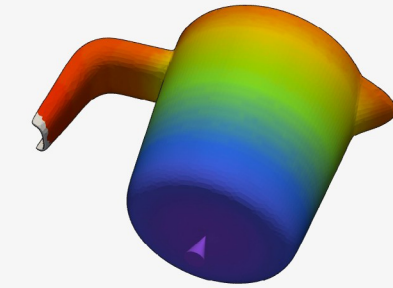


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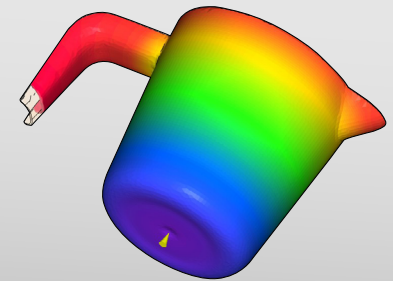
SIMCON

Comparison of Cadmould AI Solver generated simulations with Cadmould Flex results

What you can expect from Cadmould AI Solver simulation.
A brief introduction to your own test.



Cadmould
AI Solver



Cadmould Flex

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What is Cadmould AI Solver?

Introducing Cadmould AI Solver, the world's first neural physics engine for plastic injection molding. This technology is set to revolutionize design for manufacturing by delivering the full scope of classical simulation — including shrinkage and warpage — at near-real-time speeds and with superior accuracy.

Unlike generative AI tools that create images based on visual patterns, Cadmould AI Solver does not "guess" what a filling pattern looks like. It predicts the physical forces acting on the polymer.

This document shows the actual status of the Cadmould AI Solver demo while development is ongoing.

How to use this document?

This document shows some example comparisons between Cadmould AI Solver results and Cadmould Flex results.

It is only an overview. Feel free to make other comparisons on your own and feedback what you think about it.

What is the actual status of the Cadmould AI Solver?

Cadmould AI Solver is still in development.

Nevertheless, we are proud to already give you the opportunity to test the results - and see what still needs to be developed on the one hand and how fast and great the results already are.

What we still have to do?

At the moment, the model can give basic results for filling, and is not trained on shrinkage and warpage yet.

Within the filling results, we see some opportunity to raise quality e.g. in the freezing behavior. This is what we are working on.

Stay tuned and follow the next steps!

Overview of dataset for your comparison between Cadmould AI Solver and Cadmould Flex

Zip-Download

This dataset includes this document together with ready-to-use files for Cadmould Flex. It also contains the files needed to calculate in any other simulation software. This enables you to compare Cadmould AI Solver results to your most common injection-moulding simulation software.

All files needed are included in this package.

No Cadmould Flex available?

Go to our homepage and register for the viewer for free! If you like more, start the evaluation of Cadmould Flex - also available on our homepage.

simcon.ai



PDF-Overview

This document - gives you an overview what can be investigated and how.



Folder "Geometry Data"

this is the simulated part so you can use it in any software you like to.



Folder "Cadmould Flex"

This Folder includes the project file as well as all results coming from Cadmould Flex.

Open it directly in Cadmould Flex to change situations and create your own simulation or in Cadmould Viewer to have a deeper look on all results.

1.

Comparison between Cadmould AI Solver and Cadmould Flex simulations


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A few words about the comparative test series

We have compared results from Cadmould AI Solver and Cadmould Flex. Therefore, we set up the projects in both Cadmould AI Solver and Cadmould Flex with the same parameters.

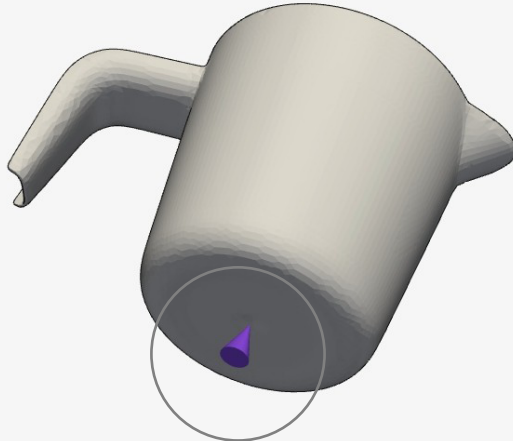
We chose certain KPIs and snapshots to compare the results and prove how well Cadmould AI Solver already performs. Calculation time was about 5s in Cadmould AI-Solver which is est. 70 times faster than in the already fast simulation of Cadmould Flex.


Parameters – we chose a common process for the comparison



Injection point:

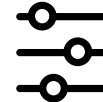
Injection point in the middle of the bottom





Material

Material is PP Generic out of the Cadmould database

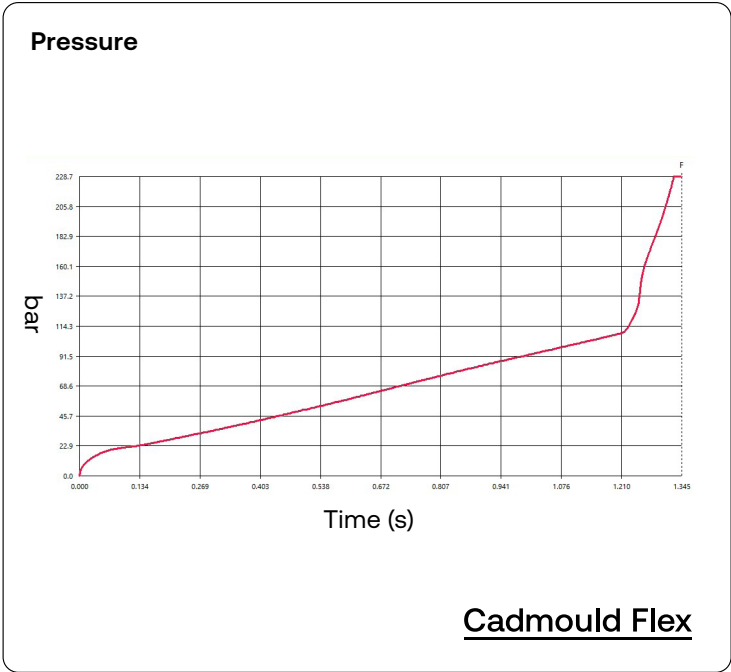
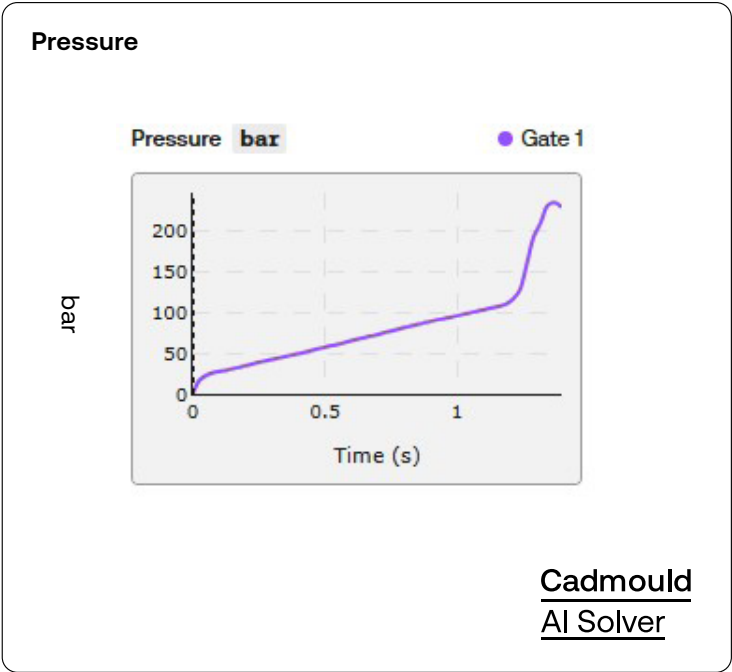


Process parameters

Flow Rate:	100 ccm/s
Melt temperature:	240 °C
Wall temperature:	40 °C

Comparison with Cadmould Flex: Pressure at the injection point

We compare the pressure at the gate needed to fill the part with the certain speed



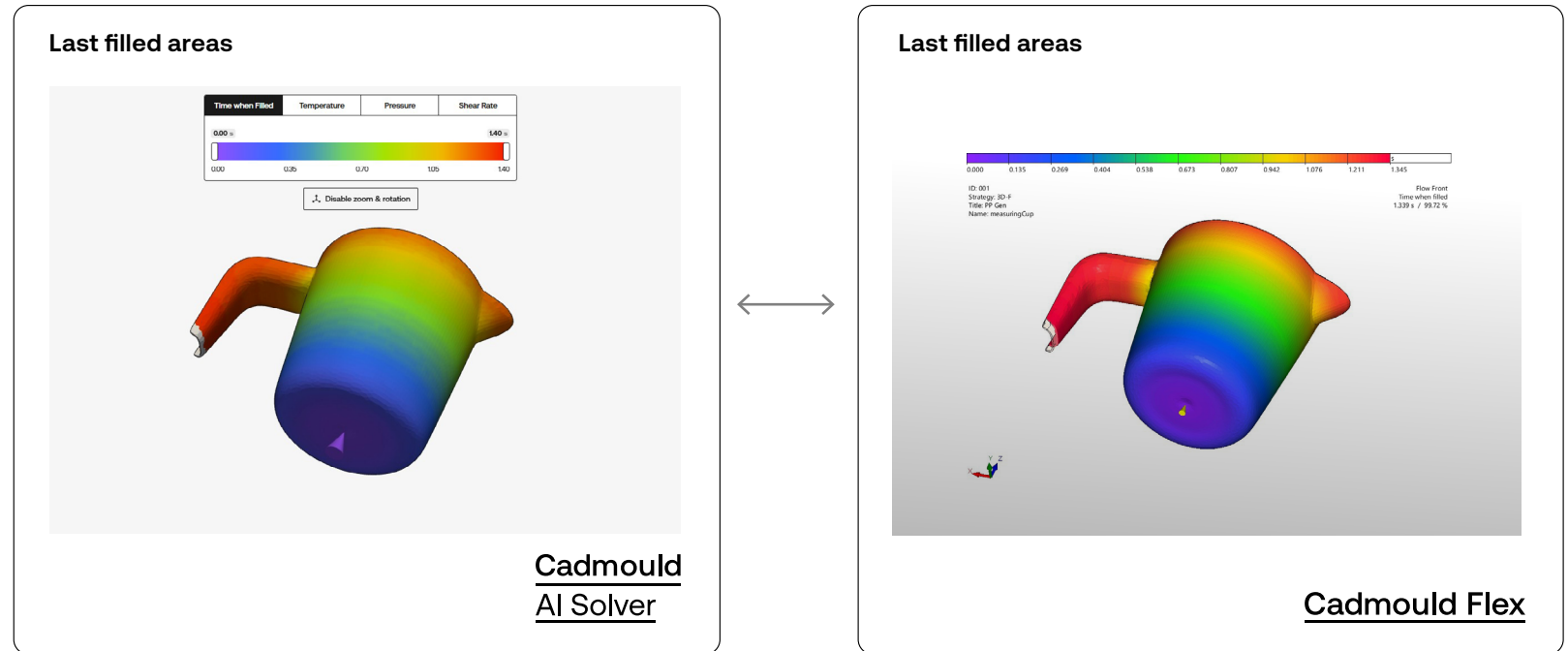
The values are very close in both applications

Comparison

Est. Filling time	1.37 s	1.34 s
Max. Pressure	235.00 bar	229.00 bar
Average Temperature at the end of filling	202.30 °C	205.30 °C

Comparison with Cadmould Flex: Last filled area

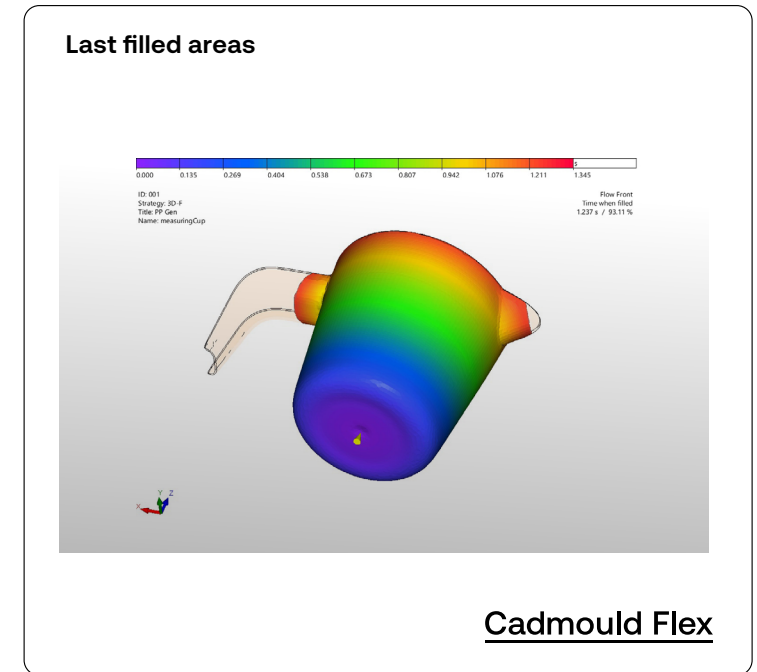
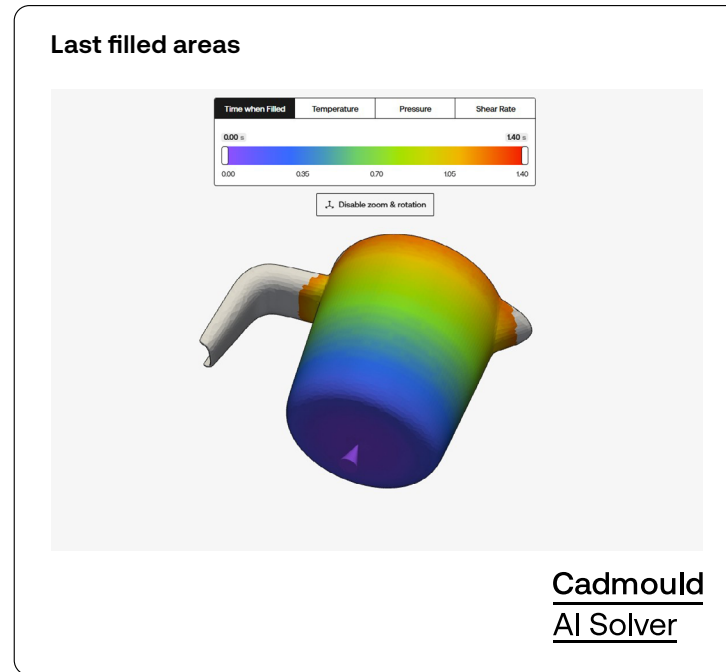
Filling behavior can be compared by comparing the last filled areas. We have a look on snapshots where the areas can be visualized well.



In both simulations, the end of the handle is filled last while the cup itself is already completely filled.

Comparison with Cadmould Flex: Filling status when last region of cup is filled

Also snapshots within the filling can be compared. Here, we chose the situation where the last region of the cup itself is filled. Compare how far the handle is filled at this moment.

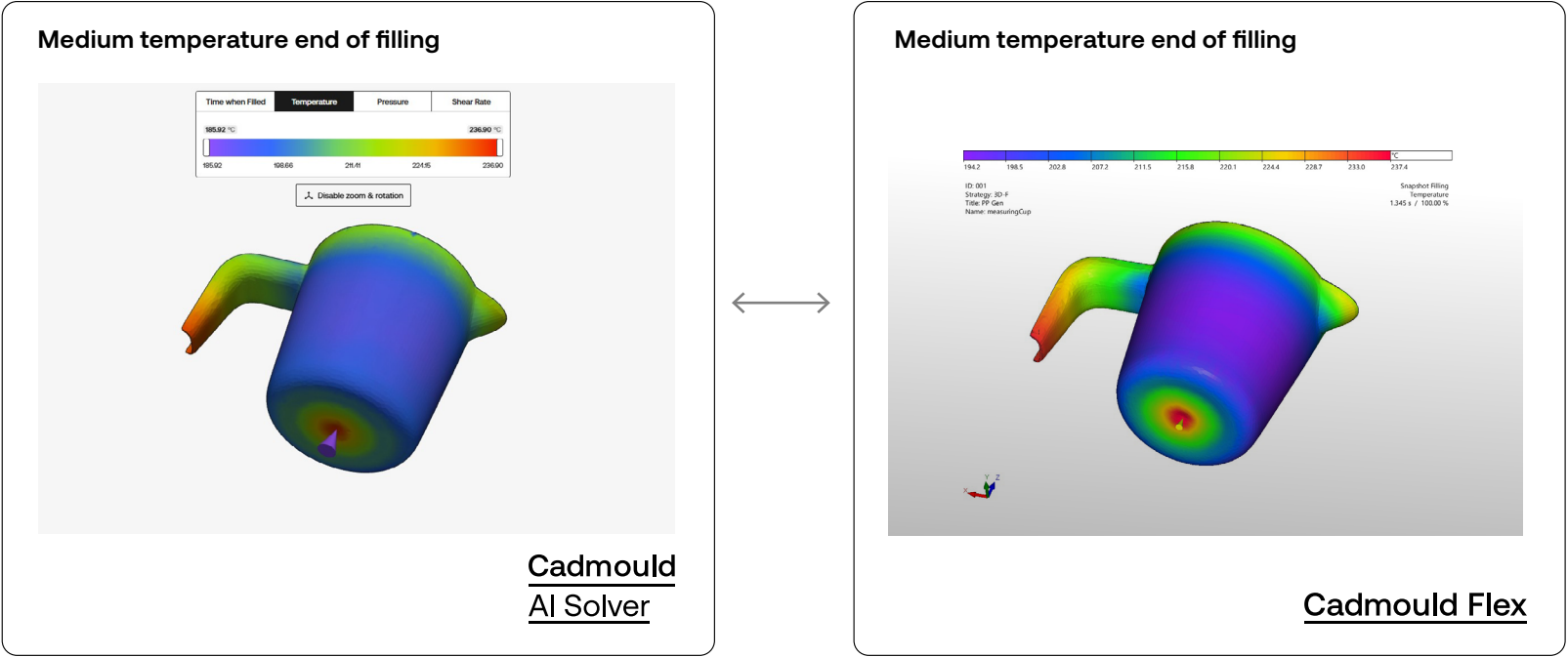


In both simulations, the handle has started to fill in a similar way. Also the form of the flow front is very similar to each other.

Comparison with Cadmould Flex: average temperature end of filling

While filling, melt is cooling down due to the colder surrounding as well as heated up due to shearing.

This behavior can be compared at the end of filling. We are comparing the average temperature over the thickness at the end of the filling all over the part.

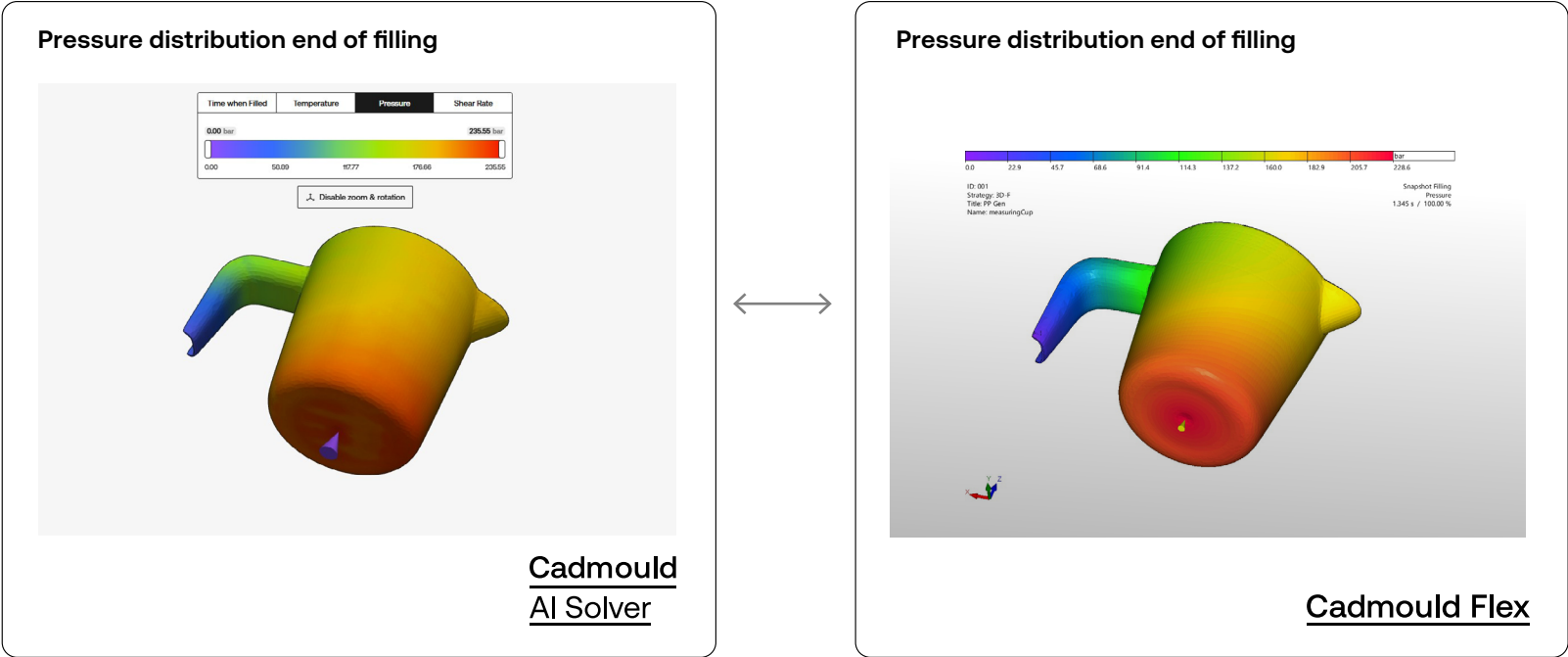


Differences are local and distribution is very similar

KPIs			
max medium temp	236,9 °C		237,4 °C
min medium temp	185,9 °C		194,2 °C

Comparison with Cadmould Flex: Pressure distribution end of filling

Beside the pressure curve at the injection point, we can compare the pressure distribution at certain time steps. We chose the last filling step – where last areas are filled.

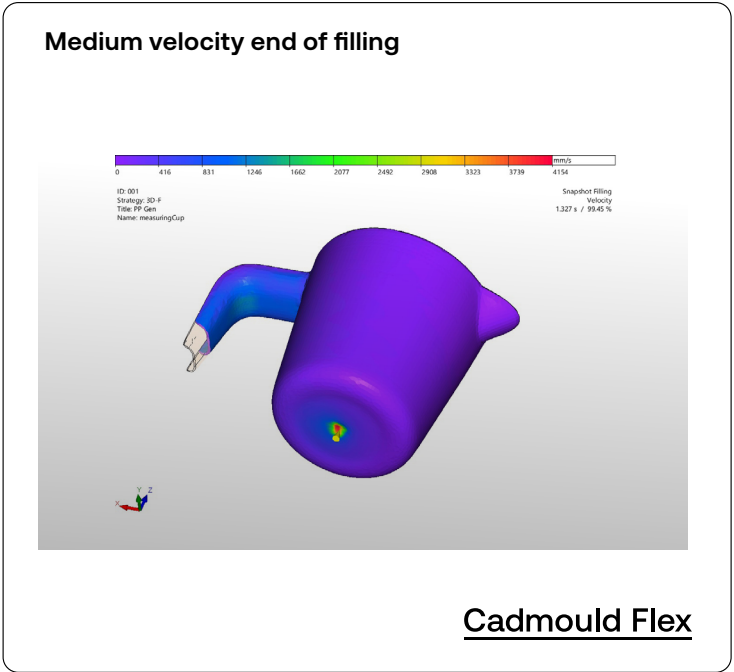
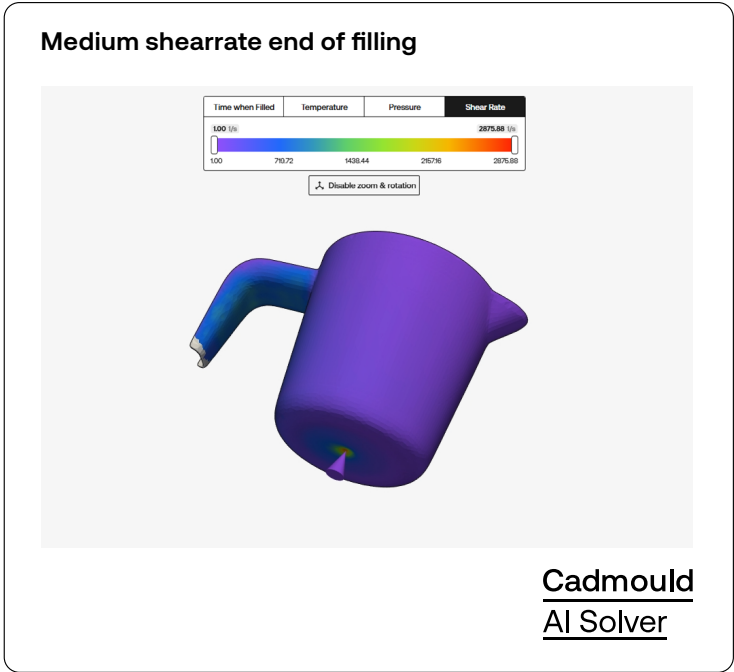


In both simulations, pressure distribution is similar

Comparison with Cadmould Flex: Medium shearrate end of filling

The next result in Cadmould AI Solver is medium shearrate. We took the one at the last filling step.

As this result is not directly available in Cadmould Flex, we compare it to medium velocity (which is directly associated with shear rate).



Both distributions are similar - areas of higher shearrate / speed are comparable

Quintessence

Results coming from Cadmould AI Solver are comparable to the ones coming from state of the art injection moulding simulation in a wide range. They are processed in a very fast way.

There are smaller gaps in the results or in quality which we are investigating on to proof and raise the quality of the model.

2.

How to conduct your own comparison test – quick guide

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What will you need for the test?

The first comparison given in this document shows one certain case. We are sure the model is also resilient in other cases - and are interested in cases you find out where results could be optimized.

So we are happy to provide you all necessary information to conduct your own test.



Cadmould Flex – the easiest way

Using Cadmould Flex, you can directly import the project file contained in this package. Feel free to change the injection point and process parameters - part and material are already chosen equal to possible input into the demo of Cadmould AI Solver.

Material can be changed as well. To ensure best comparability please use generic materials. The related properties are part of this package as well.



Any other injection moulding simulation- software:

If you are using another simulation software, we provide you with all needed information in this package.

What we give you is the part – just import it. Material properties can be found on the next page. Set up you own project and create your own results.

To get similar results, you need to simulate with the same material – Material properties

Please add it to your database.

In Cadmould Flex, it is directly accessible as PP Generic

Original data used in AI Solver

Viscosity

Carreau-WLF:
P1 = 319.716 Pa·s
P2 = 0.0109112 s
P3 = 0.69555
T0 = 240 °C
Ts = 0.08 °C
Fp = 0 K/bar
Ei = 0 Pa·s
Fa = 8.86

pvT

Renner:
CM1 = 0.0012608 m³/kg
CM2 = 0.0012677 m³/kg
CM3 = 3.88128e-10 1/Pa
CM4 = 8.74729e-09 1/Pa
CS1 = 0.00116215 m³/kg
CS2 = 0.00117104 m³/kg
CS3 = 2.04986e-10 1/Pa
CS4 = 3.53793e-10 1/Pa
CS5 = 30 K
CS6 = 4
CS7 = 0.0414575
CT1 = 408.15 K
CT2 = 2.65609e-07 K/Pa

In Cadmould Flex, this material is accessible as PP Generic.

Alternative fittings

Viscosity

Cross-WLF
n = 0.25745039392490676
Tau = 41478.59198165772
D1 = 320883036538.63916
D2 = 253.51798763343868
D3 = 0
A1 = 26.73474883253379
A2 = 76.35125259779059
u = 5.529969154606297e-12

pvT

2-domain-tait
b5 = 408.81403032789143
b6 = 2.5079432154051104e-7
b1m= 0.001263696040264051
b2m= 6.903187220126487e-7
b3m= 131033940.56077291
b4m= 0.004566143627415271
b1s = 0.0012025891315571224
b2s = 8.924654548674155e-7
b3s = 145082773.96733946
b4s = 0.00017532275275251996
b7 = 0.00006245072390210899
b8 = 0.13327609152279382
b9 = 3.859868705110562e-8

As Carreau-WLF and Renner are not available in all simulation software, we provide coefficients for different materials models. Results will be not completely the same, but will enable you to compare with your common software.

Compare to Cadmould AI Solver

Now, you will create your results within Cadmold AI Solver.



Cadmould Flex

Choose measuring cup, select your material and the right injection points in combination with the process used in your Cadmould Flex simulation.

Click Run



Any other injection moulding simulation-software:

Choose measuring cup, select PP as material and the right injection point in combination with the process parameters used in your simulation.

Click Run

Contact

Any remarks?

Please contact us at:

ai.solver@simcon.ai

We are happy hearing
your feedback.

SIMCON

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