CASE STUDY

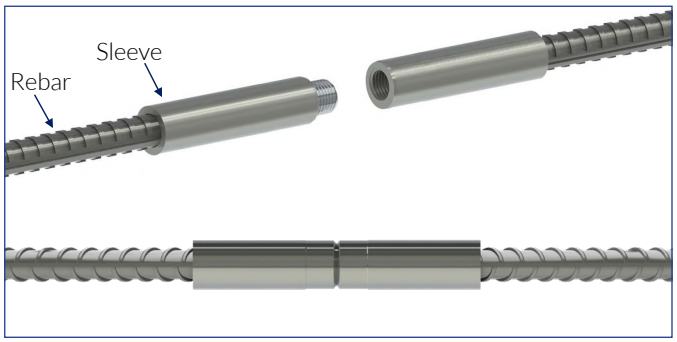
Simulation of cold swaging process

Application to the Dextra Griptec® rebar splicing system

FORGE® by Transvalor

Dextra Group

Established since 1983 in Thailand by French investors, Dextra Group is a manufacturing, freight forwarding and trading company specialized in supplying the construction and industrial sectors. Dextra designs, engineers, manufactures and distributes highly efficient construction solutions that answer the ever-growing technical requirements and challenges of contractors and consulting firms worldwide. From three major industrial sites located in Bangkok (Thailand), Guangzhou (China) and Mumbai (India), Dextra completely owns its manufacturing facilities and processes.



Griptec®, rebar splicing system by Dextra

Customer
Dextra Group
Bangkok, Thailand
www.dextragroup.com

Process
Swaging (cold forming)

Challenge
Optimize the swaging process of their key product by managing the load applied on the equipment and dimensioning the tools.

Solution
Carry out a parametric study to provide guidance, establish accurate swaging effort diagram and determine elastoplastic law.

Dextra

CHALLENGE

Dextra most popular solutions are full performance rebar splicing systems designed for the connection of concrete reinforcing bars typically used for nuclear reactor buildings.

Griptec® is among Dextra's key product for the nuclear industry where high quality standards are of paramount importance. The manufacturing process is automated. Griptec® consists of a sleeve that is swaged directly onto a rebar and then proof-tested by a non-destructive tensile test systematically performed by the swaging machine. This equipment constitutes a strong competitive asset for Dextra.

Dextra has selected FORGE® software to simulate the cold swaging process and reached several objectives with the support of Transvalor teams:

- optimize the swaging machine dimensioning by forecasting the loads applied to its tools
- optimize the process by calibrating the load exerted by a resisting die
- carry out parametric studies to determine the best die shape
- determine the impact of various reinforcing bars geometries

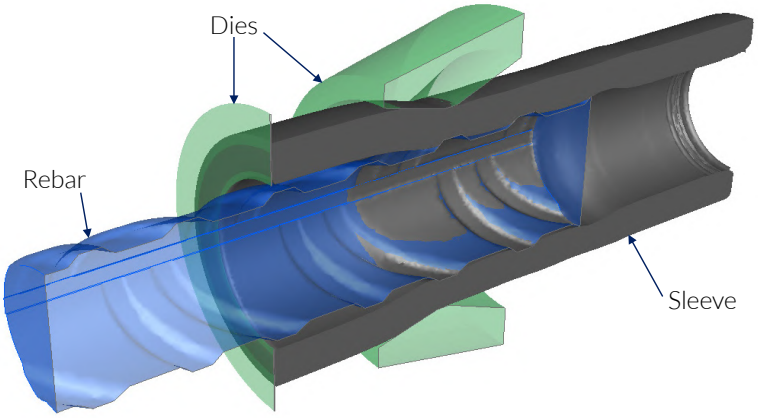
SOLUTION

Simulate the extrusion process

The main outcome brought by FORGE® is the evolution of the load along the swaging process, which enables Dextra to dimension the hydraulic cylinders.

A parametric study was carried out with FORGE® in order to optimize the tools shape and dimensions, and consequently reduce the load applied on them.
Various parameters were tested:

- swaging die diameters and angles,
- sleeve raw material and geometries,
- rebar geometries.



FEM simulation of a Griptec® extrusion

Force evolution on equipment according to the load applied

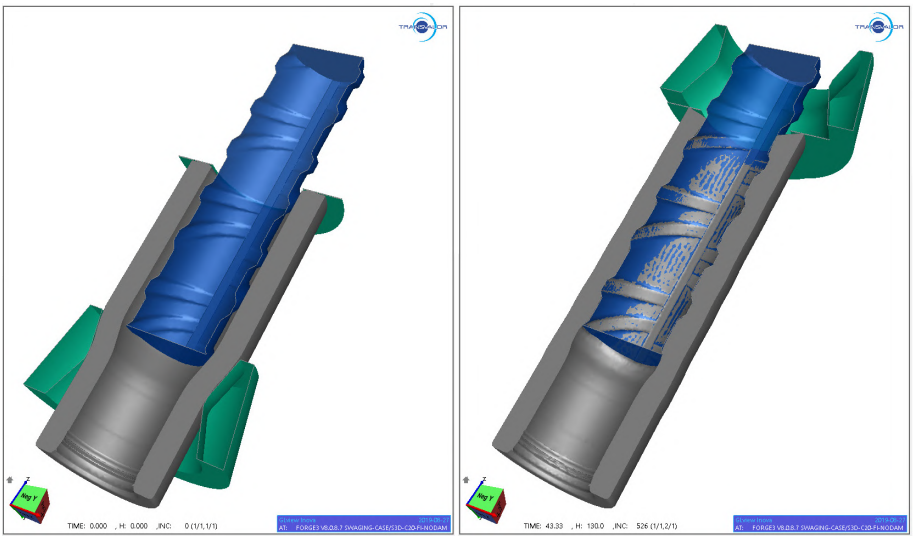
Dextra has also studied the impact of all these factors on evolution of mechanical properties and distribution of hardness in the product.

Friction was also taken into account and revealed to be a relevant factor. Presets from the software gave a helpful starting point.

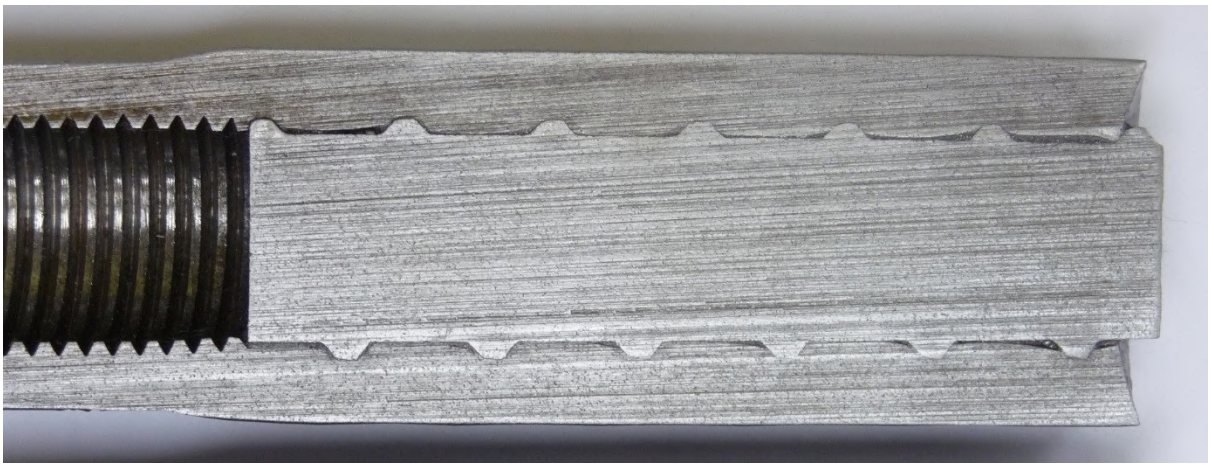
Transvalor Customer Service was very helpful and support Dextra to mesh the models efficiently, to apply boundary conditions and to define elastoplastic law of materials.

«Griptec® product is at the core of our solutions for nuclear application, which is why mastering its properties is critical for us. Correlation between simulations and experiment has always shown great accuracy on the past studies we have done with FORGE® software; be it in terms of efforts, deformations, stress reached, or hardness evolution. We systematically now use it to optimize our forging processes, as it is complete and reliable. »

- Laurent Fort,
Engineering and Plant Manager
at Dextra Group



Simulation of the swaging process of a Griptec® with FORGE® software



Griptec® system

BENEFITS

Reduce development and production costs

By simulating the cold swaging process, Dextra has been able to optimize the Griptec® system and has greatly reduced development and manufacturing costs. FORGE® is an effective solution:

- Cost of experimental testing has been drastically reduced due to the guideline that simulation represents. Significant amount of time spent on development has also been saved.
- Cost of equipment was reduced by the downsizing of cylinders and frame. This also had a favorable impact on maintenance and production costs.
- Parametric study conducted with FORGE® led to a better prediction of the final product geometry, given all input such as rebar geometry and sleeve raw material dimensions.
- Evolution of sleeve hardness after swaging could be visualized, giving the opportunity to optimize the initial sleeve shape before swaging. Mechanical properties can be more homogeneously distributed in the final part and augmented in critical sections.

«The precision of the simulation drastically reduces development time, cost and testing. On top of that we greatly appreciate the fact that Transvalor support always does the extra step to answer technical queries, and to help optimizing our models.»