

solidThinking Click2Extrude™ Metal is a simulation environment designed to help metal extrusion companies meet the ever increasing demands to produce complex profiles with tight tolerances, quality surface finishes and high strength properties at reduced cost. Click2Extrude is a virtual press where users can visualize material flow and temperature inside a die during extrusion and make necessary changes to ensure balanced flow, while identifying and eliminating product defects.

Product Highlights

- Test and validate new die designs
- Improve productivity
- Optimize/correct die designs and process conditions
- Determine product quality
- Automated, easy to learn, extrusion-specific user interface

Benefits

- **Validate and Correct Die Design:** Use Click2Extrude simulations to understand and improve the performance of a die from multiple perspectives (nose cone, product quality, weld strength, process efficiency).
- **Extrude New Alloys:** Flow stress and material behavior of new alloys requires an accurate simulation. Click2Extrude can handle a wide range of alloys.
- **Determine Die Stresses and Failure:** Click2Extrude is used to determine tool deflection, mandrel shift, stress concentrations and potential early die failure.
- **Increase Productivity:** Click2Extrude is used to optimize ram speed, billet preheat and billet taper heating to improve productivity and reduce cost.
- **Increase Recovery and Reduce Scrap:** To minimize front and back scrap, the weld length can be computed and the skin material of the billet entering the

product can be tracked. Click2Extrude can optimize the billet length to reduce the scrap considering all aspects of extrusion and fabrication.

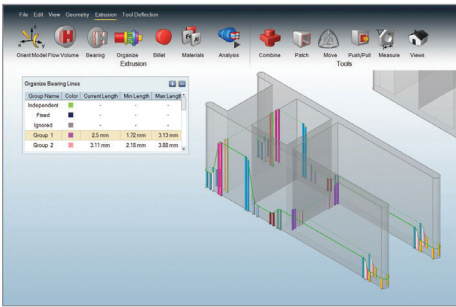
- **Determine Product Quality:** Product quality can be improved by eliminating extrusion defects and the effects of die deflection on the product shape. By determination of seam weld location and strength, grain size and yield strength the product quality is further assessed.
- **Analyze Quenching:** Quenching the extruded profile is crucial for controlling grain size and mechanical properties of the profile. Quenching analysis is used to predict the cooling rate, temperature and uniformity of cooling during the process.

A Complete Solution

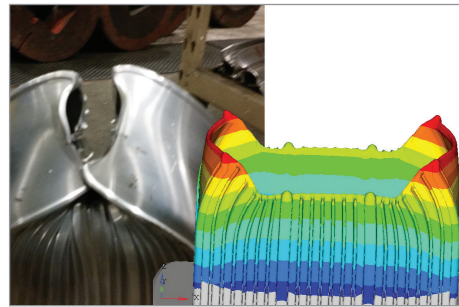
Die Design Engineers:

- Test and validate new die designs
- Determine correct bearing lengths
- Adjust porthole and pocket dimensions
- Predict die deflection, stresses and failure

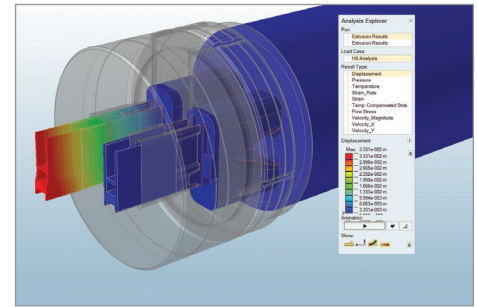
Learn more:
solidthinking.com/click2extrude



Bearing optimization



Experimental validation of a test case



Extrusion result visualization

Simulation Engineers:

- Troubleshoot problem dies
- Improve productivity
- Predict product quality

Production Engineers:

- Optimize process conditions
- Manage extrusion inventory
- Reduce scrap and maximize recovery
- Prepare cost estimates and quotations

Quality Engineers:

- Determine product quality
- Predict grain size and recrystallization
- Calculate yield strength

Capabilities

Click2Extrude comes with powerful and complete features that enable an extrusion engineer to optimize the die and improve product quality in the design stage before going into the first die trial.

Support for all Die Types:

- Solid, semi-hollow and hollow profiles
- Multi-hole dies
- Feeder plates and spreader dies
- Direct, indirect, conform and coextrusion processes

Product Quality and Defects:

- Predict profile shape and nose cone
- Predict surface defects
- Predict the location and quality of seam welds
- Determine transverse weld length
- Track surface impurities and determine when they enter the profile
- Predict grain size and yield strength of the profile

Thermal Management:

- Simulate coupled flow and thermal solution
- Determine optimum billet preheat and taper
- Determine temperature changes in tool between different extrusion cycles

Virtual Die Trials:

- Visualize material flowing through the die passages
- Determine causes for flow imbalance and overheating
- Study responses to design changes

Tool Deflection Analysis:

- Simulate coupled flow, thermal and stress analysis
- Calculate die deflection and mandrel shift during extrusion
- Minimize tool deflection to meet product tolerances
- Identify causes for tool breakage
- Optimize the shape and size of dummy block, backers and bolsters

Super Alloy Extrusion:

- Simulate glass lubrication
- Predict glass pad erosion
- Compute lubrication effectiveness

Comprehensive Material Database:

- Database of commonly used alloys
- Fit flow stress model
 - Based on extrudability number
 - From flow stress table data
- Support of user defined material model subroutines

Contact Friction:

- Viscoplastic friction model
- Coulomb friction model
- Slip velocity model

Optimize Die Design:

- Accurate and easy to use bearing length correction module
- Modify pocket and porthole dimensions

Extrusion System Management:

- Calculate optimum process conditions
- Determine best press to increase productivity
- Optimize billet length to reduce scrap
- Estimate costs
- Prepare quotations

Results:

- Profile deformation and nose cone
- Extrusion load
- Seam weld locations and strength
- Transverse weld length
- Billet skin tracking
- Particle traces and velocity vectors
- Temperature distribution
- Strain and strain rate
- Flow stress
- Stress tensor
- Tool deflection and stresses
- Product quality:
 - Grain size
 - Yield strength
 - Surface quality
- User defined results
- Glass lubrication effectiveness
- Quench analysis:
 - Cooling rate
 - Quench factor