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Small Lap Detection

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Overview

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- Small laps pose a challenge in 3D simulations.
- Defect scale is a mere fraction of total model size.
- Laps must be larger than the minimum element size.
- Specific tools and methods can greatly improve small lap detection ability.

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Critical Considerations

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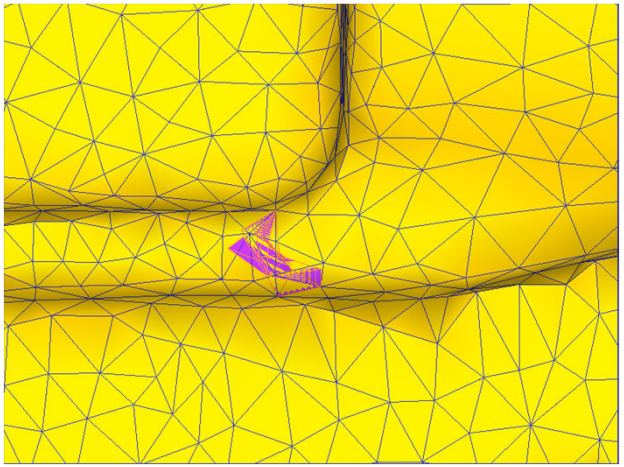
- Mesh settings
- Material data
- Setup options
- Postprocessing tools
- Postprocessing effort

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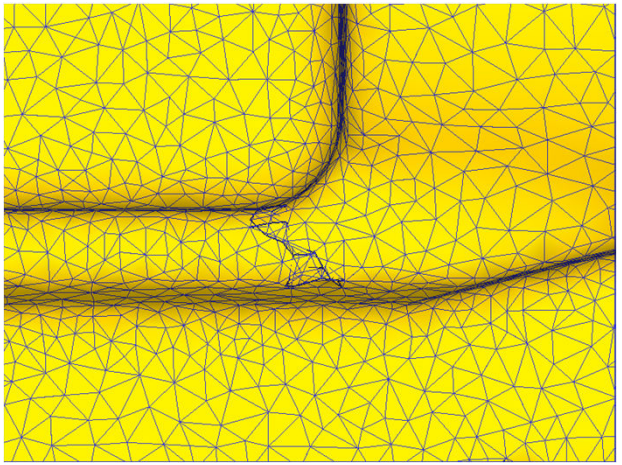
Mesh Settings

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- Mesh density is important in capturing laps.
- Self-contact can be utilized.
- Local remeshing may preserve more fold detail than global.
- Strain-rate magnitude mesh weighting is on option that may improve element size near fold edges.



Coarse, global remesh w/o self contact



Fine, local remesh with self contact

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Material Data

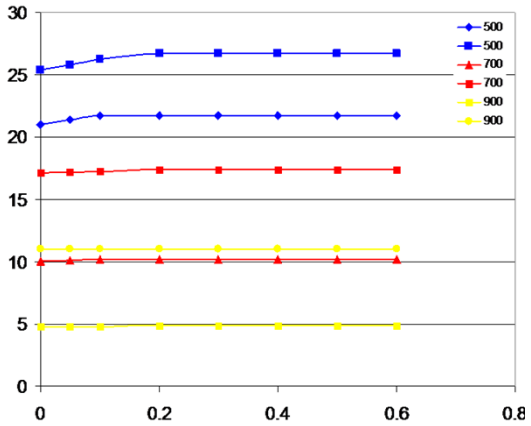
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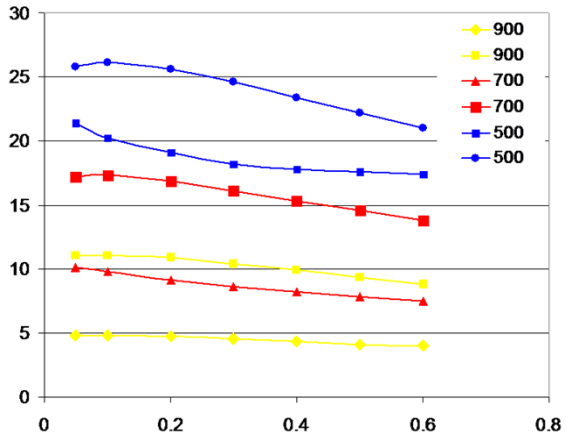
- Flow softening can contribute to the severity of laps.
- It may be needed to correctly detect some actual laps.
- With out it, some laps start to form but then “push out”.
- Aluminum and other soft metals are especially suspect to flow softening effects.
- Select DEFORM material data has been updated to include flow softening effects.

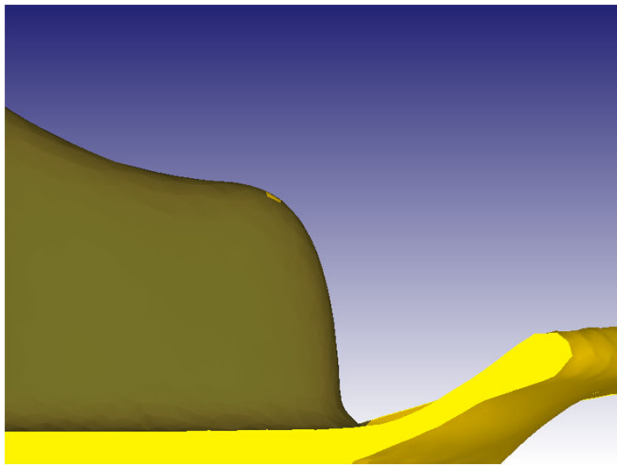
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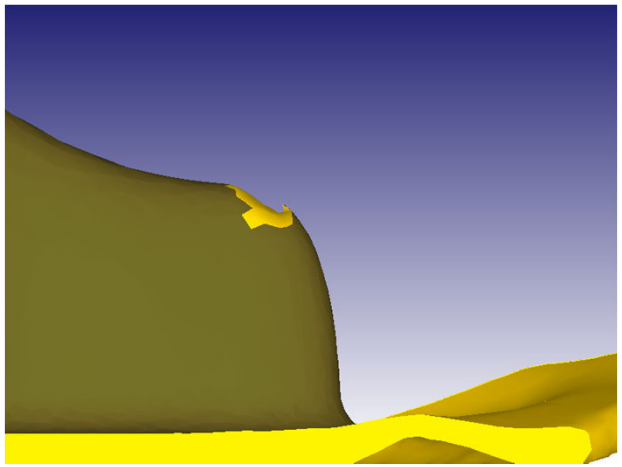
Material Data

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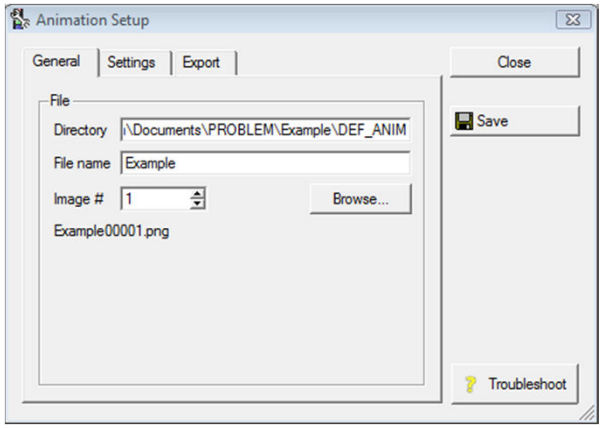


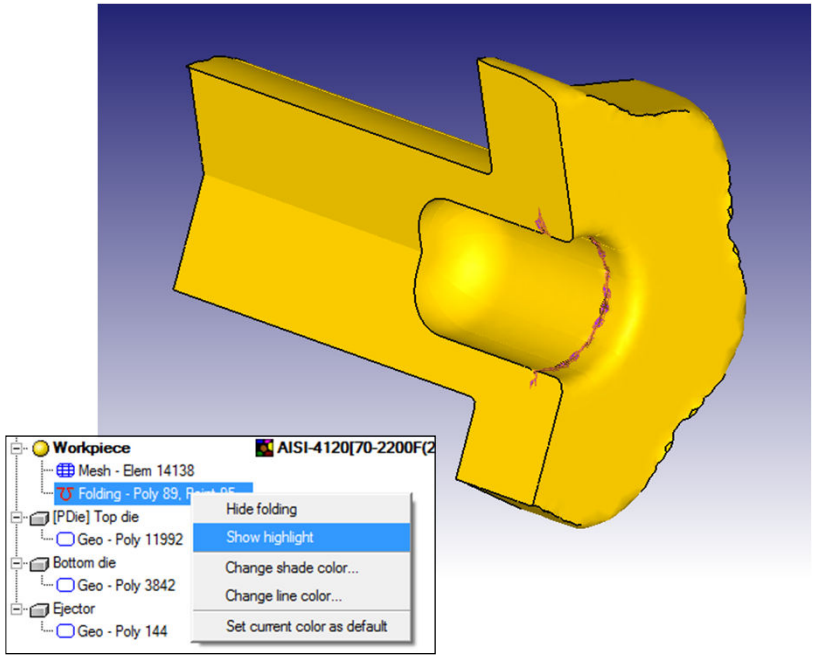
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Postprocessing

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- Close inspection of results is recommended.
- Animations are the best tool for defect detection.
- Automatic fold highlighting tracks folds that were removed during global remeshing.



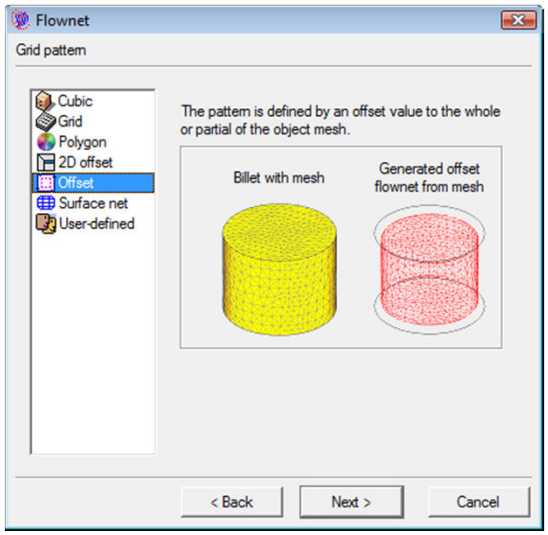


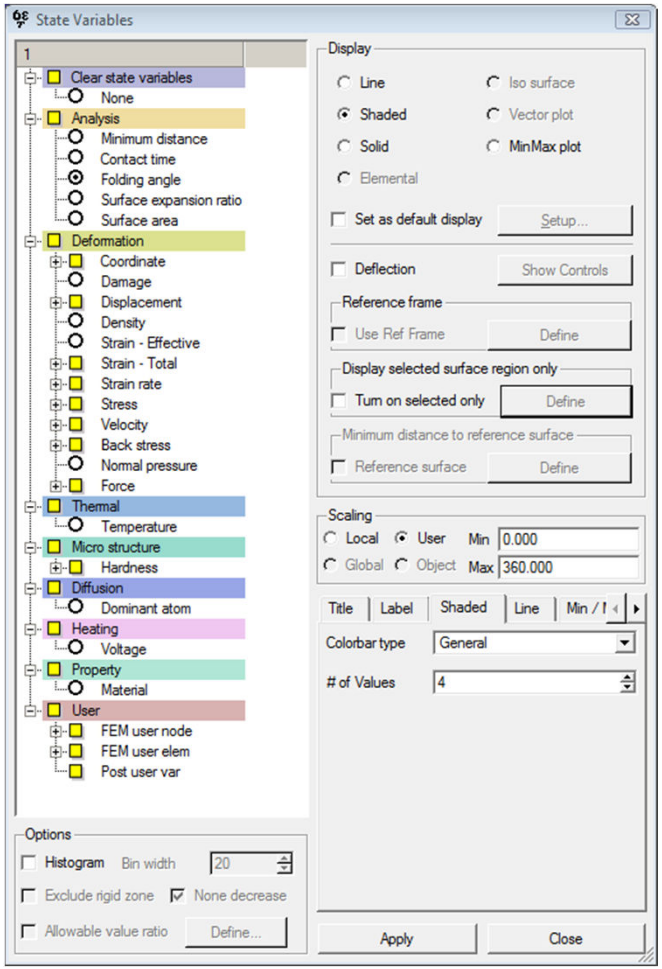
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Postprocessing

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- Adaptive offset FLOWNET is ideal for flow defects.
- Fold angle state variable highlights fold regions well.

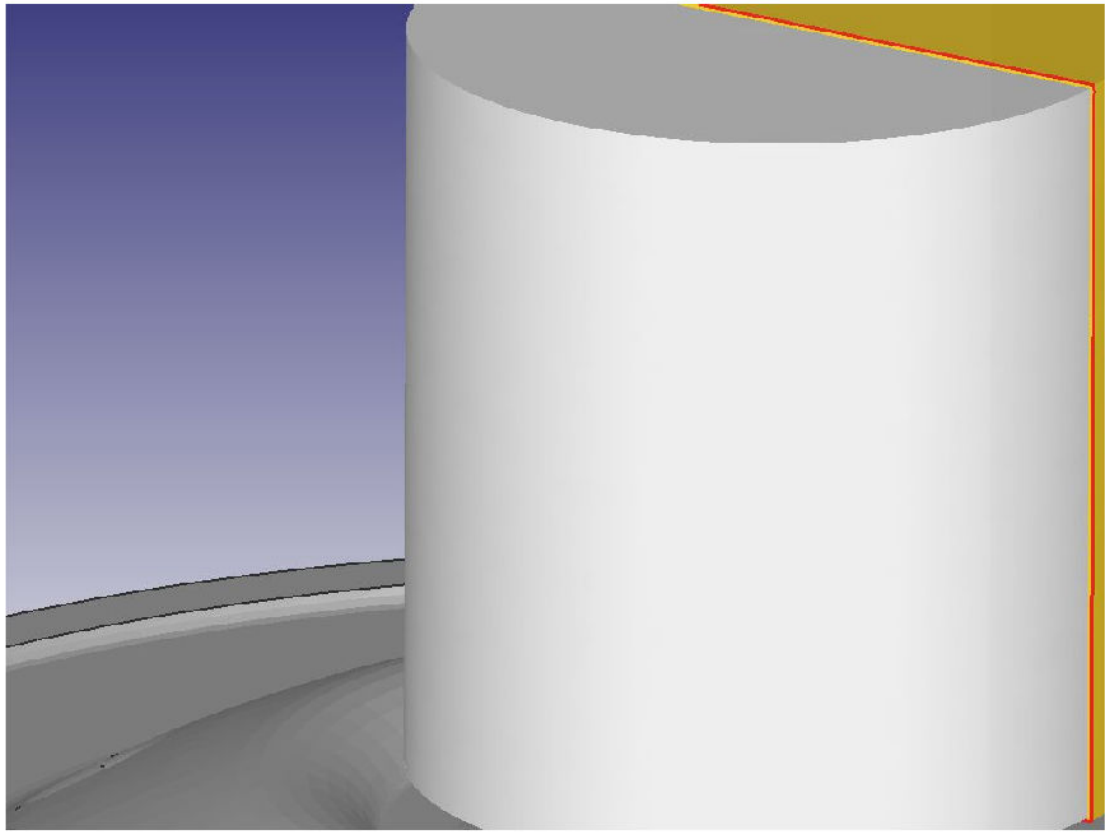




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Offset FLOWNET

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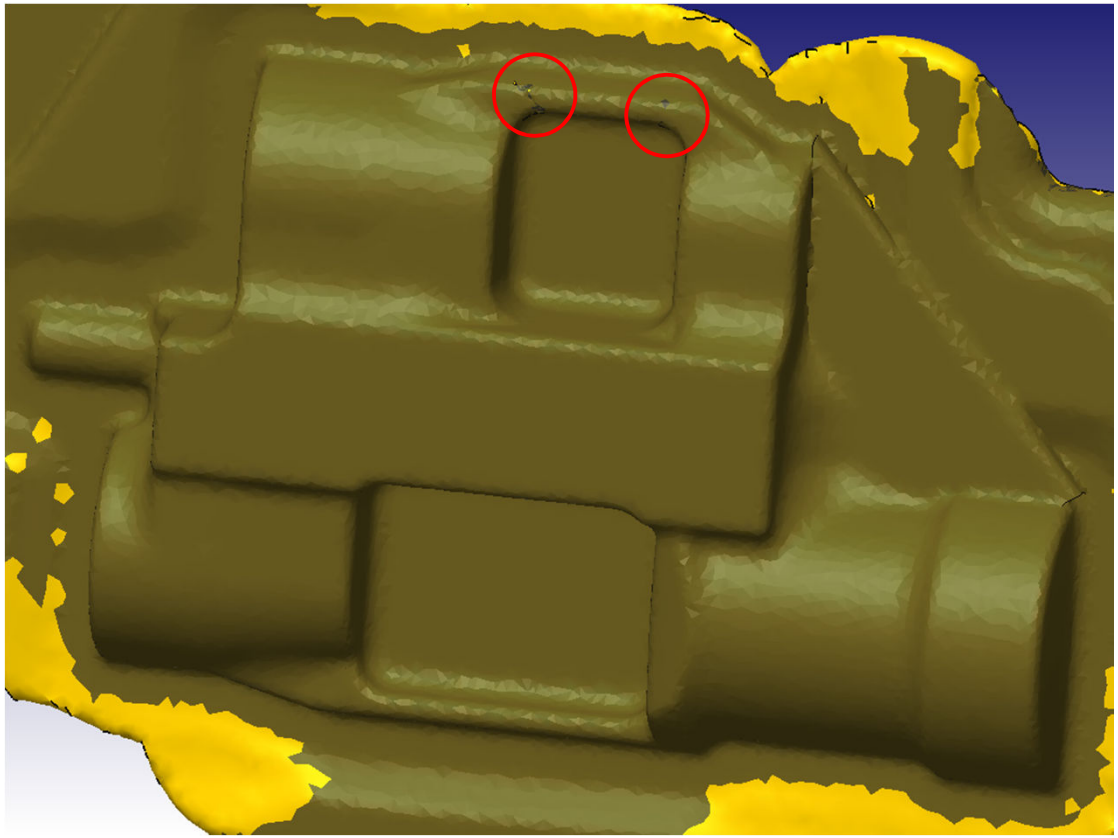


Offset flownet shows a suck defect on the inner rim of the hub.

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Small Lap - Example

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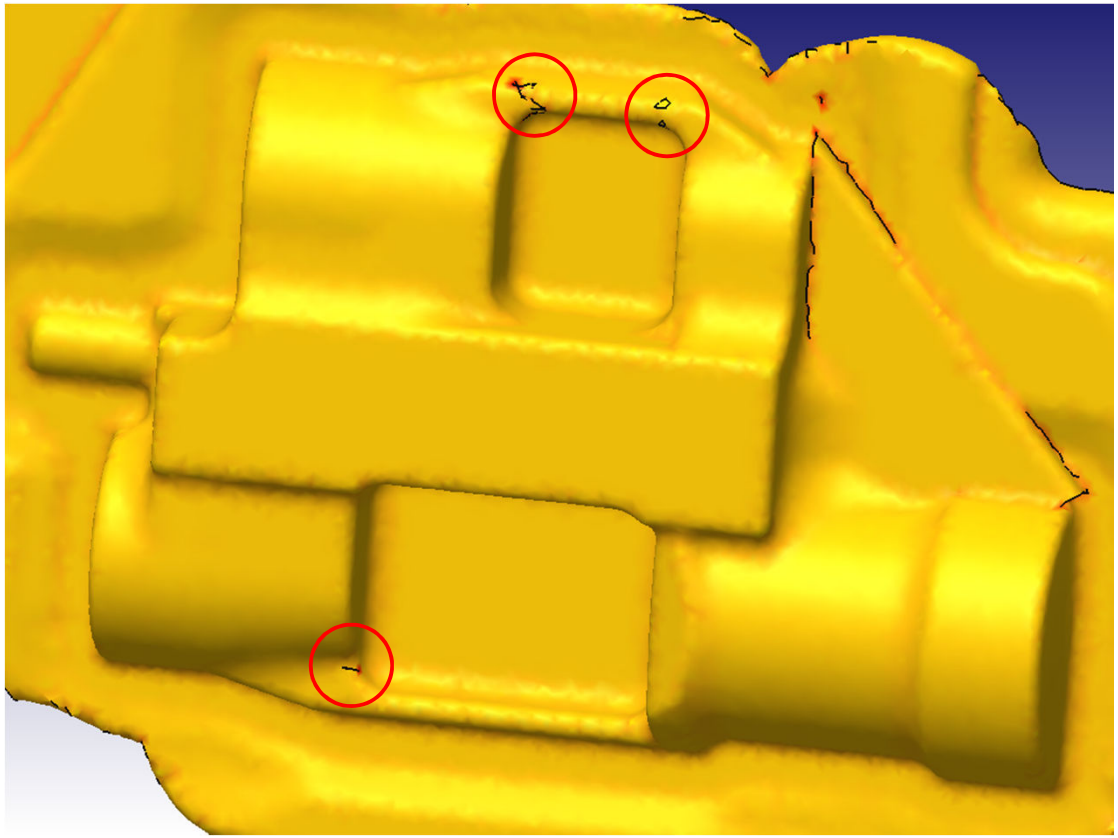
Contact display highlights fill and major laps.

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Courtesy DLA, FDMC & Consolidated Industries

Small Lap - Example

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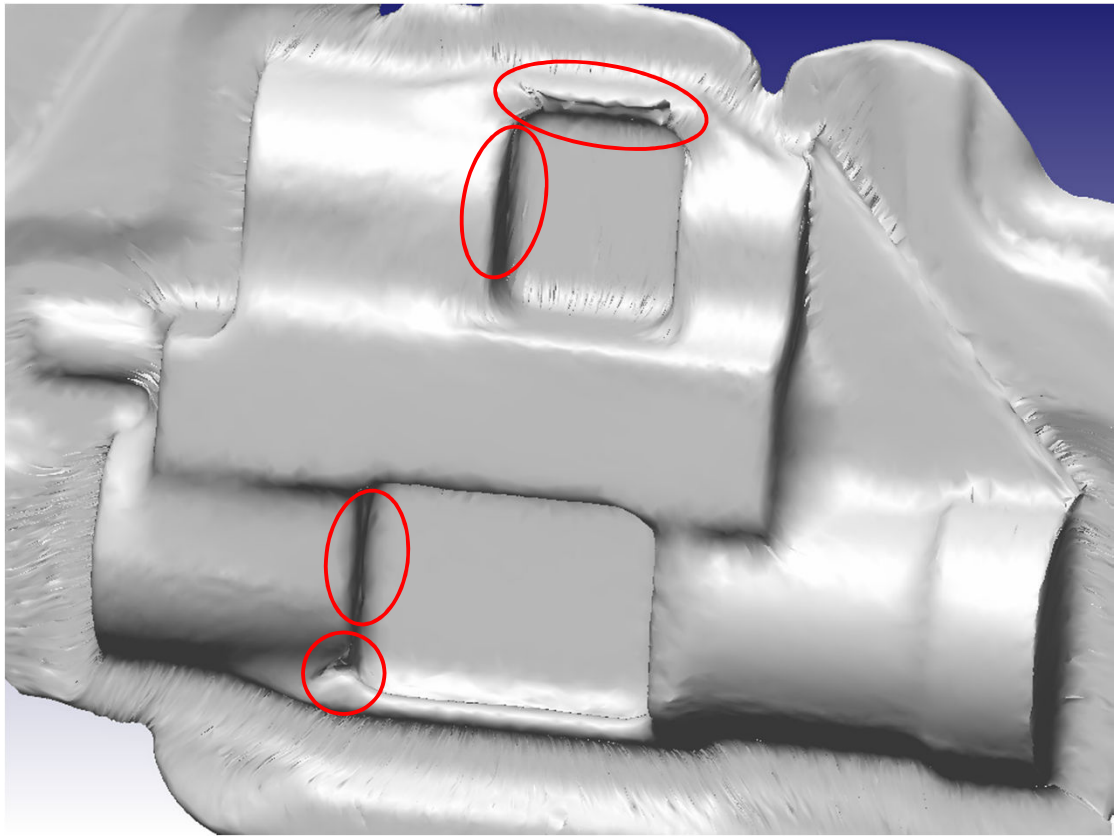
The fold angle contour and edge display identifies more laps.

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Courtesy DLA, FDMC & Consolidated Industries

Small Lap - Example

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An offset flownet clearly shows small laps and flow defects.

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