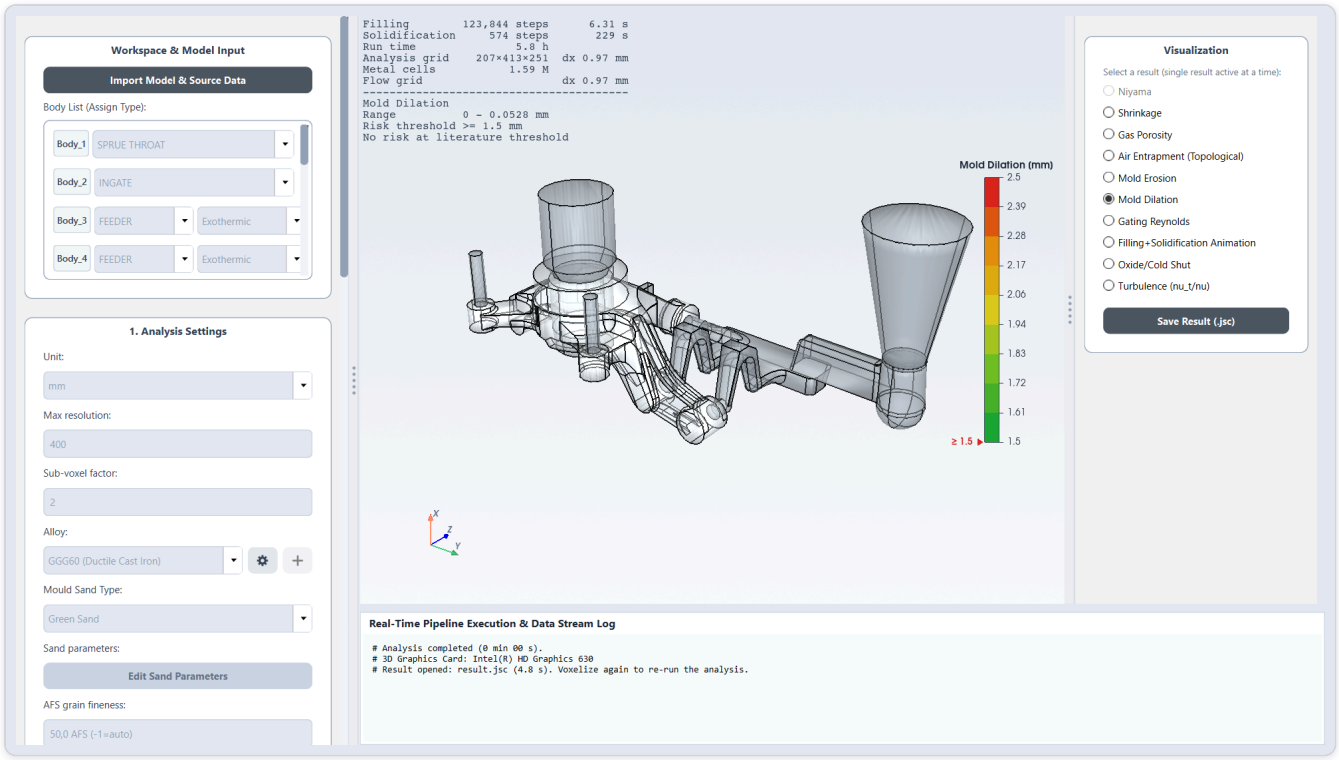
Mould erosion



What it shows: where fast or impacting metal can wash sand off the mould wall — sand inclusions in the casting.

What to do: reduce the gate velocity (larger gates, a choke in the right place), avoid jets hitting mould walls or cores, use a harder sand/coating at that spot.

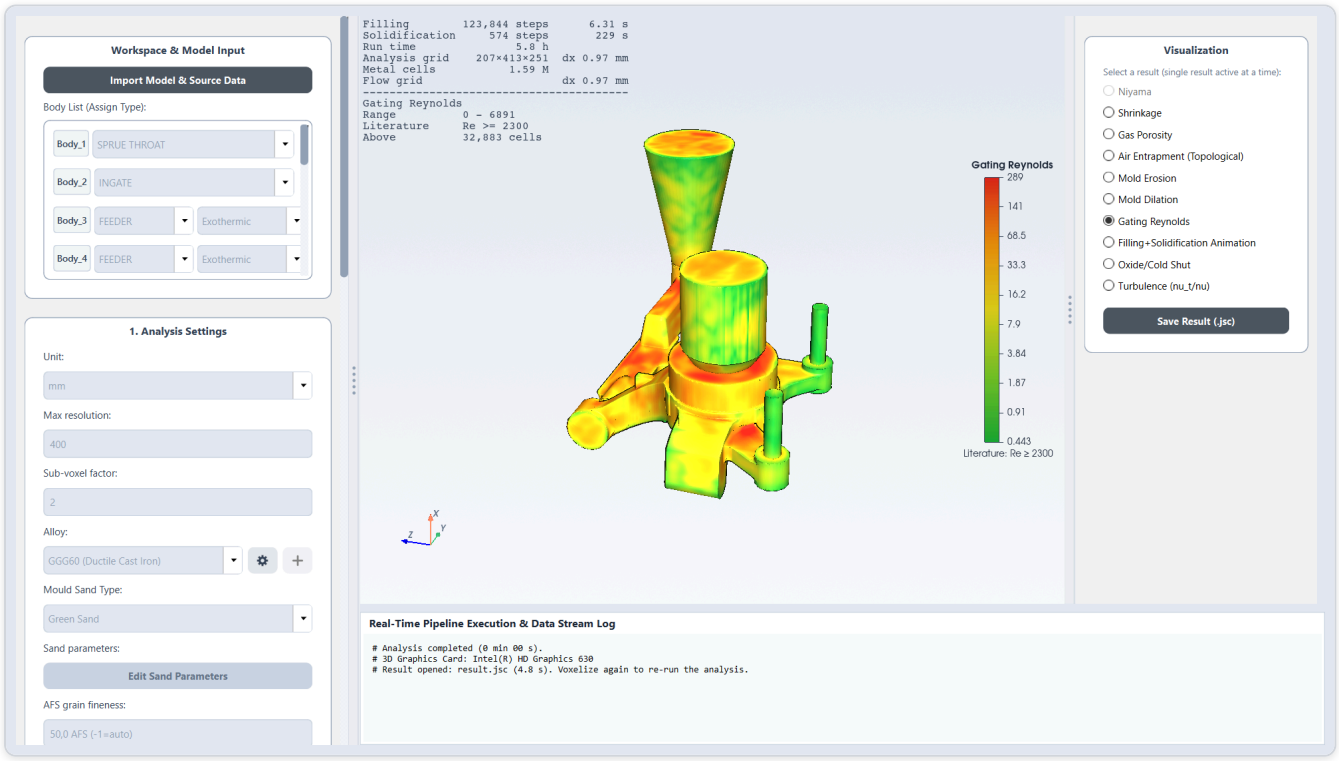
Mould dilation



What it shows: how much the sand mould wall moves outward (in mm) under heat and metal pressure — oversize dimensions, swells and fins.

What to do: firmer mould (higher compaction, stronger binder), lower pouring height.

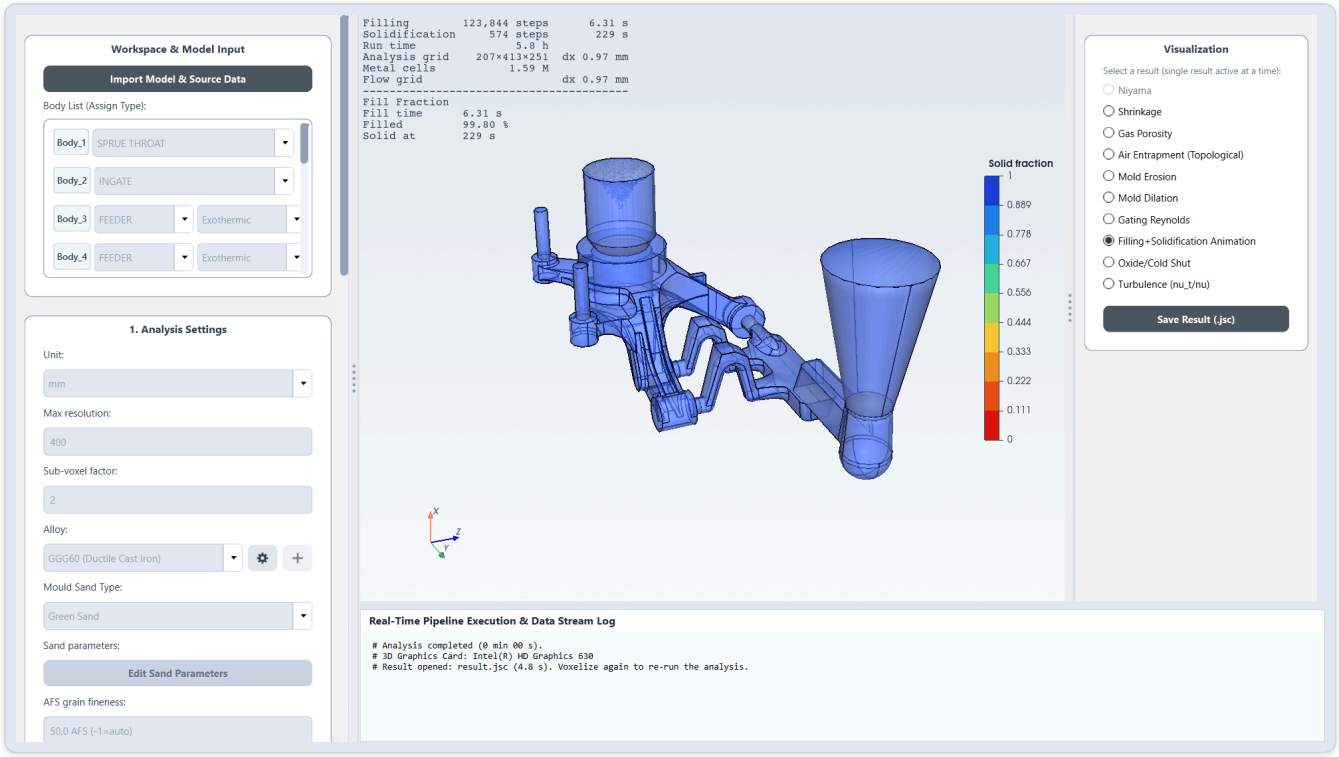
Gating Reynolds



What it shows: how turbulent the flow is in each region (Reynolds number). High values in the gating system mean a violent, splashing flow that creates oxides.

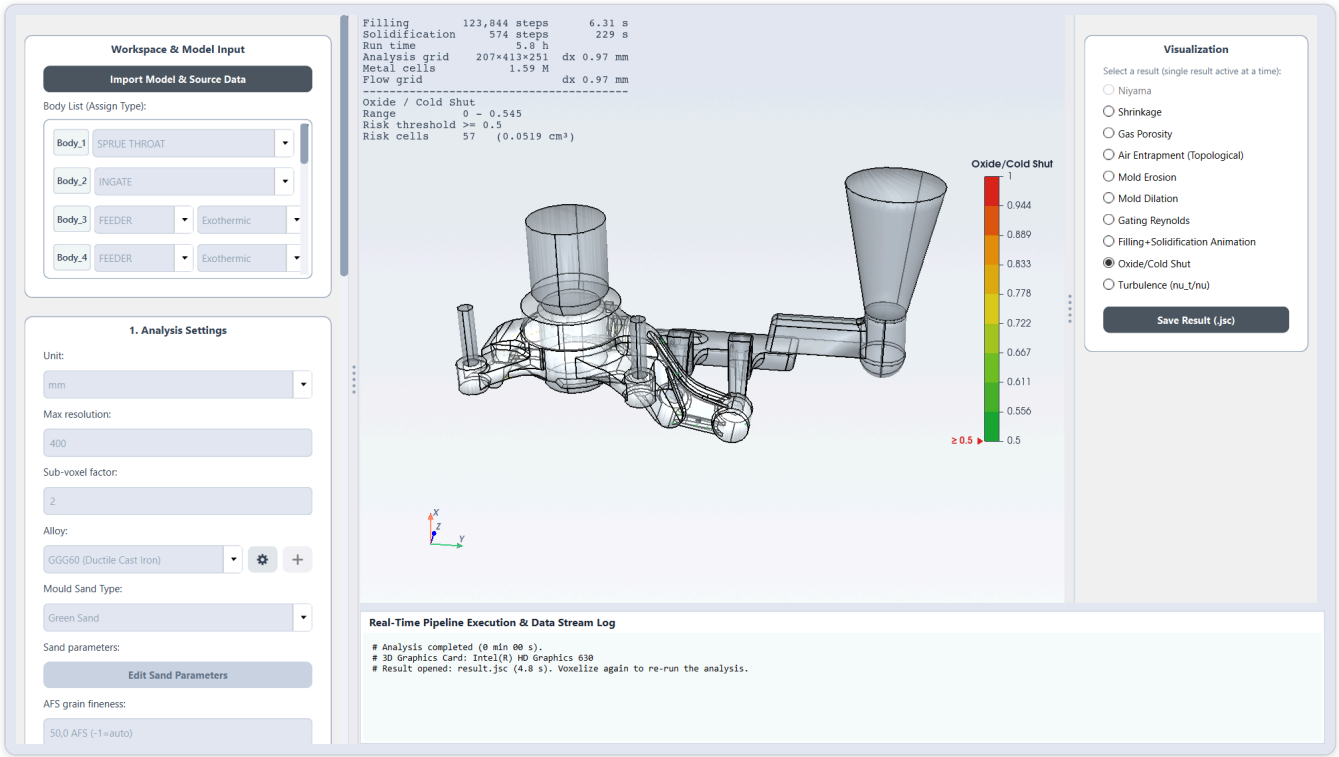
What to do: a smoother, wider gating system; avoid sharp corners and sudden section changes.

Filling + solidification animation



What it shows: a film of the whole process. Press play on the bottom bar: first the metal fills the mould (colour = flow speed), then the casting solidifies (colour = solid fraction). It is the best way to *see* the filling order and where the last liquid metal remains.

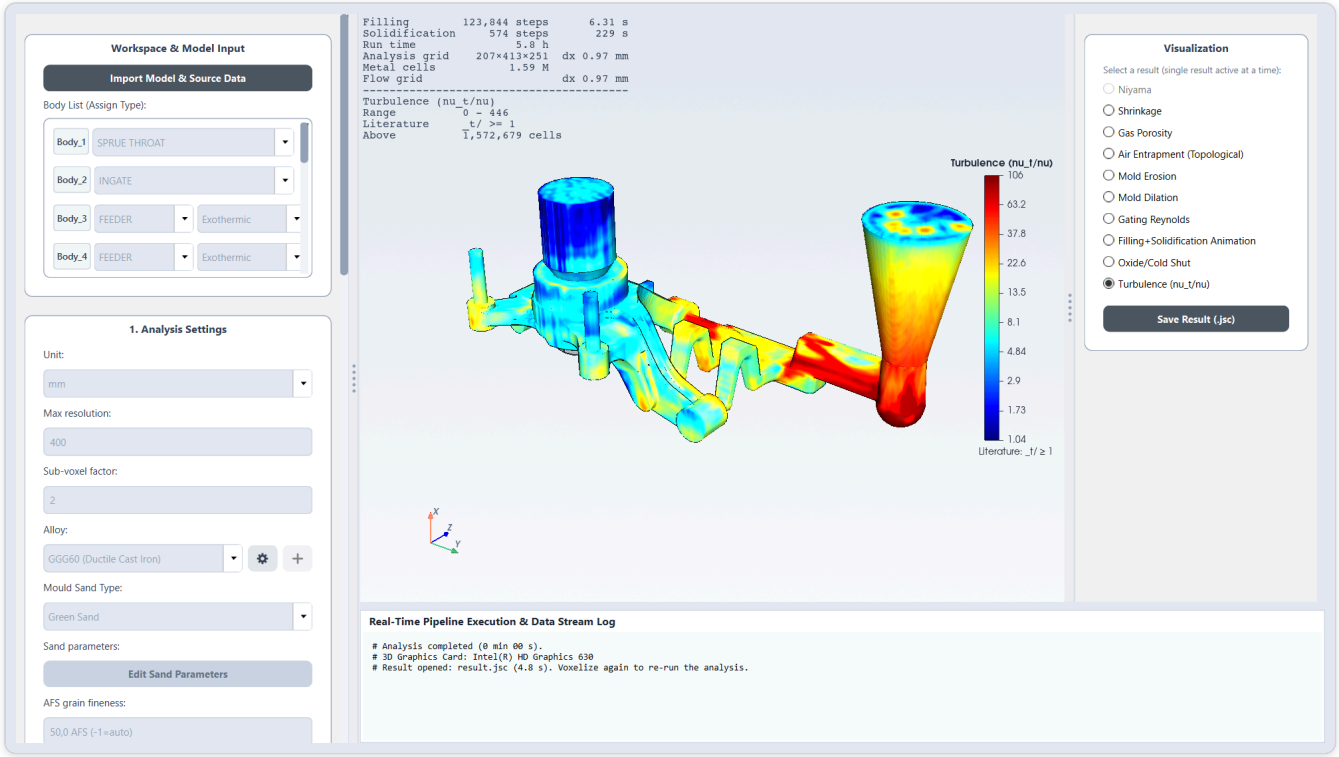
Oxide / cold shut



What it shows: places where two metal fronts meet after they have already cooled down — they may not fuse properly (cold shut, cold lap) or trap an oxide film.

What to do: higher pouring temperature, shorter filling time, an extra gate so the fronts meet earlier and hotter.

Turbulence



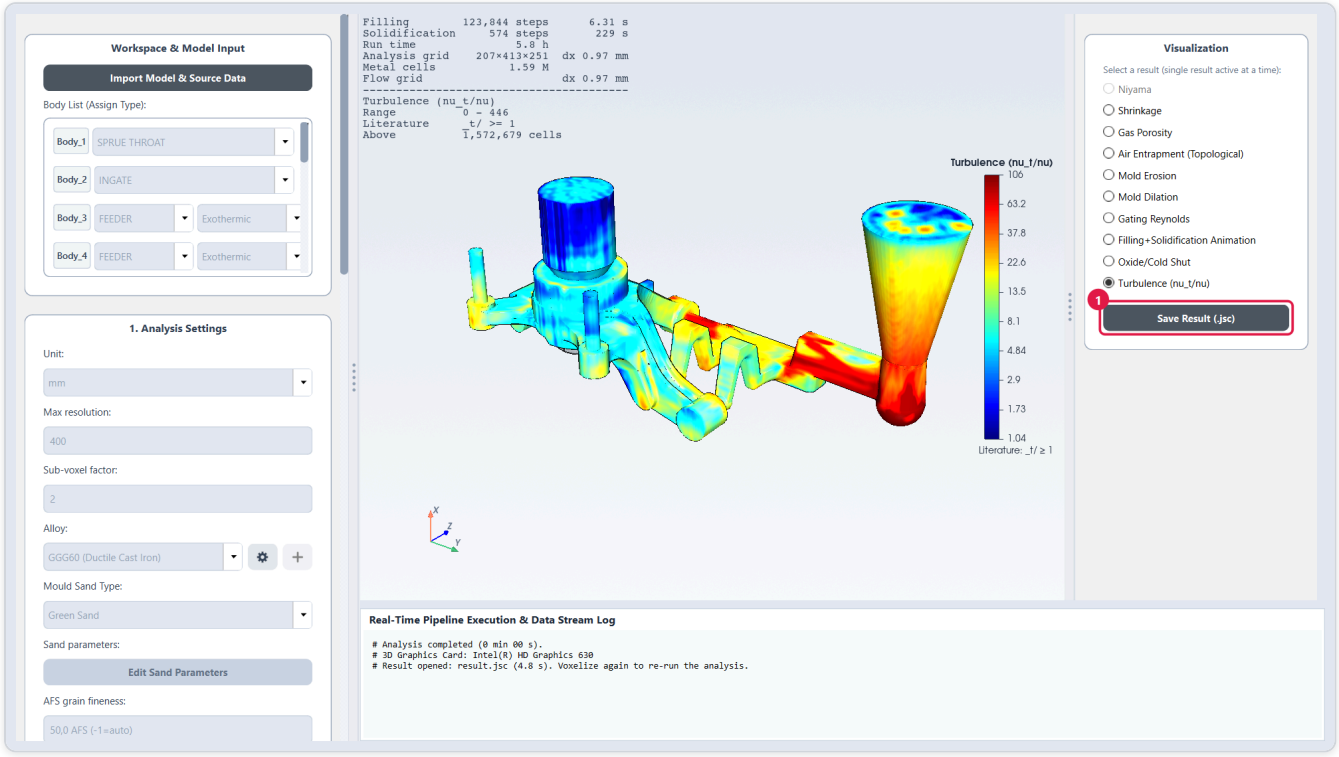
What it shows: how much stronger the flow mixing is than in calm flow. Strong turbulence folds the metal surface in and creates oxide inclusions. It is normally highest in the sprue and the runner — what matters is that it calms down before the metal enters the part.

> **Niyama** appears in the list for steels. It is not shown for cast irons, because the classic Niyama criterion is not valid for them; for cast irons use **Shrinkage**.

5. Saving and opening results

Every finished analysis is **saved automatically** in `Documents\JoseCast Analyzer\Jobs\<date>_<time>_<model name>\result.jsc`.

To save a copy elsewhere (for example to send to a colleague), click **Save Result (.jsc) (1)**.



To open a result later: click **Import Model & Source Data** and choose the `.jsc` file. All results are available again immediately — no recalculation needed.

> Job folders can be large (up to a few GB). You can delete old job folders in `Documents\JoseCast Analyzer\Jobs` when you no longer need them; save the `.jsc` first if you want to keep the result.

6. Long runs: closing the program while it calculates

The calculation runs in its own separate process. If you close the window during an analysis, the program asks:

- **Keep Running and Close** — the window closes, **the calculation continues** in the background and writes its result.
- **Stop Solver and Close** — the calculation is stopped; this run gives no result.

When you open JoseCast Analyzer again:

- if the analysis is still running, the program offers to **reconnect** and show its progress;
- if it finished while the program was closed, it offers to **open the result**.

> Do not shut down or restart the computer while an analysis is running in the background.

7. Preparing your own model

1. **Model the complete casting system** in your CAD program: part, feeders, sprue, runners, gates (and cores, if any).
2. **Every component must be a separate solid body.** Bodies may touch each other.
3. Export as **STEP** (`.stp` / `.step`).
4. Note which axis points **up** in your CAD model — you will need it for the gravity direction.
5. Import, then follow steps 2–9 exactly as with the sample.

Good practice

- Start with the default resolution (400). Increase it only for very thin walls.
- Always check the gravity direction in the 3D view: the sprue must point up.
- Give the feeder modulus and type of the sleeves you really use.
- Use **Filling off** for quick feeding checks while you design; run the full analysis for the final layout.

8. Scope and limits

- **Process:** gravity casting in **sand moulds**.
- **Alloys:** steels (carbon, cast, alloy, manganese, stainless) and cast irons (ductile, compacted graphite, grey, white). Aluminium, magnesium and copper alloys are **not** included.
- Results are **predictions** to support your decisions. They show *where* and *how likely* a defect is, so you can improve the design before production. Always confirm critical parts with your own experience and inspection.

9. Quick troubleshooting

Problem	Solution
Calculate and Solve stays grey	Run **Voxel Mesh Generation** first.
The metal seems to flow sideways or upward	Wrong gravity direction — check step 5.
The model has only one body	The STEP file was exported as one merged solid. Export each component as a separate body.
The run takes very long	Lower **Max resolution**, or use **Filling off** for a first feeding check.
A result button is grey	That result was not calculated (stage switched off) or does not apply to the chosen alloy.
The program was closed during an analysis	Open it again — it offers to reconnect or to open the finished result.