Transvalor combines over 25 years of experience in the simulation of cold forming processes. Our solution is the tool of choice for many companies worldwide to solve their shop floor issues as well as to develop innovative products.

**COLDFORM**

is the right investment when wanting to:

- Decrease significantly the design phase
- Reduce physical testing costs
- Reduce material cost
- Design complex components that could not have been produced before
- Reduce time to market
- Optimize current production processes
- Extend die life
- Maintain and increase the process knowledge and expertise in your company.

**Yield improvement**

**Material cost reduction**

**Automatic design tool**

**Shaft** transmission chassis

**Rotary swaging** Net shape **Die life**

Forging load
COLDFORM is TRANSVALOR’s software solution for the simulation of coldforming processes

COLDFORM meets the needs of multiple industries:
- Manufacturers of fasteners: screws, nuts, bolts, washers etc;
- Manufacturers of automotive components such as hollow shafts, rings produced by ring-rolling as well as other automotive parts that are coldformed;
- Manufacturers of formed parts in medium to thick sheet-metal, for example in the watch-making sector;
And various other industries.

COLDFORM can be used at different stages:
For quotation to define the different costs as well as to validate the feasibility with the available shop floor equipments,
To validate the forging sequence of new products, to improve current processes on existing parts and to solve production issues,
At R&D level for the development of new innovative products or complex products that could not be produced without the help of the simulation.
Transvalor’s product range makes it possible to simulate numerous coldforming processes such as:
- Extrusion forging
- Closed-die forging
- Cutting, shearing and piercing
- Fastening
- Incremental forging* 
- Orbital forging
- Thread rolling
- Ring rolling*
- Hydroforming
- Deep drawing

With its innovative technology, COLDFORM enables you to validate the entire forging sequence.

*only available with FORGE
Fast and accurate insight into your products

**COLDFORM makes it possible to design and validate forging operations and to accurately predict:**

- The final geometry and precise dimensions, including elastic spring-back for net shape and precision components;
- Material flow throughout the whole forming sequence;
- Possible underfillings and folds/laps;
- Fibering and strain distribution;
- Marking and tracking of specific surfaces, like shear surface, from the initial billet up to the final geometry;
- Damage and rupture criteria;
- Distribution of residual stresses;

And also displacements, equivalent strain, strain rate, stresses, temperature, wear and any additional user variables.

**Comprehensive models and database**

COLDFORM embeds genuine elastoplastic models for isotropic and anistropic materials as well as a comprehensive material database. COLDFORM offers more than 200 steels, aluminum, brass and titanium references with the possibility to create material data from the normalized mechanical properties provided by the manufacturer (yield strength, tensile strength and elongation). A feature to import from Sente Software JMatPro is also available.

A wide range of friction laws are available and non-uniformed friction coefficient can be defined.
Validate your equipment choice, extend die lifetime & reduce die costs

The equipment choice can be validated at an early stage by an accurate prediction of the press required to forge the part. The deflection of the equipment can also be predicted. An extensive database offers a wide range of different presses: mechanical press, hydraulic press, knuckle joint press, link drive press, orbital forging press, ring rolling mills* and complex piloting can also be set.

Die life can be extended with the use of COLDFORM’s die analysis capability. Thermal or thermo-mechanical computation within the dies can be run and the distribution of stresses, strain, wear, temperature and damage can be predicted at any time during the process. COLDFORM allows the use of classical fast analysis which consists in applying to the surface dies cumulative die load from the whole forging process. In addition to this, COLDFORM also proposes a unique coupled calculation between the part and the dies, with the use of smart contact procedures between deformable bodies. This allows a very accurate analysis.

Pre-stressed dies and spring loaded dies can easily be defined.

*only available with FORGE
Increase productivity with HPC solutions and state-of-the-art numerical methods

Take full advantage of the hardware through fully parallel computations

TRANSVALOR is the only forging simulation software editor which has been offering since more than 10 years a unique parallel capability where all steps are run in parallel: mechanical resolution, remeshing and mapping. With the falling cost of multi-core systems, parallel processing has become accessible to businesses of all size. COLDFORM’s parallel capability allows you to get the best out of your hardware in order to reduce computation times.

Simulation and analysis of components manufactured by incremental forming now affordable

Simulating incremental forming processes is extremely demanding in CPU-time. A cutting-edge technique is integrated into COLDFORM in order to address this type of forming process. This technique relies on the use of two embedded FE meshes:

• one mesh for the mechanical resolution which is very fine where the localized deformation occurs and coarser elsewhere,

• one second mesh to store all the history variables (and for the thermal resolution).

With such method, significant CPU-time reduction is achieved while retaining similar result quality compared to a unique mesh.

*only available with FORGE
Combine highest accuracy and fastest computation time for thin products forming

COLDFORM embeds a cutting-edge capability - an adaptative and anisotropic remeshing technique - to address thin product forming processes such as deep drawing, hydroforming and fineblanking. At each time of the process, the mesh is automatically adapted to the deformation, velocity, damage and curvature. In the areas where it is required the mesh is refined and oriented in the direction where the gradients occur. It can be coarser elsewhere. In the case of thin products and in order to ensure highly accurate results, it is important to guarantee several elements in the thickness. This can be achieved with this technique without impacting the total number of nodes as opposed to the traditional adaptative technique.

With this unique capability, COLDFORM can solve most of the CPU-time demanding processes of thin product forming while ensuring high accuracy.

Deep drawing of an 115mm high and 0.8mm thick aluminium component. (courtesy of K-Won, Korea)

Initial configuration

Final configuration

Final geometry of the part. The expected wrinkles on the final shape can only be captured with an appropriate mesh. This simulation was run on a 130.000 FE node mesh while using the anisotropic remeshing technique thus insuring several elements in the thickness.
Process parameters identification

COLDFORM includes an inverse analysis capability that allows you to identify parameters of your process that cannot be measured like friction coefficient or parameters of the material model.

The optimal parameters are calculated fully automatically using the specified experimental curve as reference.

The direct benefit is an improved reliability and accuracy of the simulation through the use of the correct parameter values.

Anistropic law parameters identification

This example shows an application to the stamping simulation of a thin metal sheet. In such process, due to the anisotropy of the material, ears effect can be observed on the final shape. Thanks to the inverse analysis feature, the parameters of the anisotropic law (3 Lankford parameters) can be identified. The optimal parameters are the ones that offer the best match between the heights of the two ears (H1 and H2) and the experimental ones.

Flexibility of use

COLDFORM offers a high flexibility of use thanks to:

• import of CAD files in neutral formats such as STEP, STL, UNV, NASTRAN/PATRAN, Parasolid.
• export in 2D and STL DXF format, UNV, 3D Ansys.
• automatic chaining between operations.
• automatic simulation report.
• solver support for up to 8 cores in parallel on a workstation.
• unlimited access to graphical interface for pre- and post-treatment.

COLDFORM is an all-inclusive product: the features described above are all supplied without extra cost as part of the software, except those marked with an asterisk, available with FORGE only.
This case study highlights the benefits of the automatic design tool applied to the design of a screw-head. All the forging operations of this component are simulated with COLDFORM starting from the initial wire. The customer wanted to improve the design of the screw-head forging operation by finding the optimal initial diameter \(-D_1\) and initial height \(-D_2\) - thus ensuring the best die filling and therefore the best application of torque. The chart shows the highest possible torque (in blue) obtained with the best die filling (contact area represented in blue in the final shape) and corresponding to the optimal diameter and height.

<table>
<thead>
<tr>
<th></th>
<th>Initial</th>
<th>Optimal</th>
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<tr>
<td>(D_1)</td>
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<td>5.68</td>
</tr>
<tr>
<td>(D_2)</td>
<td>3.38</td>
<td>3.21</td>
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Improve your design with COLDFORM’s fully automatic design tool

TRANSVALOR is pioneer in the field of automatic design and provides simulation software that has integrated since several years a cutting edge fully automatic design solution.

The major benefits are:
- Reduction of material cost by decreasing the initial billet weight while ensuring the final product quality requirements;
- Savings on energy costs by optimizing press load;
- Extension of die life by minimizing stress levels in the dies.

With this advanced feature, the end-user does not have to define any Design Of Experiment points. Each parameter value is determined automatically without any input until an optimal solution is found.

It is also possible to couple COLDFORM directly with CAD software so that the geometry can be modified directly by the latter.
Transvalor, leading software editor of material forming numerical simulation

Transvalor has developed an extensive suite of high performance simulation software that addresses a wide range and variety of forming processes, for metallic solid and liquid materials as well as for polymers:

FORGE for extensive hot, warm and cold metal forming,
COLDFORM for cold metal forming,
THERCAST for ingot casting and continuous casting,
REM3D for plastic injection molding.

Transvalor’s products provide the manufacturing and engineering intelligence to a wide range of industries: Automotive, Aerospace, Energy, Medical, Oil and Gas and many others.

Transvalor’s success comes from a comprehensive expertise of the forming processes and an unyielding capability to innovate. The value of Transvalor Material Forming Simulation Solutions can also be measured in business terms as they dramatically reduce production costs, shorten the time to market and accelerate the delivery of innovative products.

As such we help our customers:

- Gain a deeper and broader understanding of their material behavior as well as their processes,
- Optimize and shorten their design process by almost eliminating the slow and painful process of “trials and errors” on the shop-floor,
- Increase manufacturing quality.

Transvalor is born of Research and has maintained a strong association with the Center for Material Forming (CEMEF), a research center of prestigious MinesParisTech, whose main activities are centered around material forming and numerical computation.

This partnership provides a constant flow of advanced scientific developments that translate into innovative new functionalities for Transvalor’s products which in turn benefits our customers.