

Module 8. Bulk Deformation of Metals



FROM THE MANUFACTURING PROCESSES WE HAVE LEARNED SO FAR, ²
WHICH ONE CAN BE USED TO MAKE THESE?



<https://www.dreamstime.com/stock-illustration-ball-bearing-cut-view-d-render-image78323650>

FROM THE MANUFACTURING PROCESSES WE HAVE LEARNED SO FAR, WHICH ONE CAN BE USED TO MAKE THESE, ³



Extracted from: <https://www.youtube.com/watch?v=Ql8DqSRBRNg>

MAIN CATEGORIES OF BULK DEFORMATION PROCESSES:

- Rolling
- Extrusion
- Drawing
- Forging

ADVANTAGES OF PARTS MADE BY DEFORMATION, COMPARED WITH MACHINING AND CASTING

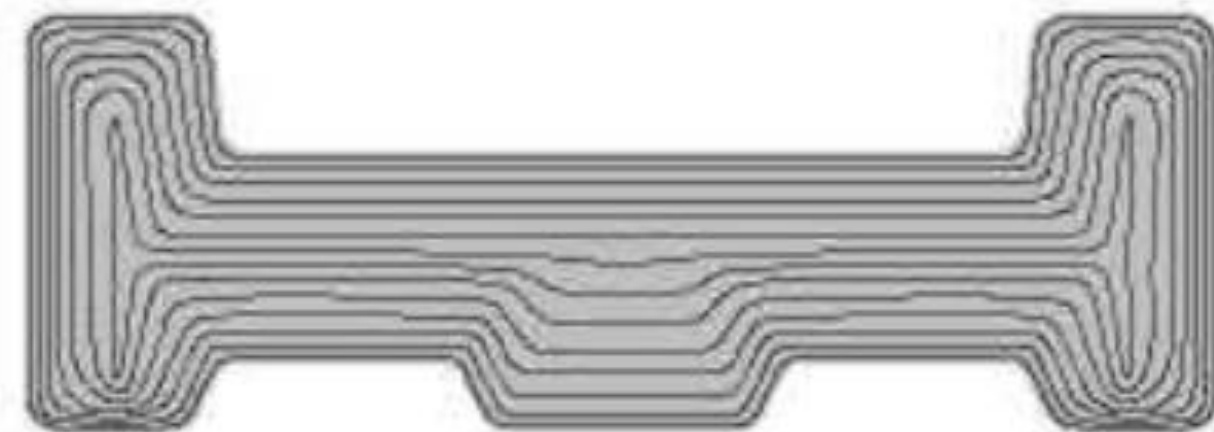
5

- Higher production rates,
- Less metal waste,
- Greater strength,
- Favorable grain orientation,
- Better fatigue resistance.

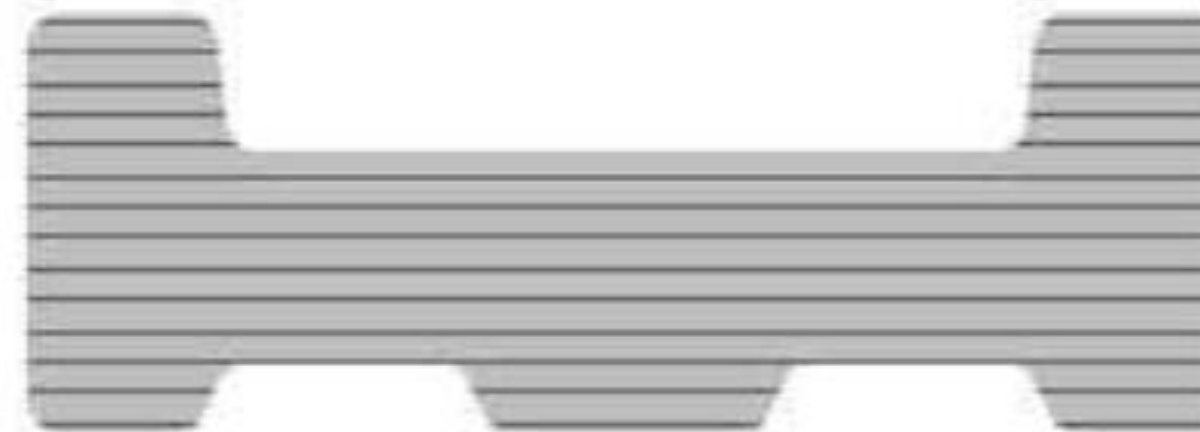
ADVANTAGES OF PARTS MADE BY DEFORMATION, COMPARED WITH MACHINING AND CASTING

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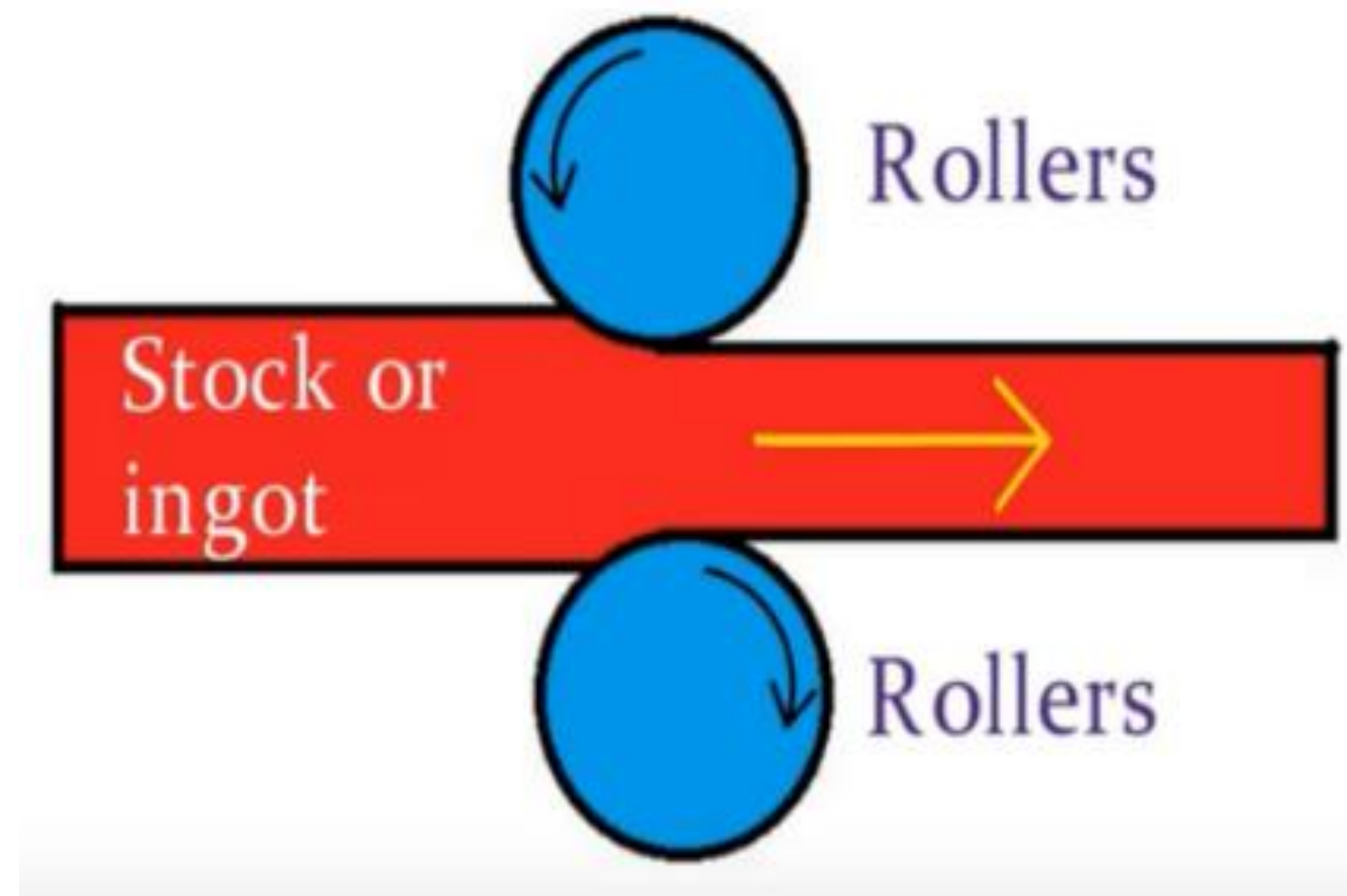


Forged Part

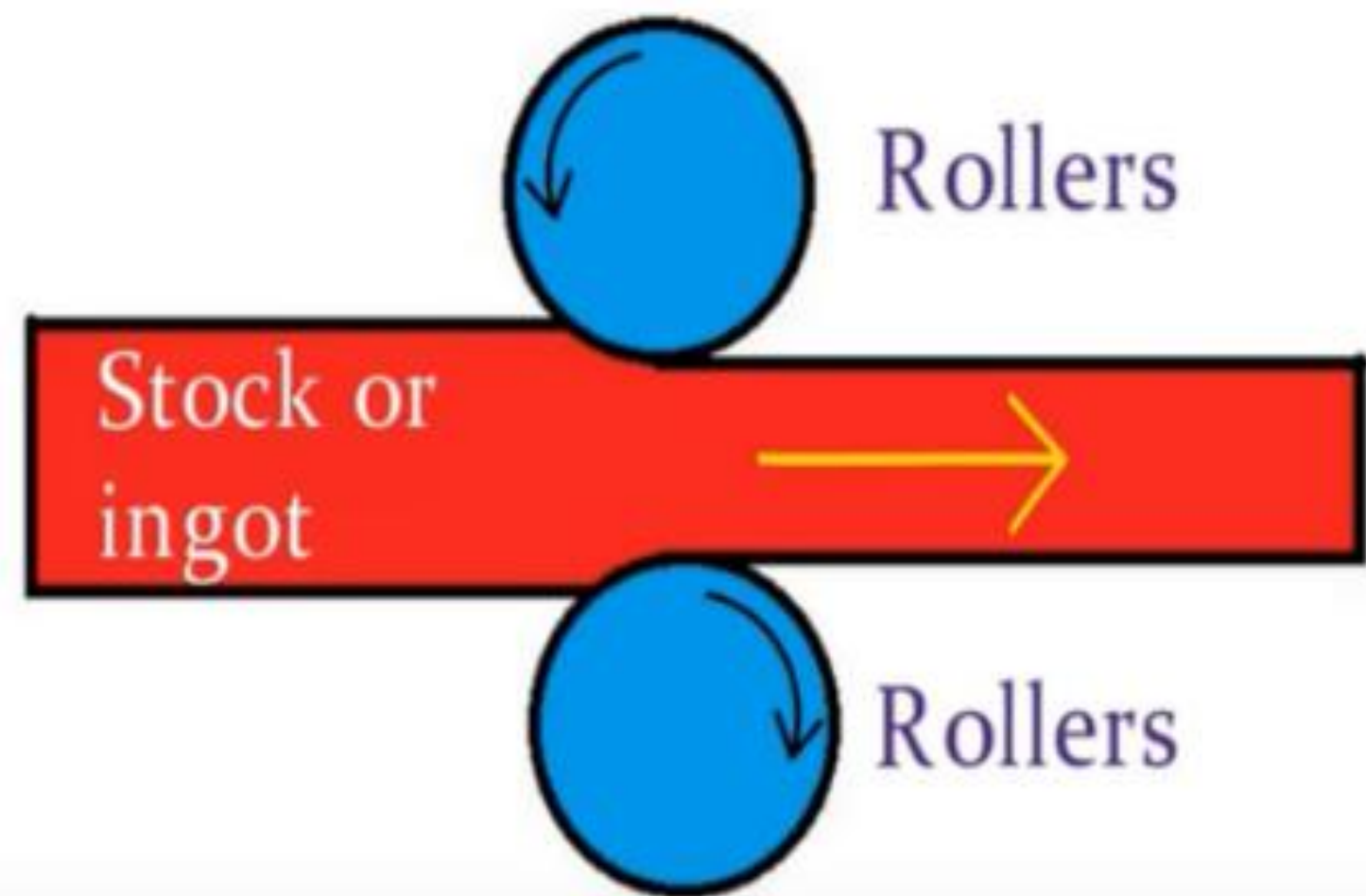


Machined Part

ROLLING

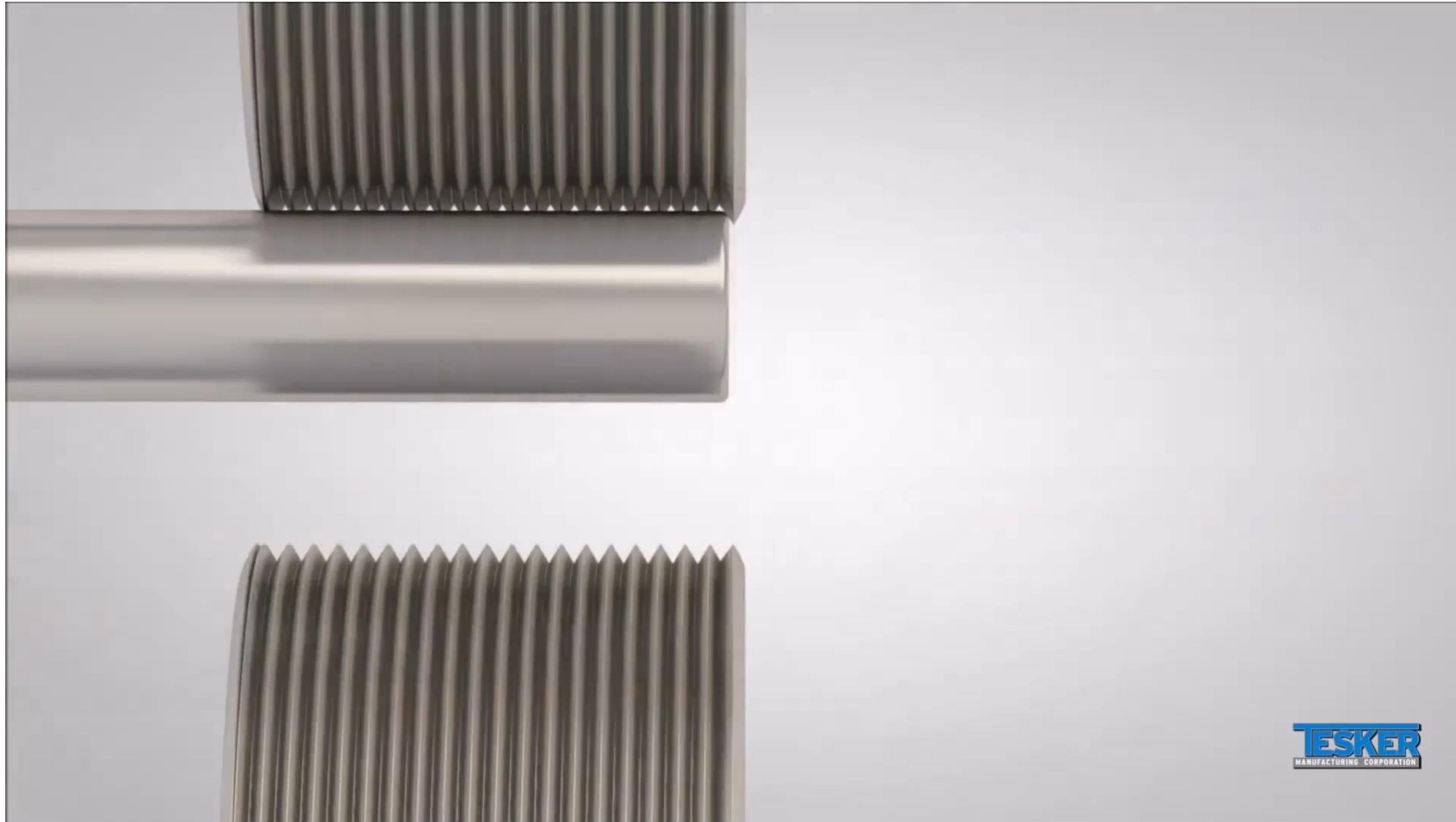


ROLLING



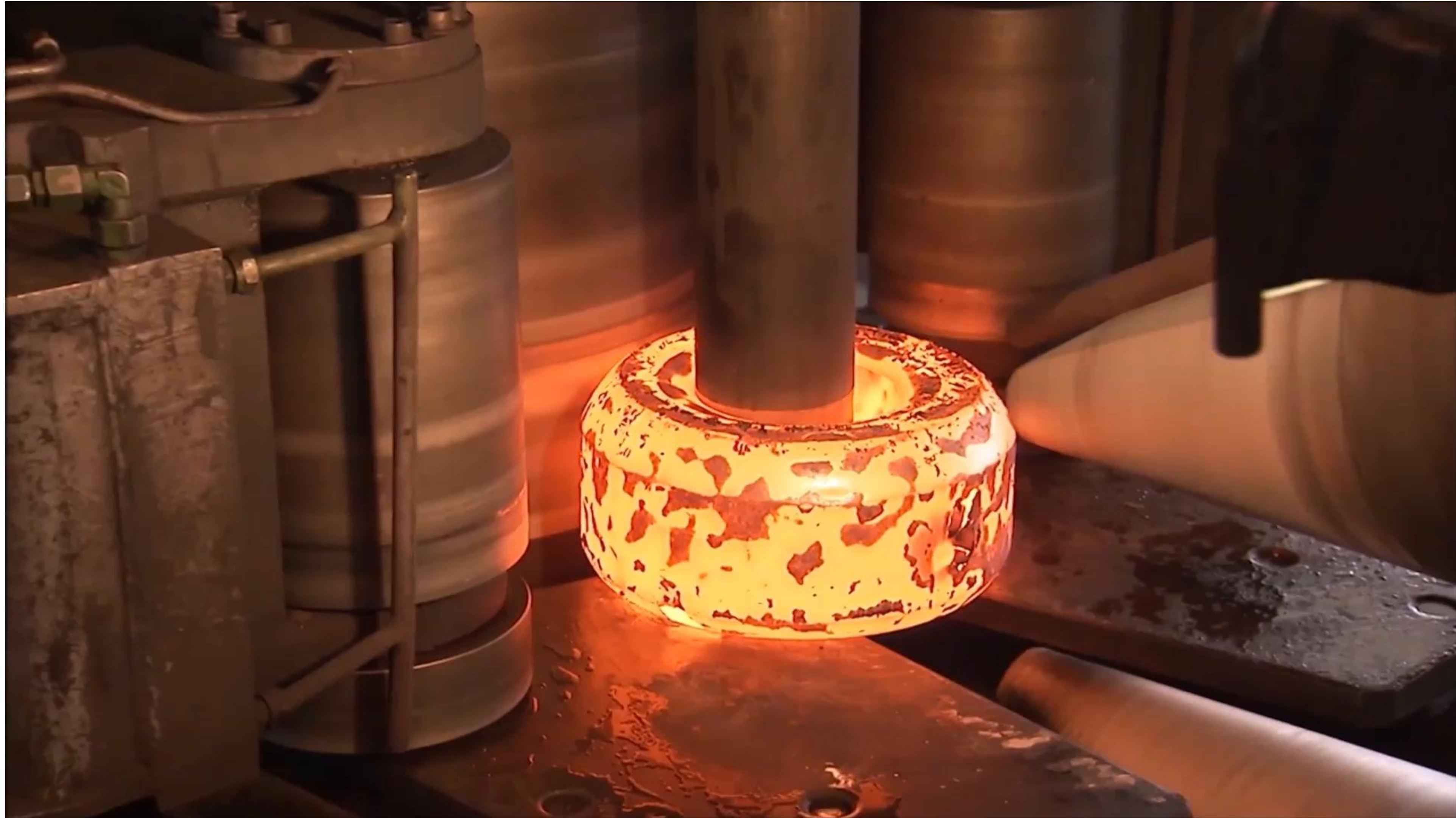
<https://www.youtube.com/watch?v=KRn73gKQ2YU>

THREAD ROLLING

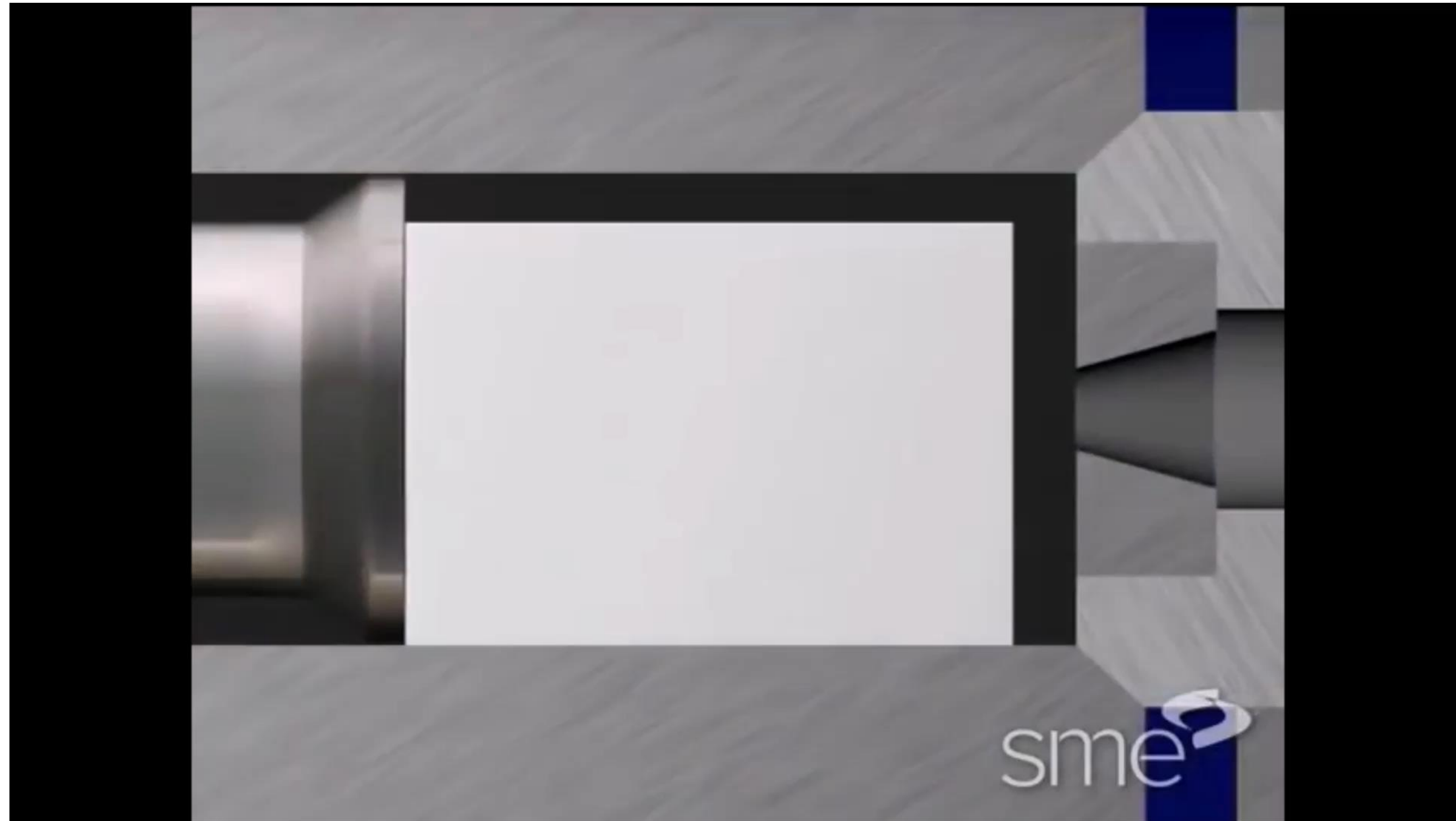


<https://www.youtube.com/watch?v=rwArBBcUNr4>

RING ROLLING



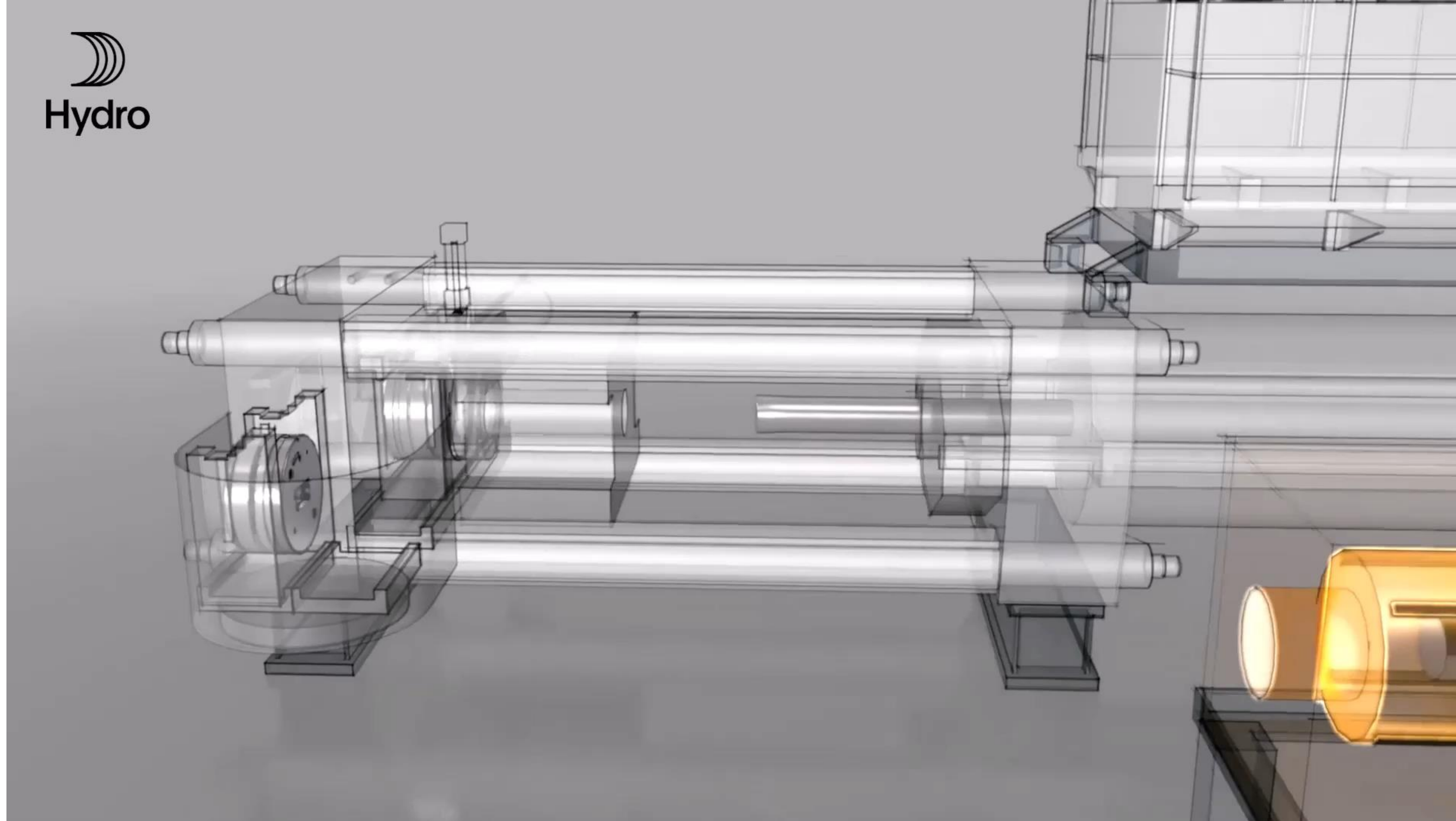
EXTRUSION



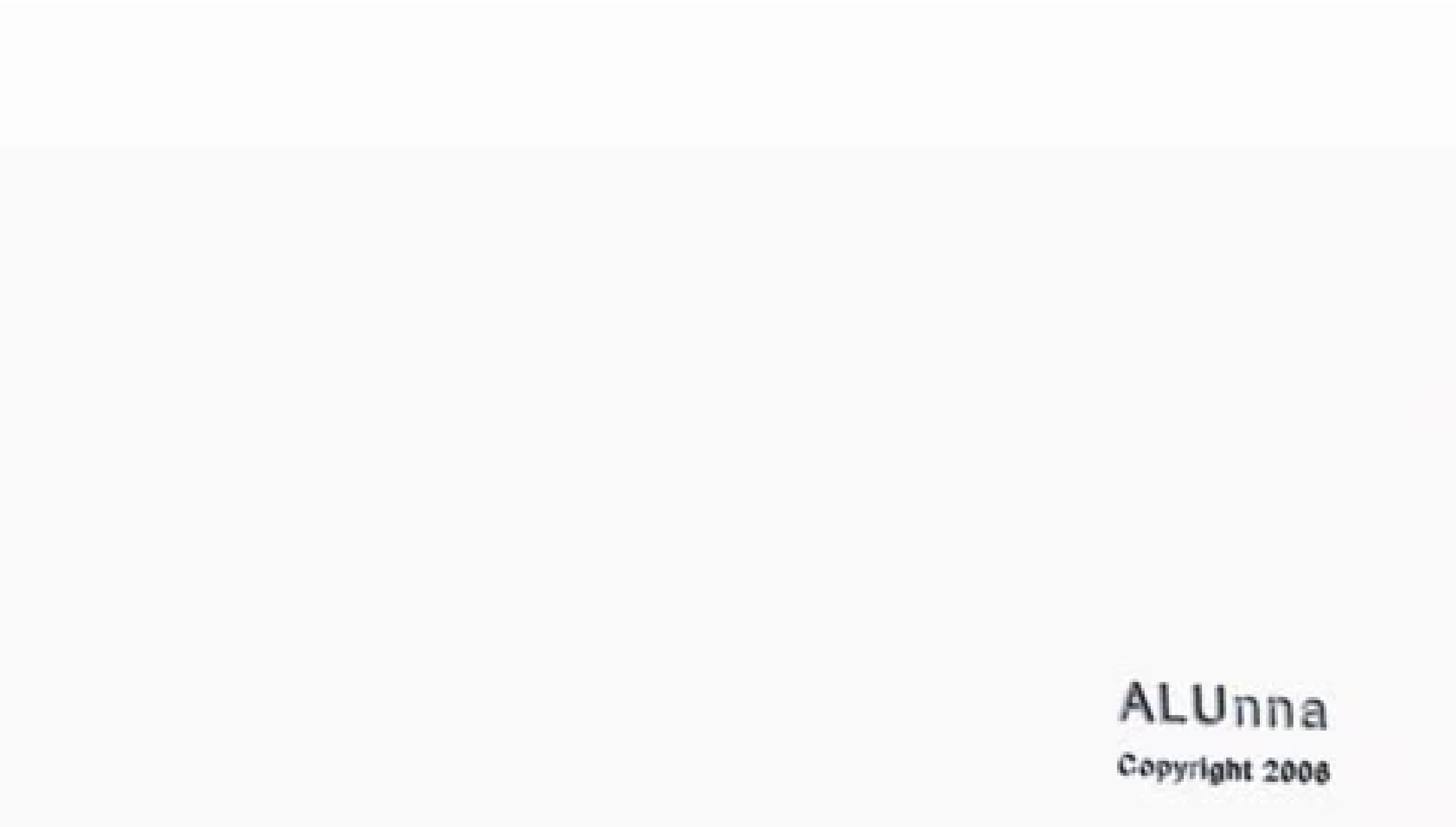
https://www.youtube.com/watch?v=Bc7o_sEdX8U

ALUMINUM EXTRUSION PROCESS

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https://www.youtube.com/watch?v=Bc7o_sEdX8U



ALUnna
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https://www.youtube.com/watch?v=QKAq1yMZlpY&list=PLGU2NEype87oEz_UGbQB1AL3B3ouxY773&index=5

FORGING

- **Open-die forging (*upset forging*)**
- **Impression-die forging (*closed-die forging*)**
- **Flashless forging**

FORGING

- Open-die forging (*upset forging*)

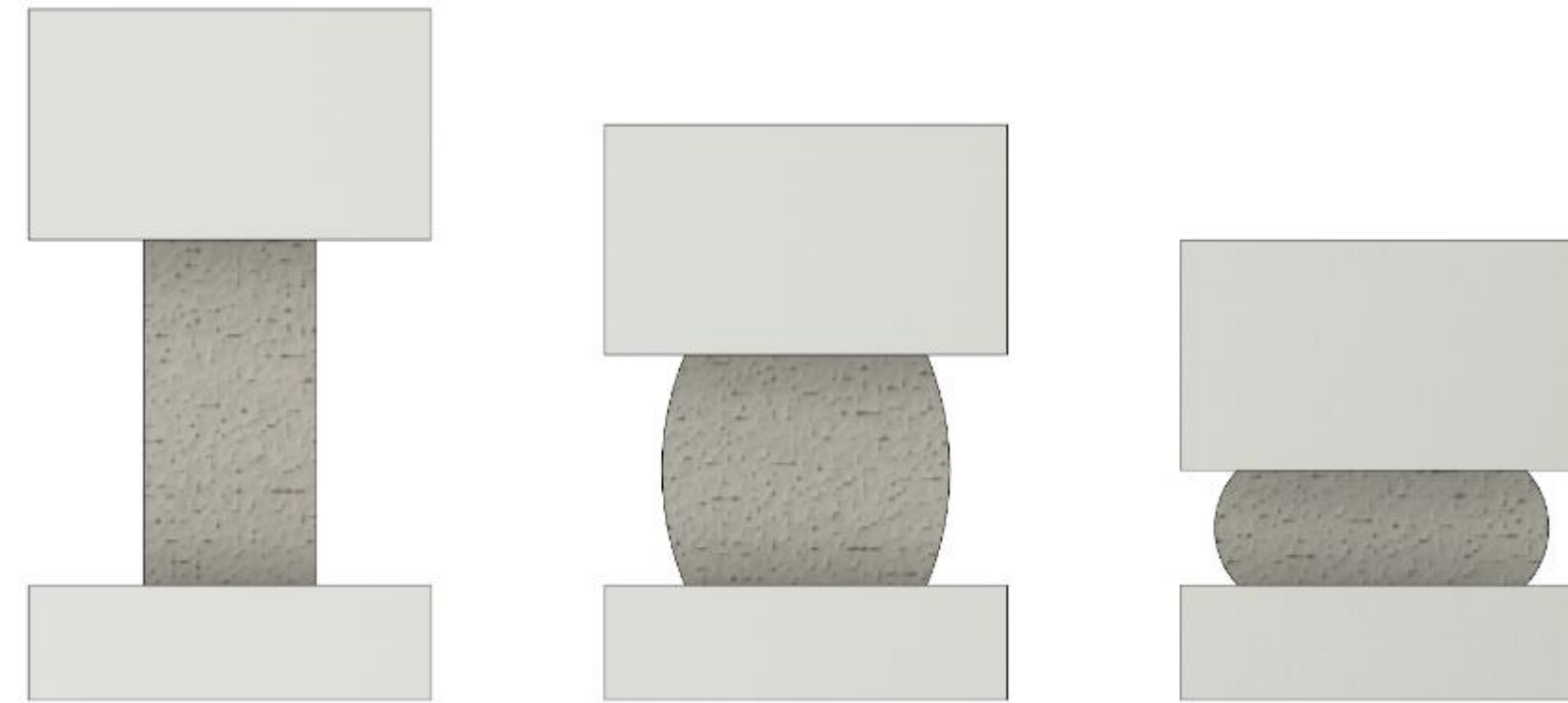


- Impression-die forging (*closed-die forging*)

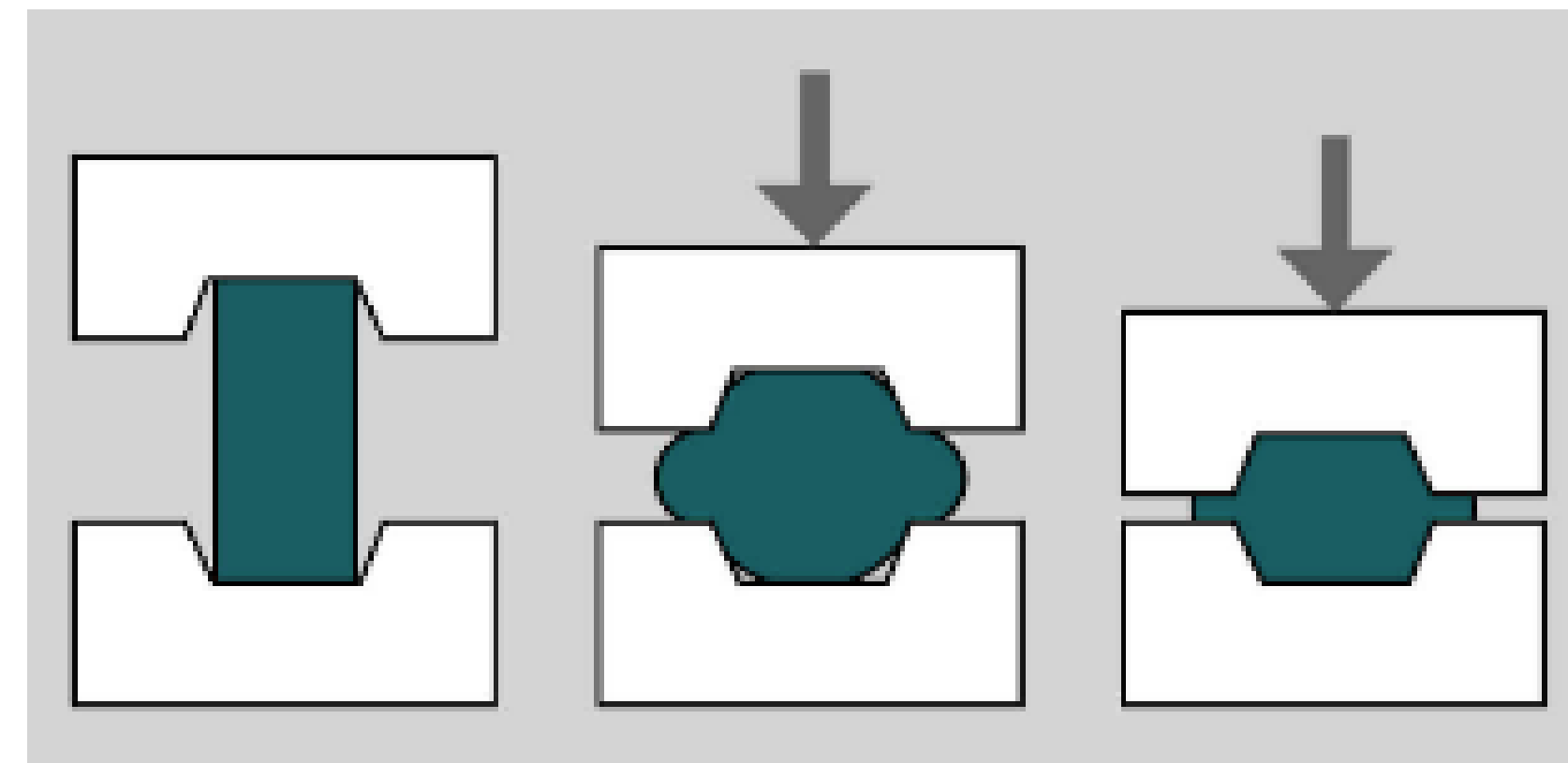
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FORGING

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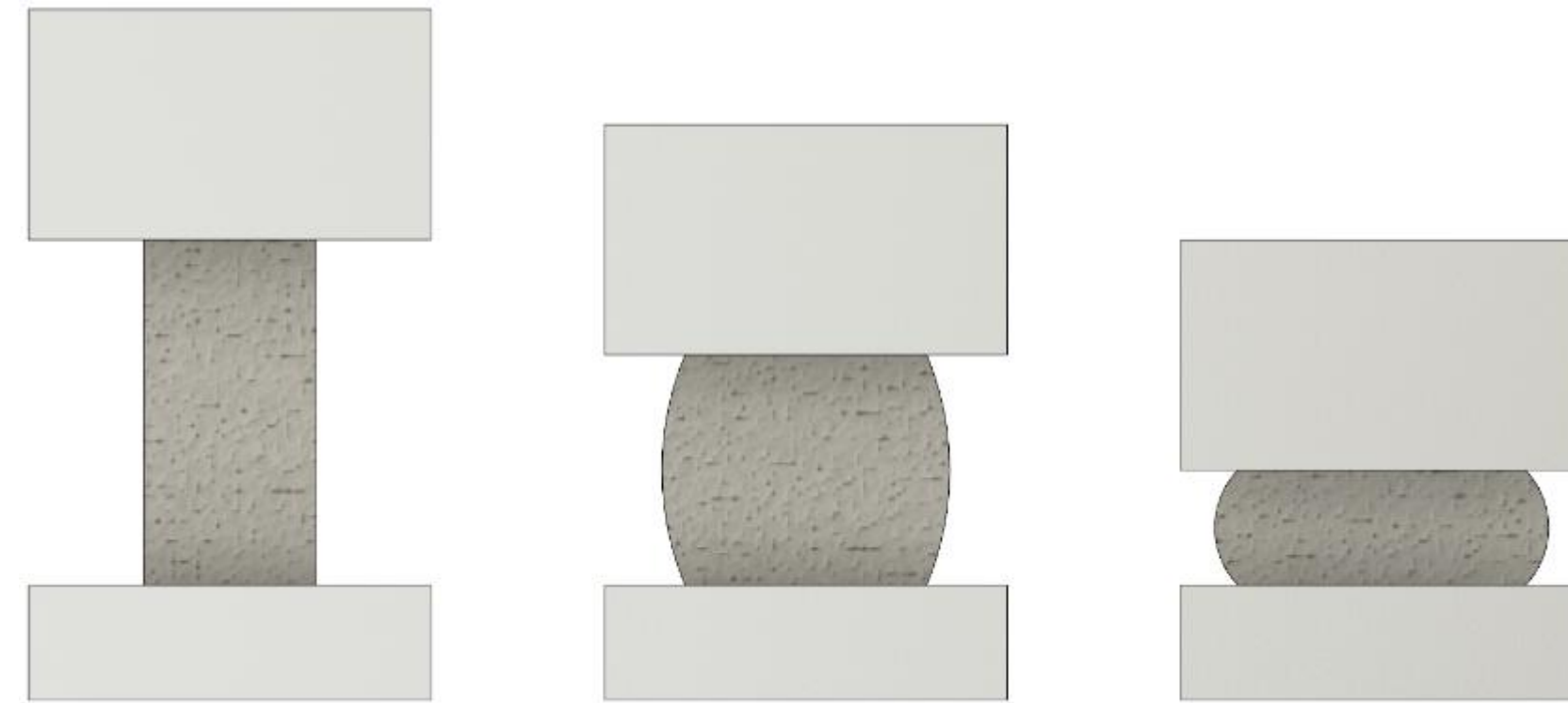
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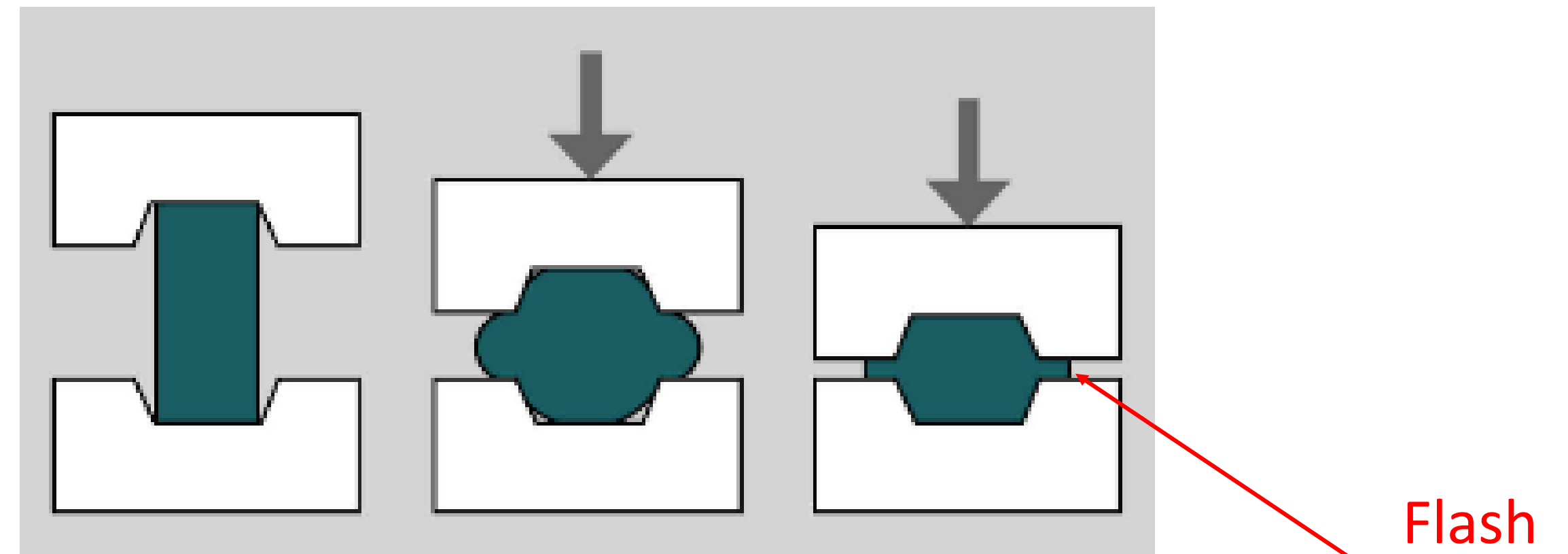
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FORGING

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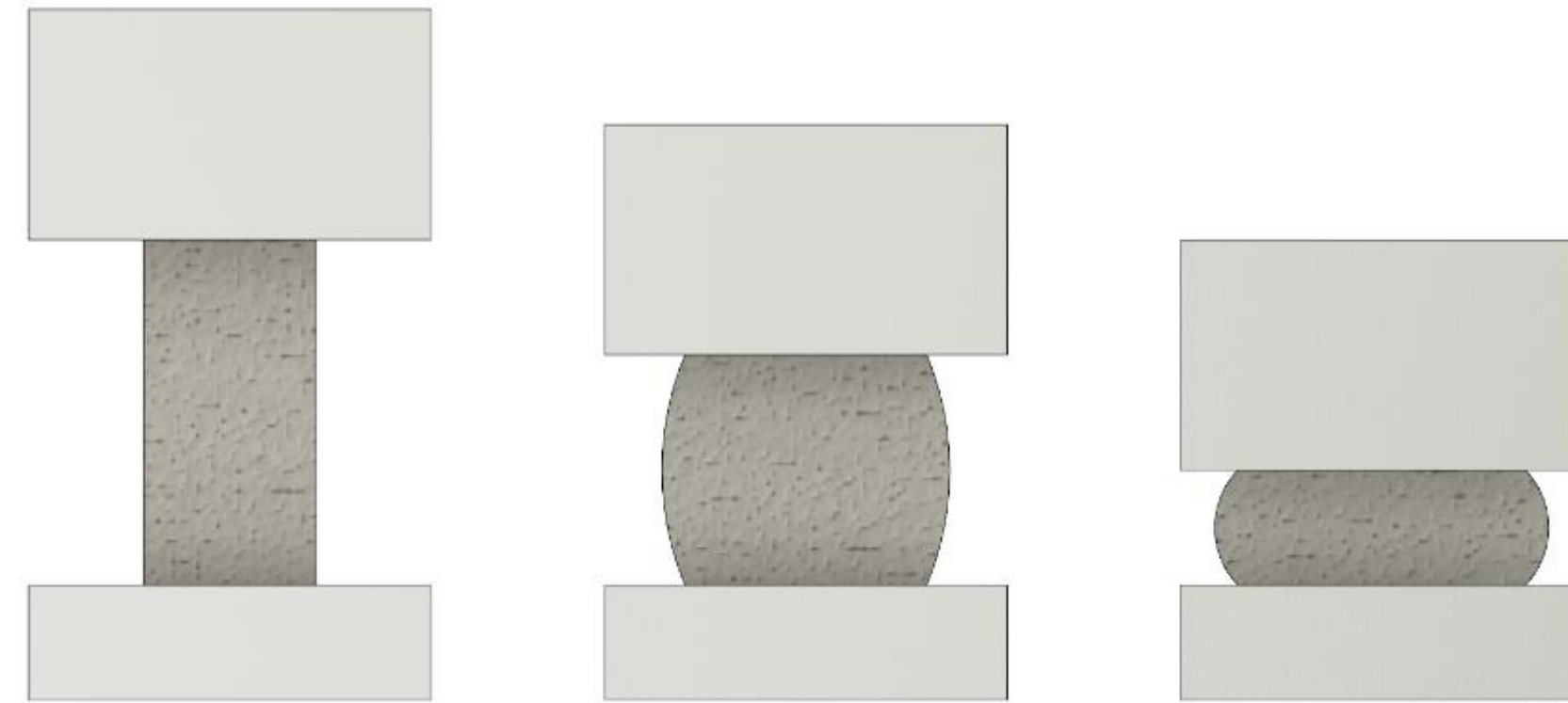
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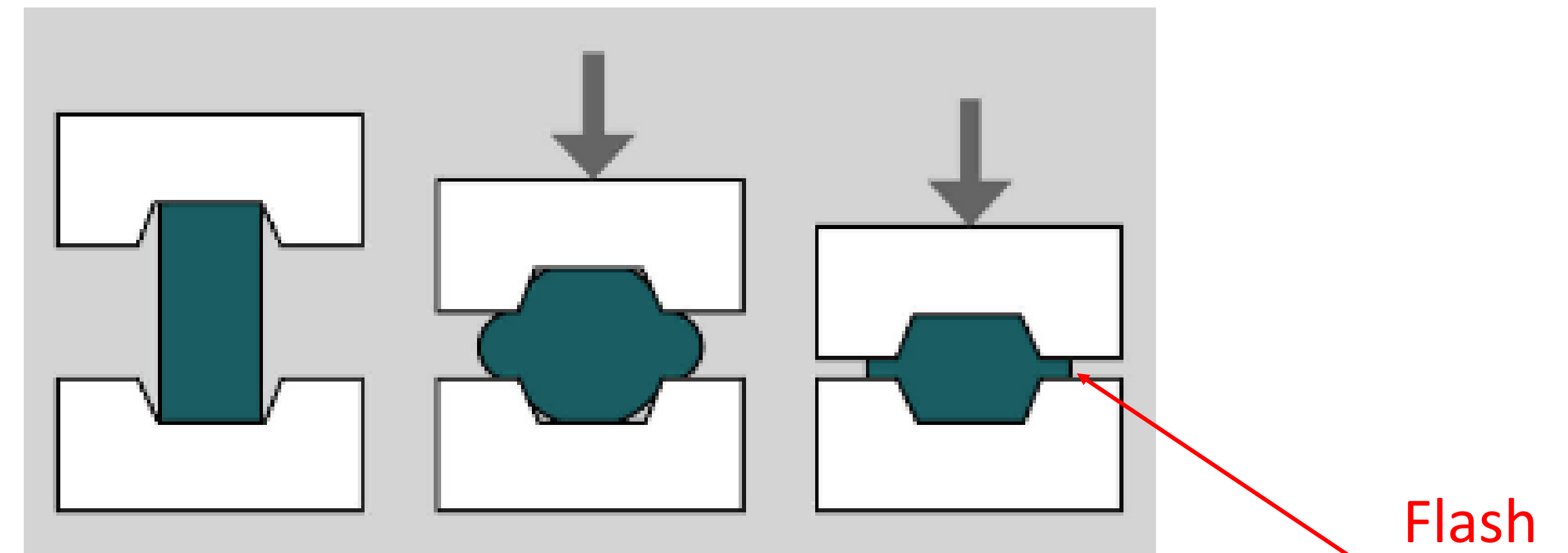
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FORGING

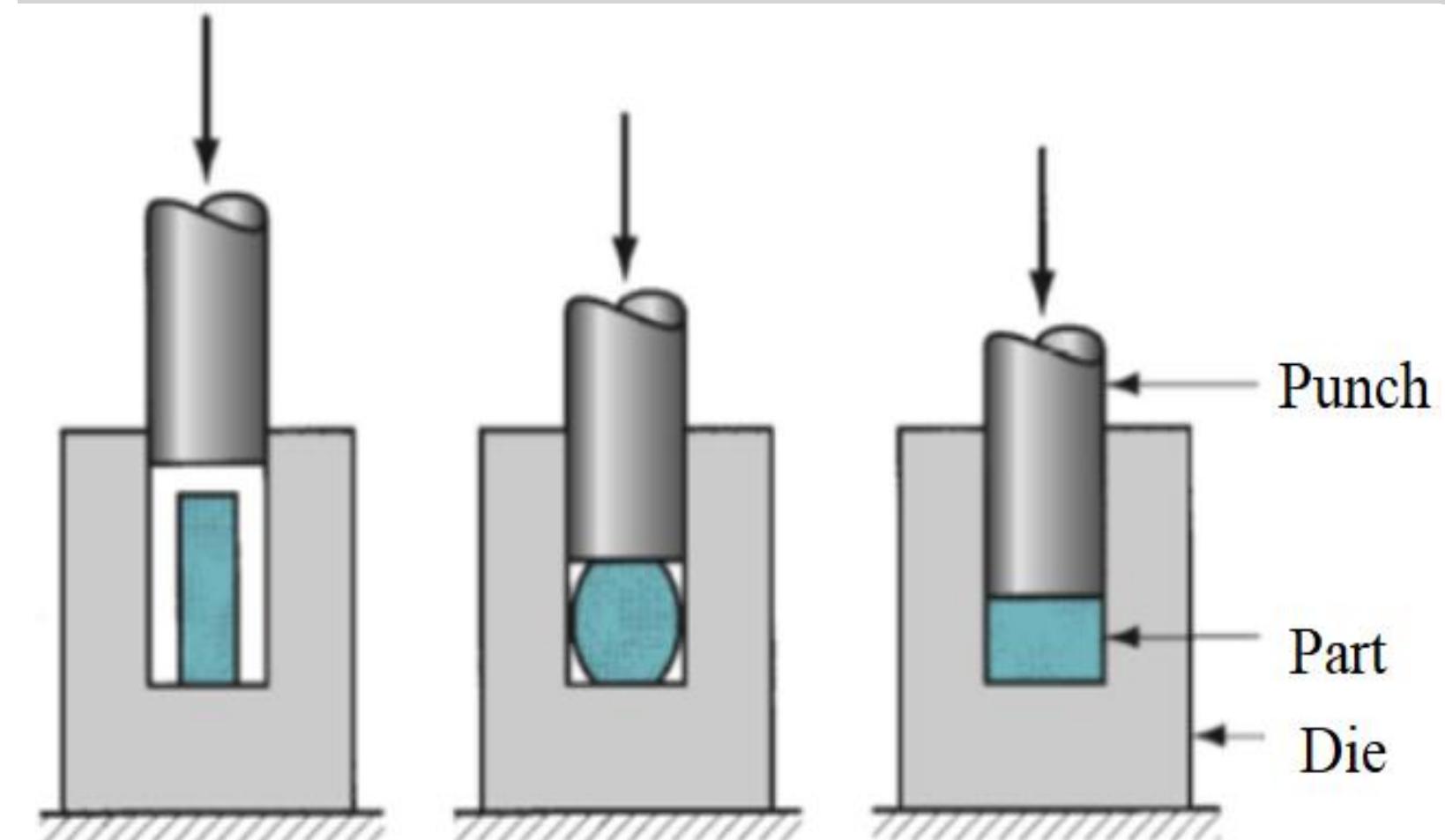
- Open-die forging (*upset forging*)



- Impression-die forging (*closed-die forging*)



- Flashless forging



ENGINEERING ANALYSIS OF BULK DEFORMATION

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In class lecture notes...