

## Brief instructions RTM Simulation using myRTM

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## myRTM brief instructions

## 1.1 Introduction

myRTM is a simulation software package for predicting mould-filling behaviour in the RTM process. Particular emphasis was laid on simplicity of use and user-friendliness. The software can be started directly with no installation procedure.

Geometrical data can be imported from CAD programs by means of the interfaces step, iges or brep. Alternatively, various Finite Element models can be read in, e.g. ANSYS db files. The injection conditions can be defined interactively, and can be altered while the simulation is running. Still images at different stages of injection can be automatically stored.

The simulation was developed at IWK (The Institute for Materials Technology and Plastics Processing) of HSR (The Technical University of Rapperswil) and has been successfully applied in a number of industrial projects to the geometries of actual components. The software can be obtained without charge via the website <http://www.myrtm.ch>.

## 1.2 Preparing to use myRTM

No Installation procedure is needed. You may for example store the software in a directory on the desktop after downloading it. In this way the necessary libraries, together with the program gmsh<sup>1</sup> for creating the FEM mesh from a CAD file will be stored in the same directory.

## 2 Running the simulation

### 2.1 Important control functions

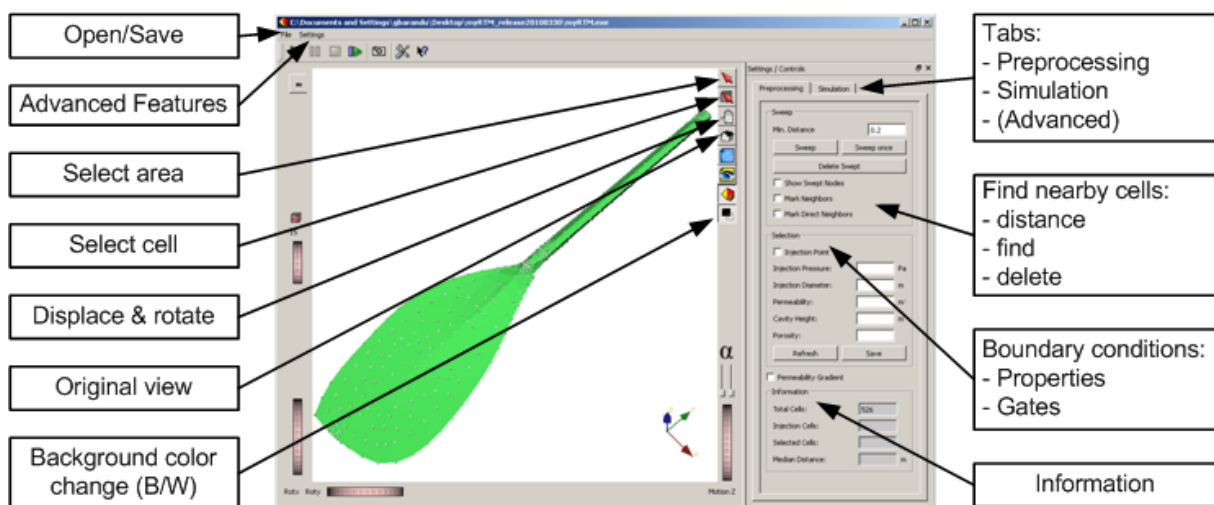


Figure 1: User interface

<sup>1</sup> <http://www.geuz.org/gmsh>

## 2.2 Importing the geometry

Both 2D and 3D geometries can be read in. They may be in the form of either \*.step, \*.iges or \*.brep CAD files or else FEM mesh models produced with appropriate software such as ANSYS. Readable formats are:

- \*.db (Ansys)
- \*.nas (Nastran)
- \*.msh (gmsh)
  
- \*.stp (Step, 3D volume geometries)
- \*.igs (Iges, 2D surface geometries)

## 2.3 Removing superfluous cells

In order to obtain an even cell distribution, closely packed cells can be removed. To do this, enter a value of 0.5 under the *Preprocessing* tab. This will ensure that all cells whose distance apart is less than 50% of the average cell spacing will be highlighted when you click on *Sweep*. After this, you can delete such highlighted cells using *Delete Swept*.





## 2.4 Material properties

In order to simulate local variations in permeability or fibre volume content, these values may be given for each cell. To do this, you use the *Select area* tool (Figure 1), which allows you to trace out a polygon, which you then close with a double-click. Then under the first tab *Preprocessing* you can enter the permeability and the porosity (1-fibre volume content) of all the cells you have so delineated. In the field *Cavity Height* you should enter the wall thickness (2D flat model) or the average cell spacing (3D model). Then you confirm the newly entered data by clicking on *Save*.

## 2.5 Introducing gates

This is similar to defining the material data. First you select the cells you wish to define as gates. Under the *Preprocessing* tab, activate the control box *Injection Point*, enter the required injection pressure and then enter in the field *Injection diameter* the effective gate diameter (this must be smaller than the node spacing).

## 2.6 Controlling the simulation

Change to the *Simulation* tab. Start the simulation with the icon . The simulation can be held at any time () and then allowed to continue running using . Clicking  will end the simulation, resetting the state of filling of the cells to zero. As soon as the simulation is interrupted you can make changes to the model. Gates can be added or removed, and injection pressures altered. In the same way, permeabilities and porosities can be modified.

## 2.7 Images from the simulation

Images of the instantaneous state of filling can be stored at regular and equal intervals throughout the simulation. Under the *Simulation* tab, activate the control box *Take Pictures* and enter the required time interval between pictures.