GREAT DESIGNS IN STEEL

The Next Era in Stamping Technology (Nest) “Hybrid Stamping”

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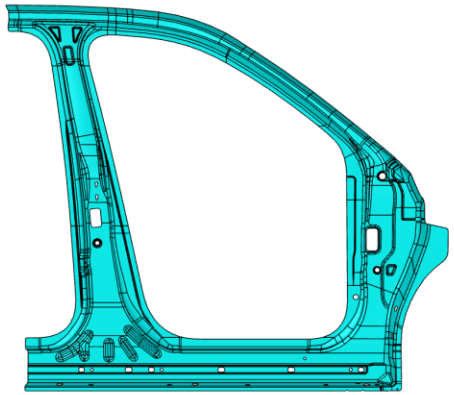
Today's Talking Points

- Incentive(s)
- "Hybrid Stamping" Ideation
- "Hybrid Stamping" Production Model
- Hybrid Stamping Forming Tonnage
- Next Steps/Take-Aways

“Hybrid Stamped” Incentive(s)



- **Mega and Giga trends in part size.**
- **Stamping Concerns with the Next Generation of AHSS.**
  - **Formability**
  - **Quality**
  - **Tonnage**

Stamping Process Paradigms

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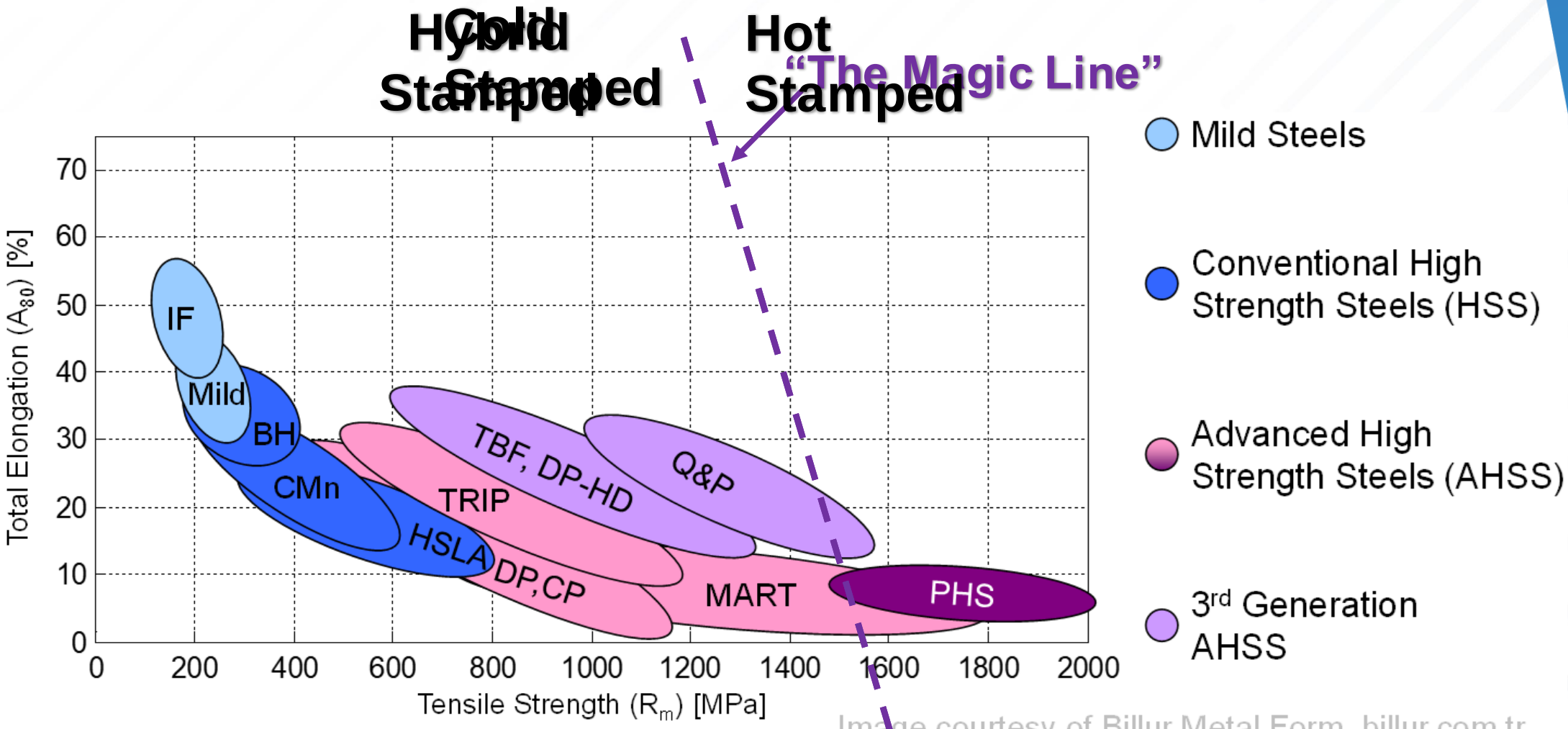

Image courtesy of Billur Metal Form, billur.com.tr

Hybrid Stamping Ideation

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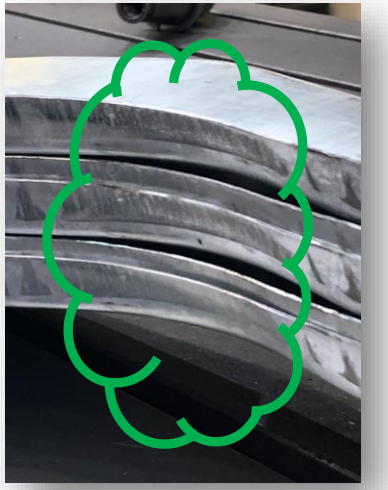

Localized Induction Microstructure

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The “Hybrid Stamping Process” creates a tempered Martensite and Ferrite microstructure that is both finer and stronger in the final product.

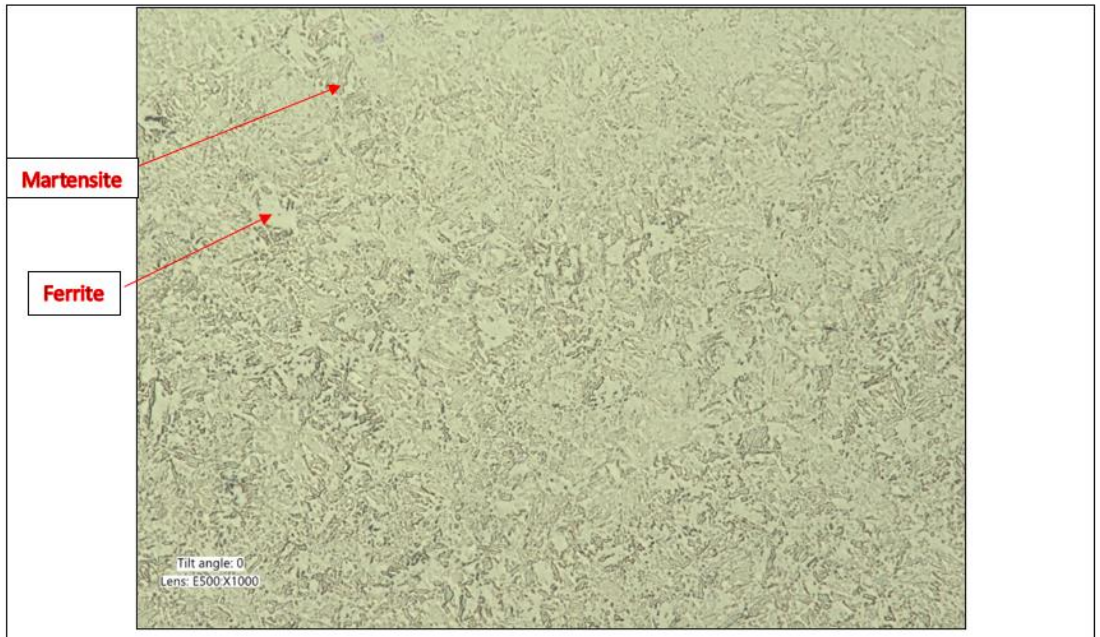


Fig. 32 Grain Structure- Un- Heated Sample - 1000X Magnification
Ferritic (Light) and Martensitic (Black) phases are clearly distinguished

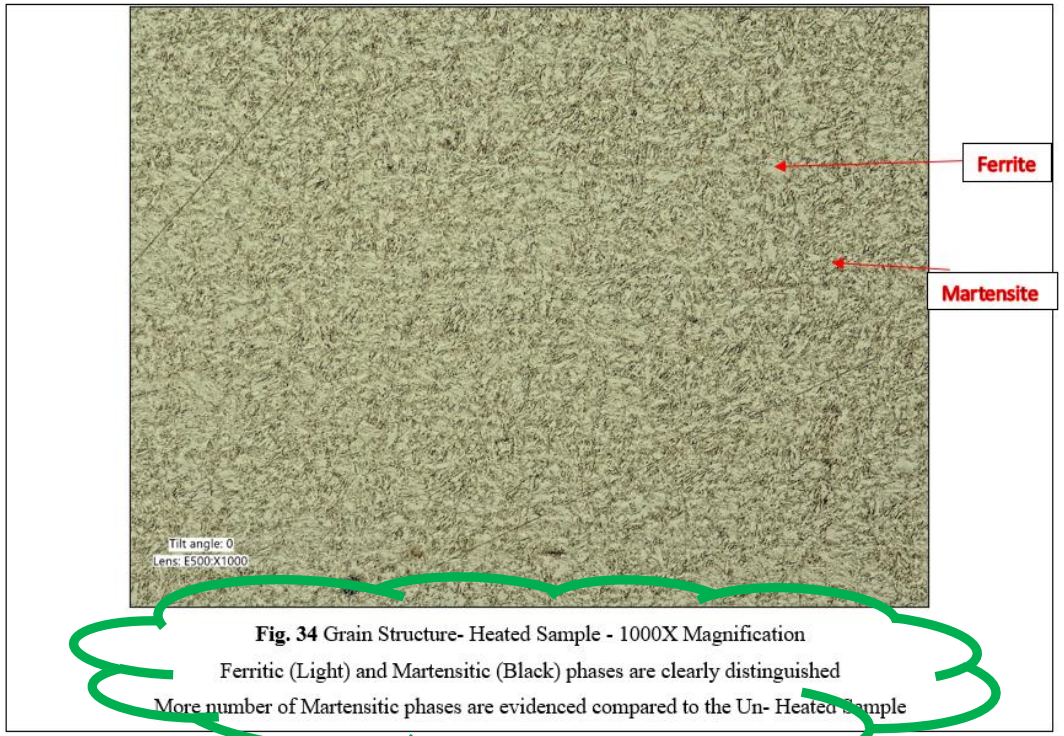


Fig. 34 Grain Structure- Heated Sample - 1000X Magnification
Ferritic (Light) and Martensitic (Black) phases are clearly distinguished
More number of Martensitic phases are evidenced compared to the Un- Heated Sample

Localized Induction Hardness Results

Measured Location	Heated			Un- Heated		
	Mean Diagonal Length (d) (µm)	Force(P) (gF)	Vickers Hardness (HK)	Mean Diagonal Length (d) (µm)	Force(P) (gF)	Vickers Hardness (HV)
1A	50.1	500	369	55.2	500	304
1B	49.7	500	375	54.9	500	308
1C	49.1	500	385	55.1	500	305
2A	50.5	500	364	54.5	500	312
2B	50.9	500	358	55.1	500	305
2C	49.9	500	372	54.7	500	310
3A	49.6	500	377			
3B	49.4	500	380			
3C	49.3	500	381			
Sample Average			*374*			*307*

VI CONCLUSIONS

- Average Coating Thickness on the top side of the Heated Location is less than that of the Un-Heated Location.
- Comparing martensite in the heated and un-heated region it is obvious that the amount of martensite in the heated region, as shown in Fig. 34, is dramatically increased and finer to the un-heated region, as shown in Fig.32
- Grain size is in the same range; however, greater number of martensitic phases might be the reason for higher hardness value in the heated sample

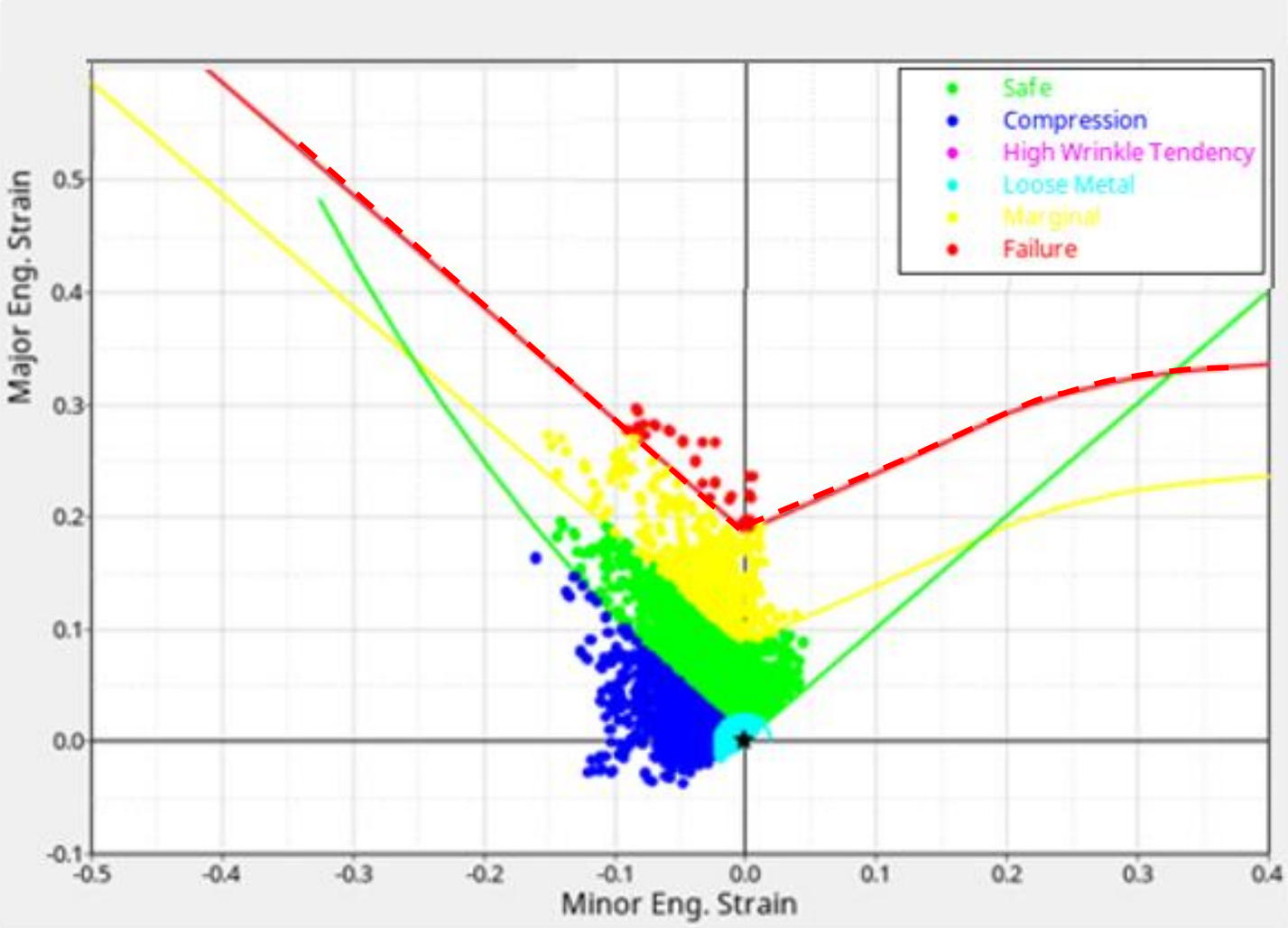
Hybrid Stamping Ideation

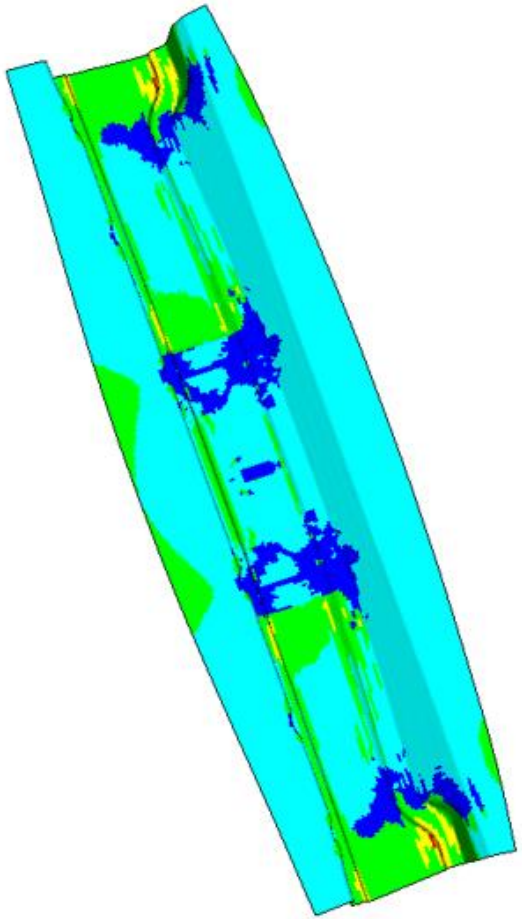
Hybrid Stamping:
First hit off die

Conventional Stamping:
First hit off die

Hybrid Stamping Ideation

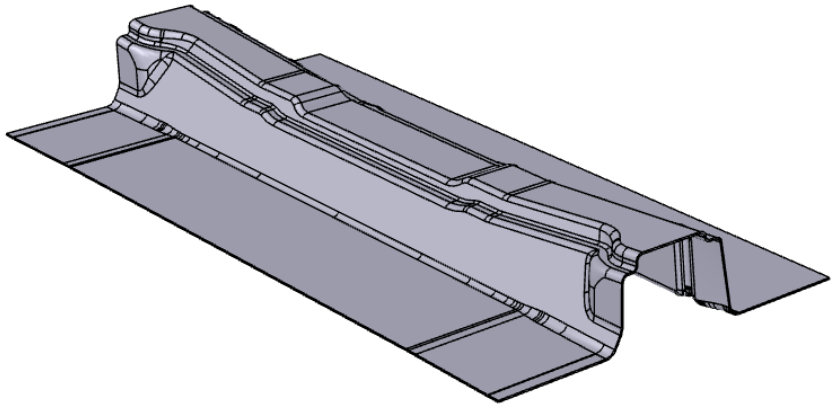
Forming: Forming Limit Diagram (at mid surface)

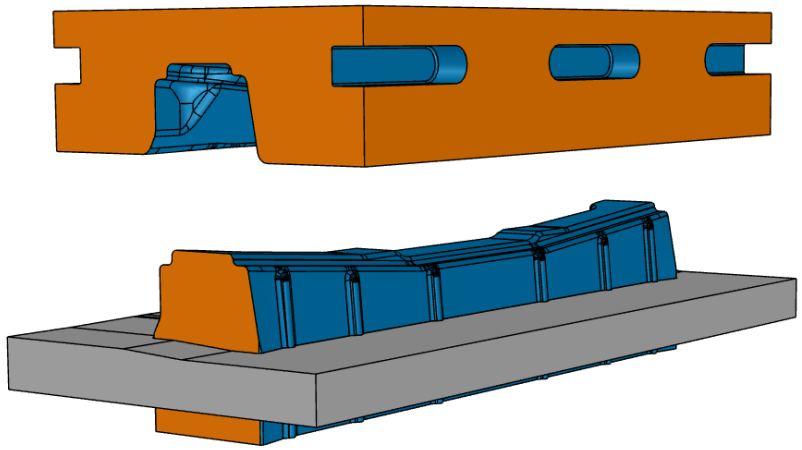


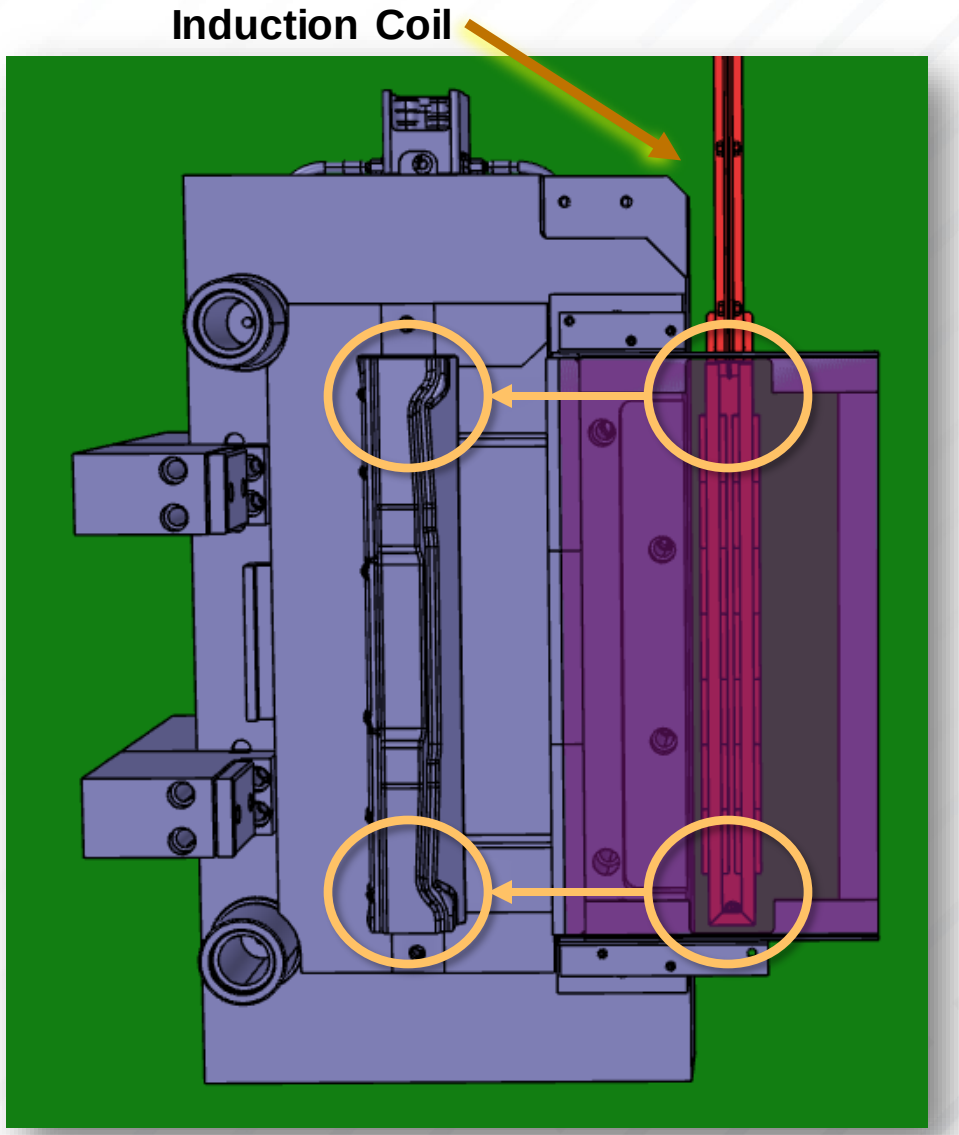


Let's Talk "Hybrid Stamped" Production Model

Hybrid Stamping - Production Model







Hybrid Stamping – Production Model

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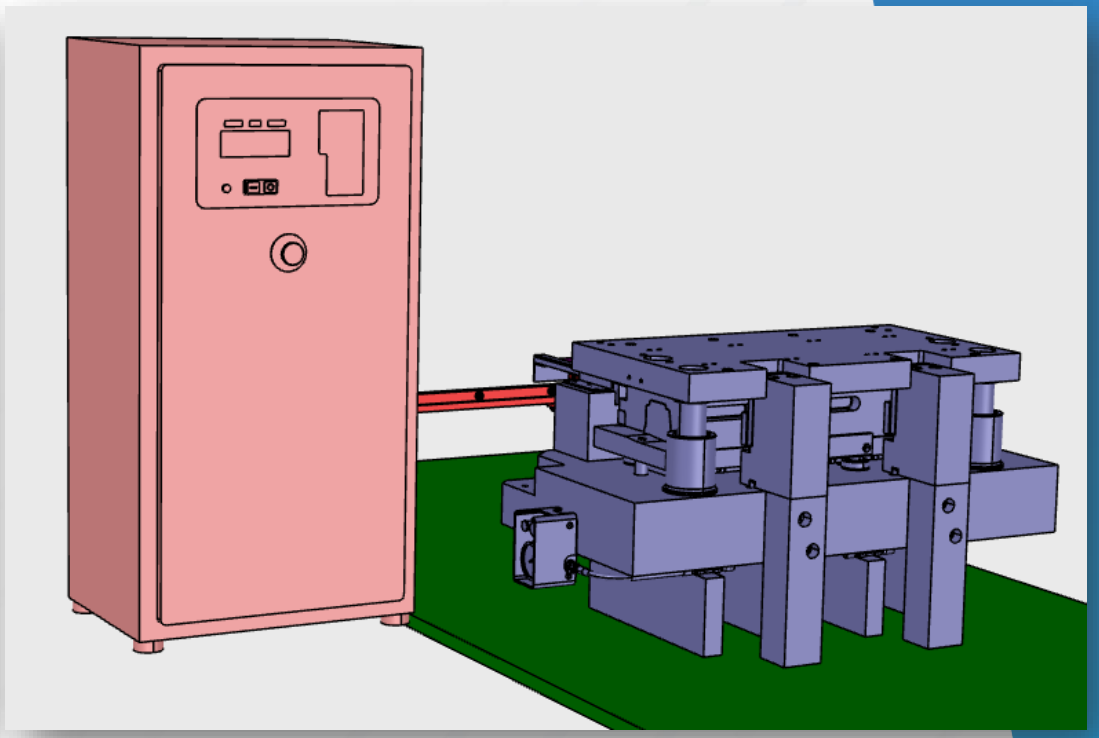

Coil Fed Process

Power Supply

Stamping Die

Hybrid Stamping – Production Model

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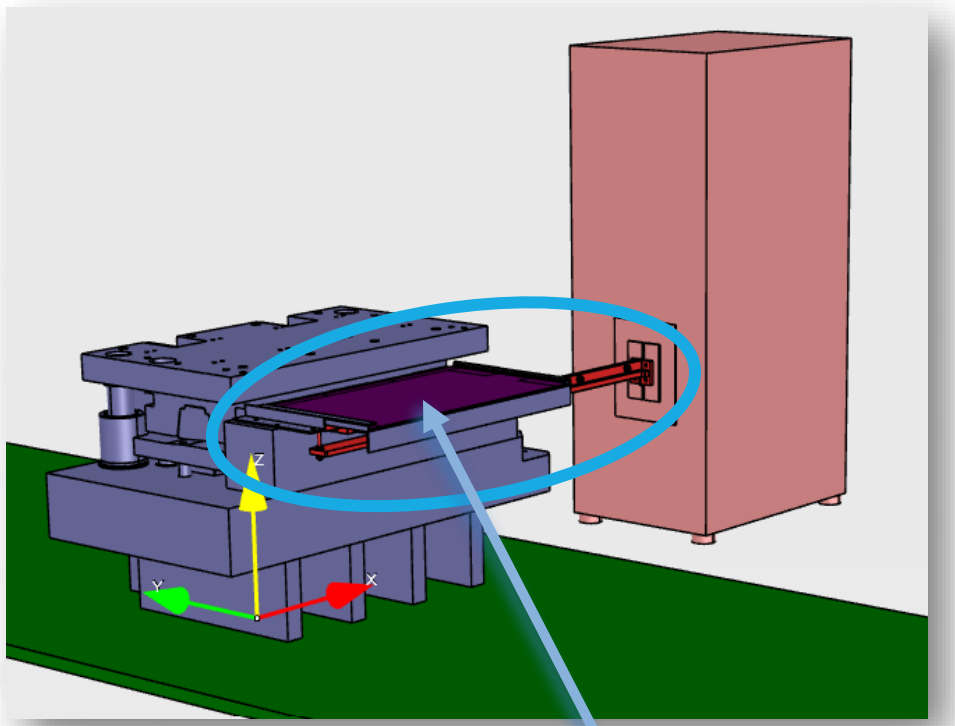

Blank/Coil in Heating "Nest"

Locally Heated

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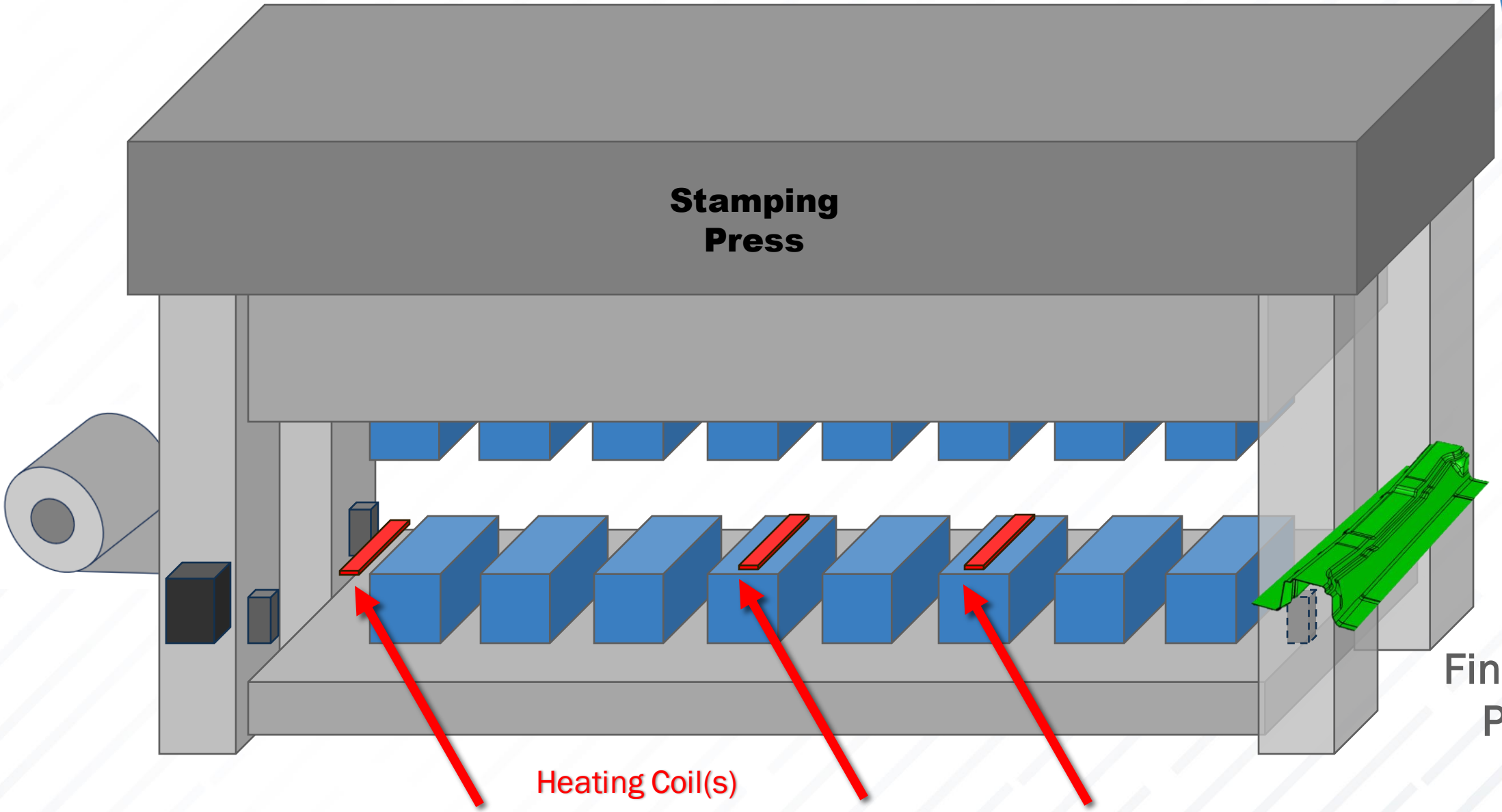
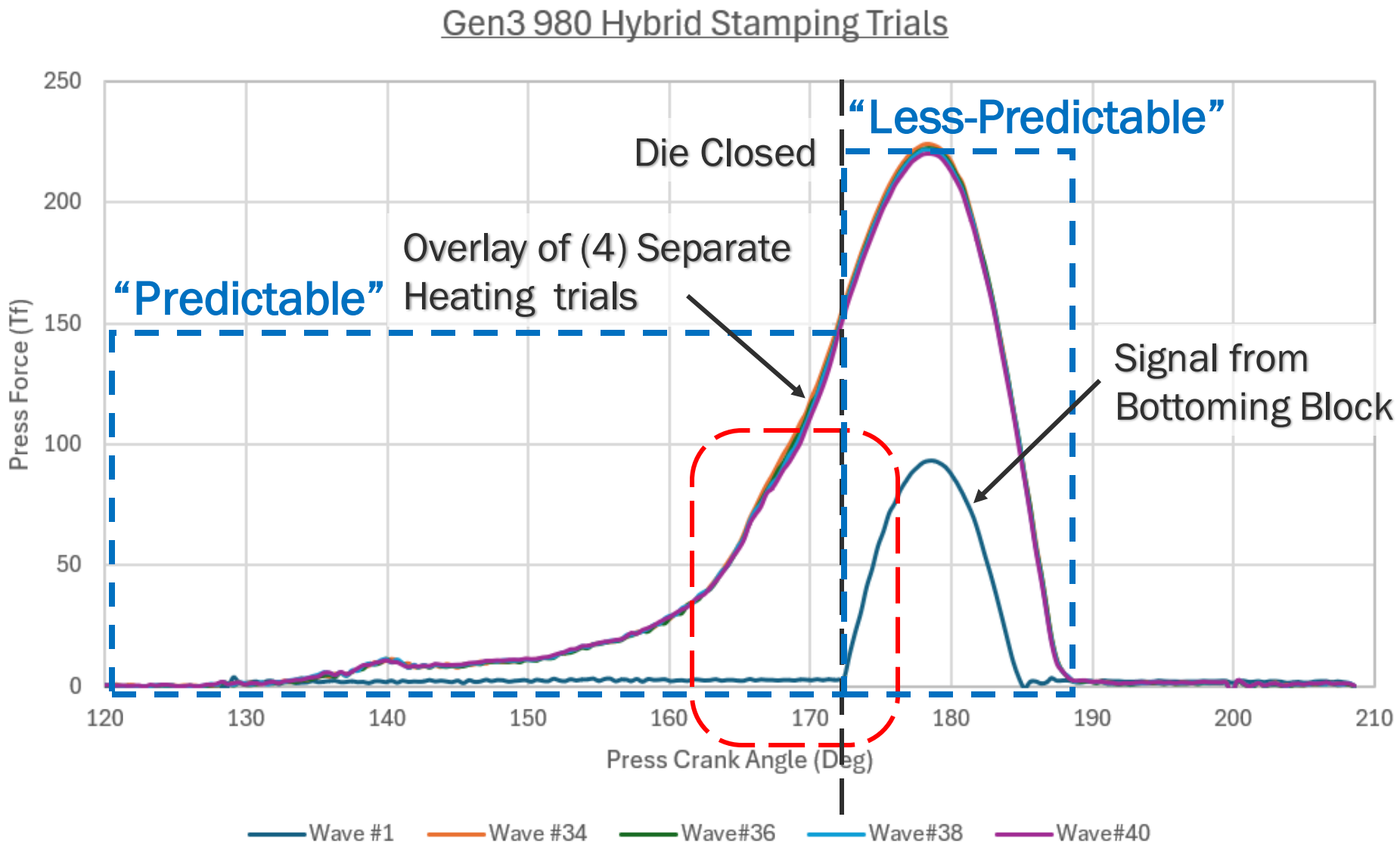
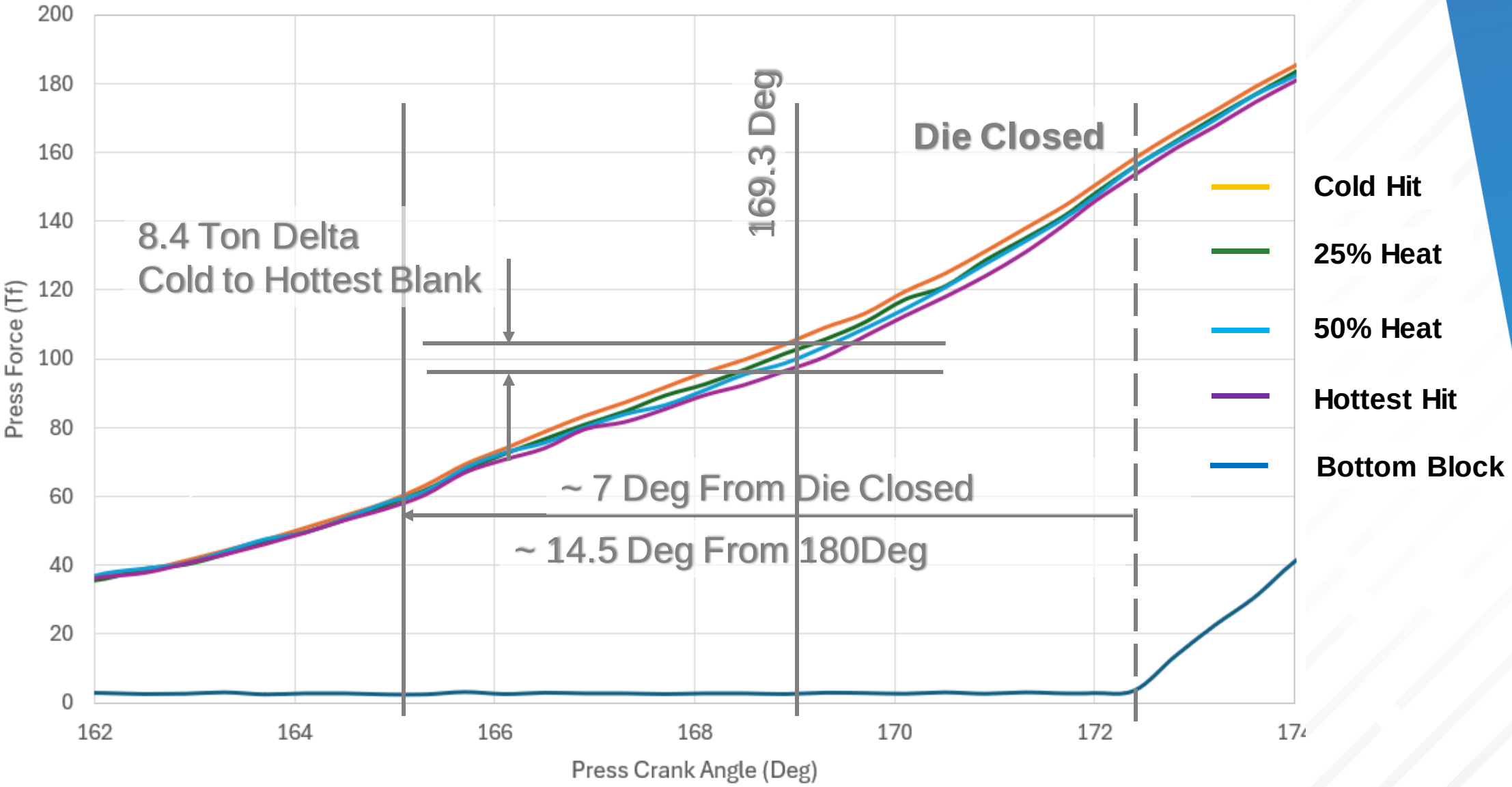


Hybrid Stamping – Tonnage Curve Study



Gen3 980 Hybrid Stamping Trials



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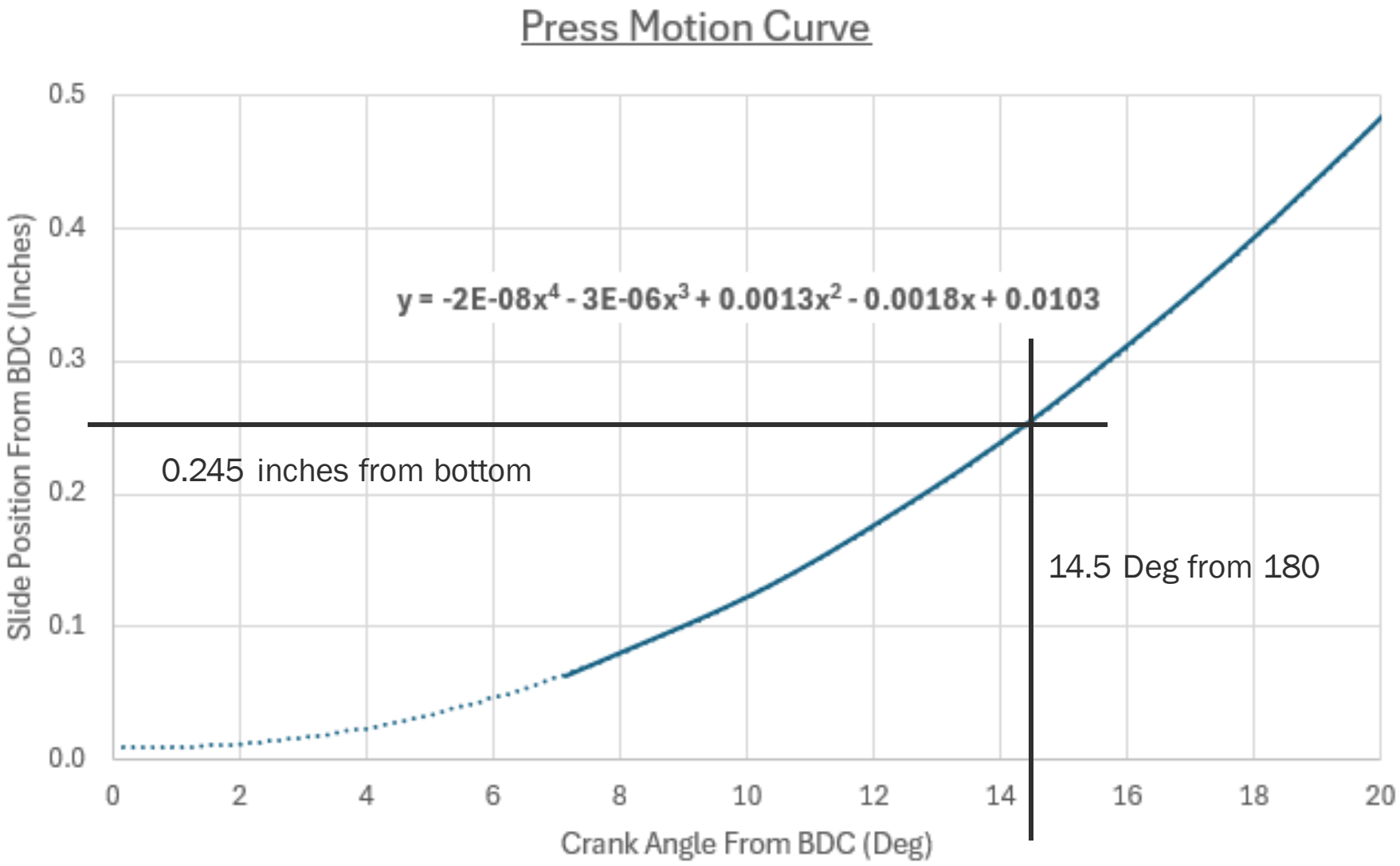

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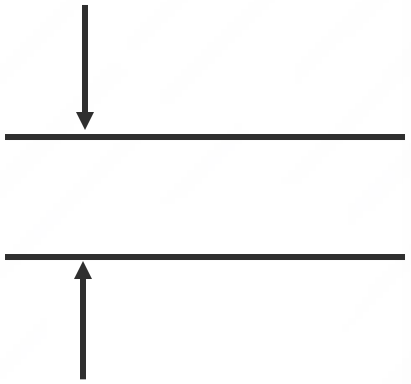

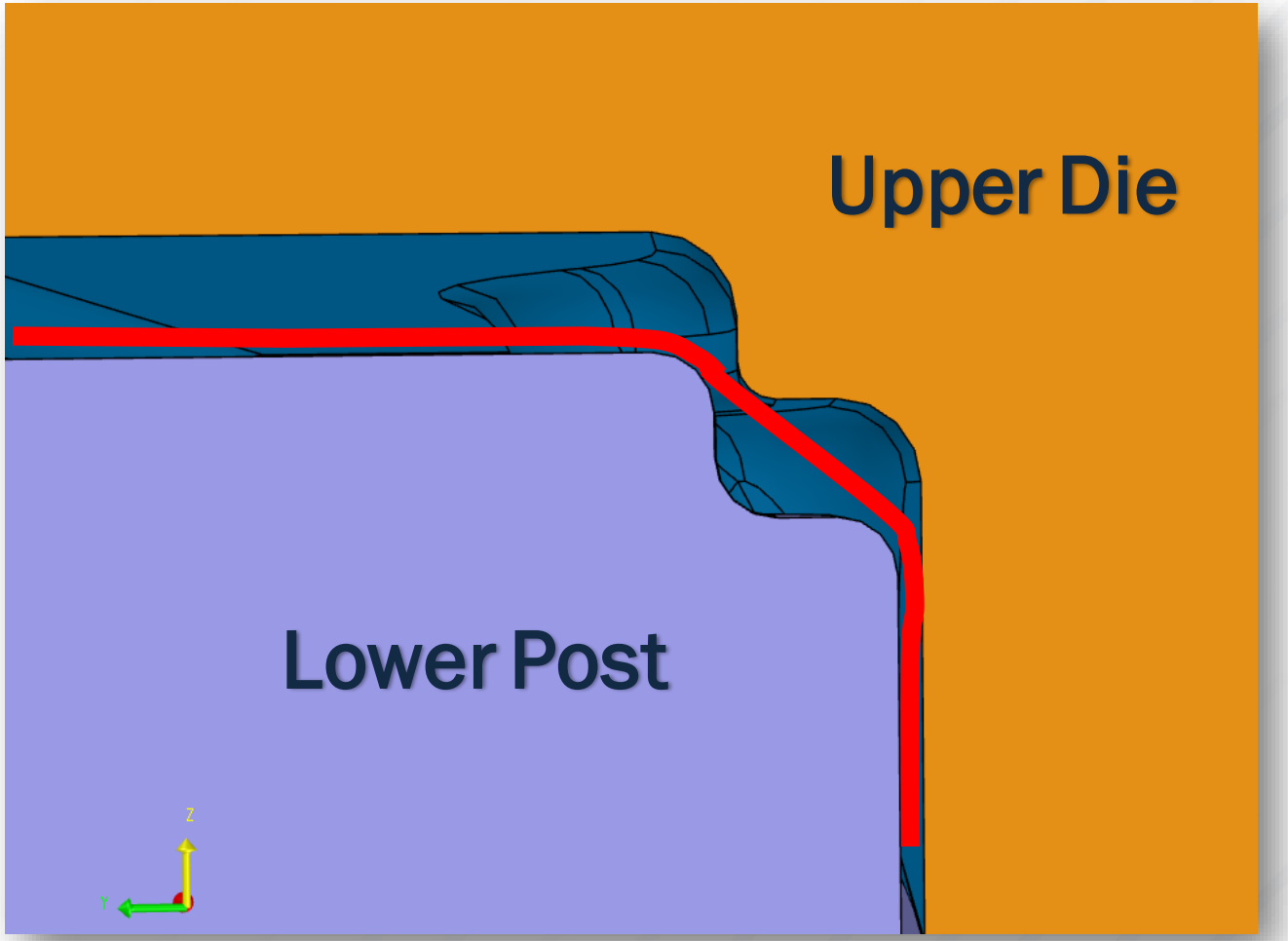

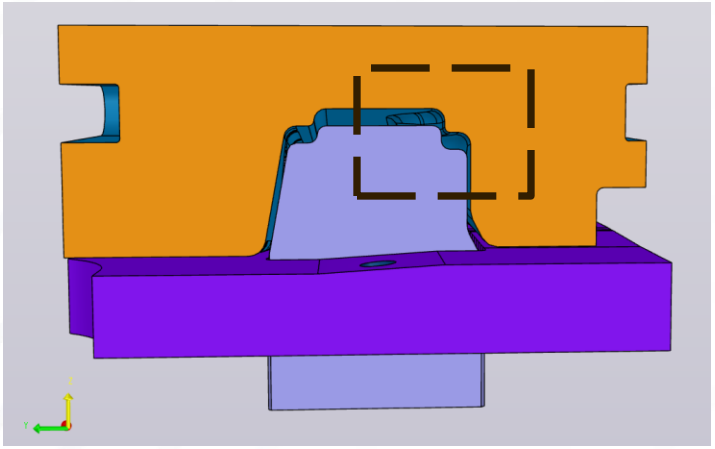

Hybrid Stamping - Take Aways/Next Steps

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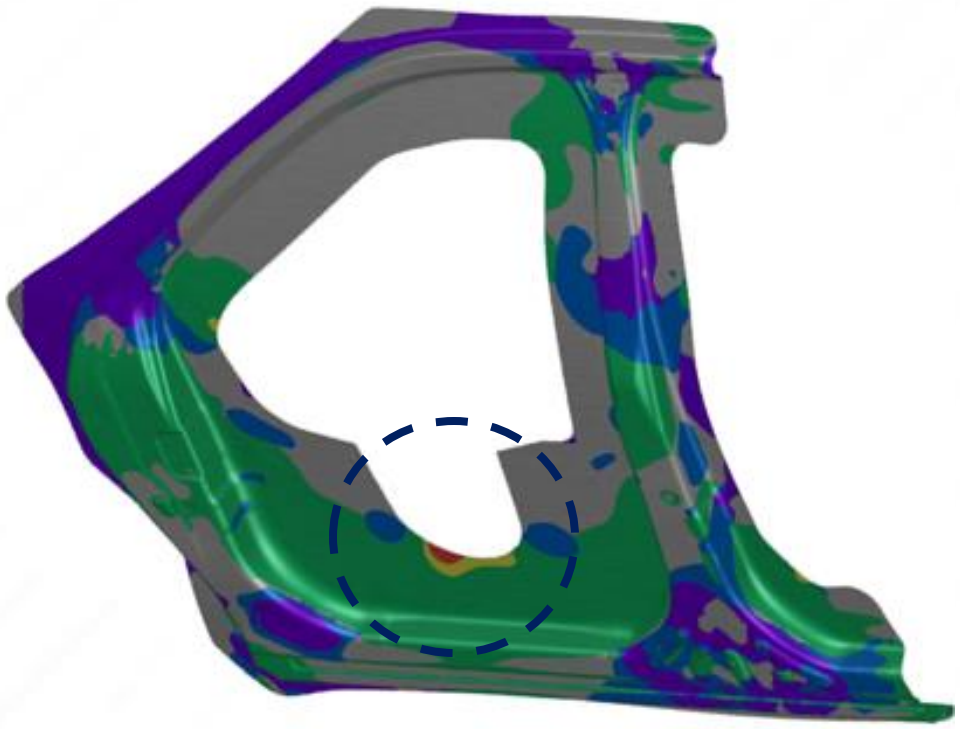

Operations - 1	Total Forces Legends		
	Tools	Legend Color	Max Force
D-20	Ram		1316.8 tonf
	Bed		1316.8 tonf

The strategic addition of heat in a Hybrid Stamping process can:

- Reduce local forming tonnages
- Increase local material properties
- Keep pace with high volume production
- Decrease tryout time
- Enable “Mega” stampings
- Enable a larger range of incoming materials to be used
- **Understand how this process can benefit paradigm shifting products**

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