IDONiAL
TECHNOLOGY CENTRE

NUMERICAL SIMULATION

ADDITIVE MANUFACTURING PROCESS SIMULATION

The heating and cooling process that occurs during metal additive manufacturing induces distortions and residual stresses in the part. By means of FEA, it is possible to predict these effects and correct them to obtain the desired final part within tolerances.
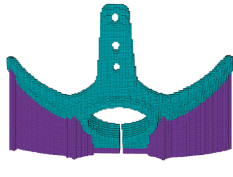
RED-DMLS

A fast simulation solution for metal additive manufacturing

RED-DMLS is a tool powered by the *shrinkage approach*, this technique decreases the simulation times to predict the distortion and the residual stresses in an actual part manufactured in Powder Bed Fusion by means of Direct Metal Laser Sintering. Furthermore, with RED-DMLS, the pre-warped CAD geometry can be obtained to reduce the distortions, so the part is within the allowable tolerance.
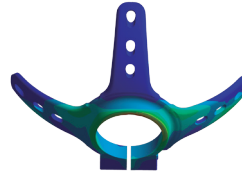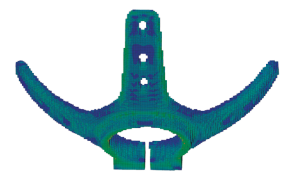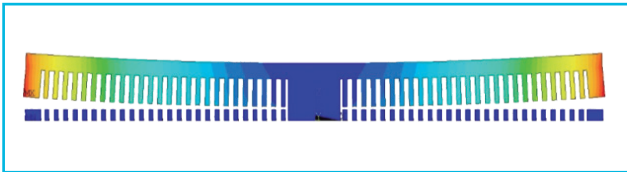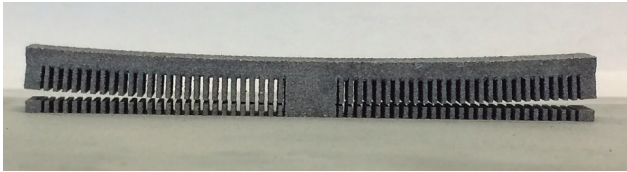
| Part | FE model | Distortions | Pre-warping | Residual stresses |

PART MATERIAL CALIBRATION

RED-DMLS requires of a calibration process for each machine-material pair for taking into account the process parameters:

➜ Scanning strategy, laser power, laser velocity and powder layer height

➜ Heating and cooling process (volumetric contraction)

➜ FE model simplifications: linear elastic material behaviour and layer condensation technique

SUPPORT STRUCTURE MODEL CALIBRATION
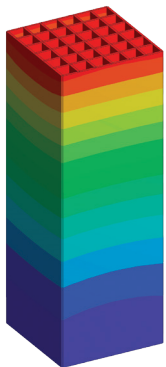
With RED-DMLS the geometrical complexity of any support structures is simplified in an equivalent solid FE model with the same anisotropic behaviour, this means a calibration process:

➜ FE simulation of the structural behaviour

➜ Tensile test to determine their ultimate strength and predict the breakage
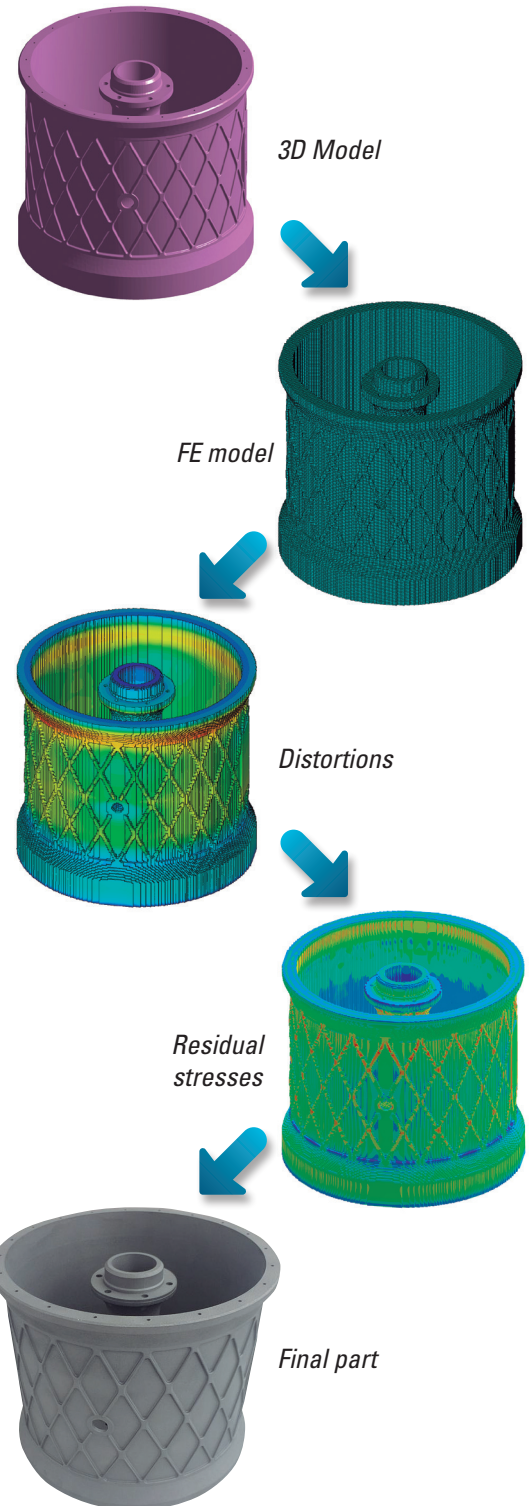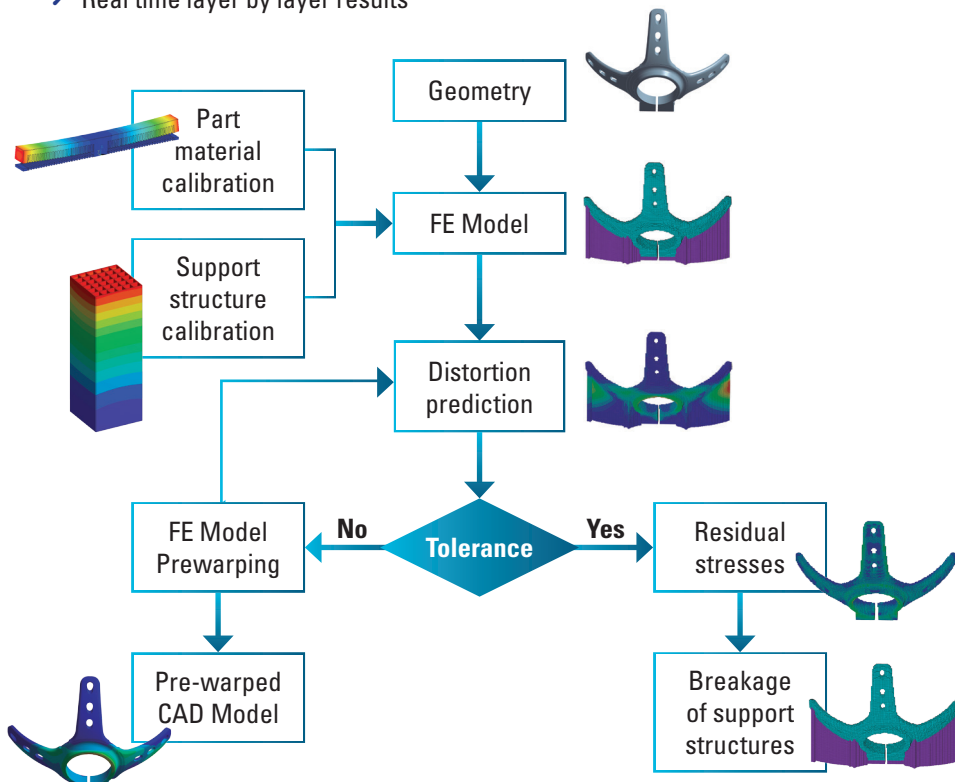
NUMERICAL SIMULATION

ADDITIVE MANUFACTURING PROCESS SIMULATION

The heating and cooling process that occurs during metal additive manufacturing induces distortions and residual stresses in the part. By means of FEA, it is possible to predict these effects and correct them to obtain the desired final part within tolerances.
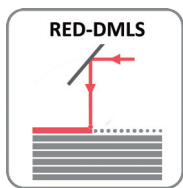
RED-DMLS SKILLS AND SIMULATION WORKFLOW

RED-DMLS is a tool for predicting before the manufacturing process:

➜ Optimal part orientation and support structure distribution

➜ Support structures breakage

➜ Part shape distortion

➜ Pre-warped CAD file (STL file)

➜ Residual stresses

➜ Real time layer by layer results

3D Model

FE model

Distortions

Part material calibration

Geometry

Support structure calibration

FE Model

Distortion prediction

No ← Tolerance → **Yes**

FE Model Prewarping

Residual stresses

Pre-warped CAD Model

Breakage of support structures

Residual stresses

Final part

RED-DMLS. APP FOR ANSYS® WORKBENCH™

RED-DMLS

RED-DMLS is a solution for the simulation of the additive manufacturing processes and it helps you to optimize the build-up direction, predict the breakage of the support structures and reduce the distortions of the final part.

IDONIAL
TECHNOLOGY CENTRE