# COPRA® FEA RF

Our Simulation Module COPRA® FEA RF is the world leading software solution for the simulation of Roll Forming processes. The program calculates the entire process including pre and post operations and screens for possible design errors. Through the intelligent interconnectedness of our COPRA® products, simulation results will be available for design review immediately. Due to our intelligent menus there is no need for a dedicated FEA specialist.
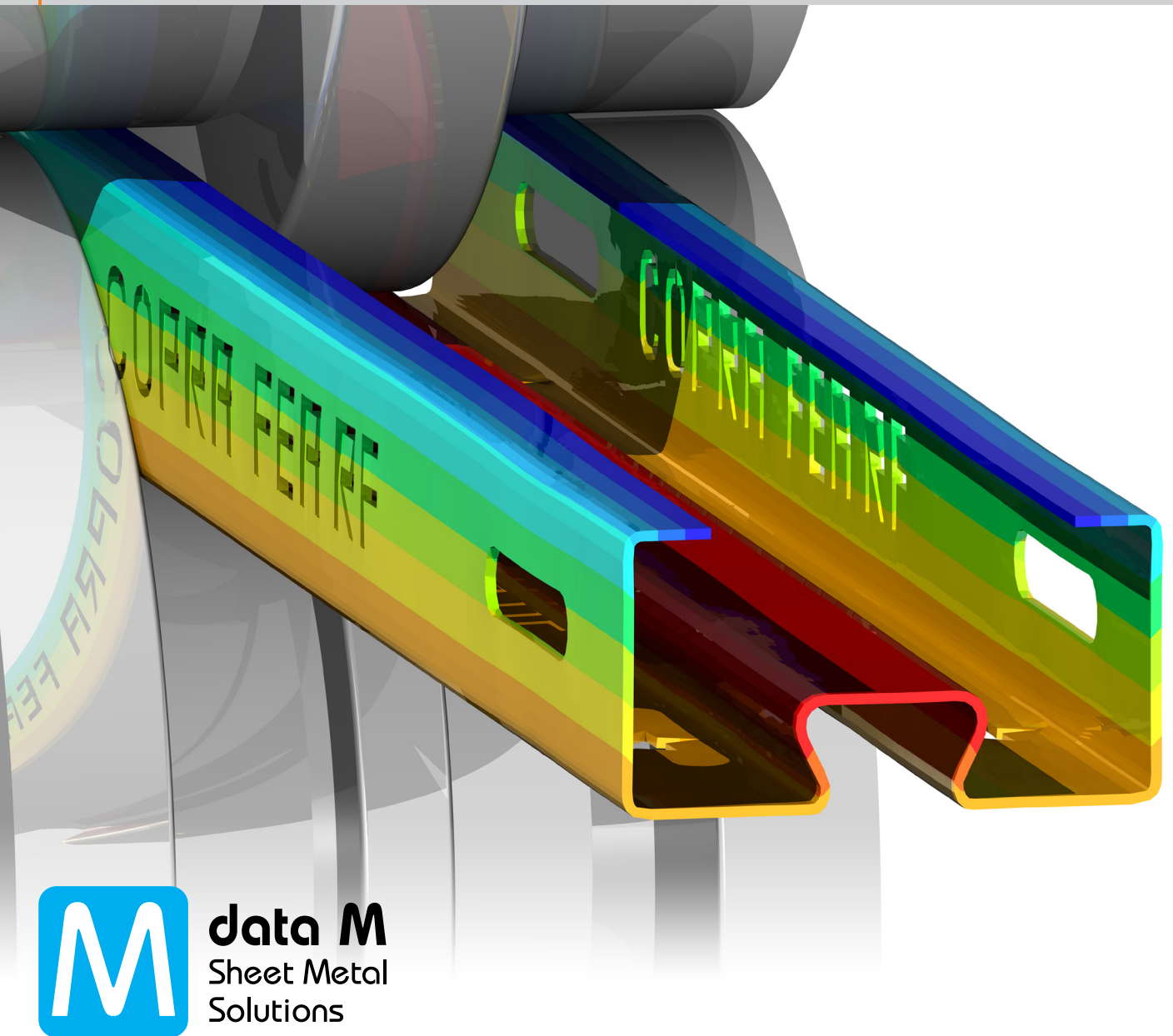
data M
Sheet Metal
Solutions

Prevent trial and error by simulation of the manufacturing process

More often than not, roll formers operate along the lines of trial and error. After production of the entire roll set, the machine is activated in order to find mistakes or weaknesses during the roll forming process or even to test the feasibility of the entire project. Naturally, this method often causes high expenses. To prevent scenarios of this kind, companies of various manufacturing branches conduct process simulations. With methods like these, producers predict results of planned manufacturing processes by reference to virtual models. data M has been developing and enhancing COPRA® FEA RF for 20 years. The software computes the roll forming process with the so called non-linear elastoplastic calculation method.

With this approach, even the most complex production processes can be verified and the results thus be predicted with sufficient accuracy. COPRA® FEA RF imports the required data directly from the design module COPRA® RF. The results in turn will be available for design optimizations right after simulation. All the important information like forming forces, driving torque, elongations etc. can be viewed and applied accordingly.

However, preventing defects and bad product quality with consistent simulation is only the most straight-forward advantage of COPRA® FEA RF. Product development and the design process can be optimized and thus also profit hugely from verification.

One also shouldn't underestimate the increased know-how within the company through testing of various forming strategies within a virtual roll forming machine. We must remember a "classic" trial and error approach generates high cost only by testing a single strategy.

## COPRA® FEA RF - The virtual Roll Forming Machine

In order to understand the functionality of COPRA® FEA RF, it is helpful to imagine the program as a virtual roll forming line since our software enables you to test new roll designs at will before the actual roll manufacturing process. Sometimes even more important: It is particularly suited to test if complex projects are feasible after all. Many of our customers were able to achieve significant cost reductions by consistent utilisation of our simulation tools.

Contrary to common believe, manufacturers don't need a dedicated FEA specialist. Rather, any designer with experience in the field of roll forming can operate the software because COPRA® FEA RF automatically generates the FE model out of the design data. There is also the assumption that processing would take as long as simple test procedures. This may have been true around ten years ago. Nowadays even desktop CPUs provide enough performance to simulate even complex roll forming processes in only a few hours.

Provided a complete roll set costs circa 30 000 € and the ability to reduce tool wearout to a minimum through consistent simulation will alone recover the capital expenditure for the software, even in the mid-term. Additionally, machine down times as well as the required times for equipping and implementing will also be reduced, thus the machine can actually be used for bread and butter production with the time saved.

Increased product quality through non-linear Finite Element Simulation

Material changes that occur during manufacturing processes frequently present producers with huge challenges. COPRA® FEA RF simulates these changes
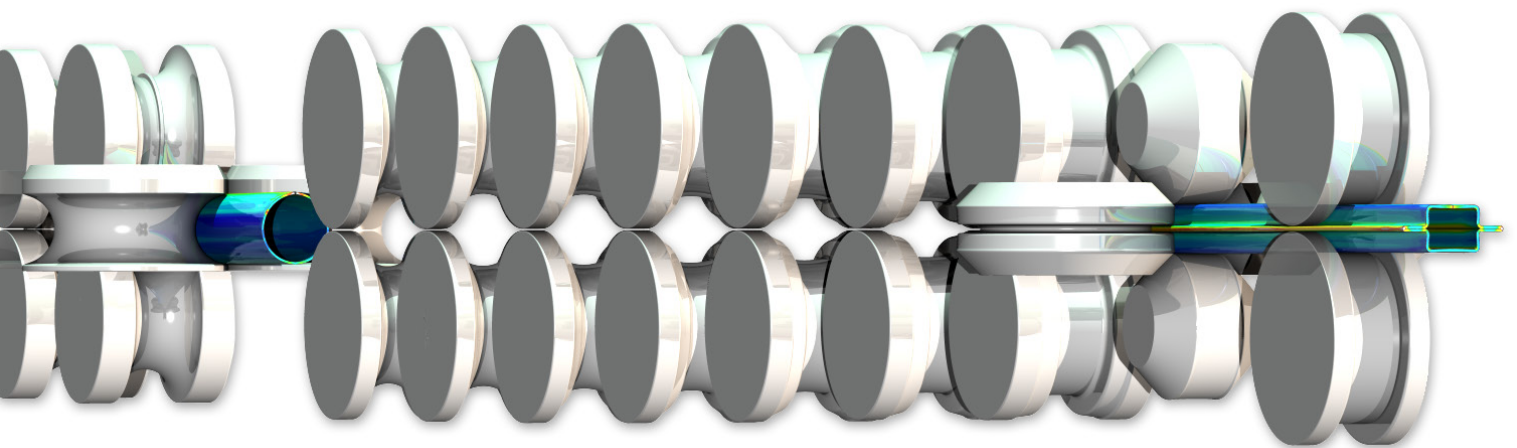
reliably and quickly. Also the usual defects like strip edge waviness, twist or bow can be prevented beforehand by verification of the design. After the simulation, COPRA® FEA RF provides a dynamic animation of the roll forming process as well as a graphic depiction of the results.

Various auxiliary functions and customizable templates facilitate a quick and automated breakdown of results, so the designer profits from significant time savings. The so called "Automatic Report" feature also allows all evaluation parameter of interest to be broken down to each individual station, providing detailed insights into the manufacturing process.

You can follow how the material is behaving during the actual manufacturing process. Furthermore, the software provides important information of the applied forces, torsional moments, pressure and tension values as well as lastly a complete 3D-visualization of the finished (virtual) product. Of course, the applied pressures can also be broken down by the respective axis.

Calculation of station stiffness

With the possibility of taking station stiffness into account, the quality of the simulation results is enhanced even further. Thus, COPRA® FEA RF can simulate the alteration of the roll gap reliably.

By contrast, assuming of fixed roll positions and neglecting of shaft deflection would lead to higher forming forces than in reality. The accurate calculation of the roll gap is particularly important for the product quality when using high strength materials because of different bending angles and radii.

Stretch Bending 1 - Failure
not enough Stretching

Stretch Bending 2 - OK
sufficient Stretching
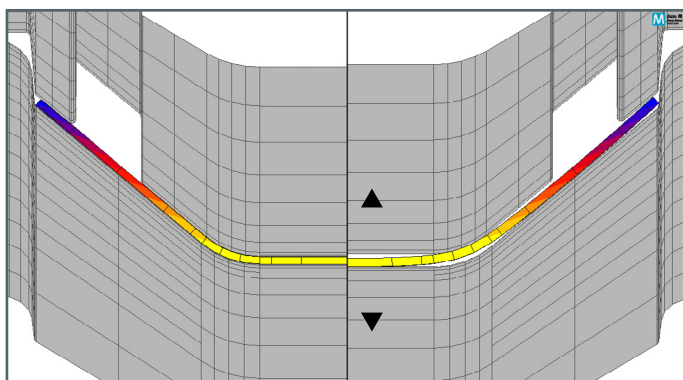
Station stiffness **not** taken into account: Roll gap is constant

Station stiffness **is** taken into account: Roll gap changes due to forming forces
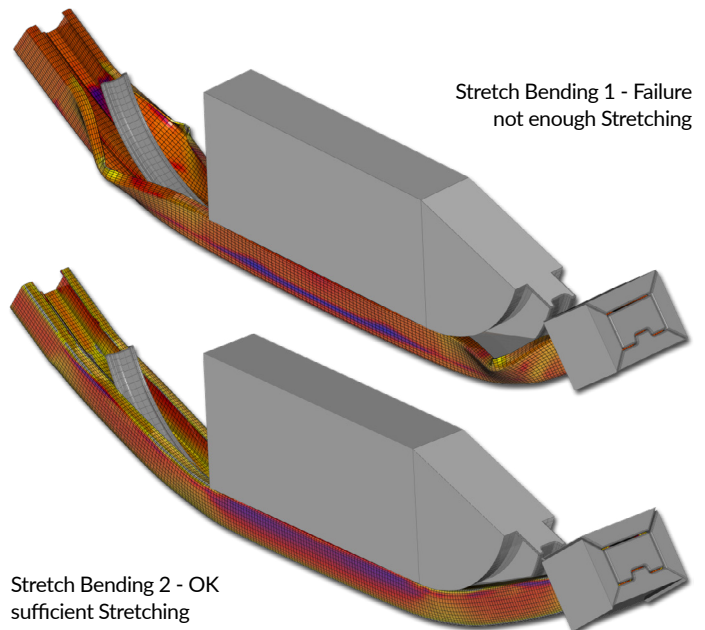
COPRA® FEA RF as a fundamental element of the process chain

The consistently enhanced user interface allows your designers to navigate naturally though the forming stations. After output of the simulation results, the respective positions of the relevant cross sections will be identified by "Roll-Planes" and compared to the required cross section. You can of course export the data for further use with other CAD programs. Your designers will then be able to test new roll tools or complete sets for the effects on the manufacturing process. Like all COPRA® products, the simulation methods are tailored to the roll forming process – and for highest efficiency.
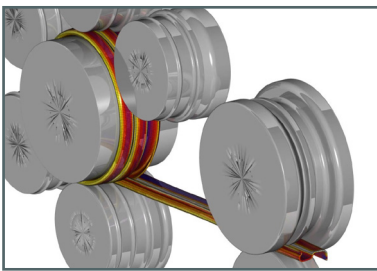
COPRA® FEA RF not only simulates the roll forming process, but is furthermore able to calculate all common pre and post-operational manufacturing steps including stretch-bending. For this, you can use the extended import functions and import new formats like STEP and SAT. The software is thus a central part of our integrated solution concept for roll formers. Repeated verification through FEA simulation is inevitable for subsequent calculations. Particularly stresses and tensions caused by roll forming influence the calculation results significantly. In case of a car bumper for instance, all process steps will be simulated reliably, so that the roll set can be adjusted quickly and easily as required.
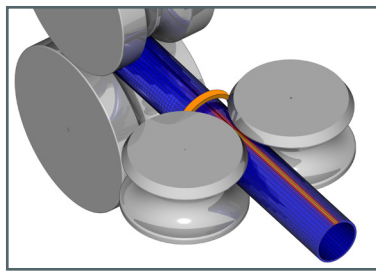
Why COPRA® FEA RF?

COPRA® FEA RF is a software solution for the simulation of roll forming processes as well as pre and post-operational manufacturing steps. However, roll formers profit in multiple ways: Additionally to reduced machine- and tool-cost as well as the avoidance of total losses, COPRA® FEA RF generates genuine innovation within companies.

Various forming strategies can be tested within virtual roll forming machines and thus optimize the production process in the mid- and long-term. Stay competitive with software verification instead of expensive trial and error.

I FEA-Model generation within seconds

I Easy and quick optimization of roll set

I Virtual implementing of roll designs

I Advanced Restart - adaption of grid at any time during simulation

I Station Stiffness – calculates alteration of roll gap by forming forces

I Besides IGES, new formats like STEP and SAT can be imported

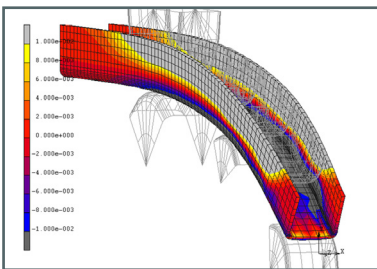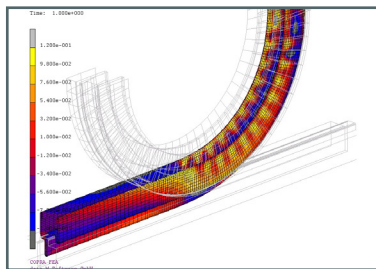I Marc / Mentat included (also for COPRA® FEA RF WireRolling)
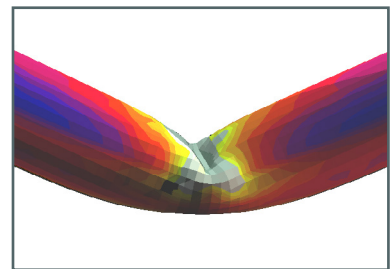

I Winding

I High-frequency Welding

I Inline-Bending

I Sweeping

I Stretch Bending

I Crash Simulation