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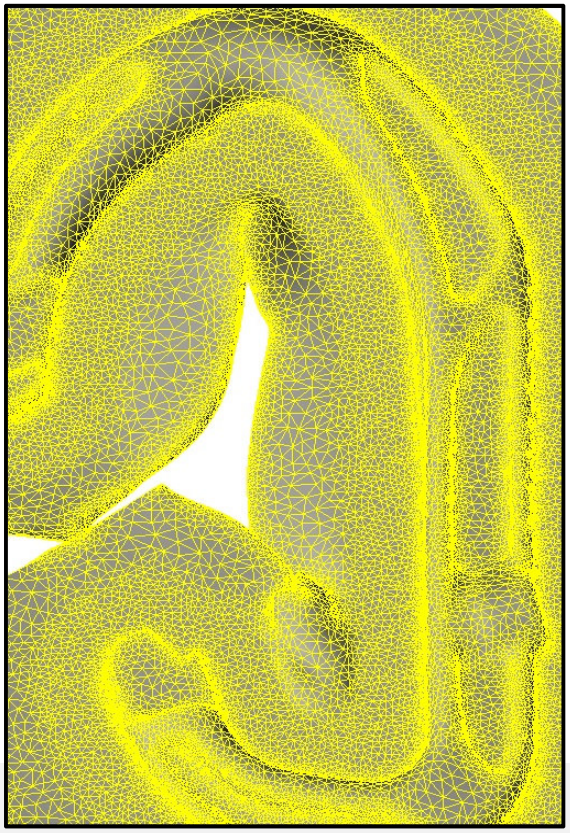
QForm 7 at DMM (UK)

Forging simulation to aid production and design

DMM PROFESSIONAL
www.dmmwales.com

Thanks to Darren McMaster

Design Engineer



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Who is DMM?

- DMM Professional have been making fine quality hardware since 1981.
  - Company based in Llanberis, Snowdonia, UK
  - 30+ years of innovation and 150+ employees, supply to 42 countries
  - Full production cycle: from idea to reality

- Safety critical products
  - Rock climbing / mountaineering
  - Work at height
  - Tree care
  - Tactical
  - Bespoke engineering

- Specialists in hot and cold forging
  - 7075 and 6082 and Steels

- 7 screw presses 150 to 1500 tons

Courtesy of DMM, Llanberis, Wales

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Field of DMM products application

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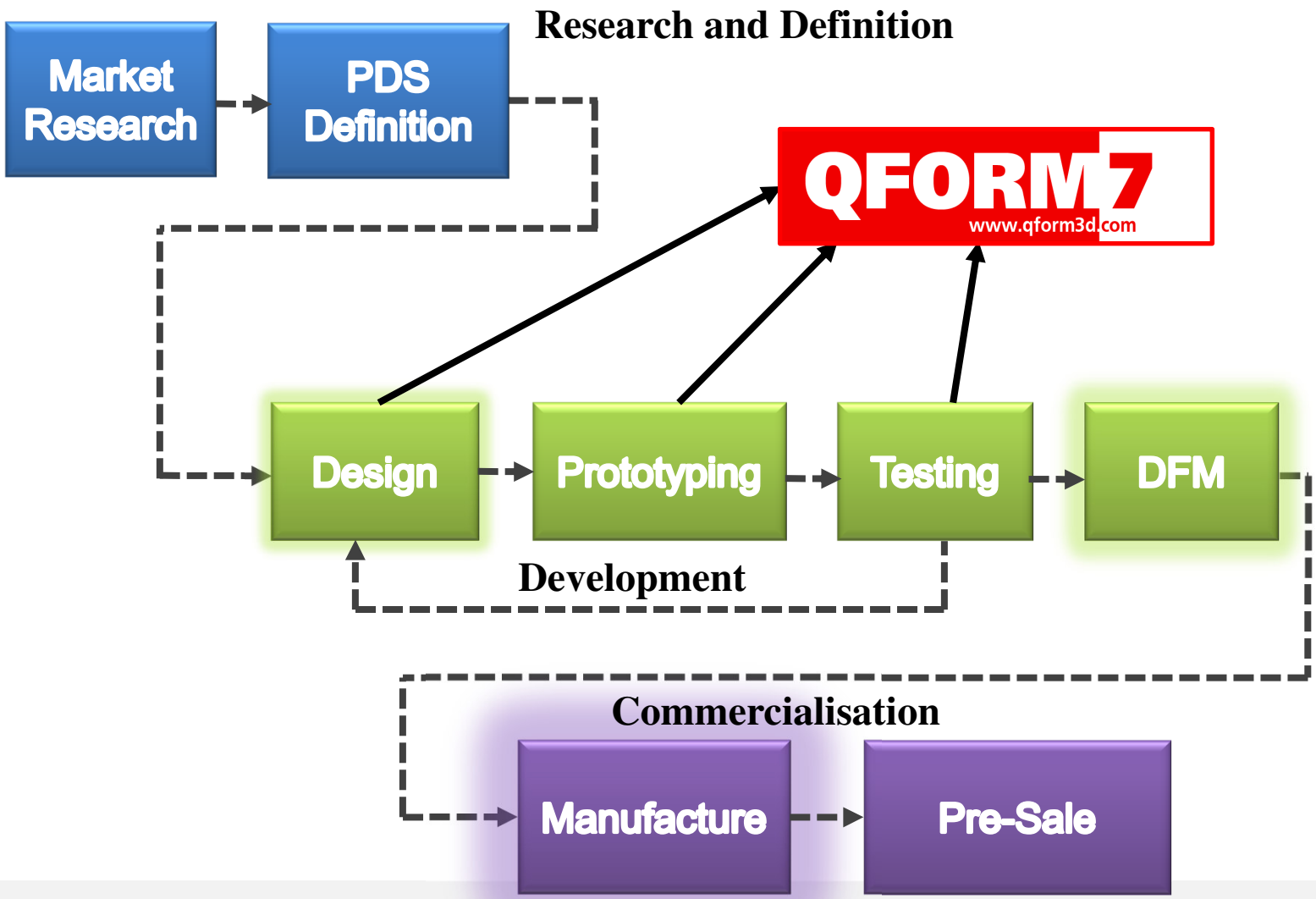
DMM process development stages



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Why DMM began to use QForm 7

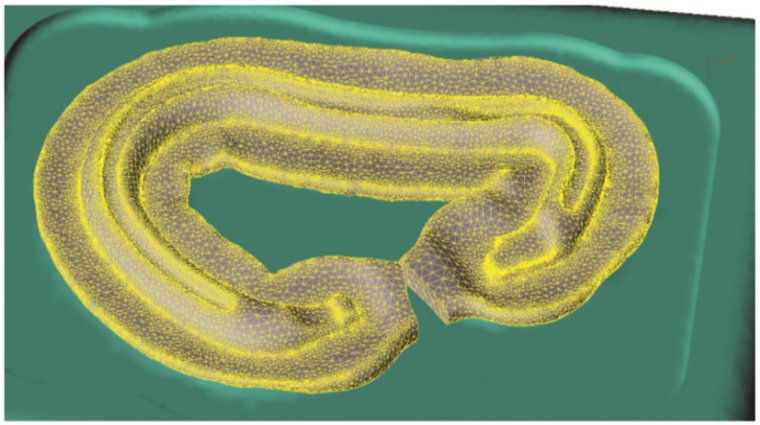
➢ **Expectations of using QForm 7:**

- Solve historic production issues (lots of tooling trials and modifications).
- Checking products before committing to tooling
- Design products based on results of the software to improve forgeability

The finished product, an aluminum carabiner for climbing tackle hardware.

➢ **What QForm 7 is doing for DMM:**

- Reducing tooling trials and modifications
- Reduced cost and lead time (only virtual trial)
- Optimising billet
- Solving historic problems with parts
- Reducing downstream costs
- Design tool
- More professional appearance



The finite element mesh of an aluminum carabiner forging at the end of stroke.

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Economic Benefits

- Tool trial £500 (inc. overhead)
- Tool modification £50 / hour (inc. overhead)

"Carbiners"	Cresto	"Axes"

• 13 different types
• 40 trials
  • £20,000
• Tool mods
  • £6,000
• Unrequired tool
  • £4,000
• **Total**
  • **£30,000**
	• 6 different types
	• 20 trials
	  • £10,000
	• Tool mods
	  • £3,000
	• First delivery on time
	• **Total**
	  • **£13,000**
		• 5 different types
		• 15 trials
		  • £7,500
		• Tool mods
		  • £2,000
		• Professional appearance
		• **Total**
		  • **£9,500**

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Case Study – D Ring

- Order 10,000 per year
- £4.00 each
- Order value of £40,000
- High customer expectations – needs to be perfect
- Getting cosmetic folds in part – unacceptable

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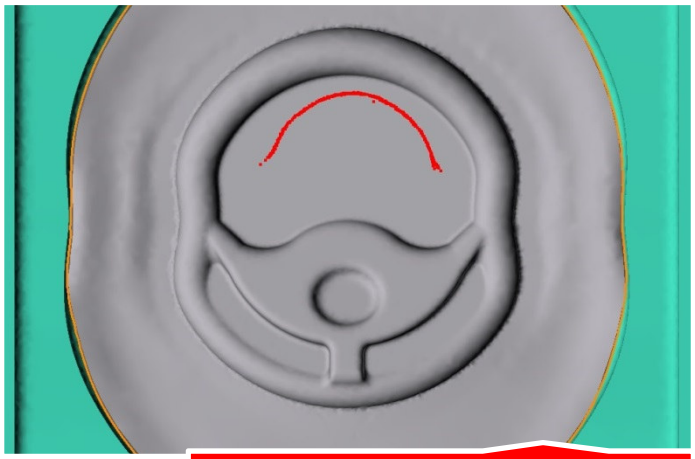
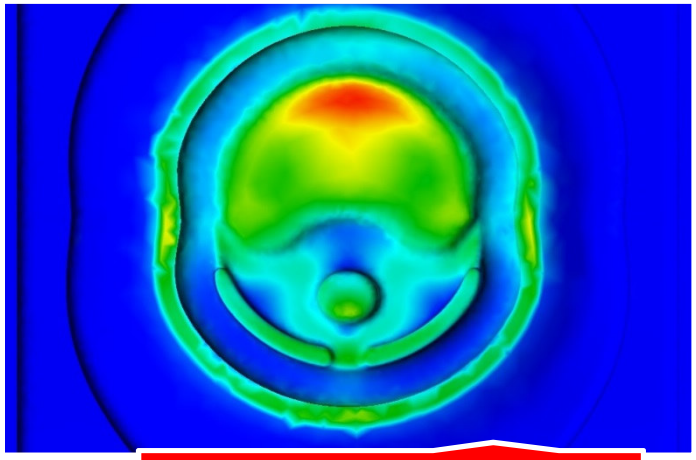
Current Production Problems

Non-standard billet



Folds on inside surface



High die wear

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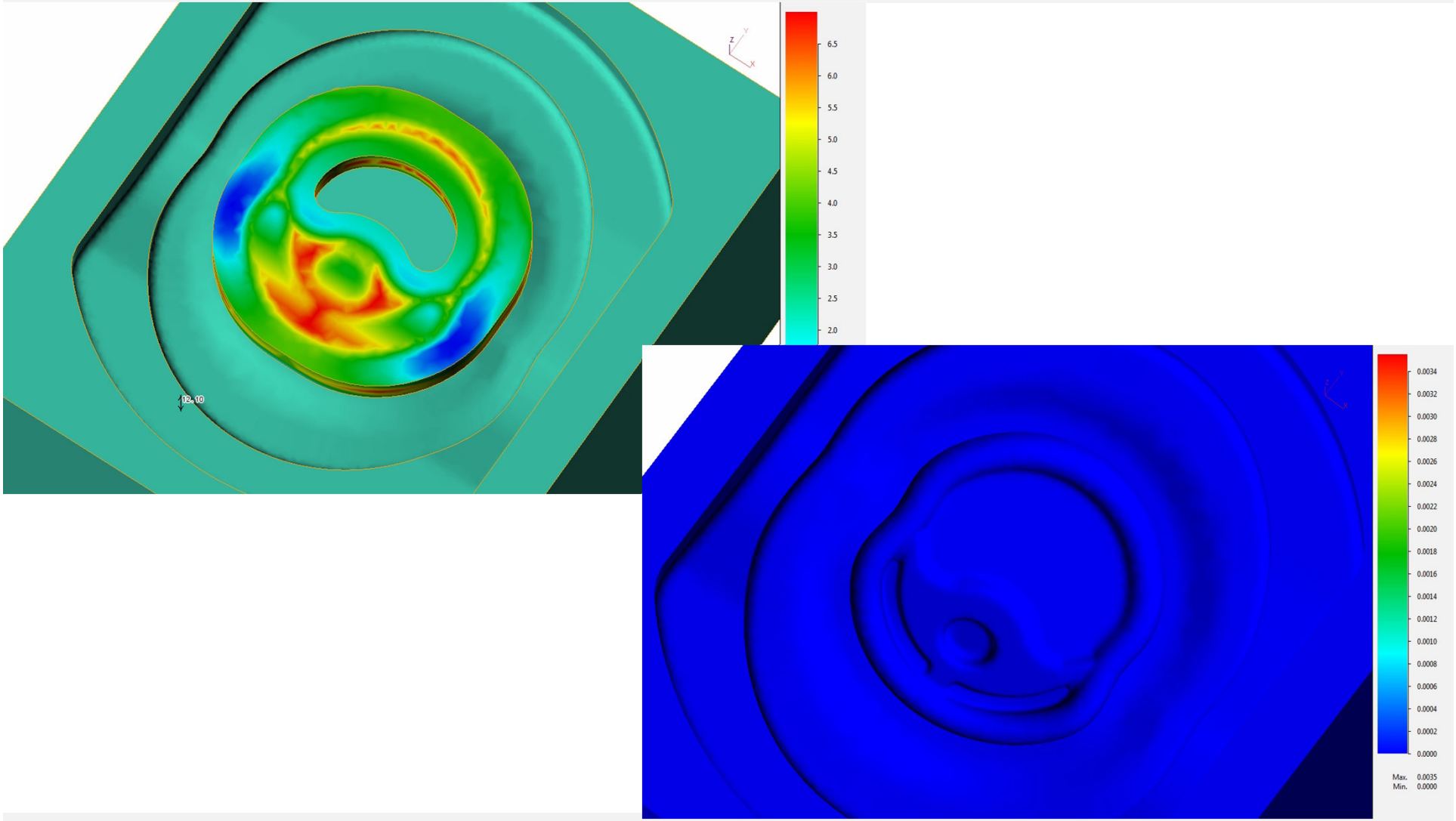
Forging Problems



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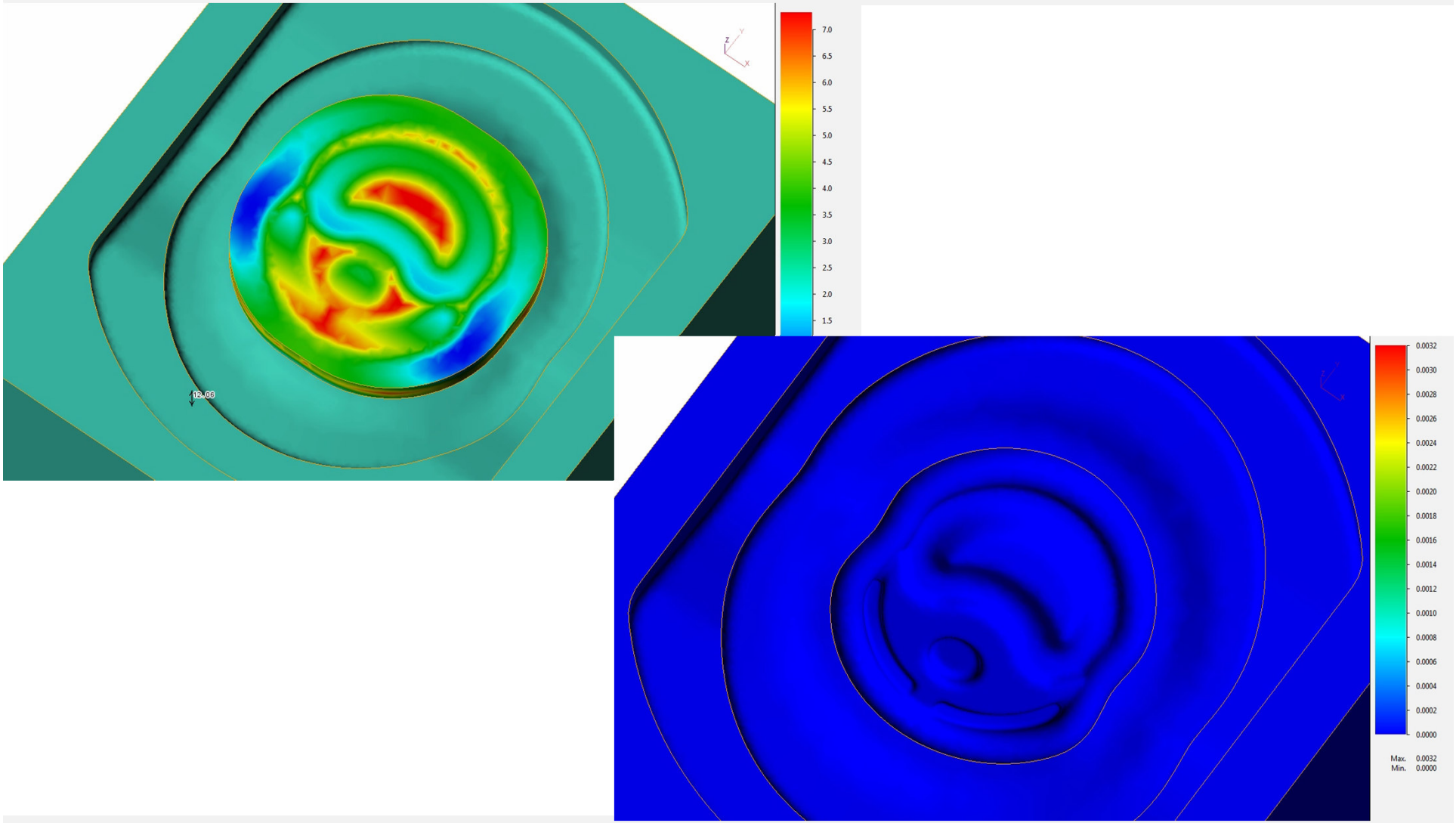
The proposed solution



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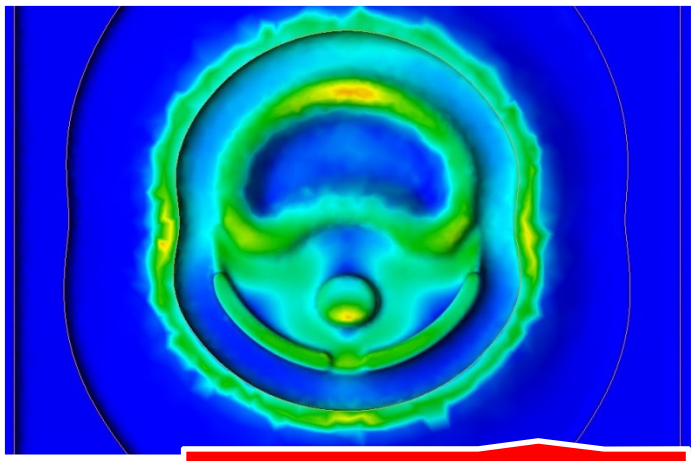
Solving Production Problems

Standard billet

No folds!



Less die wear

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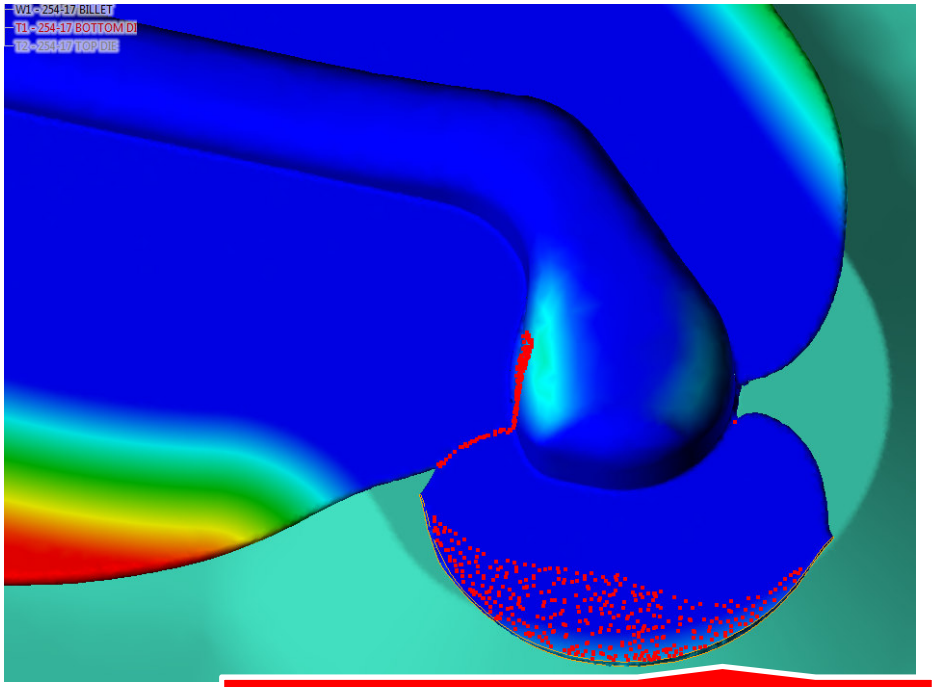
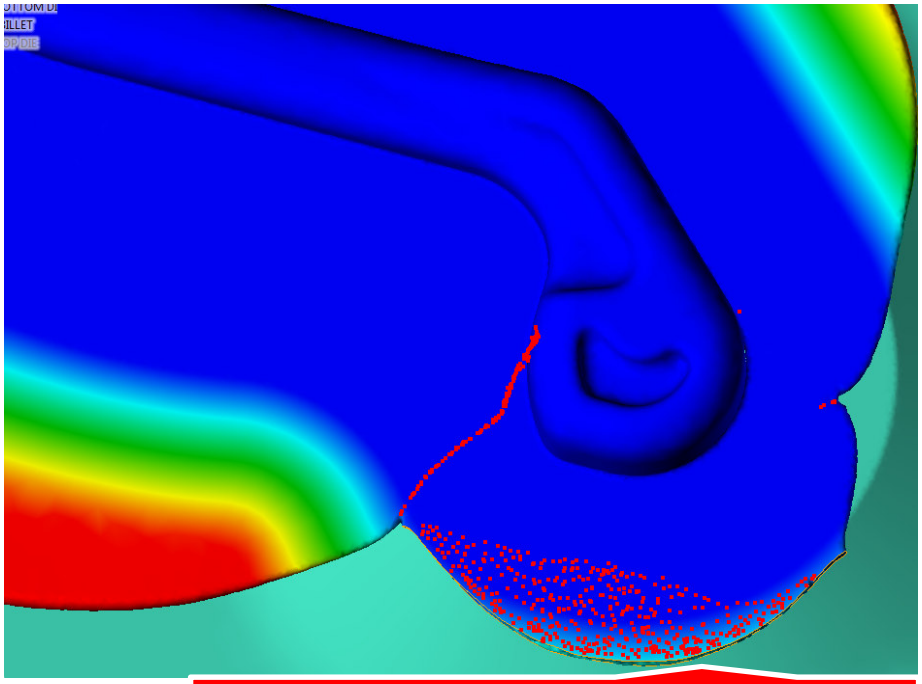
Additional case



Non fill



Panels added to improve fill

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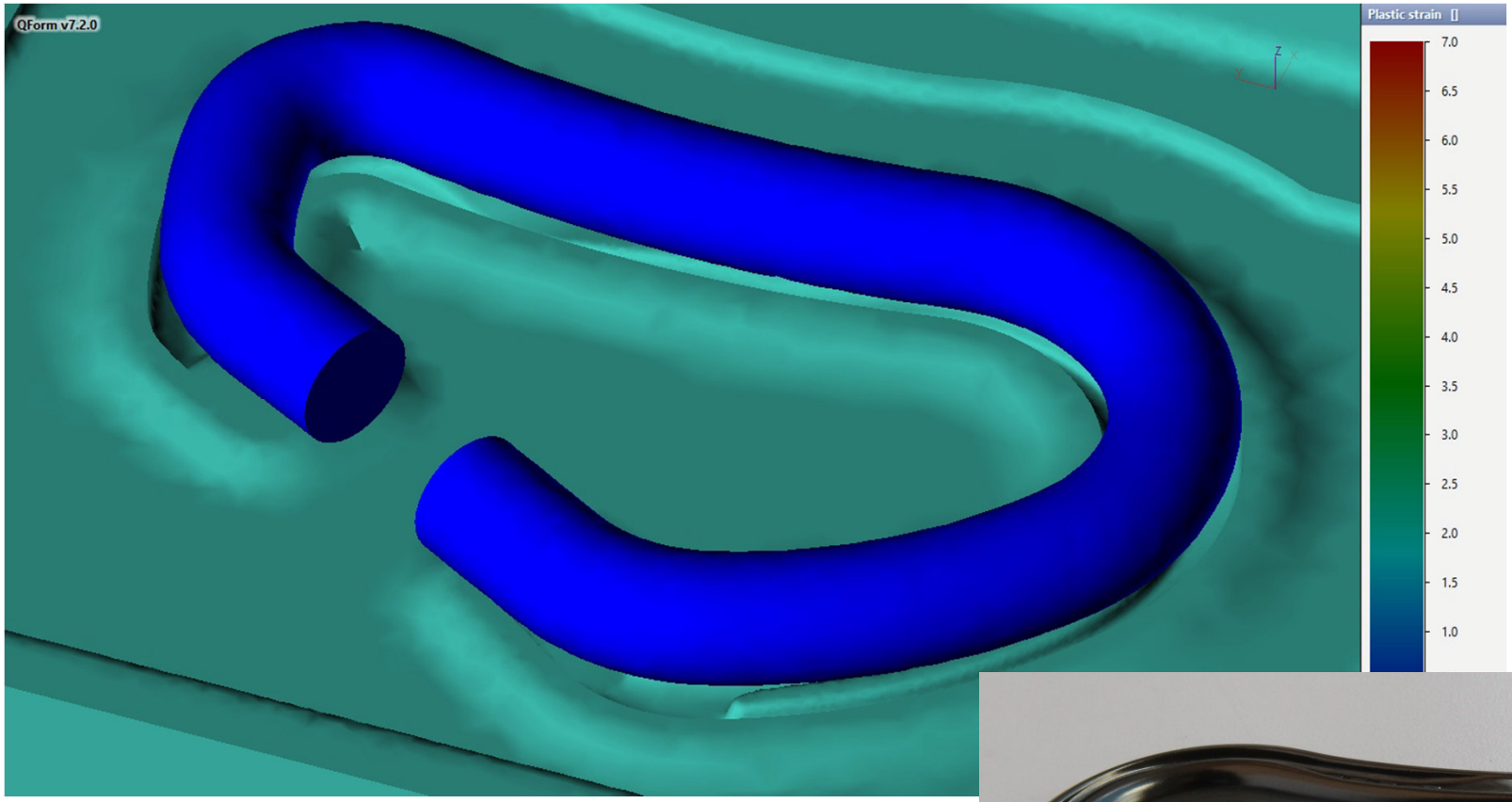
Forging of carabiners. Strain distribution



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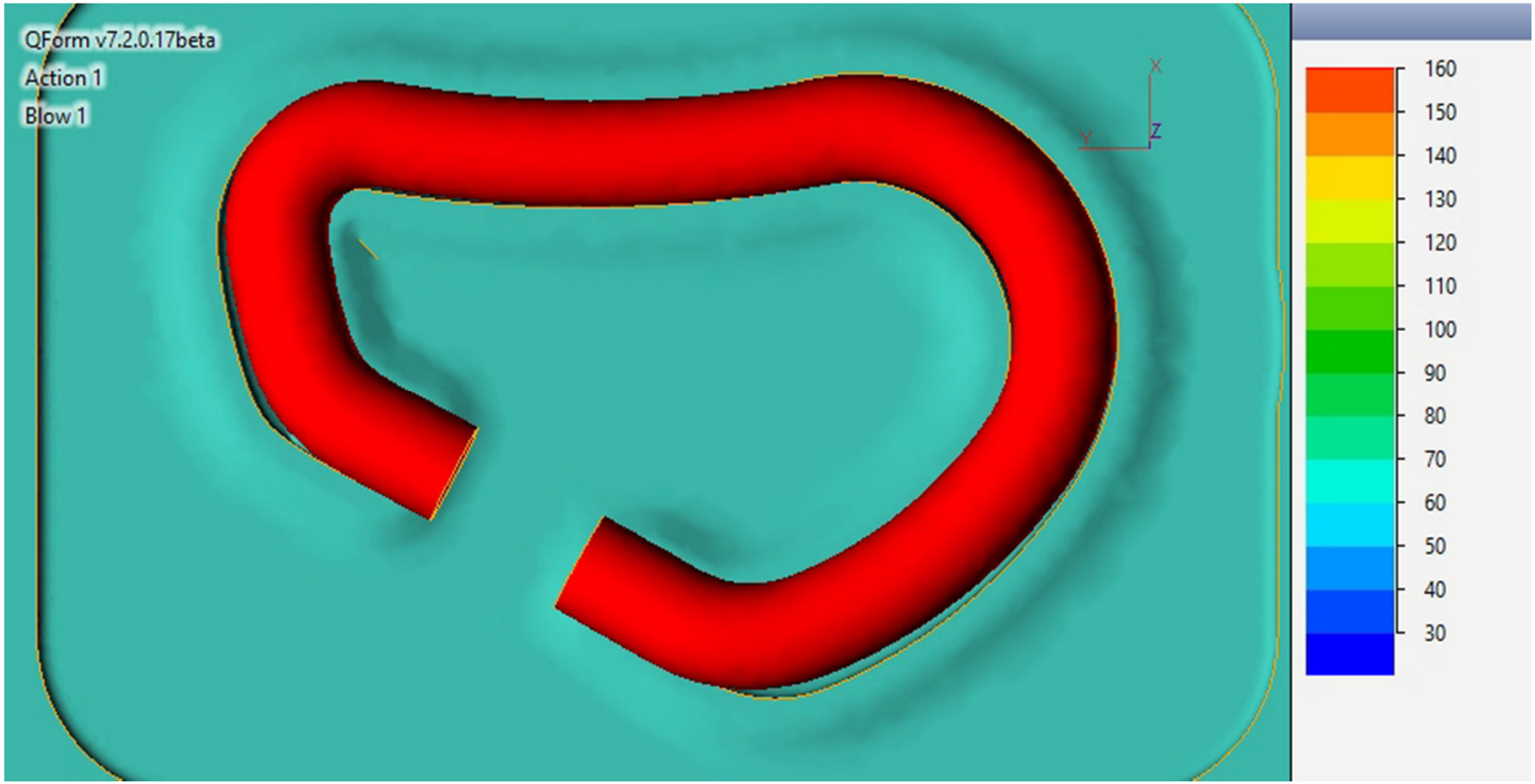
Forging of carabiners. Grain size distribution prediction (mkm)



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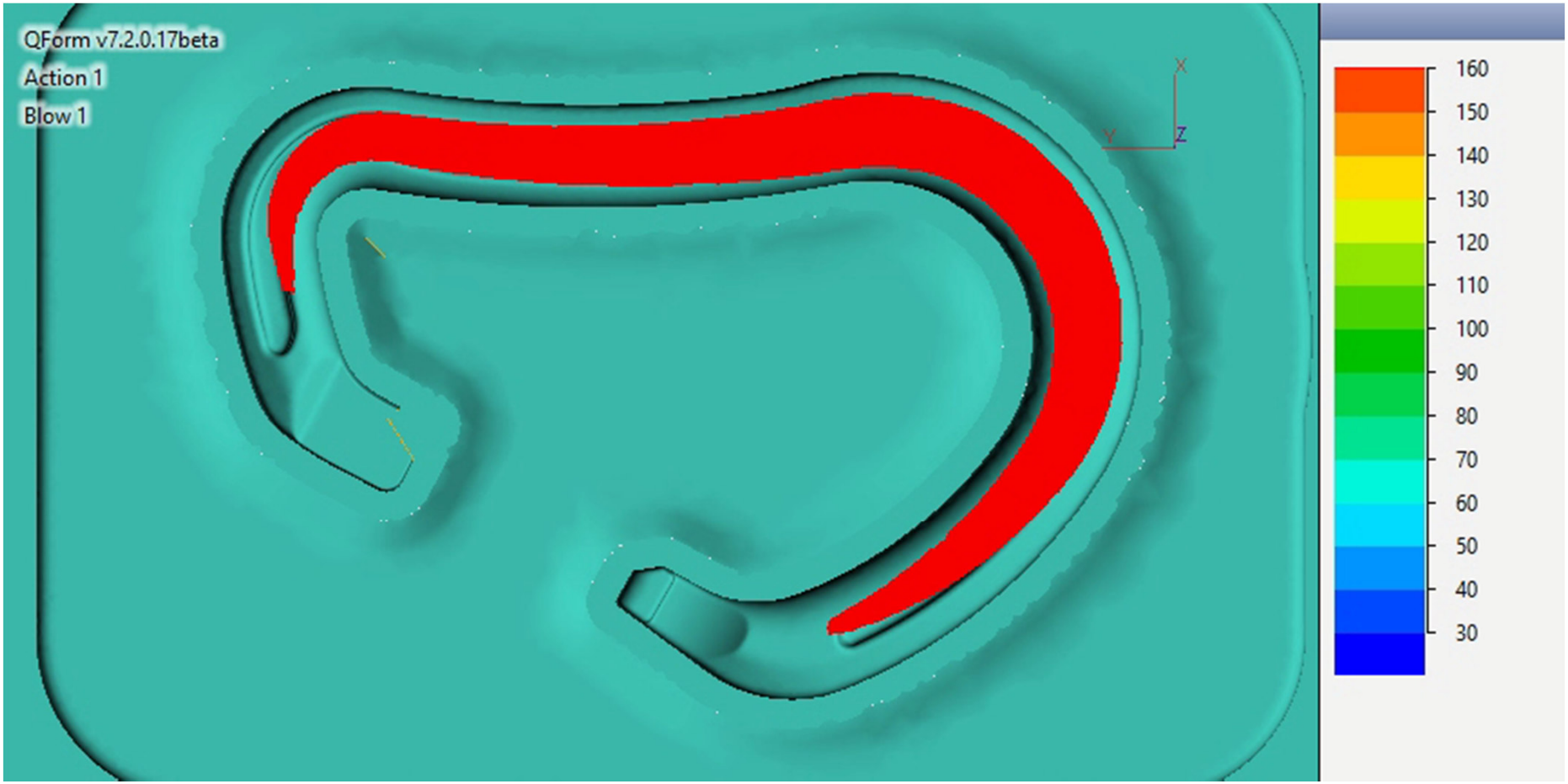
Grain size distribution prediction (mkm, meridian cross section)



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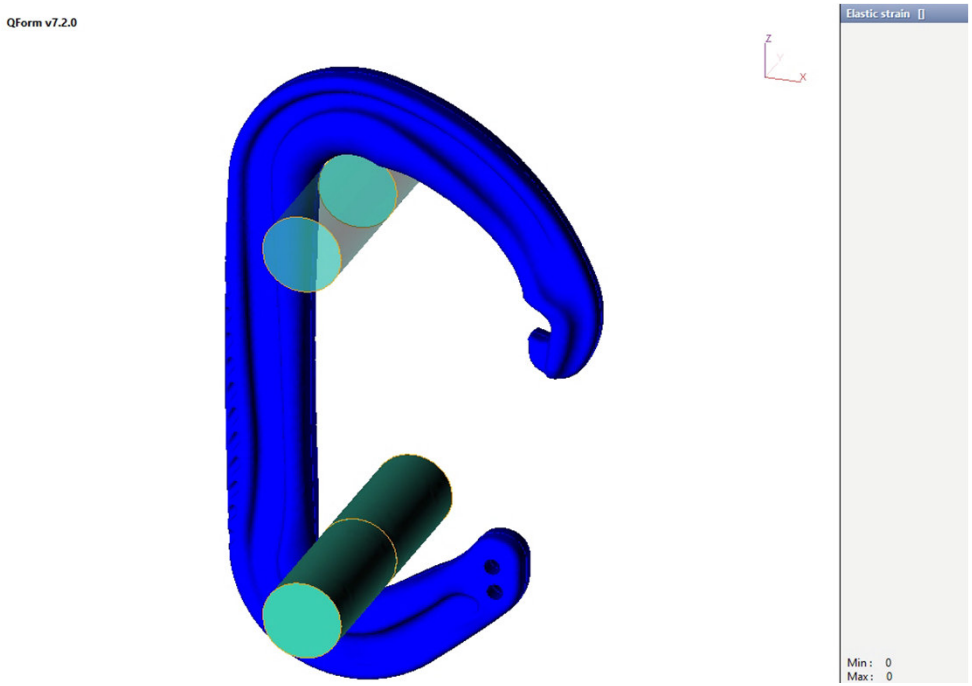
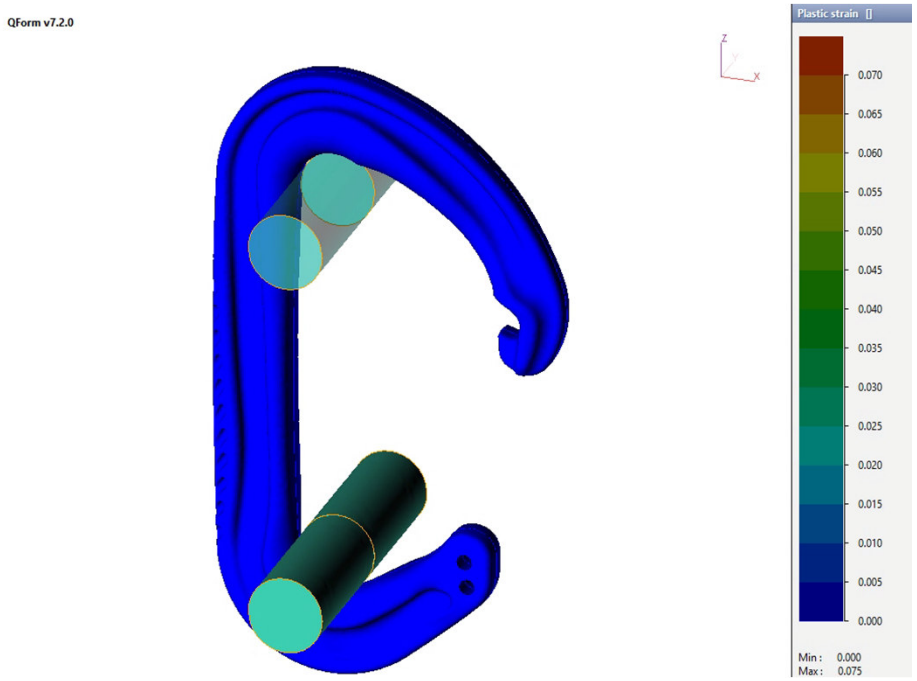
Carabiner pull test: elastic-plastic material model

Elastic component of strain



Plastic component of strain



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Summary

QForm helps to:

- Solve problems with existing products
- Improve part and tool design
- Reduce trials and tooling modifications
- Reduce the subsequent impact on production
- Reduce product lead time
- Reduce downstream costs
- Improve cash flow
- Look more professional