StaBiFü® - STRUKTURBAUTEILE WIRTSCHAFTLICH FERTIGEN

StaBiFü® - EFFICIENT MANUFACTURING OF STRUCTURAL PARTS

Ditzingen, 14 February 2019

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CONTENT

- Flexible and economic production of structural parts for car bodies
  - Trends in the automotive industry
  - StaBiFü® approach, what's behind
  - Real sample seat cross member
  - Advantages of StaBiFü® approach
  - Fraunhofer IWU Competencies for StaBiFü® approach

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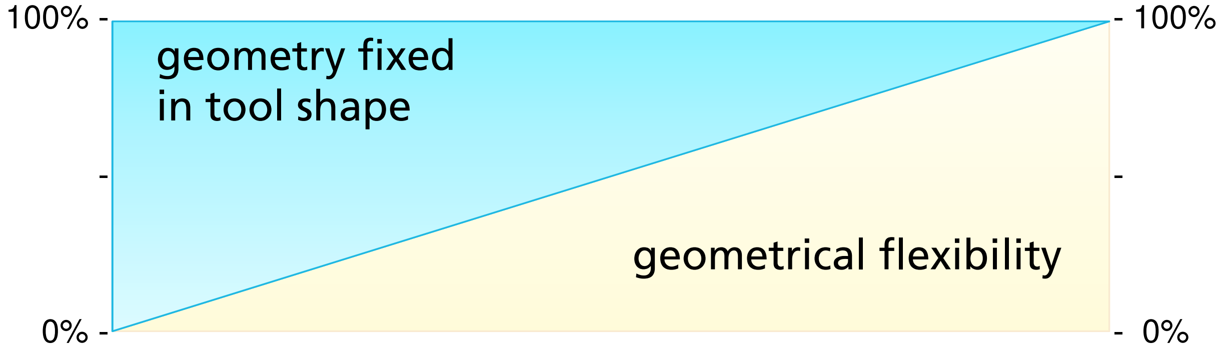
Trends in the automotive industry

- **Motivation**
  - ***Model variety*** increases faster than total production ➔ ***decreasing volume*** per variant
  - ***Conventional forming technologies***, such as multi stage deep drawing, are becoming increasingly ***uneconomical at small volumes***
  - Tooling is becoming the ***critical cost driver*** for conventional forming technologies



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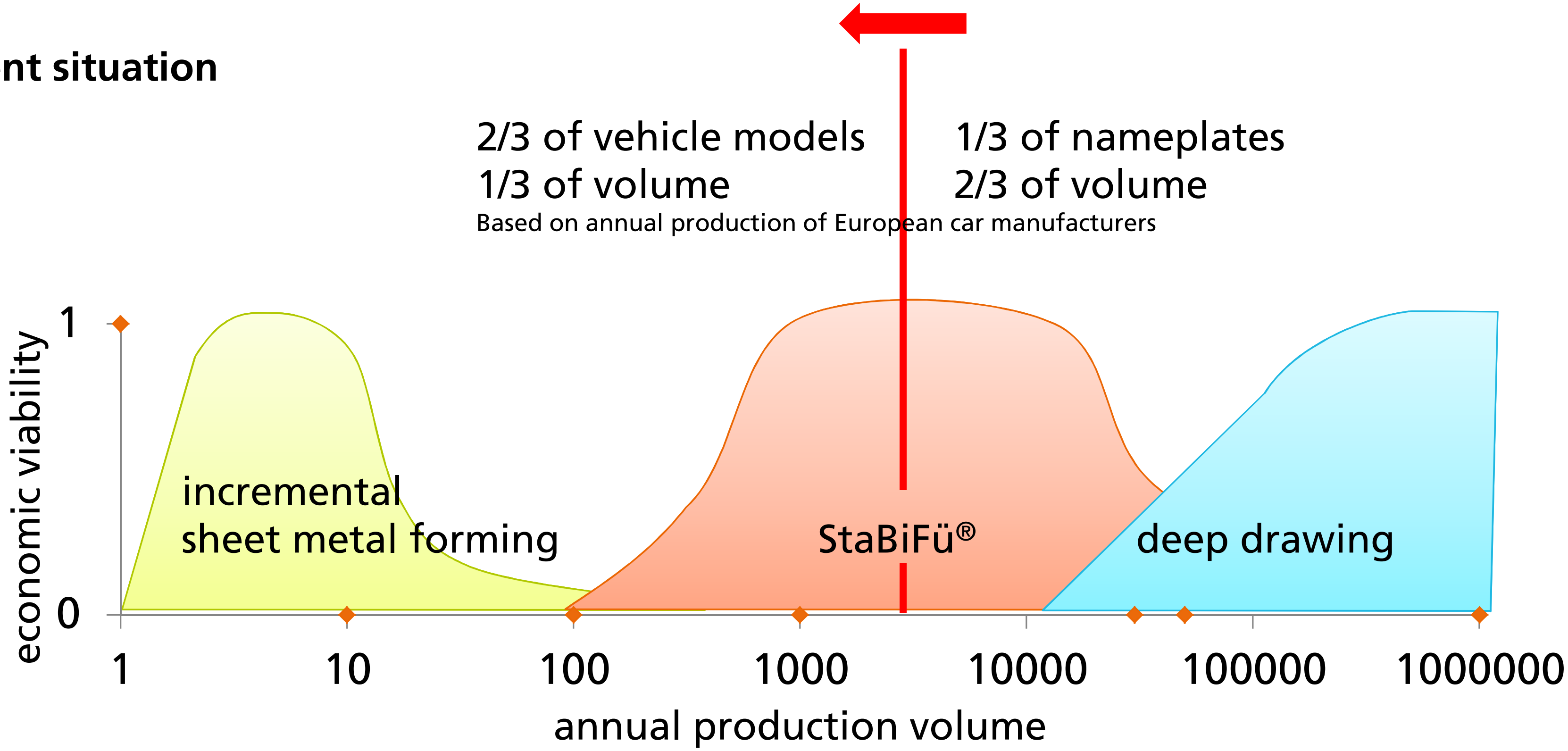
Trends in the automotive industry

- **Current situation**



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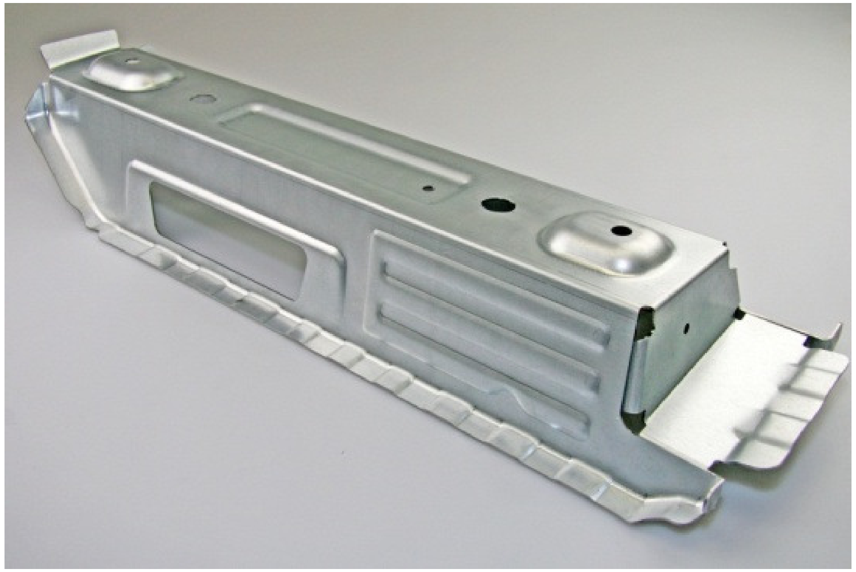
StaBiFü® approach

- **StaBiFü® approach**
  - Reduction forming to a ***single drawing stage*** for the main shape ➔ significant reduction of cost and time for die fabrication
  - All secondary forming steps are perfomand by ***flexible operations*** on CNC sheet metal working systems
  - Optimization of the ***resource efficiency*** (tooling material, blank material, energy)



StaBiFü®- seat cross member

StaBiFü® stands for **Sta**nzen-**Bi**egen-**Fü**gen

meaning a sequence of Stamping – Bending – Joining

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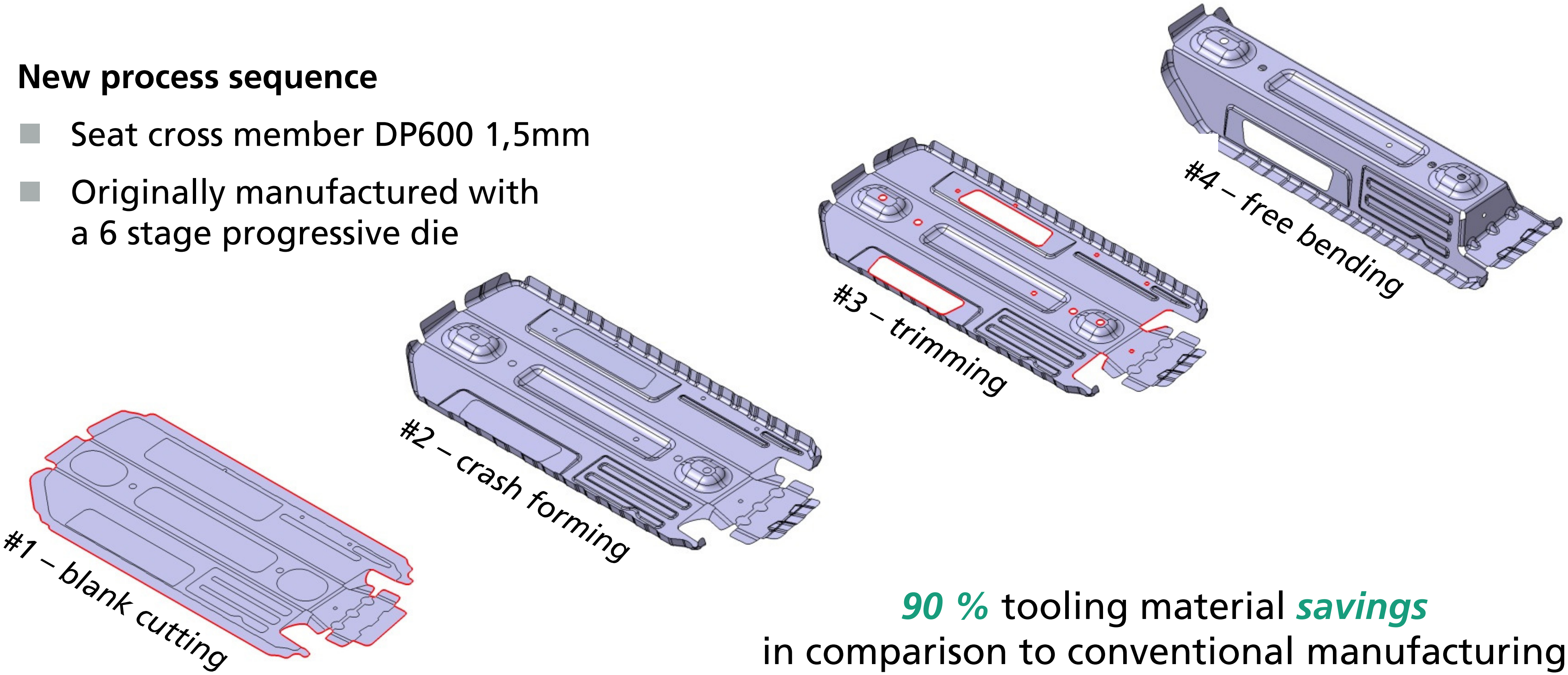
Use case - seat cross member

- **New process sequence**
  - Seat cross member DP600 1,5mm
  - Originally manufactured with a 6 stage progressive die



90 % tooling material ***savings***
in comparison to conventional manufacturing

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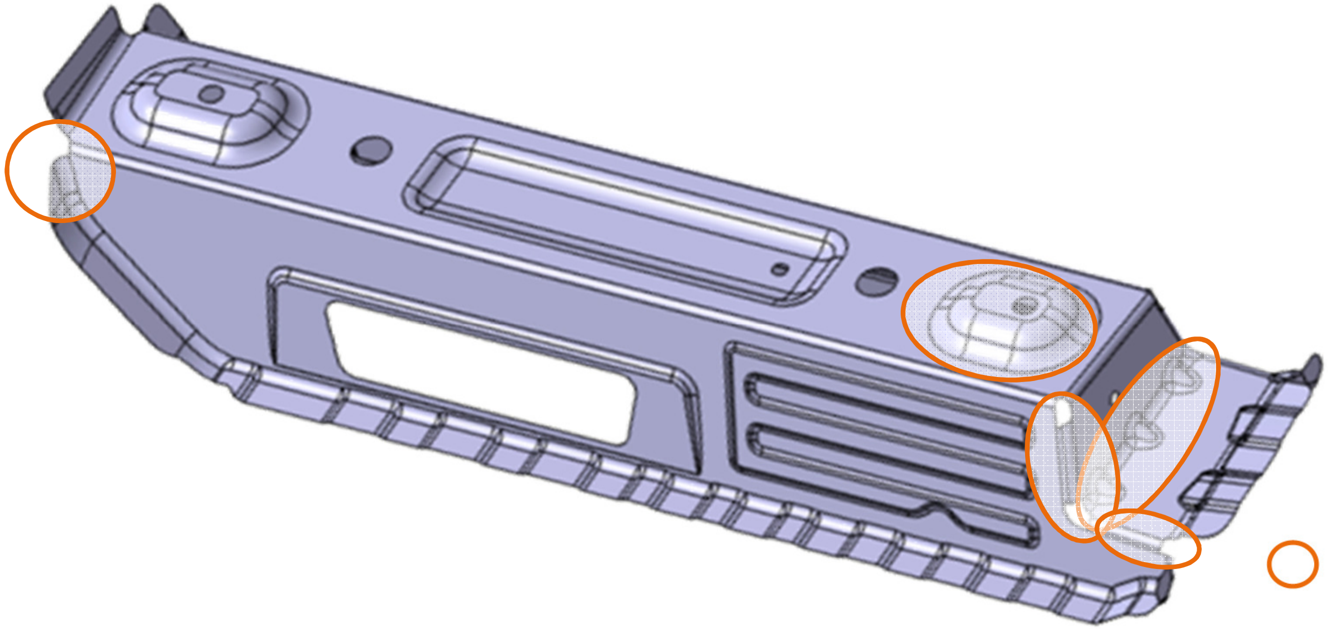
Use case - seat cross member

- **Small geometrical adaption for new technology process chain**
  - 95% of the geometry is identical with original one



areas of minor changes on part geometry

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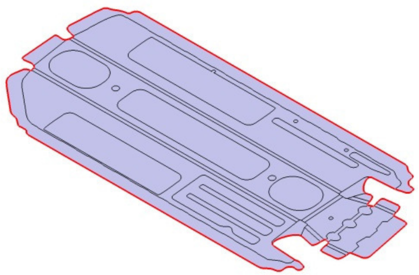
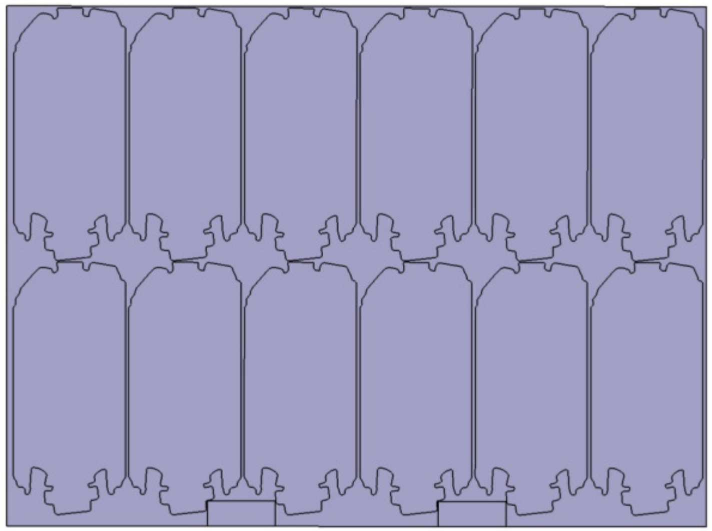
Use case - seat cross member

- **Operation 1 – blank cutting**
  - Use of 2D-Laser or laser-punching machine
  - Nesting of more parts on a standard blank
  - Cutting of optimized blank contour



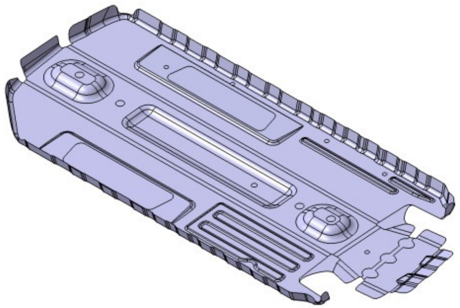


Nesting of parts

➔ ***Increasing material usage*** of sheet metal from ***60 % to 77 %***

Use case - seat cross member

- **Operation 2 – crash-forming**
  - Forming without blank-holder
  - Forming of all main features in one press stroke with one part-specific tool

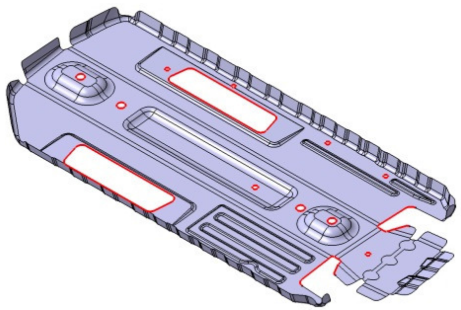


Crash-forming tool

➔ Forming without blank-holder ***saves 22 % in material***

Use case - seat cross member

- **Operation 3 – trimming**
  - Trimming of outlines
  - Cutting of holes
  - Usage of 3D-laser or similar cutting-technology

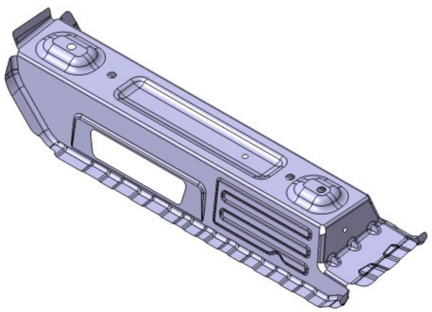


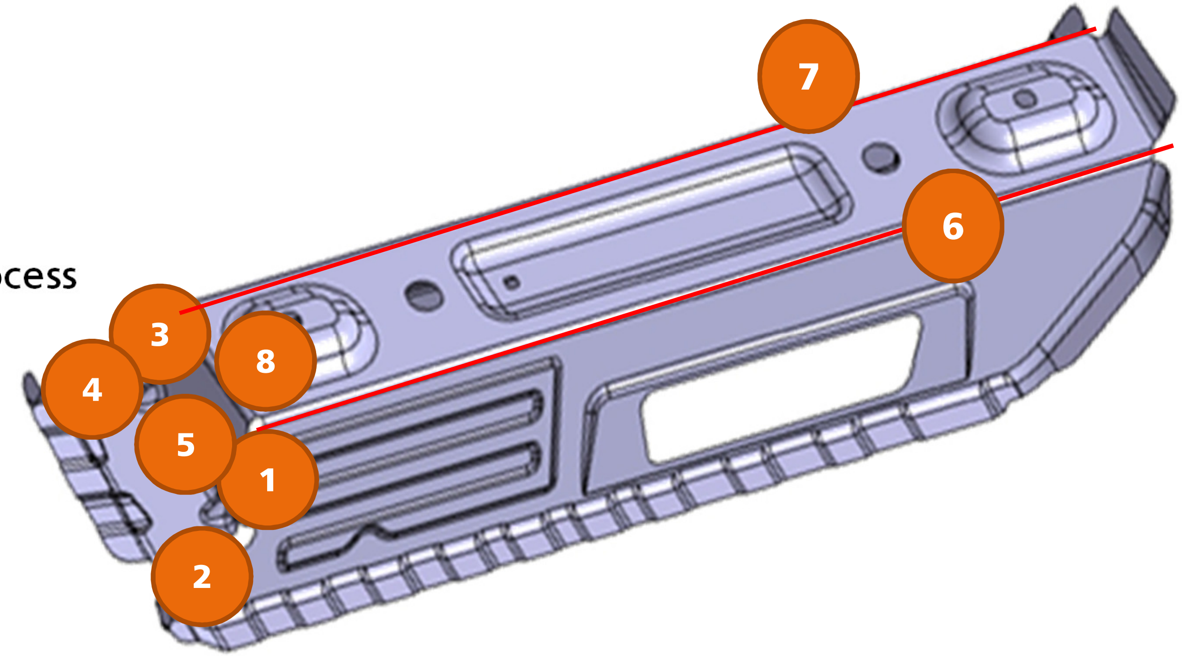
3D-trimming of part

➔ Reduction of energy consumption ***saves 50 % of energy costs***

Use case - seat cross member

- **Operation 4 – free-bending**
  - Bending of press brakes
  - Realization of 4 - 8 bends
  - Usage of standard tools
  - Forming of rips within bending process





Free-bending sequence

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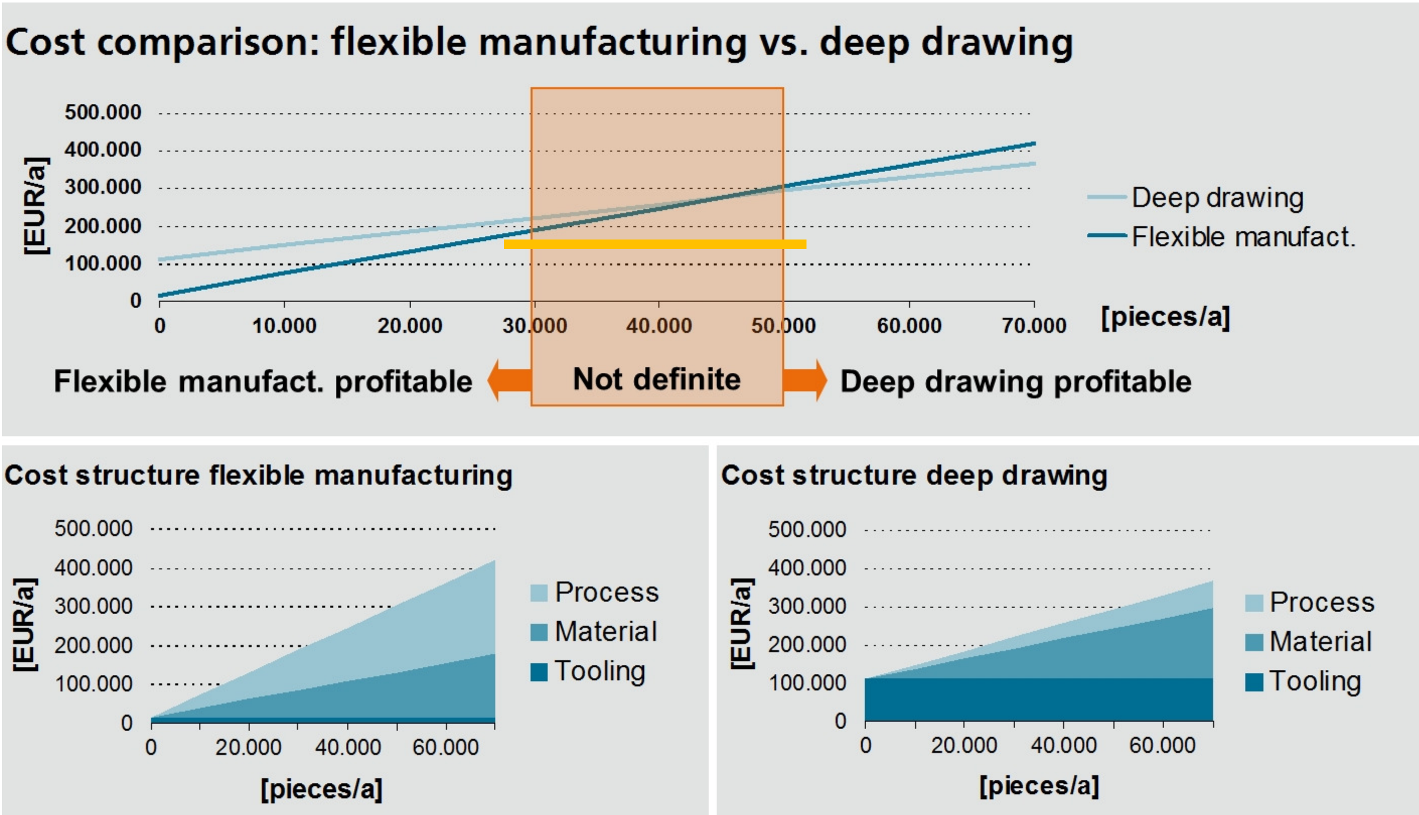
Use case - seat cross member

- **Economic benefit**



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Advantages of StaBiFü® approach

- **Advantages** compared to multistage stamping via progressive die
  - significant reduced die-cost *– 90%* (one instead of 6 - 8 stages)
  - Increased material usage *– 22% material savings*
  - operation on CNC punch and bending machines are flexible and *controlled forming operations*
  - shorter lead for development – from idea to operation *(days rather than weeks)*
  - easy to change part geometry by adapting CNC-operations *(hours rather than days)*

➔ ***cost-effective* process for *smaller production volumes***

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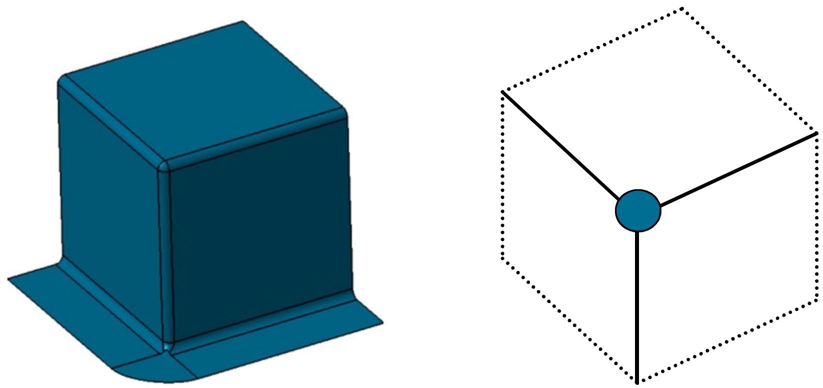
Fraunhofer IWU Competencies for StaBiFü® approach

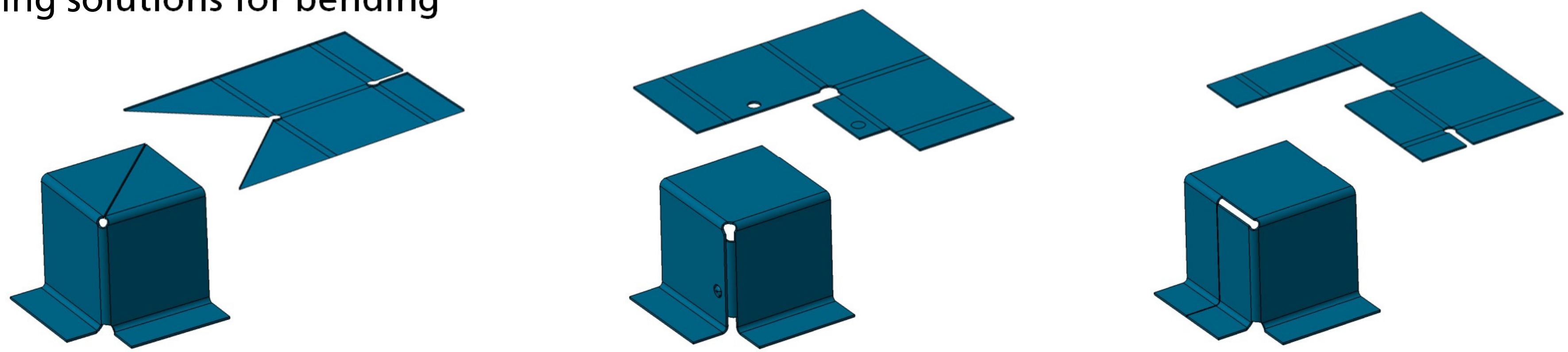
- **Catalog for geometrical adaption**

  deep drawing ➔ StaBiFü® technology

  - Analysis of deep-drawing features
  - Abstract representation of part geometry
  - Mapping solutions for bending



original geometry *abstract representation*



Fraunhofer IWU Competencies for StaBiFü® approach

- today: **Catalog of adaption variants**
  - Adapting deep-drawing geometry to StaBiFü® part geometry
  - Mapping deep-drawing features to ones operating on punching machines and press brakes
- tomorrow: **Automated morphing**
  - Automated recognition and replacing deep-drawing features by StaBiFü® features
  - KBE-CAD-modul
- Vision: **CA generation of StaBiFü® part geometries**
  - Computer-aided generation of part geometries compatible to StaBiFü® approach

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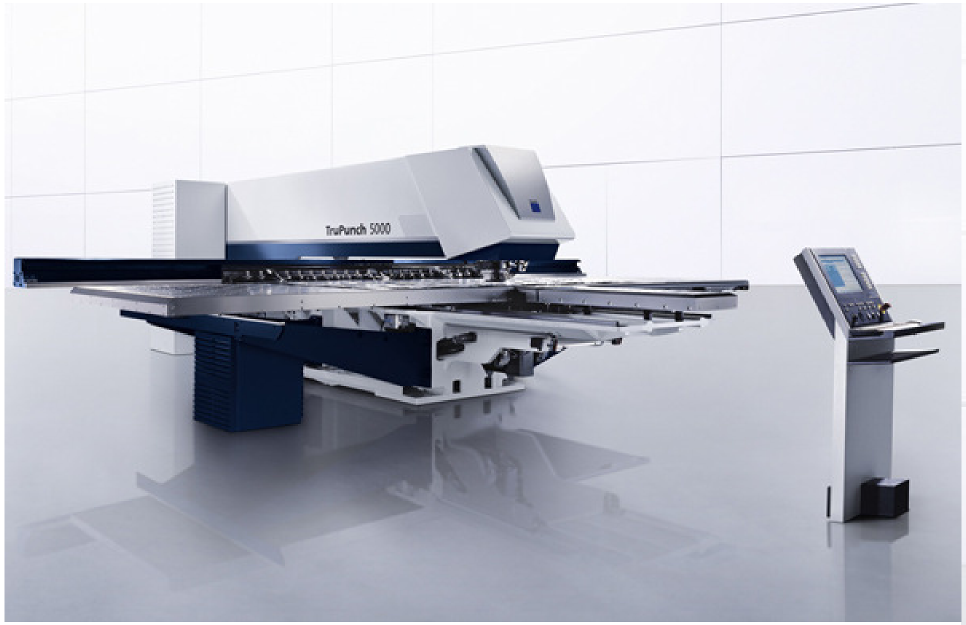

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