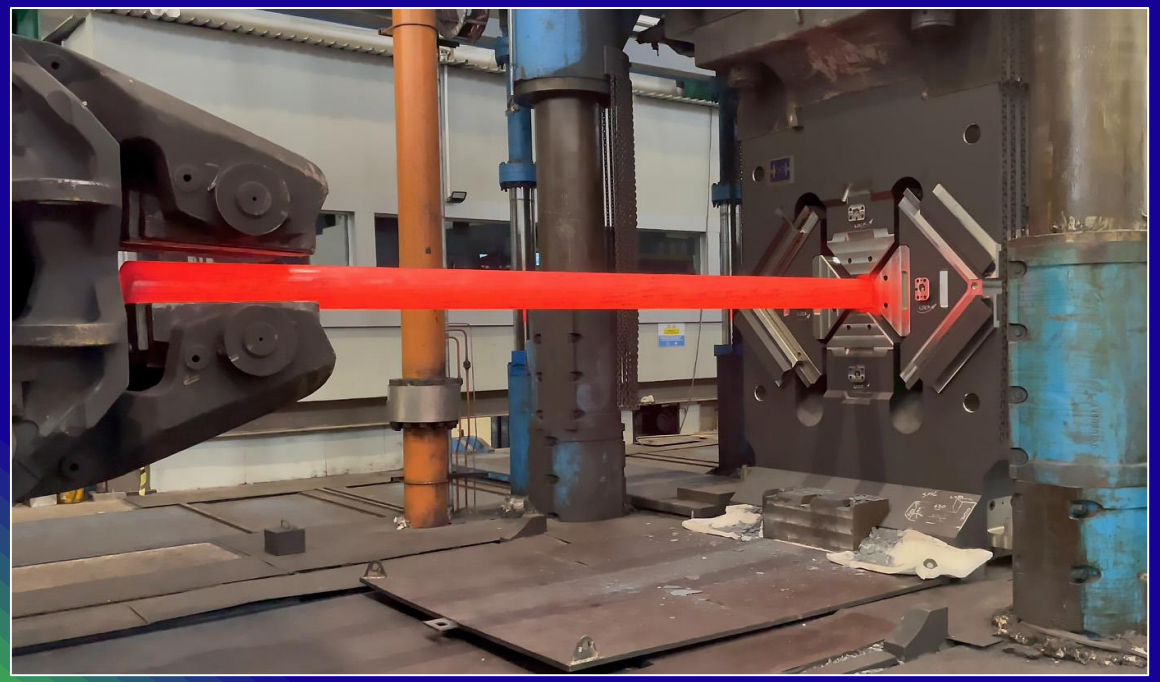
Four-Die Forging Devices (FDFDs)

and forging technologies developed by Lazorkin-Engineering company



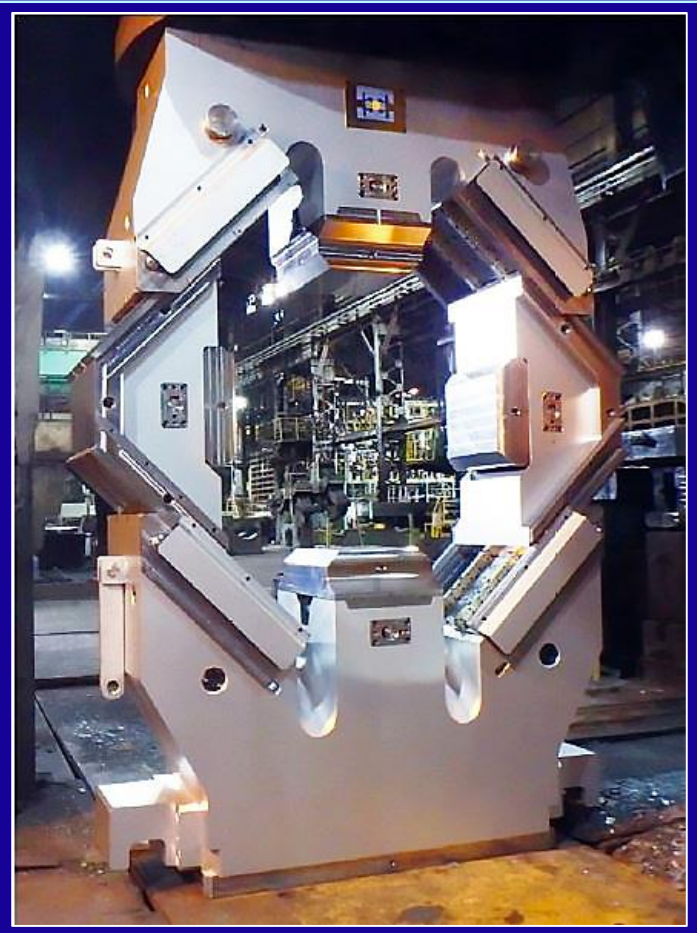
The main criteria for the selection of FDFD design

The application of this forging device allows to:

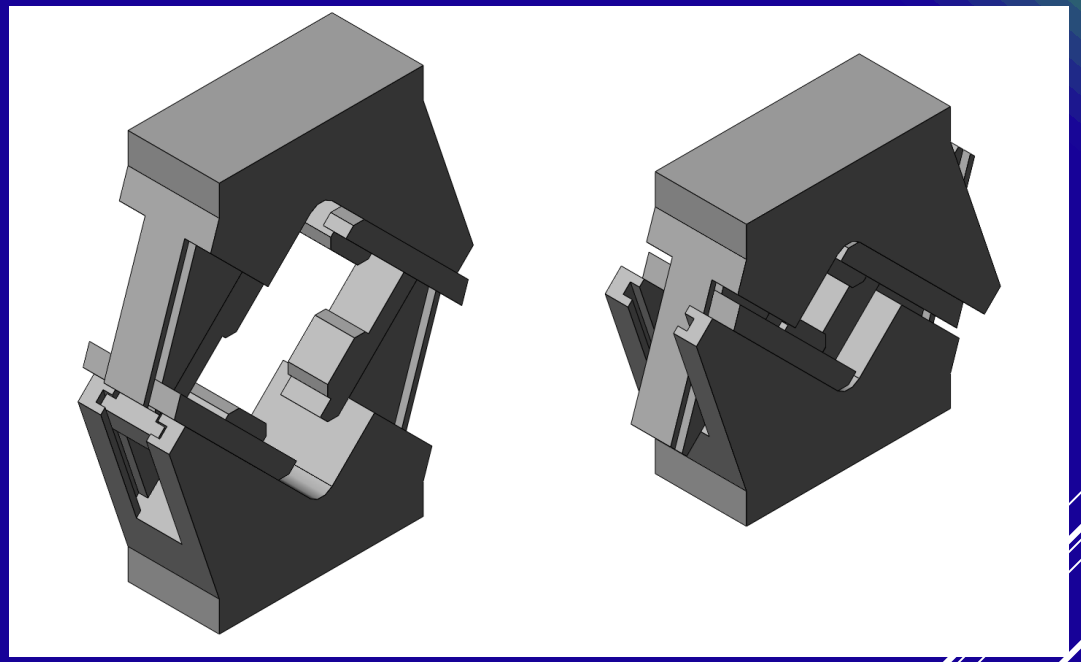
- Increase the producibility in 1,5-3 times
- Improve the metal yield by 8-15%
- Decrease the tolerances for the forgings in 2-2,5 times

- Decrease the allowances for the machining in 1,5-2 times
- Decrease the electricity bills by 30-40% when doing drawing
- Provide 20-30% savings for the gas consumption by avoiding the additional re-heatings

The main design features of FDFDs



The top die moves downwards and the lateral dies move simultaneously towards each other and also move in the same time towards the fixed bottom die

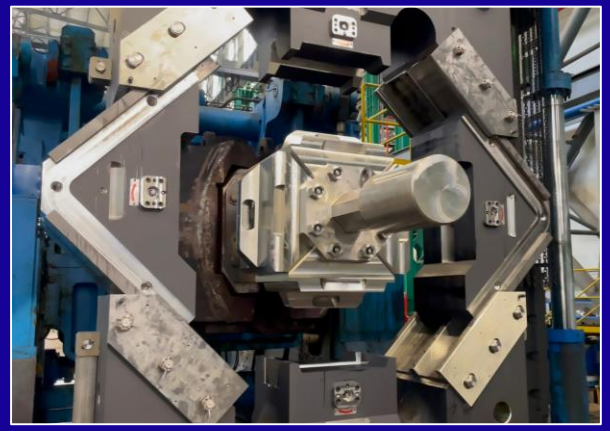


All four dies move uniformly towards the central axis of a workpiece on the principle of a radial forging machine

Design types of FDFDs

With springs

With the mechanism for quick replacement of all dies

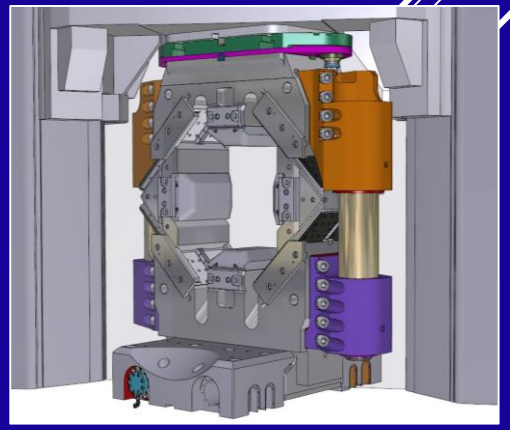


With self-lubricated sliding bearings

With cooling and lubrication systems

With system to quickly fix FDFD to the top die

With guide posts

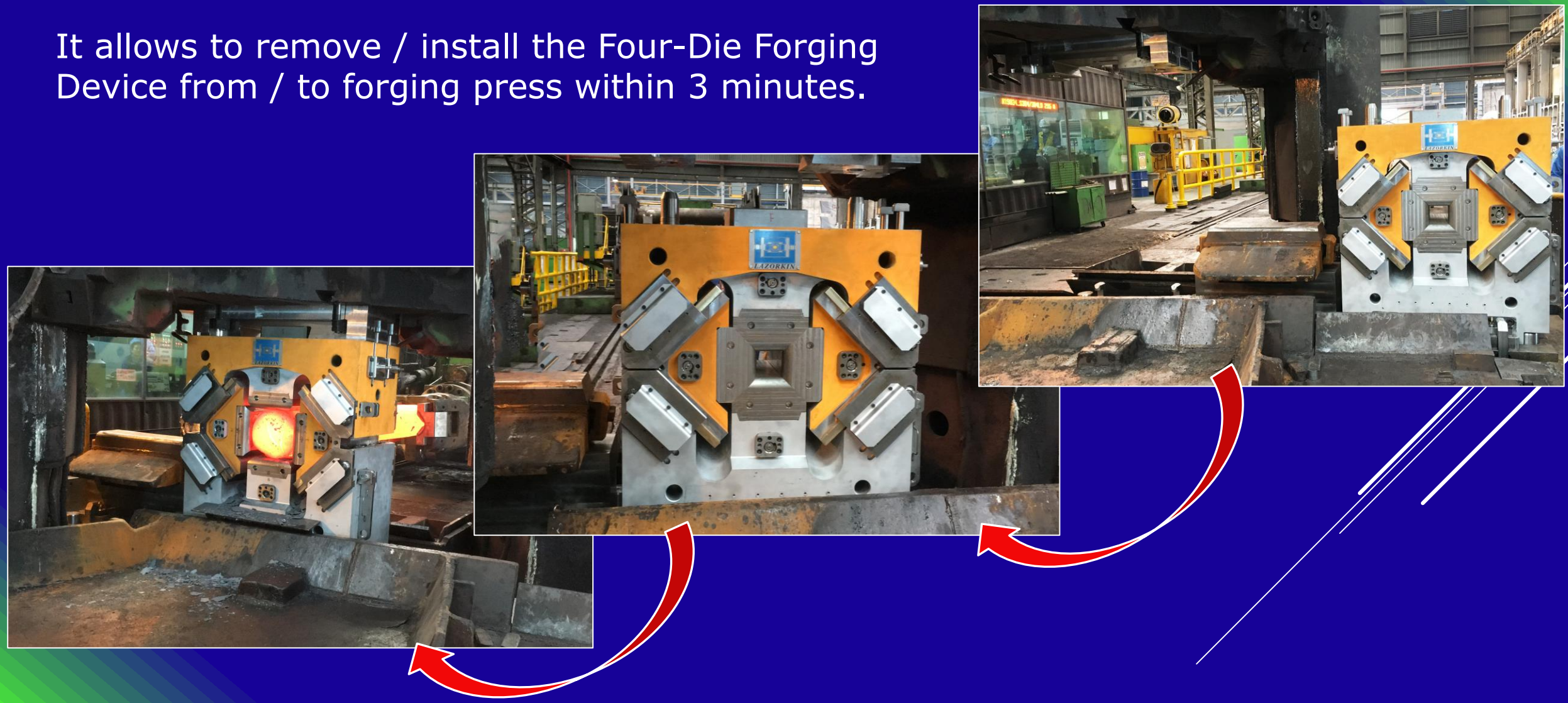


Mechanism for quick replacement of FDFD dies

It allows to replace simultaneously the set of dies (4 ea) during 10-15 minutes with FDFD fitted to the forging press.

Mechanism to quickly fix FDFD to the forging press

It allows to remove / install the Four-Die Forging Device from / to forging press within 3 minutes.



Producing the forgings in FDFD with round and square cross-sections

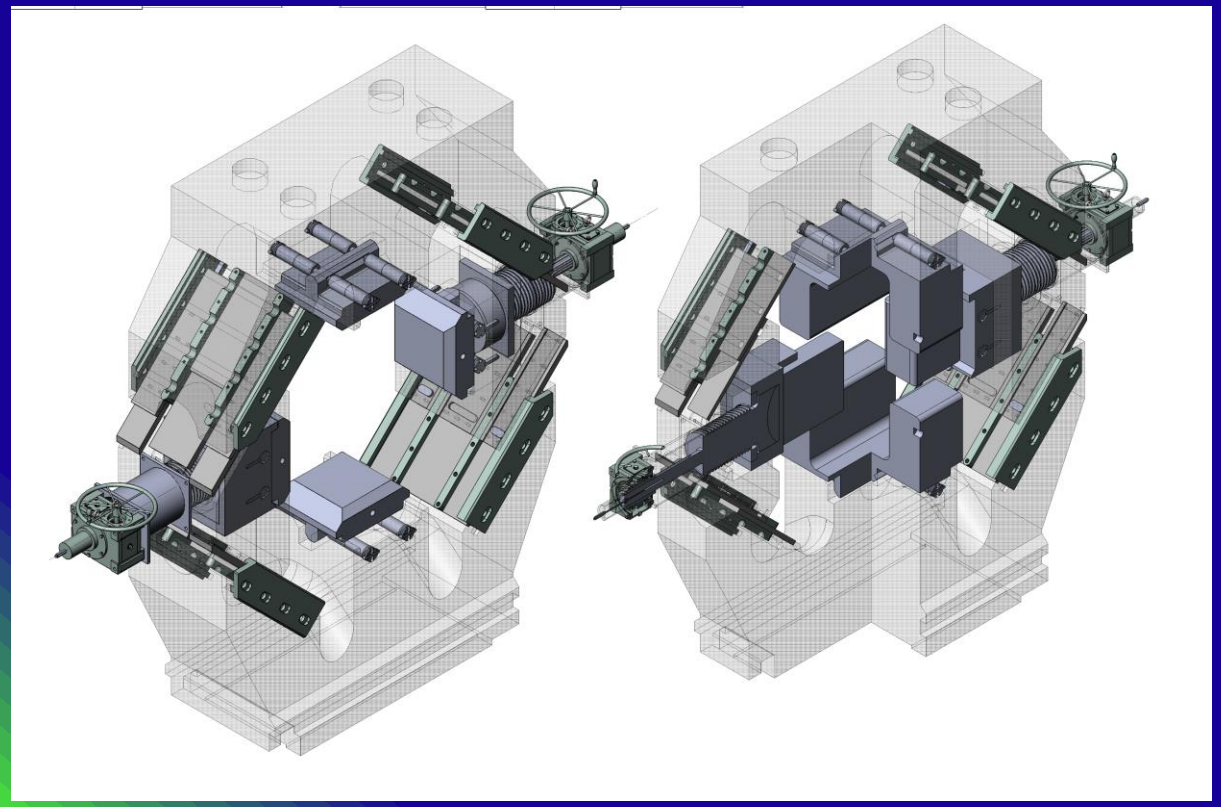
One and the same forging device can have several die sets depending on the range of the used ingots (workpieces) and on the product range of the forgings with round as well as with square cross-sections.

FDFD with dies to produce the forgings with round cross-section

FDFD with dies to produce the forgings with square cross-section

Producing the forgings in FDFD with rectangular cross-section

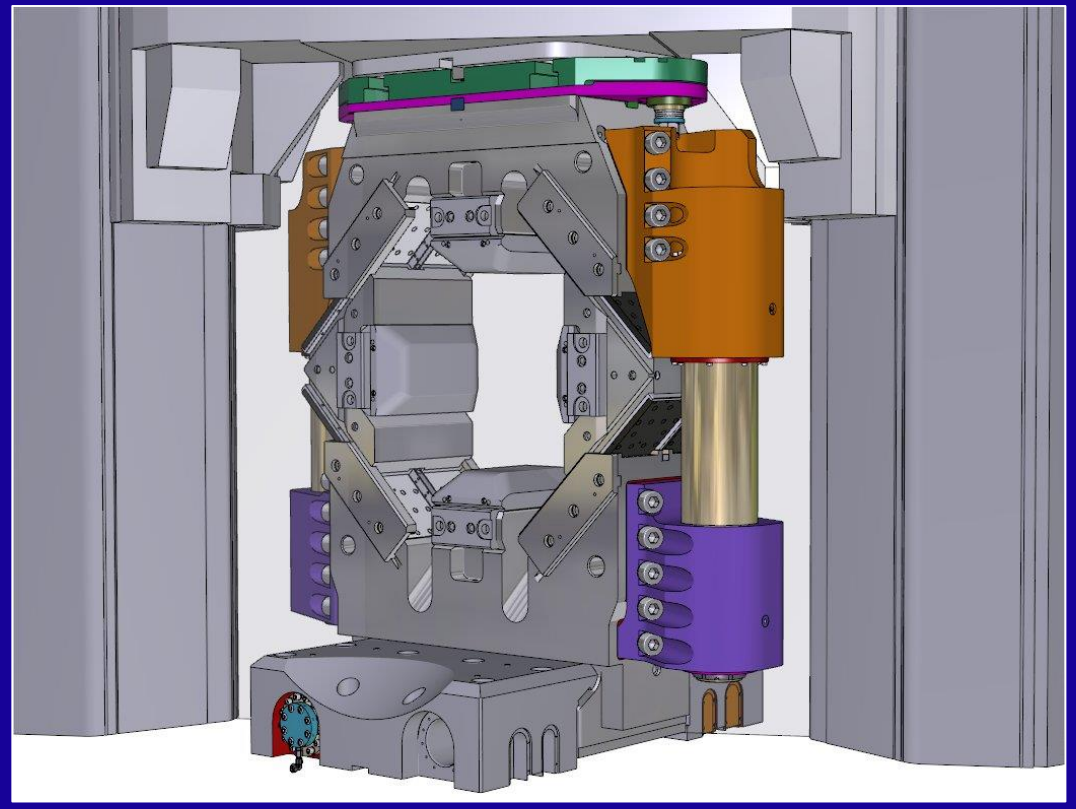
A special design solution for FDFD is used for production of the forgings with rectangular cross-section. Such design uses not only the sliders of new design type that ensure the control of the distance between the lateral dies but also the dies with special design are applied.



FDFD with the dies and sliders to produce the forgings with round, square and rectangular cross-sections

FDFD with guide posts

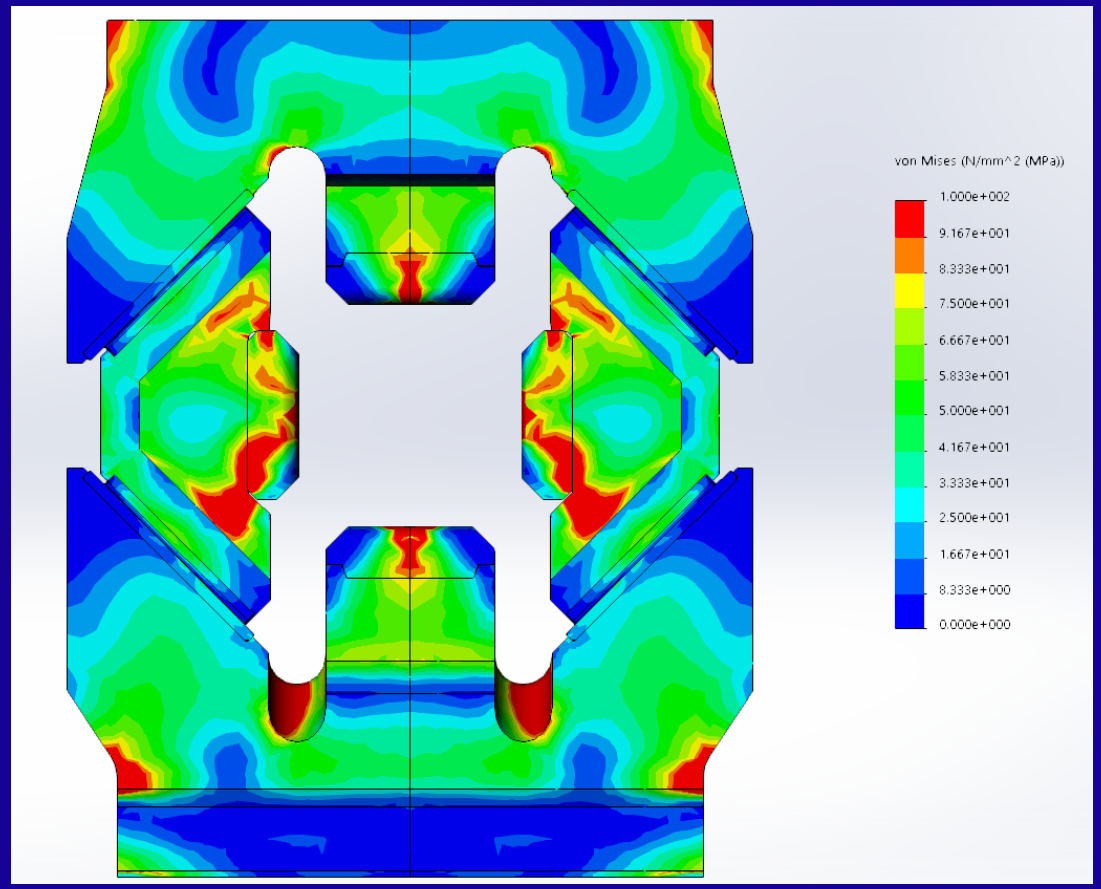
The design of the forging device enhanced by the special guide posts is developed for the forging presses with big gaps in the guide inserts and for those presses that operate with a skewness of their movable cross-beams.

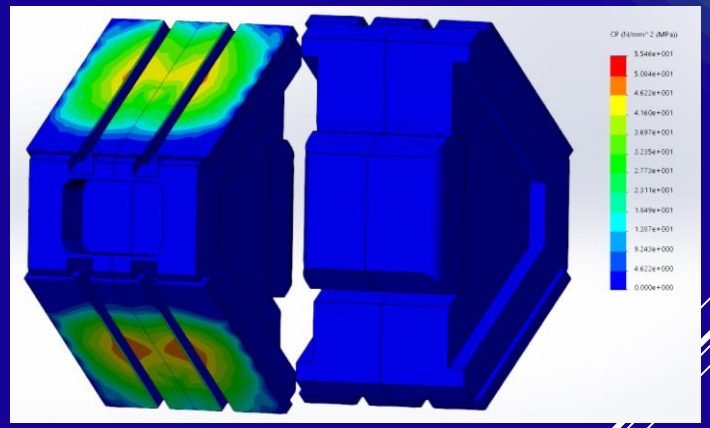


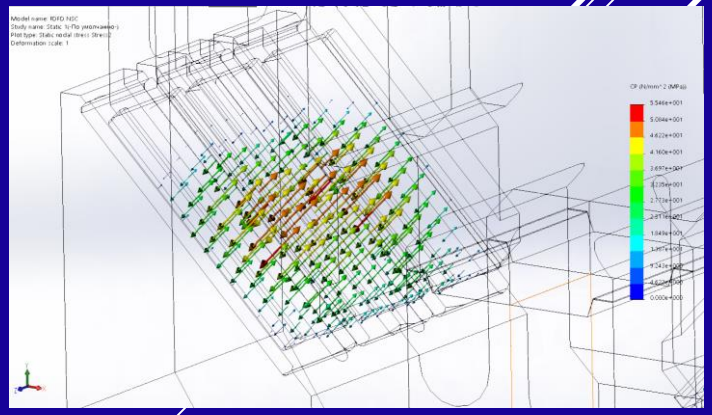
Strength analysis for FDFDs

FDFD elements undergo the strength analysis for checking and optimization by Finite Element Method (FEM).

For the most loaded elements a thermal field analysis under the forging operation conditions is performed.



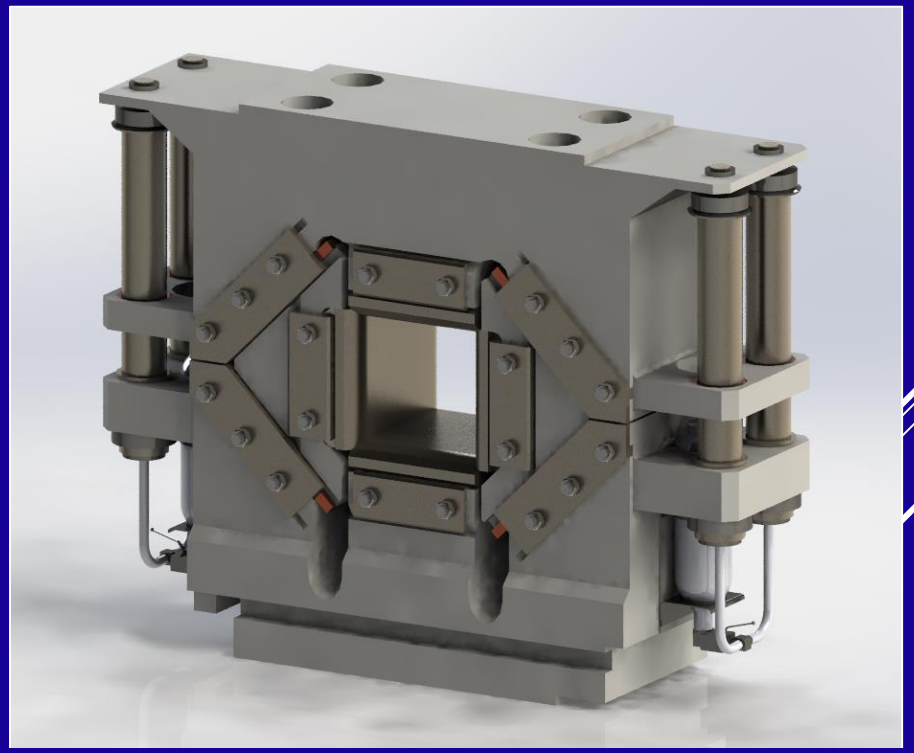




FDFD without fixation to a cross-beam of forging press

The fixation of FDFD top body to the press is not required. The homing (lift motion) of the top body together with the moveable parts of FDFD is done with a help of springs.

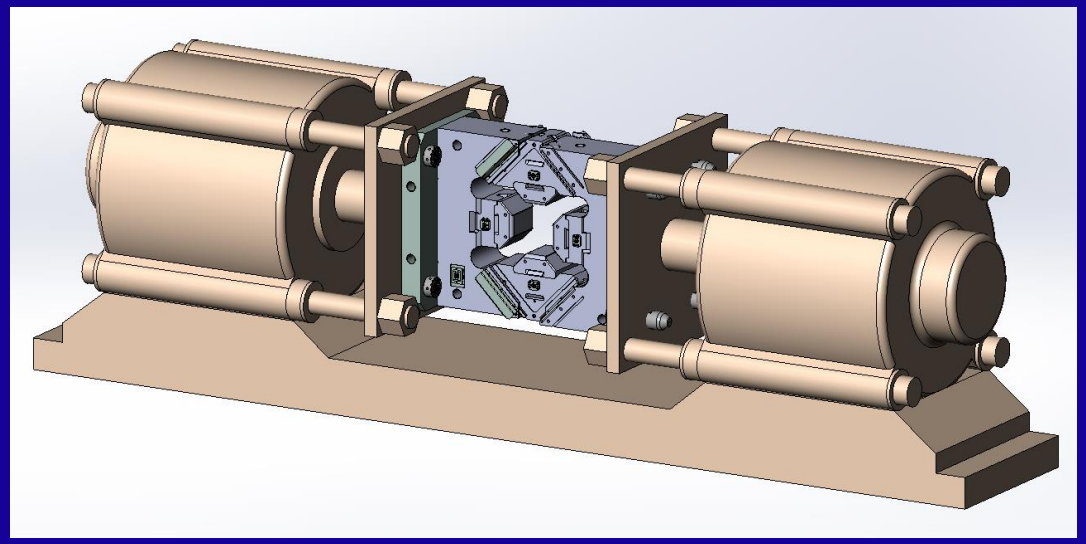
Forging device with steel springs



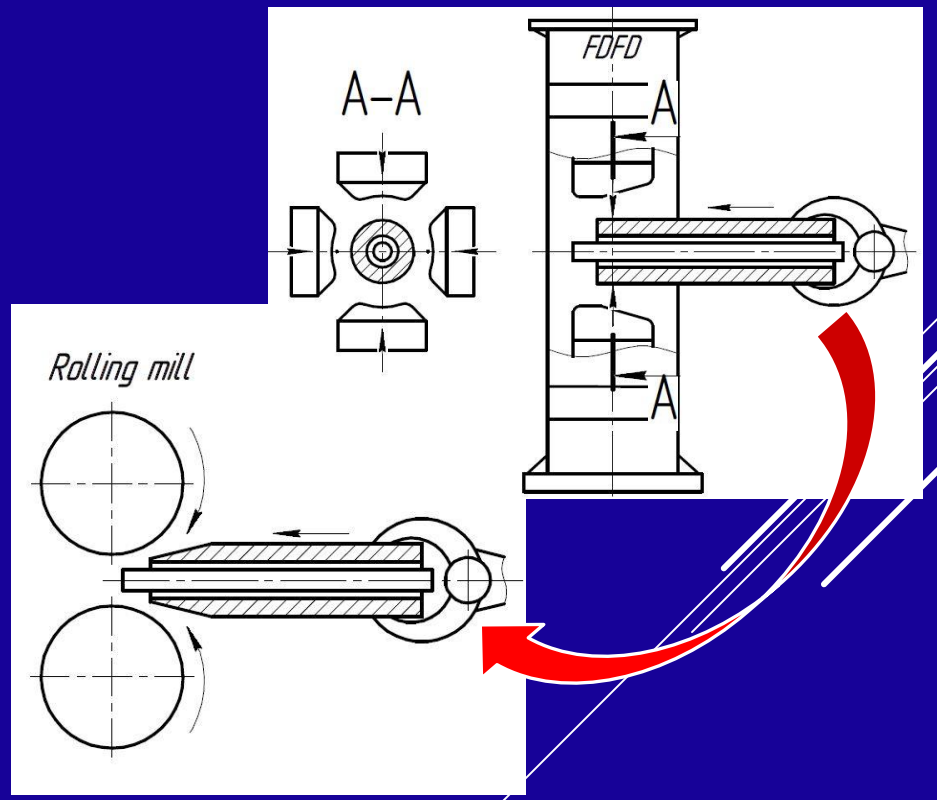
Forging device with gas-hydraulic springs

FDFD in rolling-mill production

Special radial forging machine with FDFD for swaging of a tubular bloom end during pilger rolling of tubes



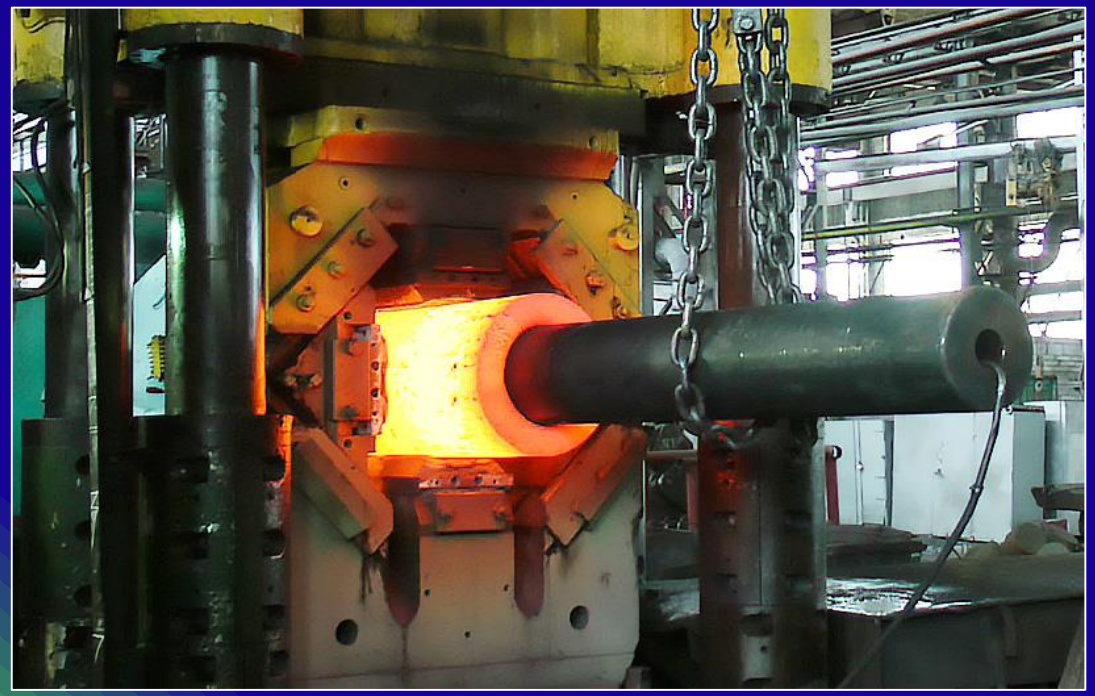
Swaging scheme for a workpiece during pilger rolling

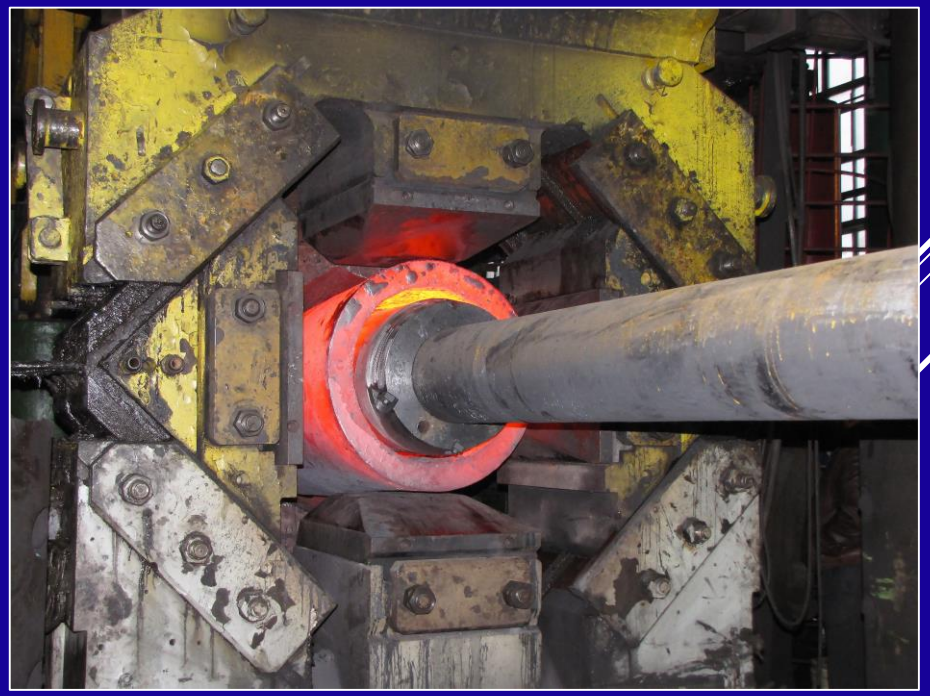


- Decreases the rolling time by 9-15%
- Decreases the technological scrap by 40-50%

Forging of tubes in FDFD

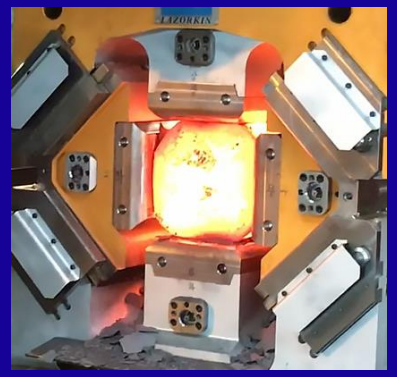
The technology of producing the hollow heavy wall forgings using four dies in the forging device with special mandrels installed into the cavity of a workpiece allows to decrease significantly all the downsides that are inherent to the forging of tubes using two dies.

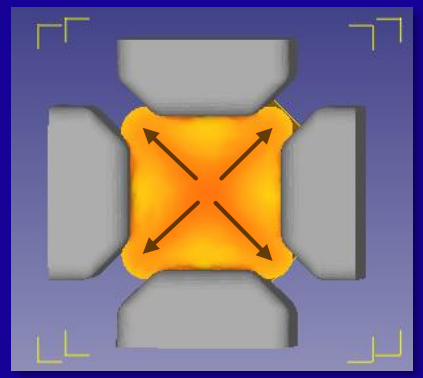


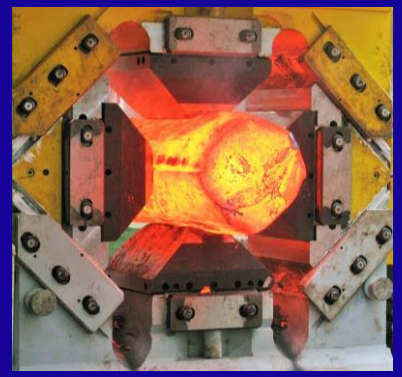


Forging technologies for FDFD

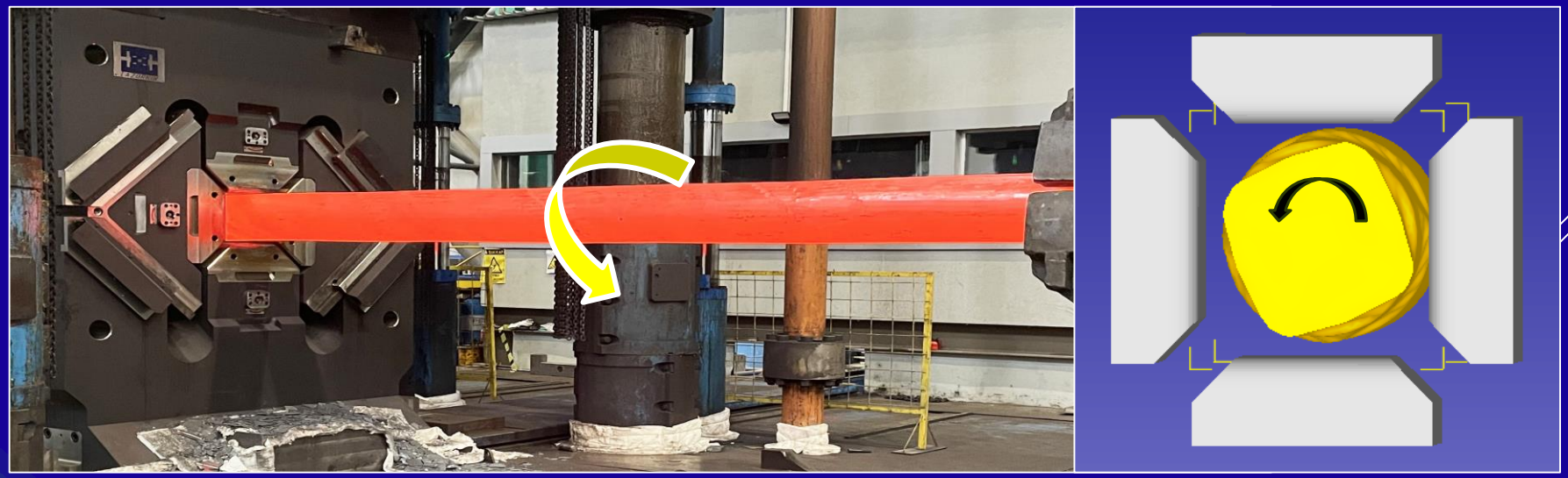
Forging with big reduction ratios, when the metal is forced to flow out between the dies







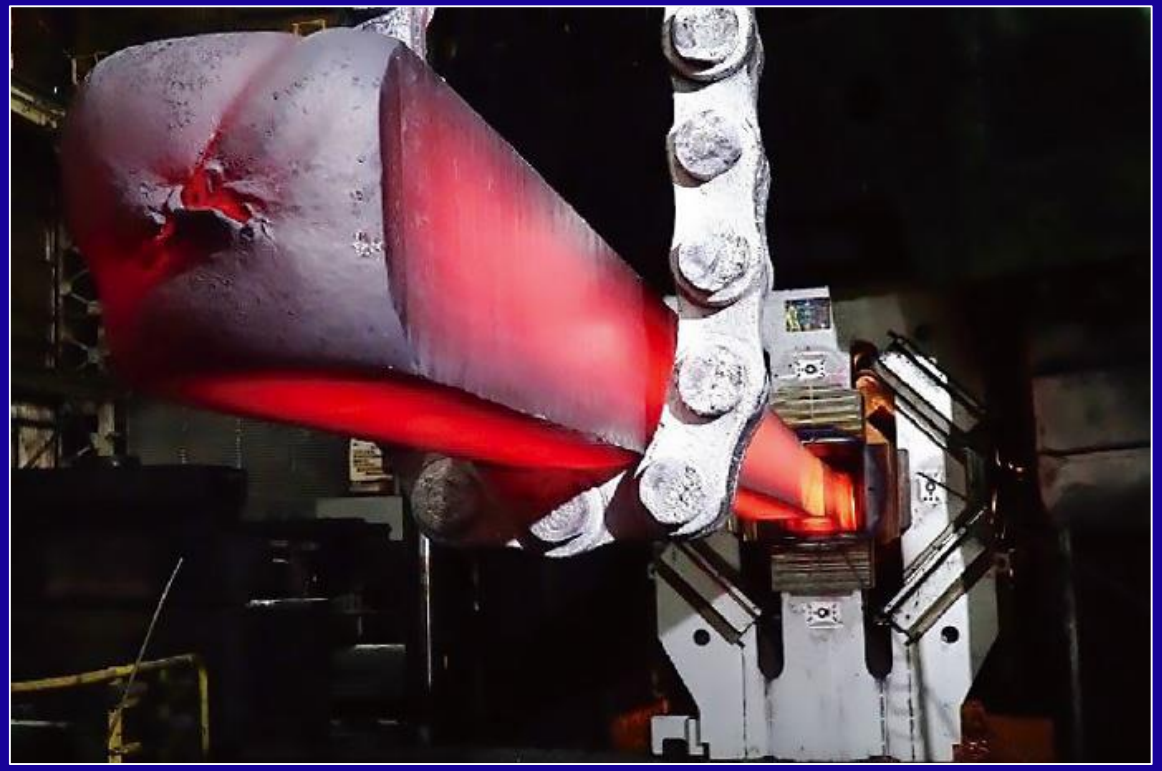
Forging with twisting the macrostructure of workpiece metal

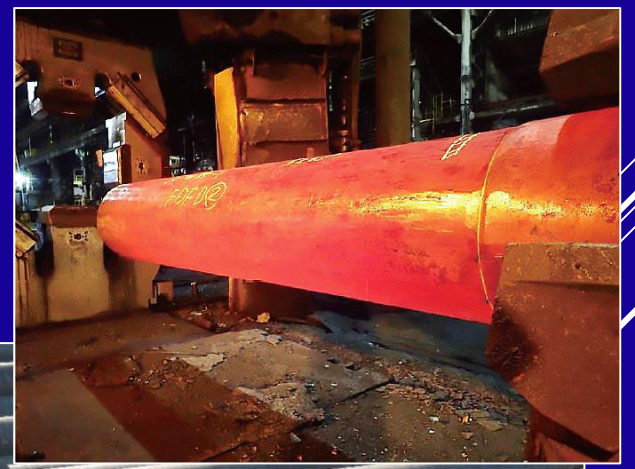


Finished forgings after forging in FDFD

High quality and precision of produced forgings allow to:

- Decrease the tolerances for all dimensions to +/- 2 mm
- Decrease the allowances for the machining in 2 times
- Save up to 30-50 kg of metal per each tonne of forgings

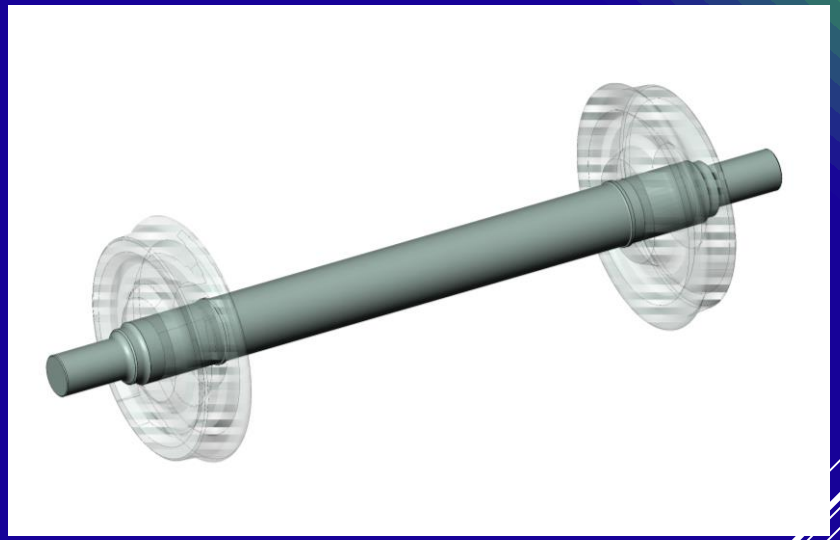


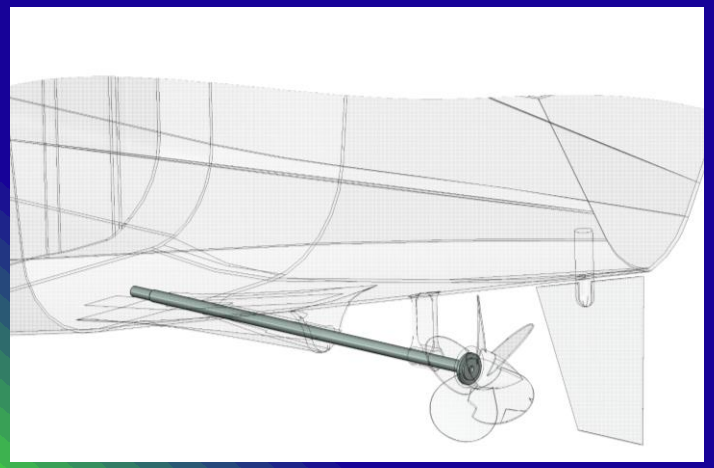


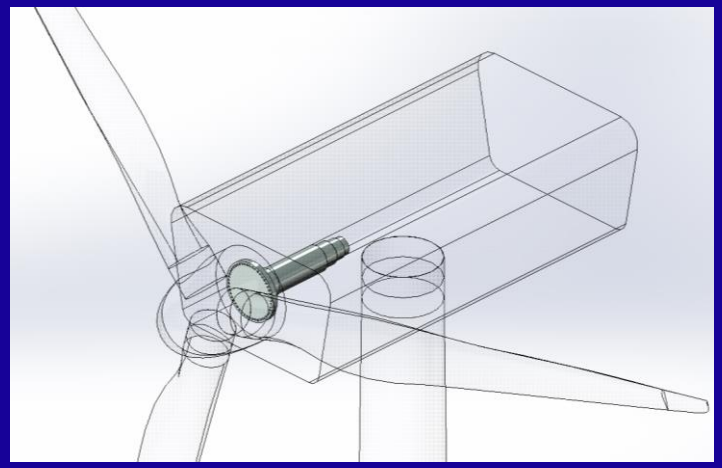
Special products obtained by forging in FDFD

The forging device allows to produce:

- Railroad axles
- Marine propeller drive shafts
- Wind turbine shafts
- Hollow forged products with different cross-sections





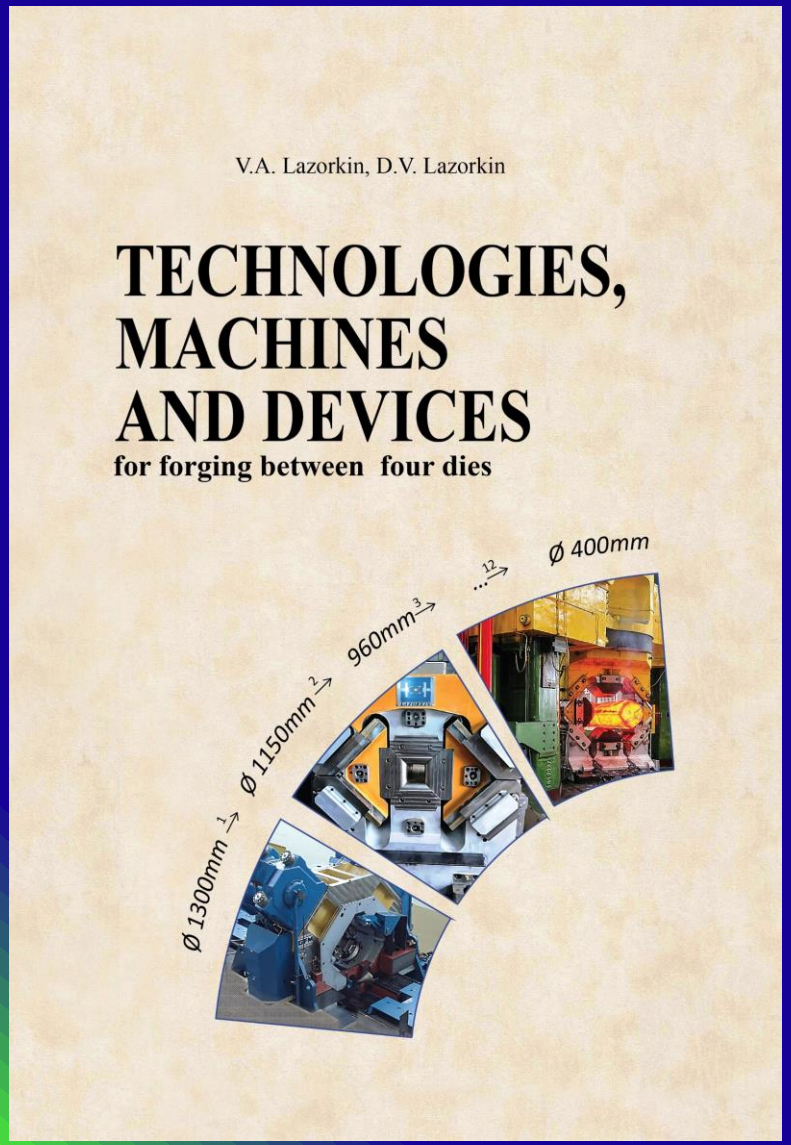


Experience in designing FDFDs and developing the forging technologies

As of year 2024 there are around 30 Four-Die Forging Devices operated in different industrial companies with forging presses with forces from 5MN up to 120MN in the following countries:

Ukraine
Germany
Spain
Italy
Brazil
Russia
India
China
Republic of Korea
Japan
Turkey

Thanks for your attention



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