

Numerical simulation a new shaped ring rolling process

FORGE[®]
by Transvalor

FELB

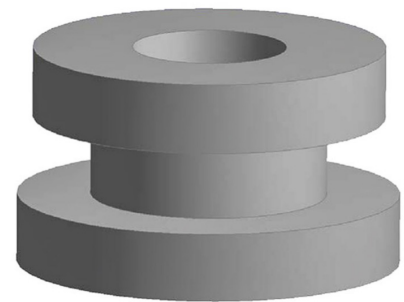
The Italian company FELB Srl was established in 2006 to meet market demand and provide medium-weight forgings. Forged products can reach a maximum weight of 10 tons with a maximum length of 6 meters, a maximum diameter of 2500 mm and a maximum width of 2000 mm. The ring rolling process allows to produce rings with a maximum diameter of 4000 mm and a maximum height of 870 mm.

All stages of the production process (cutting, forging, rolling, machining, heat treatment) are directly achieved within the plant. Orders are usually based on few items and therefore high flexibility is mandatory to satisfy the customers' requests.

THE PARTNERSHIP



For more than 20 years, EnginSoft is the Italian distributor of the product FORGE[®]. Thanks to a group of engineers specializing in the simulation of metal forming, EnginSoft conducts its support, training and consulting activities to the over 70 customers of Transvalor software. The company FELB requested the support of EnginSoft to raise their level of competencies with respect to the ring rolling process and thus being able to positively answer the order for these new products.



Flanged body ordered by the customer

Customer

FELB, Italy

<http://www.felb.it/>

Product

FORGE[®]

Challenge

The implementation of two hundred ASTM 105 steel parts by shape rolling.

Solution

The manufacturing process of steel ring has been validated numerically before production launch of the ordered lot.

CHALLENGE

FELB received an order from a new customer concerning the supply of about two hundred A105 steel shaped rings. The dimensions of the machined part are 900 mm (diameter) and 500 mm (height).

The part could be produced by the traditional process composed by ring rolling and subsequent machining. The size of the request (one order of magnitude bigger than usual), led FELB to evaluate the possibility to directly roll a shaped ring, in order to optimize material usage and to provide a final part with better in-service performances.

Due to its limited experience on the shaped rolling process, the company wanted to evaluate the FORGE[®] NxT software. The partnership with the «Metal Forming Team» of EnginSoft allowed to speed-up the software training and to obtain the best results in a very short period.

FELB achieved several simulations to confirm the technical feasibility to produce the final part by using the company equipment.

CASE STUDY



« The obtained results confirm that the use of FORGE® for the numerical simulation is definitely a good business card for our company, also talking on pure commercial terms. It allows us to differentiate in a very positive way, anticipating customers' objections and offering a sensible cost reduction and quality increase ».

- Fabio Fioletti, Sales Manager, FELB

« Thanks to FORGE®, to our knowledge and to the EnginSoft's support, we were able to offer a superior quality part, with a considerably increase on efficiency. From a CEO point of view, I'm even now noticing interesting returns: we can now expand our business, in terms of batch size and/or complexity of the parts. Advantages on the efficiency on my production processes could be the key to establishing us on these new markets. »

- Luigi Catalini, CEO, FELB

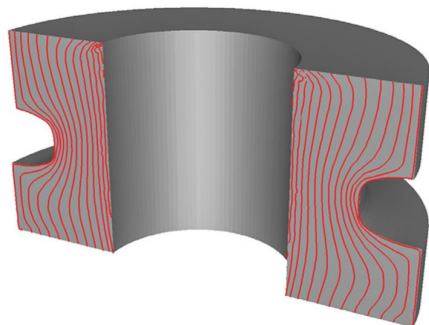
SOLUTION

Optimize the shaped ring rolling process

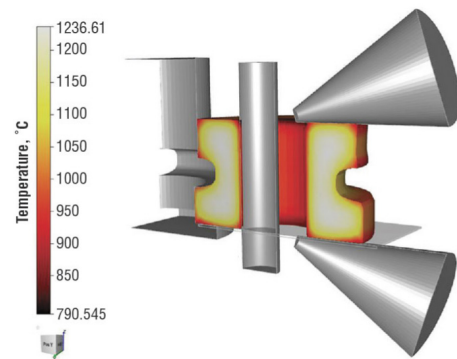
Based on FELB's know-how on ring rolling process, the studies and simulations of several lamination curves and geometries on king roll allowed the validation of the right feasibility by using the company equipment. Furthermore, the required maximum torque on king roll and axial force on mandrel were verified. The preliminary evaluations were completed in less than one week, allowing the order of the equipment supply (mandrel and king roll).

Jointly, simulation activities were focused on the evaluation of the best forging sequence to obtain the optimal preform, in order to reduce the required material. From this point of view, several modifications on flange height, both internal and external diameters have been evaluated. All the solutions have been subsequently validated by numerical simulations of ring rolling processes.

The developed simulations allowed for a very fast fine-tuning phase, highlighting the causes of some filling defects on the flanges and suggesting the best actions to be performed in order to complete the profile on the real process.



Fibering on the final part



Numerical simulation of the shaped ring rolling process

BENEFITS

Validate and master the manufacturing process of A105 steel rings

For FELB

- Radical innovation and drastic reduction on development times -80% and production costs -50%
- Possibility to optimize the time plan: equipment orders approval < 1 week.
- Validation about requirements of the rolling machine: forces and torques are below 70% of the nominal performance.
- Optimization on material usage: -15% on the weight in comparison with the previous solution.

For the customer

- Faster reply to quotation request, by proving the results obtained by the proposed process.
- Higher performances on the final parts, thanks to a better deformation rate and an optimized grain flow provided by the shaped ring rolling process.
- Significant reduction on time and cost related to machining operations (up to 40%).

Special thanks to Fabio Fioletti (FELB Srl), Federico Fracasso and Marcello Gabrielli (EnginSoft)