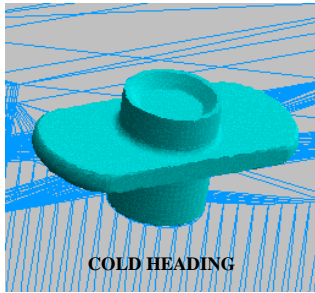
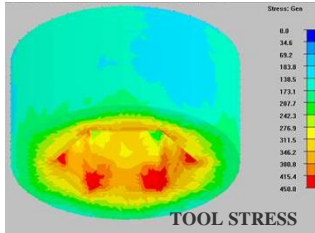


**NAGSIM.3D** is a powerful general-purpose finite element analysis (FEA) software program for the computer simulation of complex three-dimensional metal forming processes. NAGSIM.3D can simulate large plastic deformation of the part in cold, warm and hot forging environment. Its powerful solver uses a modified tetra element that simulates metal deformation with high precision while allowing automatic meshing of complex geometries.



NAGSIM.3D can also predict elastic stresses in tools during the forming process. Stress analysis allows resolution of the tool breakage and tool life issues.

NAGSIM.3D has an automatic element mesh generator that performs optimized remeshing during simulation. Users can define a region to have higher mesh density for finer definition of part feature in that region.

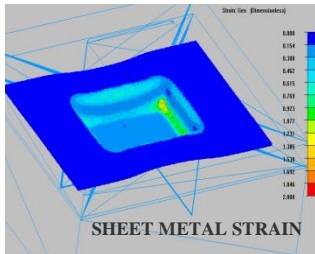


NAGSIM.3D has a material database that includes flow stress data of most commonly used materials. Material models supported are elastic, rigid-plastic, thermal rigid-viscoplastic and rigid.

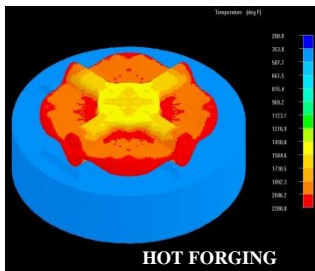
### Eliminate Costly Trial & Error in Forming

Before investing in hard tooling, industrial forming-processes can be simulated and debugged in a computer using NAGSIM.3D. It can be used to:

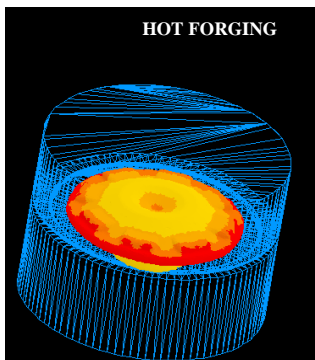
- Predict metal flow and non-fill conditions
- Predict laps and high stress / strain areas
- Optimize the preform shape
- Determine mechanical properties of the formed part
- Determine influence of process parameters such as part temperatures and lubricants
- Improve tool life



NAGSIM.3D's graphical user interface is tailored for simulating metal forming operations. It is very user-friendly and intuitive to use. NAGSIM.3D results include: Material flow, stress distribution, strain distribution, formation of laps, force distribution and contact between the part and the tools. Animation presents a clear visual of the forming operation.



**Integration with NAGSIM.2D** – NAGSIM.3D has the capability to bring in results of NAGSIM.2D simulation for the previous operation including strains. The program converts the 2D results into 3D by revolving the 2D section. This feature is extremely beneficial for Users that form parts in multiple operations. The initial 2D operations can be analyzed in NAGSIM.2D and the final operations involving 3D geometry are simulated in NAGSIM.3D program.



*All NAGSIM.2D/3D Lease options include*

- Updates during the course of the lease period.
- User Manuals with Step-by-Step Examples
- Training Videos
- 2- Day Intensive Training (At MFSI Canton, MI facility)
- Web Training as Scheduled

### Link With NAGFORM Process Design Software

– For any forming sequence design that ‘NAGFORM’ generates, the NAGFORM program can automatically create a NAGSIM.3D simulation file, and the part and tool models in STEP format. The User can also create the models in any 3D CAD system to bring into NAGSIM.3D file. For SolidWorks Users, the NAGFORM can automatically create 3D models of default tooling for simulation.

**Preprocessor** – NAGSIM.3D provides a simple method of importing geometry of the tools and the initial blank drawings into the program as outlined below:

- Surface of a tool is imported in STL format. STL is a neutral format and almost all 3-D CAD models can be ‘Saved As’ a STL File.
- The Initial Blank model can be imported from
  - STEP or STL format.
  - NAGSIM.2D Result File
  - NAGSIM.3D Result File

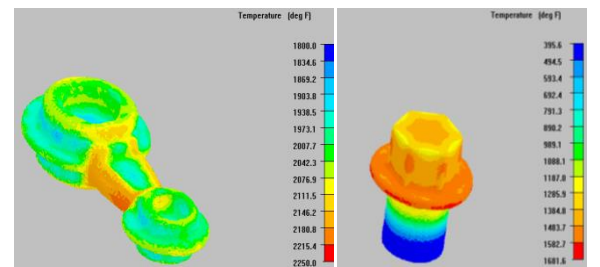
**Advantages over Competitors** – NAGSIM.3D is an efficient and cost effective FEA software product. Following are some features that set it above its competitors:

- Cost Effective Product
- User Friendly
- Predefined templates for ease in set up of a Simulation.
- Easy transition from NAGSIM.2D to NAGSIM.3D
- Sequence Designs from NAGFORM program can be validated using NAGFORM-SolidWorks interface, STEP models and NAGSIM.3D.

**Application** – NAGSIM.3D can be used to simulate complex forming processes including cold forging, warm forging, hot forging, sheet metal forming and wire drawing.

### System Requirements

- Windows operating system – 32/64 bit
- 3D Models in STL format– A 3D CAD system is needed to create or modify models of the tools and the starting blank.
- Minimum System Requirements – Quad Core Processor with 4GB RAM is recommended.

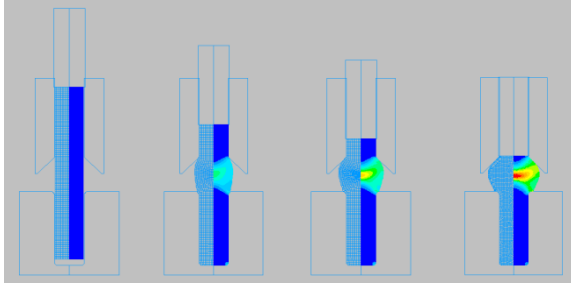


HOT FORGING OF CONNECTING ROD

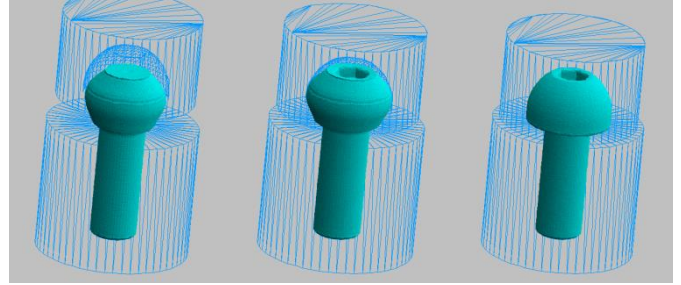
HEX BOLT HOT FORGING  
(Different starting temperatures in the Head and Shank)

## COLD FORGING - NAGSIM.2D to NAGSIM.3D

For Multi-Station Operations, initial operations where the part geometry is essentially 2D, Nagsim.2D can be used to save simulation time.



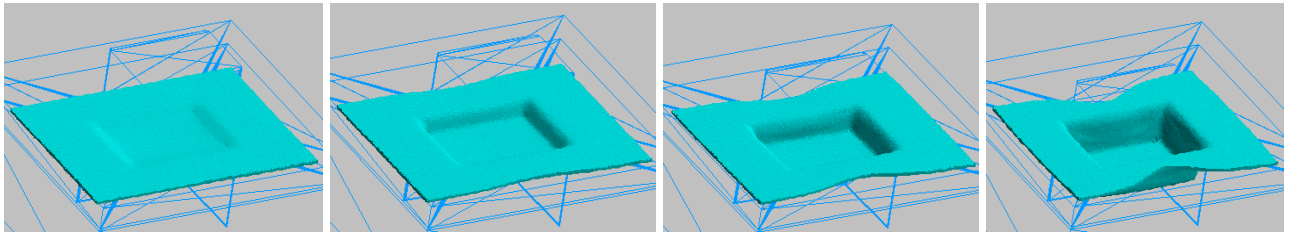
Station 1 – Sliding Punch Using NAGSIM.2D



Station 2 – NAGSIM.3D

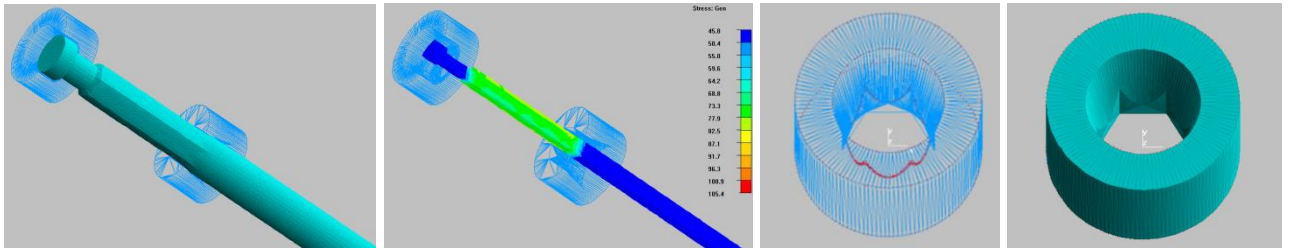
## SHEET METAL DRAW

For Sheet Metal Forming, simulation with or without blank holder can be performed.



## WIRE DRAW PROCESS

In Wire Drawing of Shapes, the temperature distribution in the wire as well as the die can be predicted.



Wire Draw

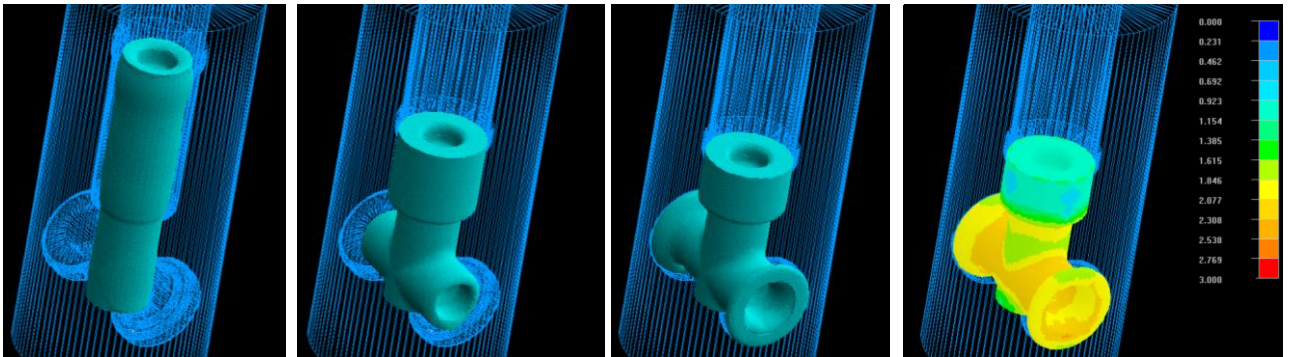
Blank Stresses

Tool Drawing (Stl)

Tool Drawing Rendered View

## VALVE FORMING

Complex Forging processes where tools are moving in different directions and speeds can be simulated in NAGSIM.3D



## HOT FORGING – TEMPERATURE ANALYSIS

For Hot Forging operations, effect of preform shape, press speed and part and tool temperature can be investigated to minimize material loss in flash.

