

## > Rupture with Forge2® v3.1 and Forge3® v6.2

The features of both Forge2® and Forge3® have been extended to simulate complex processes like riveting and shearing.

Forge2® simulates riveting and shearing of sheets with a deformable rivet. It predicts the shape of the formed part. In addition, the outline of the final shape can be used in an optimising loop.

Forge3® simulates shearing and it predicts the shape of the sheared surface.

In addition, Forge3® predicts press load, local deformation, temperature, stresses, strain rate and other typical Forge3® results.

Forge3® predicts residual stresses which are generated after shearing.

The GLPre® pre-processor in Forge3® uses a specific project template which means that the user can easily setup such simulations within a few minutes.

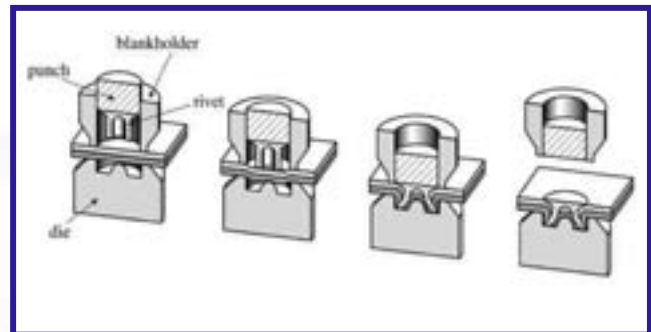
### > Riveting in 2D with Forge2® v3.1

Forge2® includes an exclusive formulation with a new element type enabling the user to automatically compute self contact and contact between multiple deformable bodies. This is illustrated in the following example.

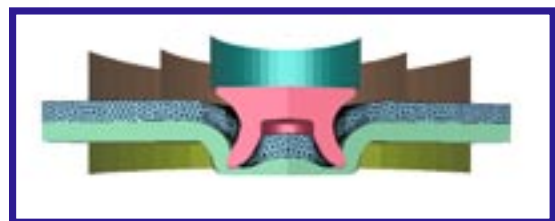
In the process shown in the following picture, a metal rivet is used to fasten sheets of metal together. The simulation is used to check that the rivet does not pierce the lower sheet.

Forge2® can simulate this process because the software takes into account contact between multiple deformable bodies. When the rivet pierces the upper sheet, the simulation can continue automatically without any manual intervention. This is a unique feature of Forge2®.

To fasten these two sheets together correctly, the final shape of the rivet is significant. The outline of this final shape can be optimised with the help of Forge2®.



*Pictures of the real part*



*Simulation with Forge2®*



## > Shearing with Forge3® v6.2

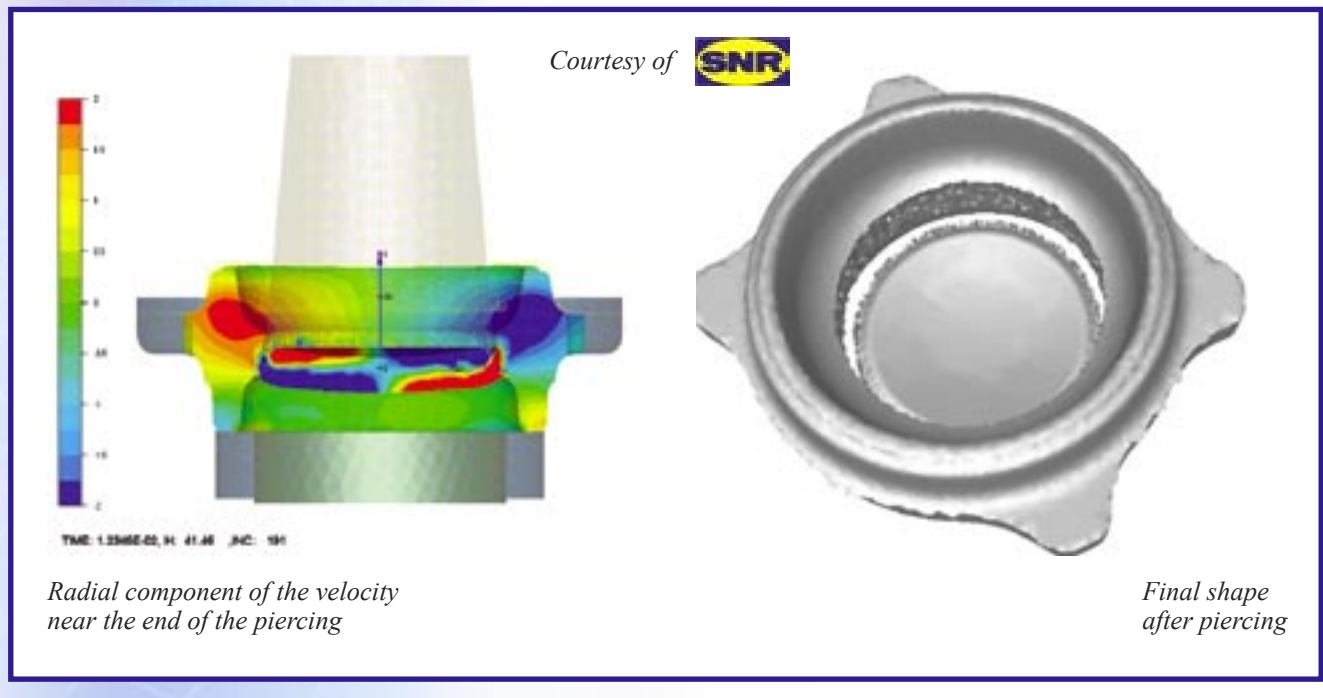
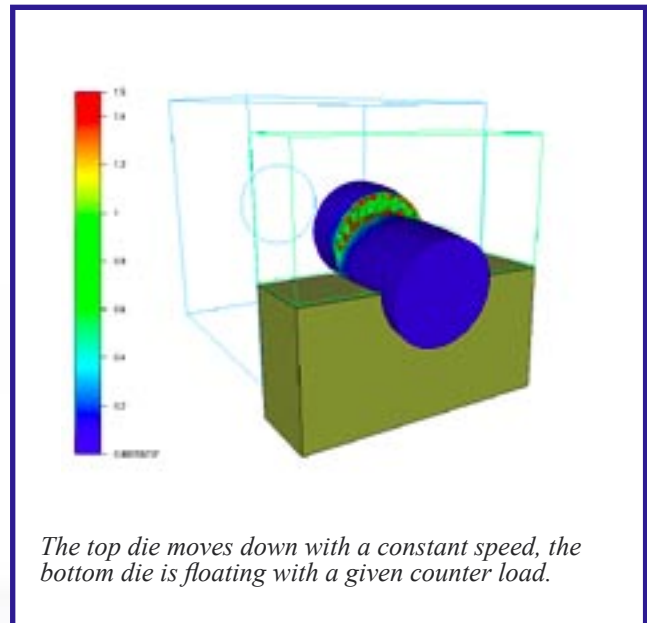
Forge3® v6.2 includes numerous improvements and more particularly a new element removal technique, coupled with a damage criterion. Forge3® enables the user to select an appropriate damage criterion (Latham & Cockroft, Oyane,...).

User routines are also available to introduce a specific damage criterion. These features have been used for the simulation of shearing and piercing of the following 3D parts.

The first example shows the hot shearing of a bar. In this application, the most important results provided by Forge3® are the press load and how the shearing progresses. At the end of the simulation, Forge3® predicts the shape of the sheared surface and the residual stresses in the case of cold shearing.

The second example shows the piercing of a part produced by SNR (France). Forge3® is used to evaluate the deformation of the part which is created during the piercing process.

The simulation shows the deformation of the part following piercing.



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