5 axis laser cutting of hot formed steel

Frank Geyer

Product Manager - Laser Systems

TRUMPF

Agenda

- Why laser cutting?
- Tools of the trade
- Trends in hot forming
  - Large parts
  - Pre-developed parts
  - Variable thickness
  - Less power, higher productivity
- Summary

Why laser cutting?

- Material hardness does not allow conventional trimming process
  - Extremely high wear of tools
  - High forces required
  - Possibility for micro cracking on mechanically cut edges
  - Design change requires re-tooling

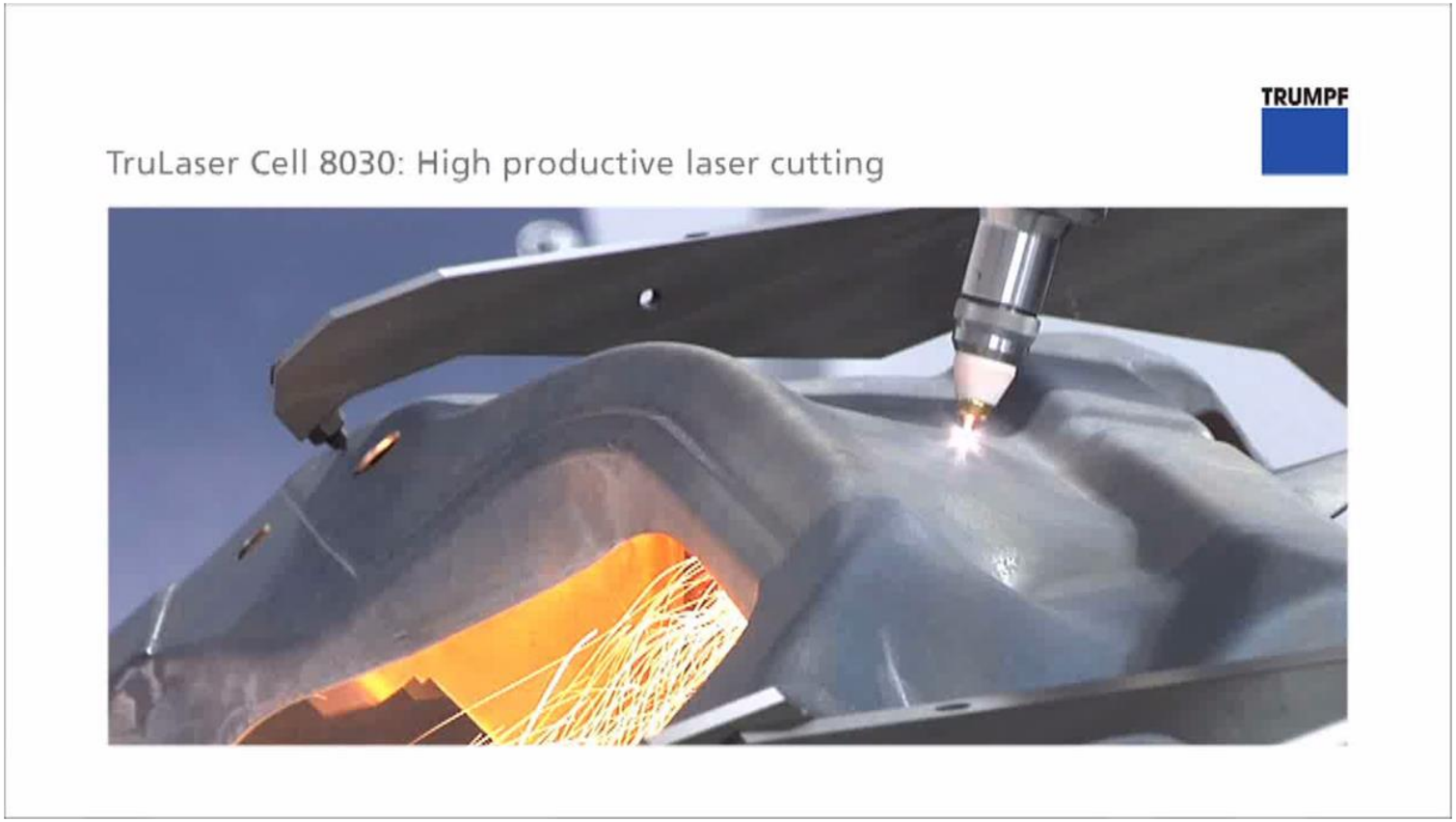
- Laser cutting advantages:
  - No tool wear, stable process
  - No deformation
  - Design changes can be addressed by adjusting the NC path of the system used

Tools of the trade

- Laser sources
  - 1 micron wavelength, fiber delivered to the work piece
  - 2-4kW laser power typical for cutting hot formed parts
- Motion systems
  - 5 axis Cartesian systems
  - Robot based systems
- Automation solutions
  - Rotary tables (2 or 3 station)
  - Dual station systems
- Part fixtures
- System programming systems

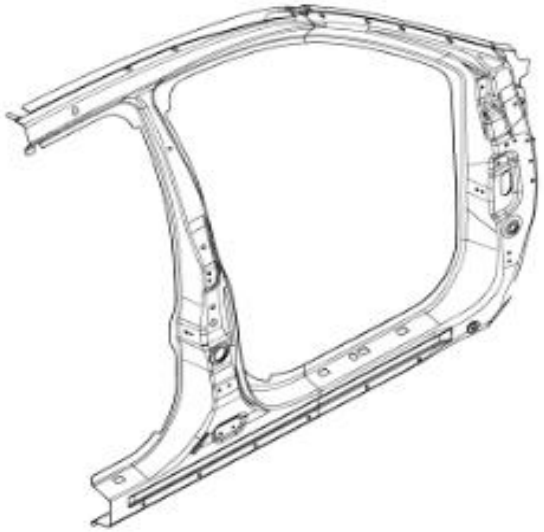
Tools of the trade

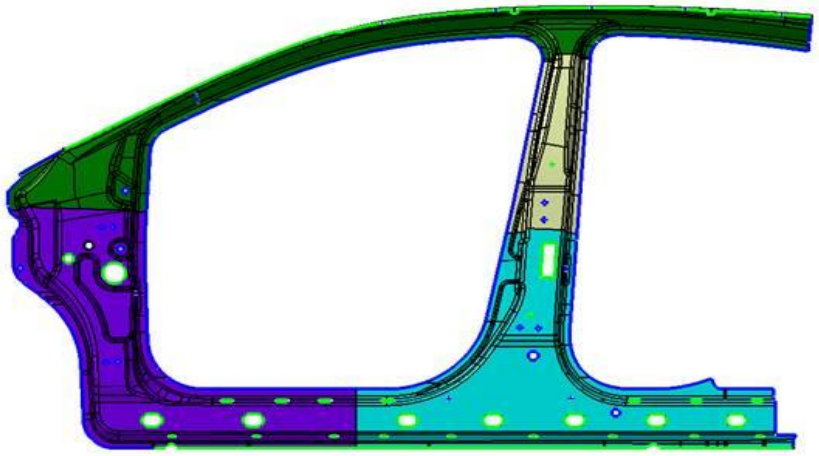
- Video, cutting of a hot formed component



Trends in hot forming

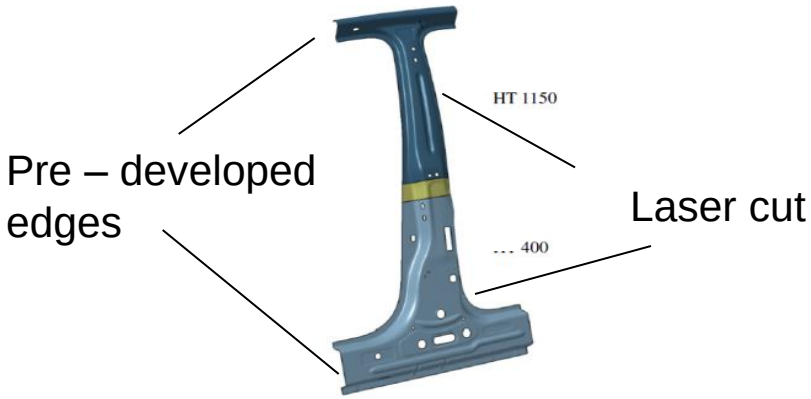
- Large parts:
  - Full body sides
  - Door rings for SUVs
- Challenge:
  - Very large working envelope
- Solution:
  - Large systems

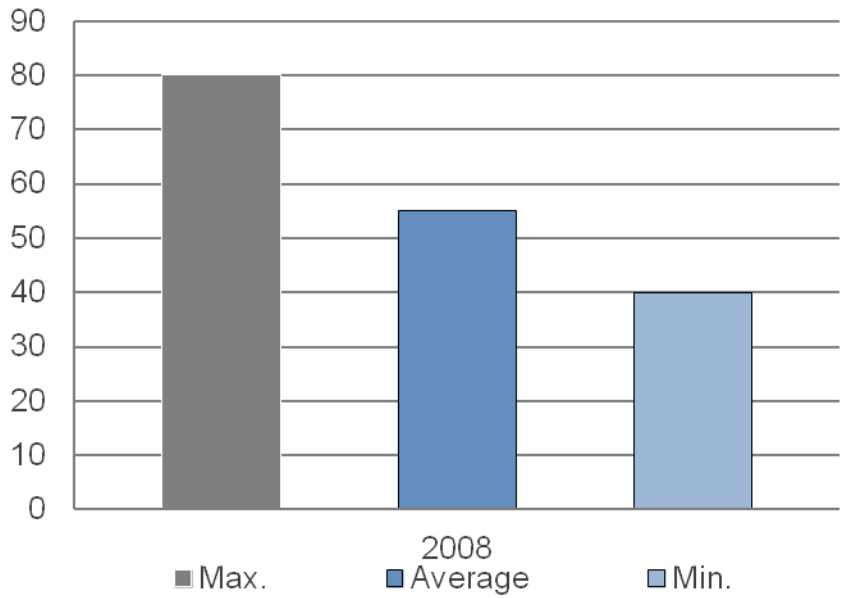


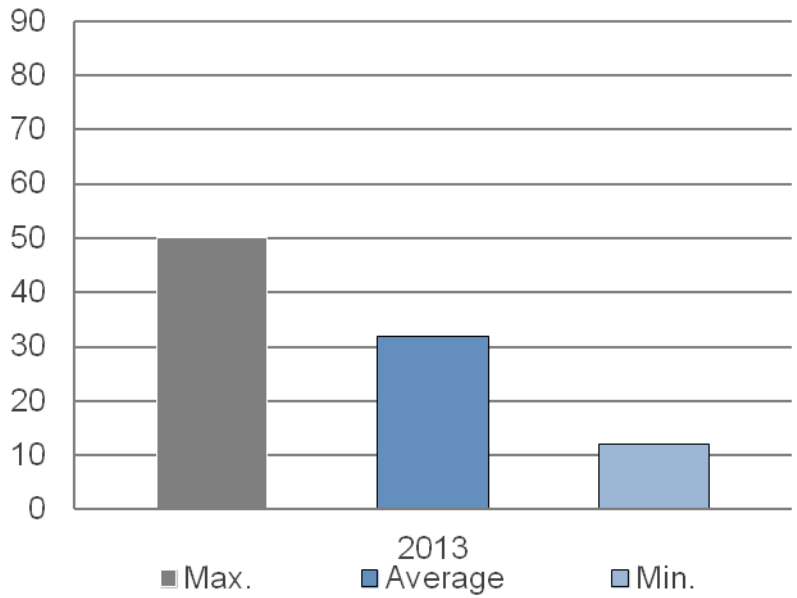


Trends in hot forming

- Pre-developed parts



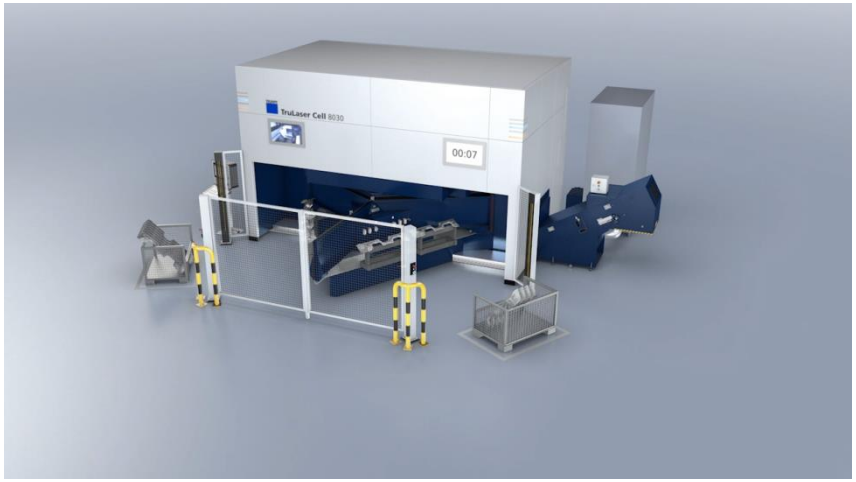




Trends in hot forming

- Problem: Cutting cycles are shorter that the load/ unload cycles
- A faster cutting speed is not always beneficial!
- Solution:

  Improve the efficiency of the non-cutting part of the cycle

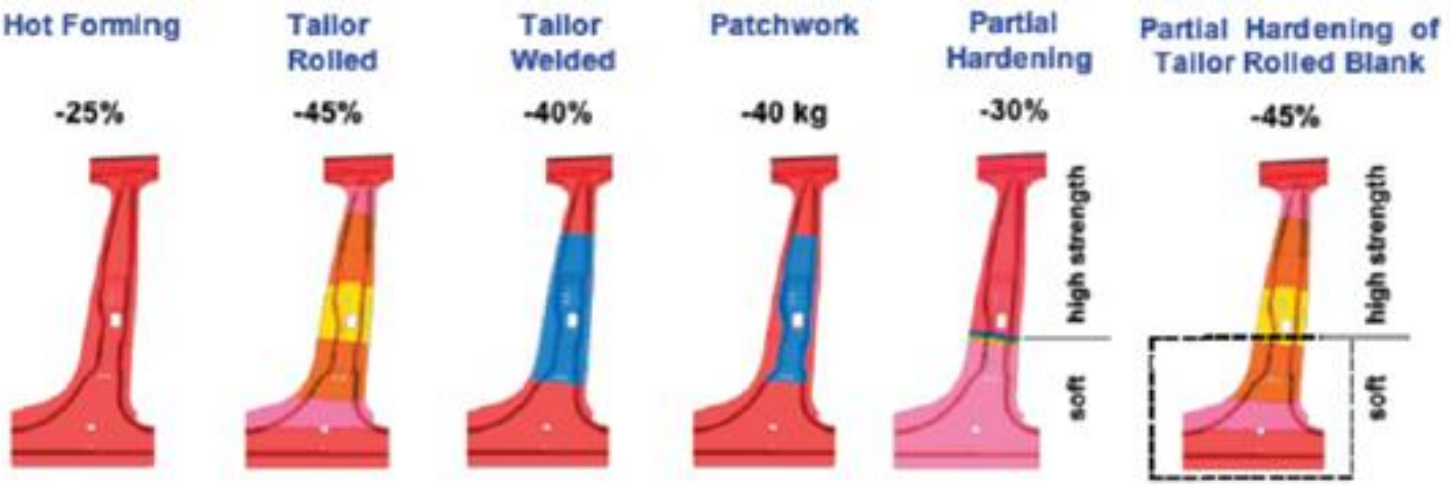


Simultaneous manual loading/ unloading

Simultaneous manual loading / automated unloading

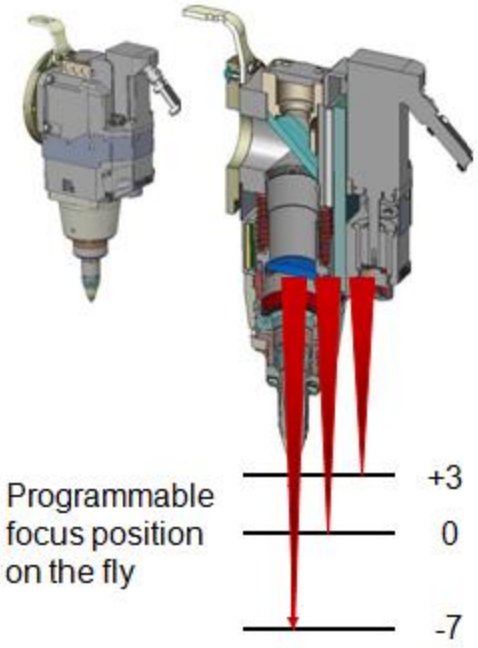
Trends in hot forming

- Tailored properties
  - Tailor welded
  - Tailor rolled
  - Patchwork
  - Inserts
  - Partial hardening



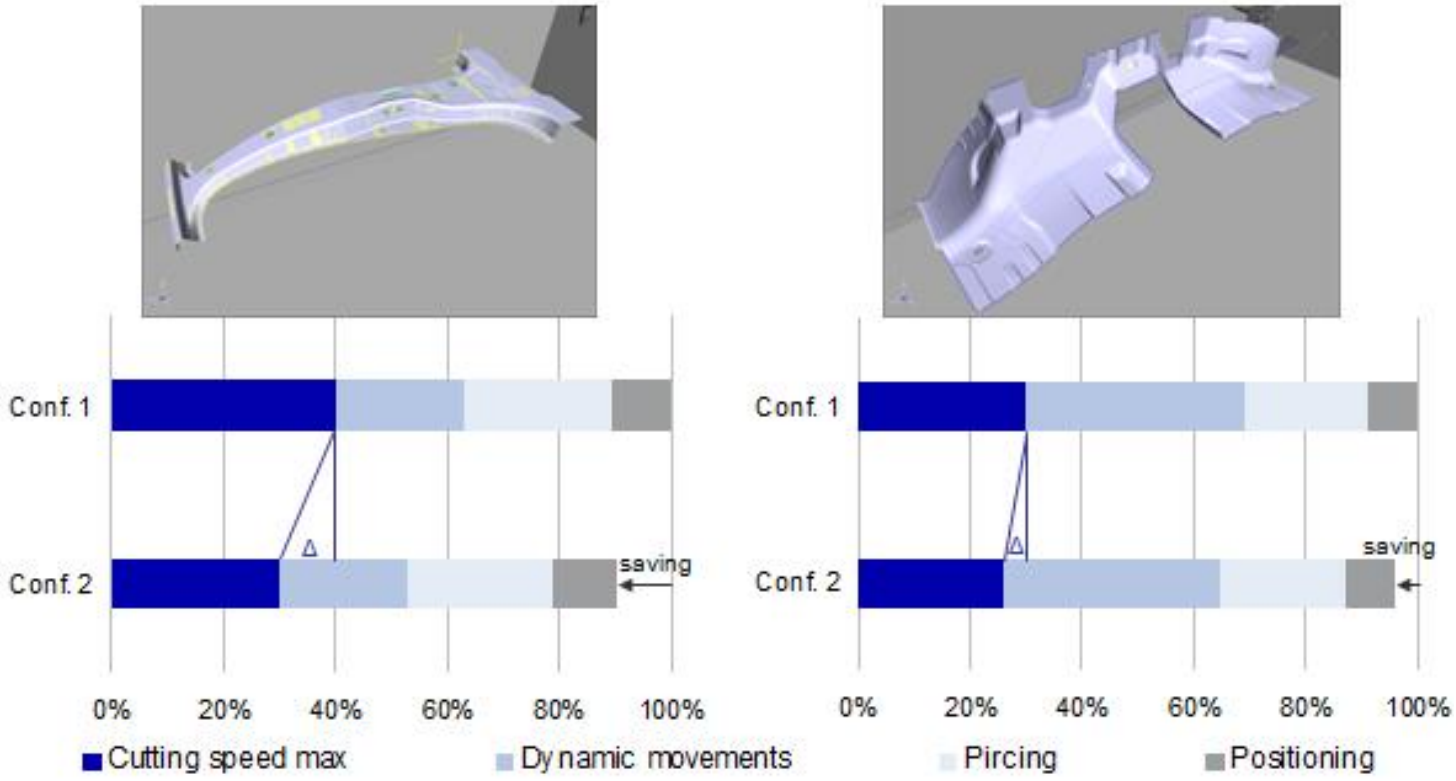
Trends in hot forming

- Variable thickness
  - Tailor welded
  - Tailor rolled
  - Patchwork
  - Inserts
- Challenge:
  - Focal position depends on part thickness
- Solution:
  - On the fly focal position adjustment



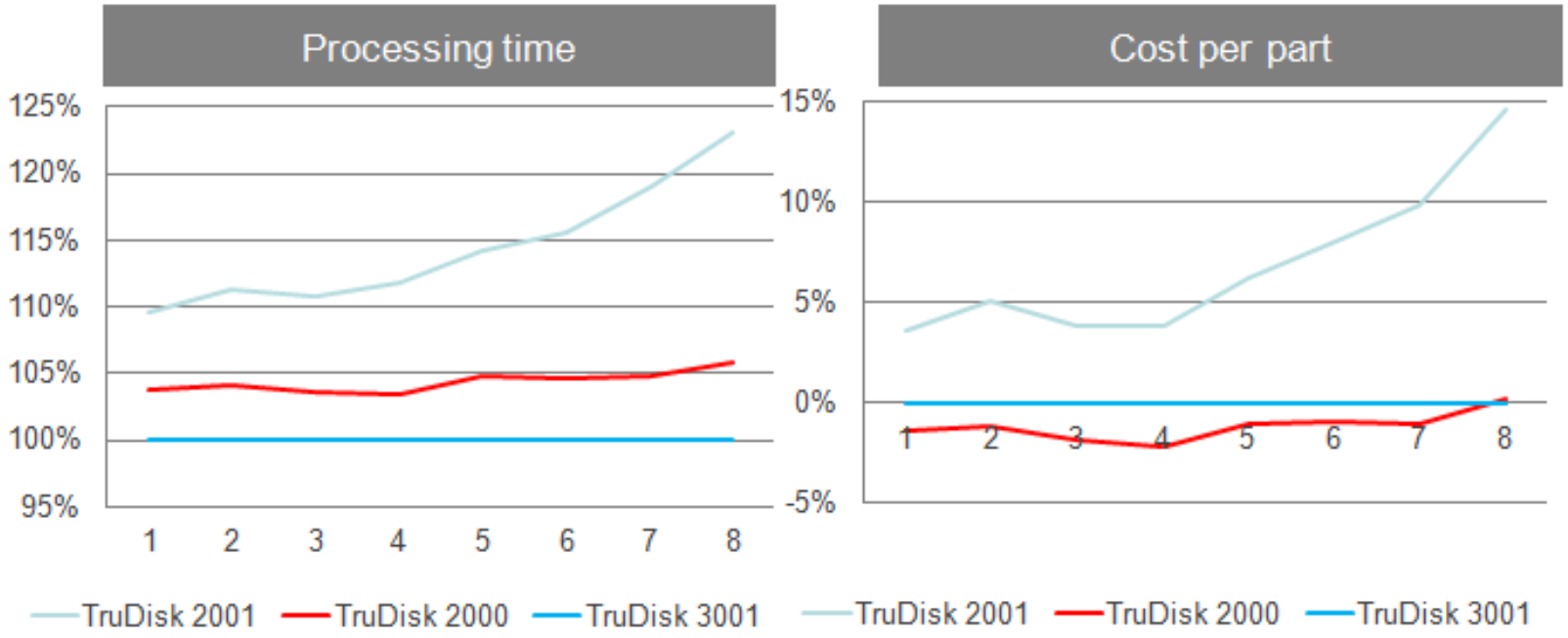
Less power, higher productivity

- Part geometry dictates processing speed and required laser power.
  - Higher power does not equal faster processing in complex parts



Less power, higher productivity

- Less is more*:
  - Lower invest / lower power consumption
  - Lower cost per part



*for thicknesses up to 1.5mm

Less power, higher productivity

- Less is more*:
  - Video comparing 2 and 3 kW solid state lasers with different beam qualities
  - Shown are :
    - 2kW solid state laser with 4mm*mrad beam quality
    - 2kW solid state laser with 2mm*mrad beam quality
    - 3kW solid state laser with 4mm*mrad beam quality

Summary

- 5 axis laser cutting systems allow customers in the hot forming industry to produce high quality parts in 24/7 production without the issues associated with mechanical trimming.
- With the choices available customers can now optimize the system configurations to match their specific needs, increasing productivity while reduce their cost.
- Through ongoing advancements in laser and systems technology the laser systems remain the tool of choice for cutting hotformed components.

Q & A

And now I am looking forward to your questions!

Frank Geyer

Product Manager – Laser Systems