

GREAT DESIGNS IN
STEEL

TWENTY YEARS

**INSIGHTS FROM MEASURING
THE “PRESS TONNAGE” OF
3RD GEN AHSS STAMPINGS**

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Martinrea International

On Behalf of Auto/Steel Partnership

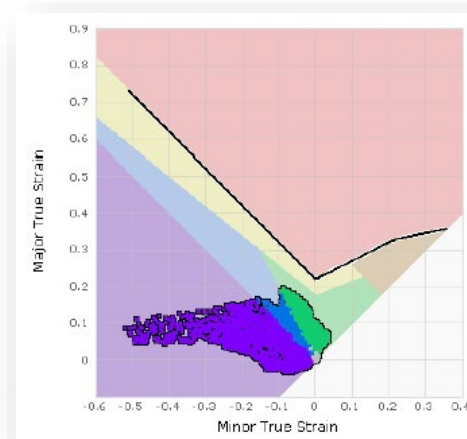
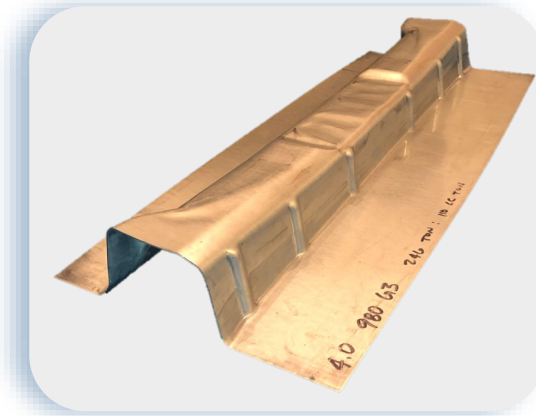
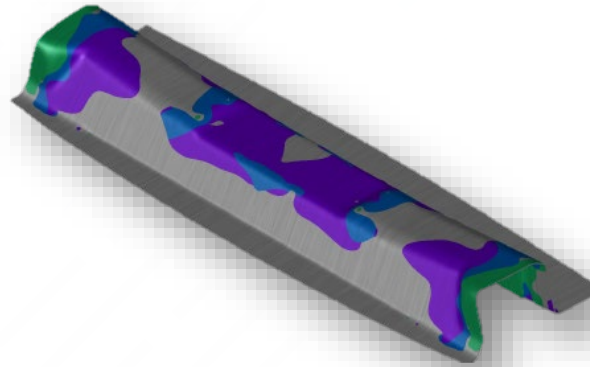
INSIGHTS FROM MEASURING THE “PRESS TONNAGE” OF 3RD GEN AHSS STAMPINGS



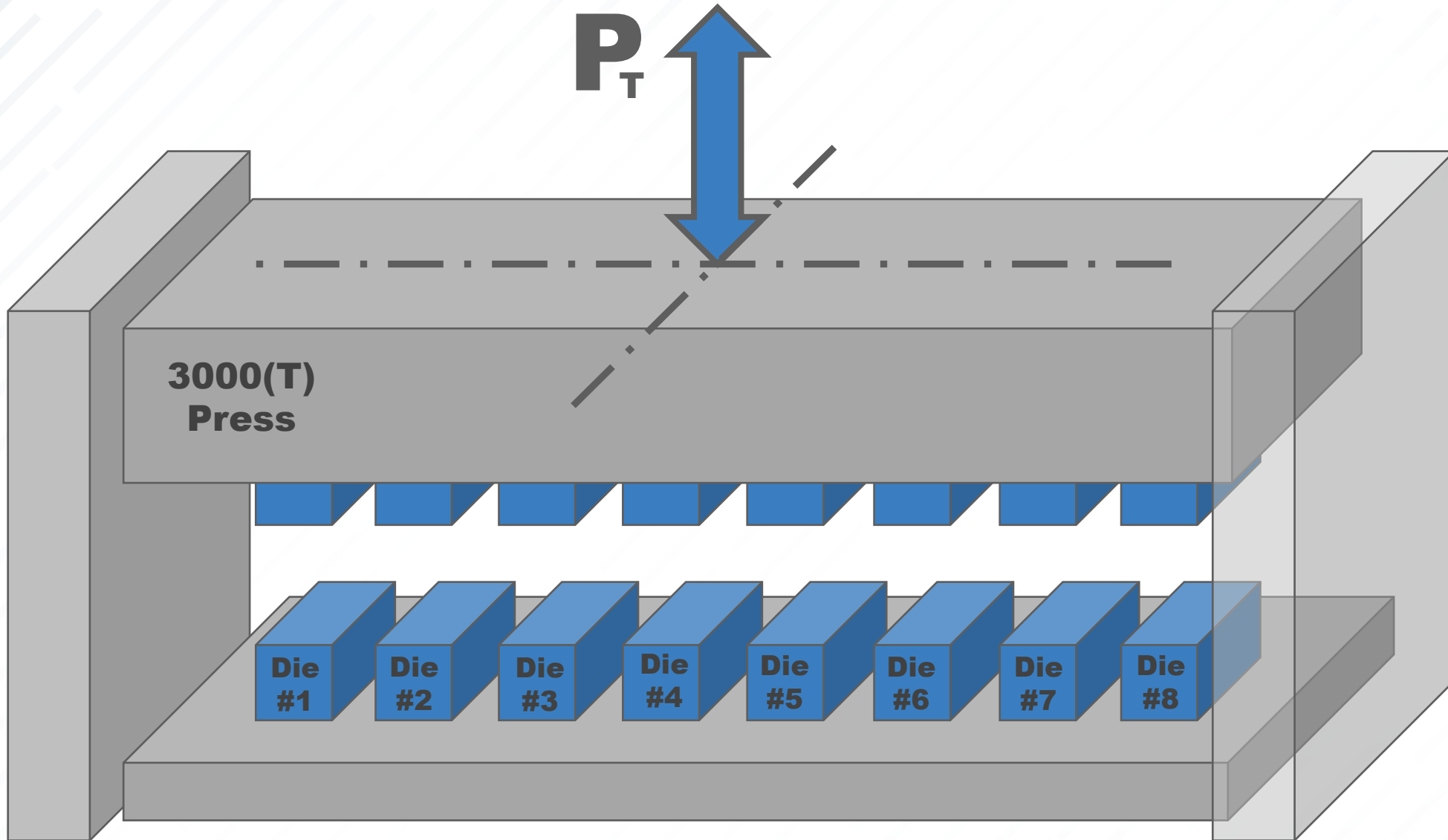
3rd Gen AHSS Insights

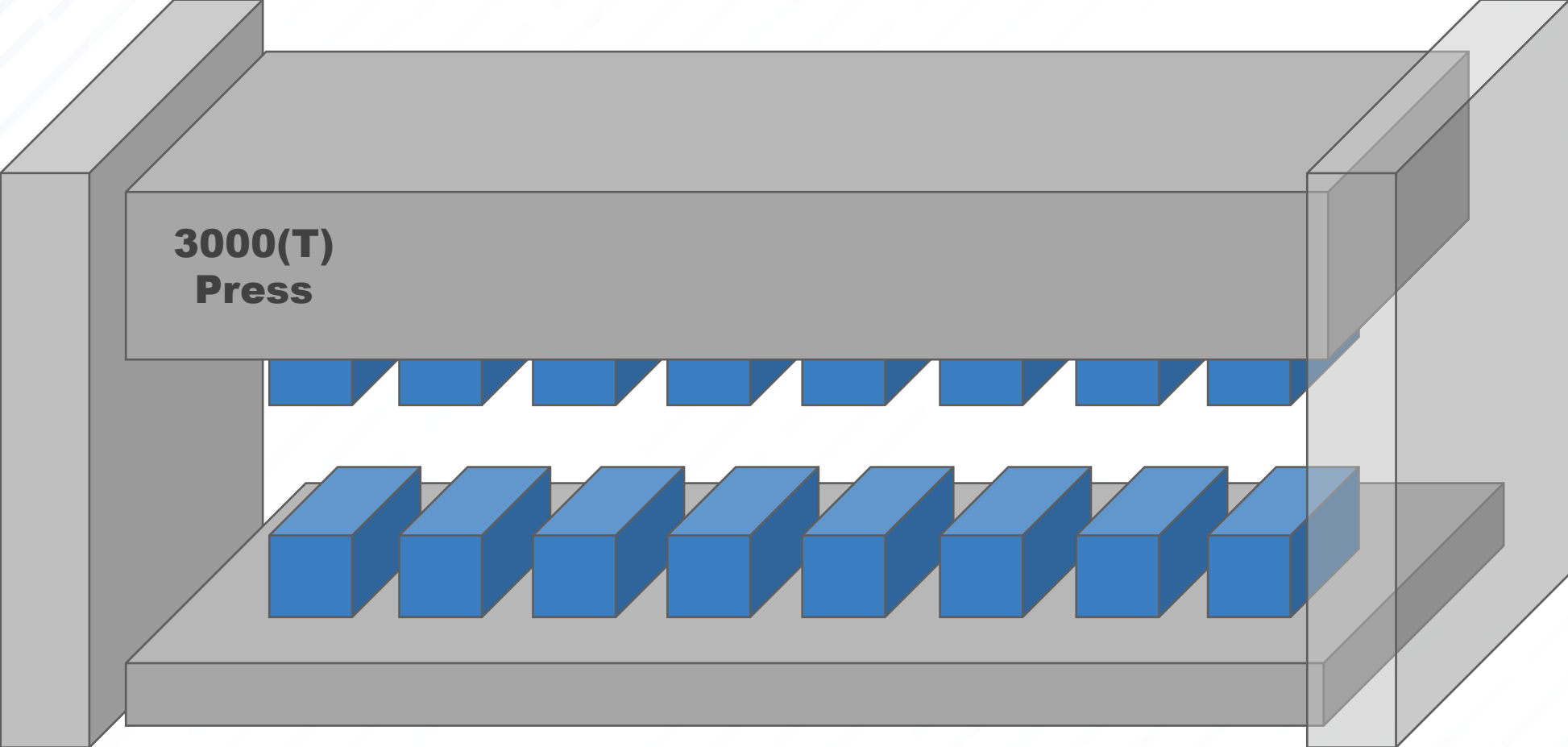
- Some Basics & Top Takeaways
- Martinrea/Minster Test Setup
- Testing Highlights
- Eccentric Loading Results
- Load Mapping Premise
- 2D Results
- Assumptions & Eccentric Load Predictions

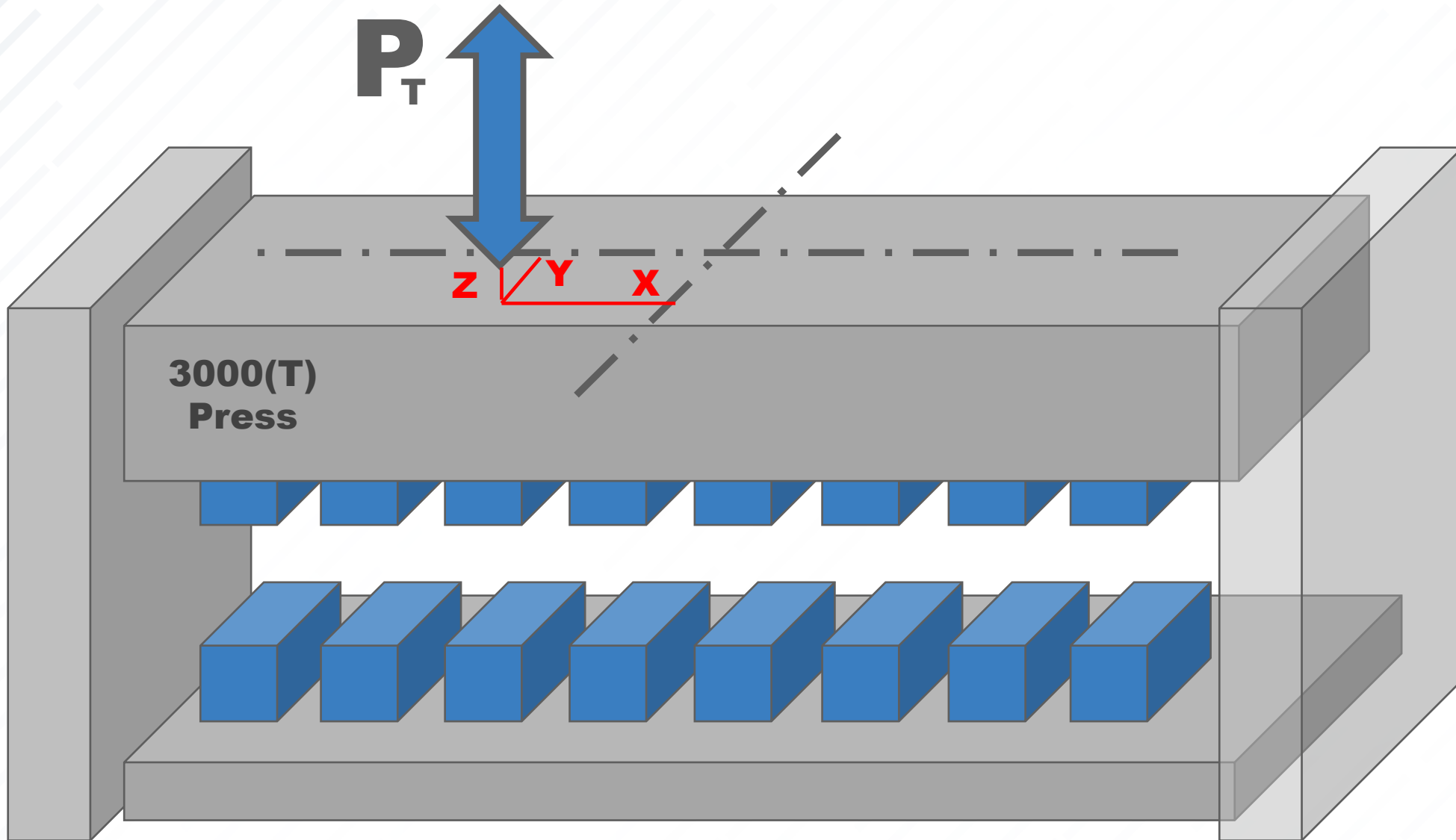
3rd Gen 980 Channel Section

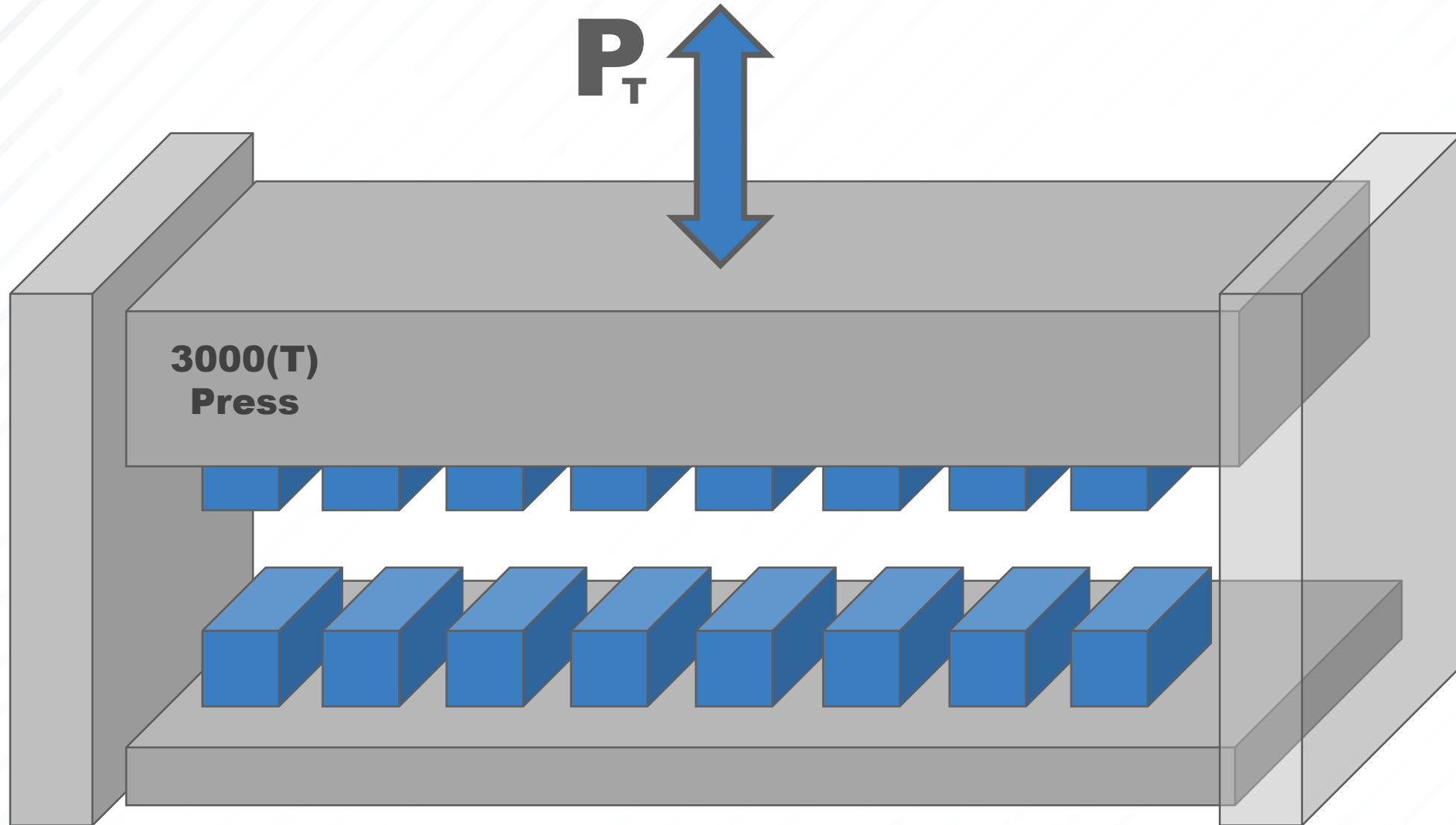


Total Forces Legends		
Tools	Legend Color	Max Force
Ram		106.6 tonf
Bed		106.6 tonf









A/SP PROJECT: 3RD GEN AHSS PRESS TONNAGE



PROJECT GOAL:

Enable the accurate prediction of the “Press Tonnage” needed to form, trim and perform any secondary forming of 3rd Gen AHSS panels.

Insights & Top Takeaways:

- Press tonnage and forming tonnage are not the same
- The term “Bottom Dead Center” is not a unique event
- The “Press Tonnage Curve” has both predictable and less-predictable segments

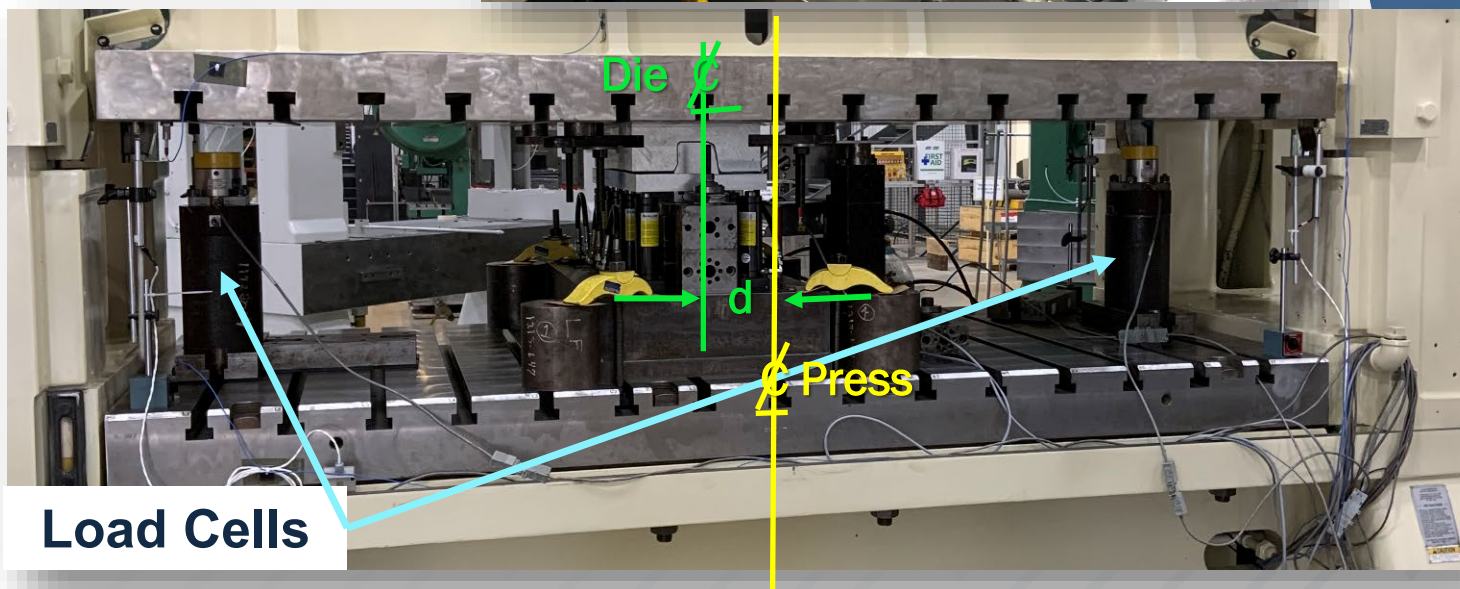
PRESS SETUP



Ram Position
Transducer

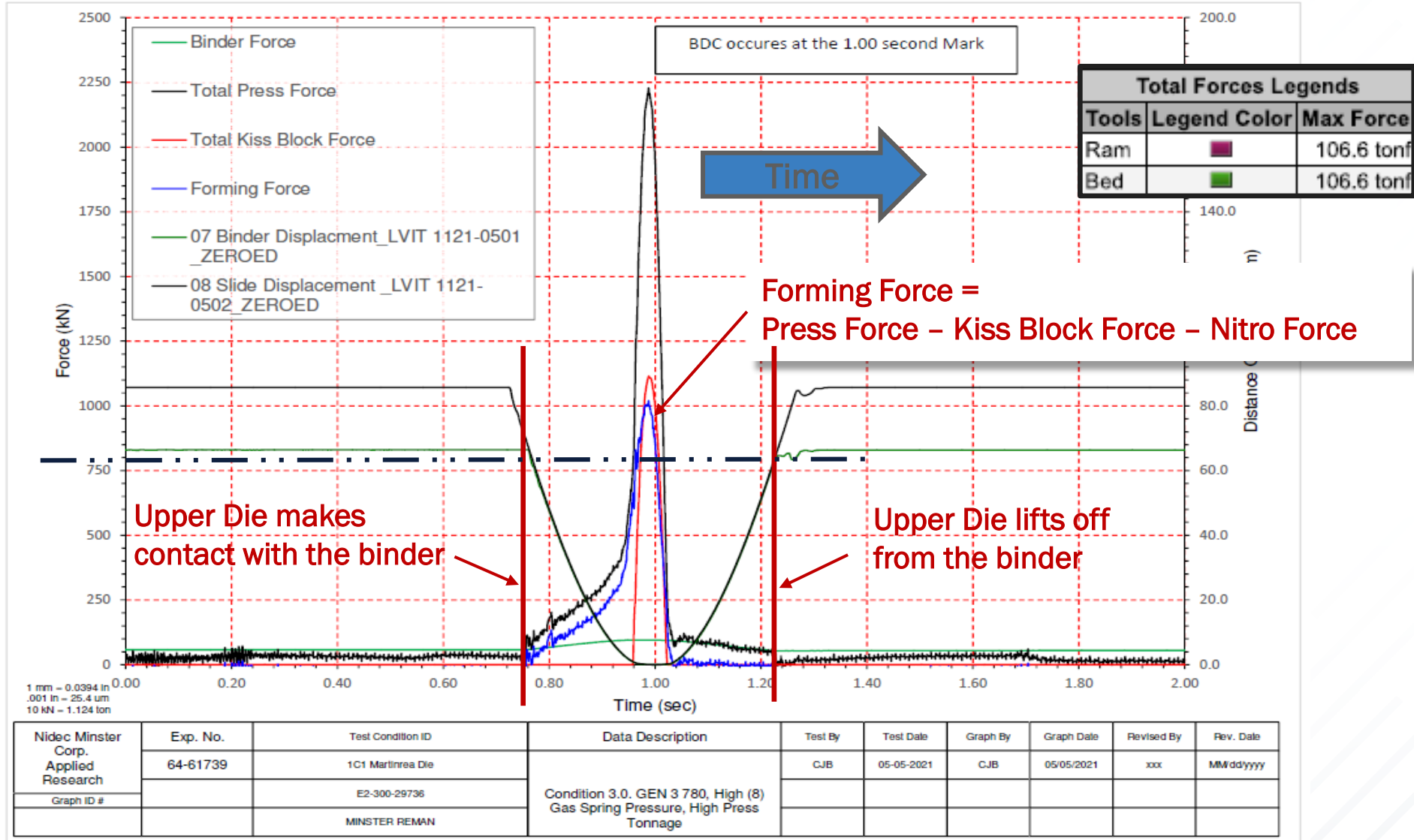
Pad Position
Transducer

KALLER
TU-750 X(8)

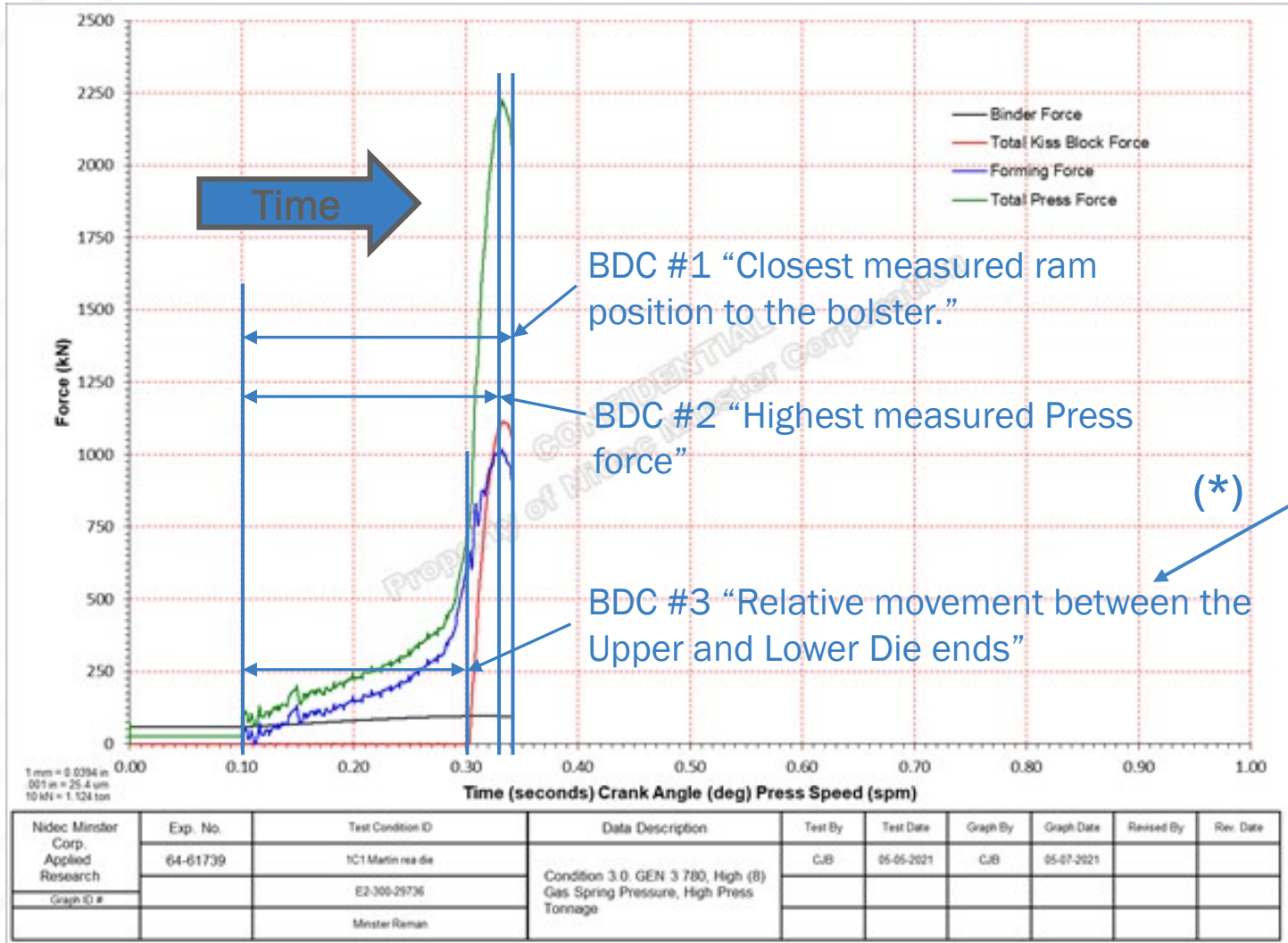


Load Cells

MEASURING PRESS TONNAGE

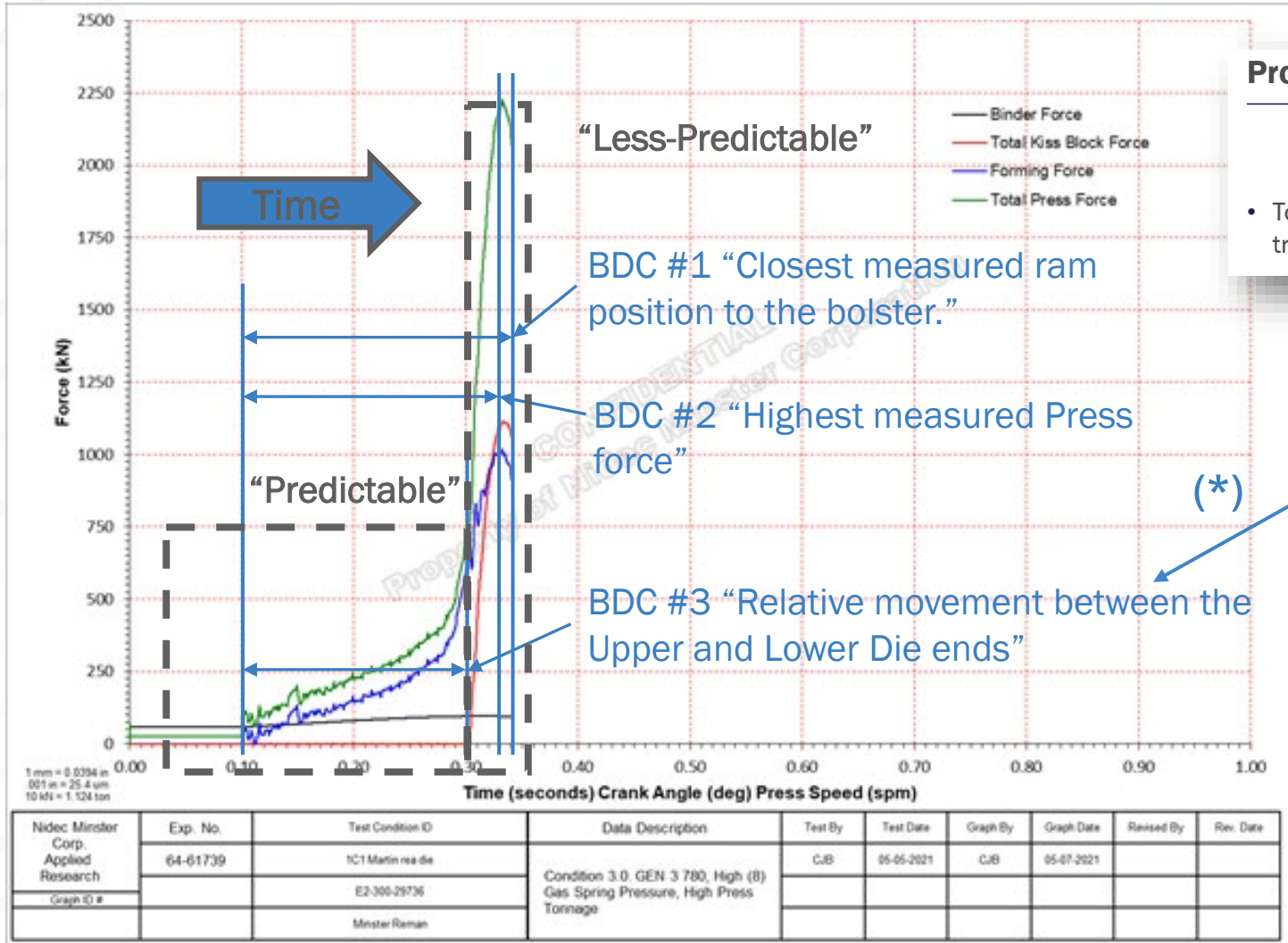


BOTTOM DEAD CENTER



It also needs to be remembered that "Bottom Dead Center" in terms of the predictive models occurs when the relative movement between the upper and lower die ends.

BOTTOM DEAD CENTER



Project Goals

- To enable accurate prediction of the "Press Tonnage" needed to form, trim and perform any secondary forming of 3rd Gen AHSS panels.

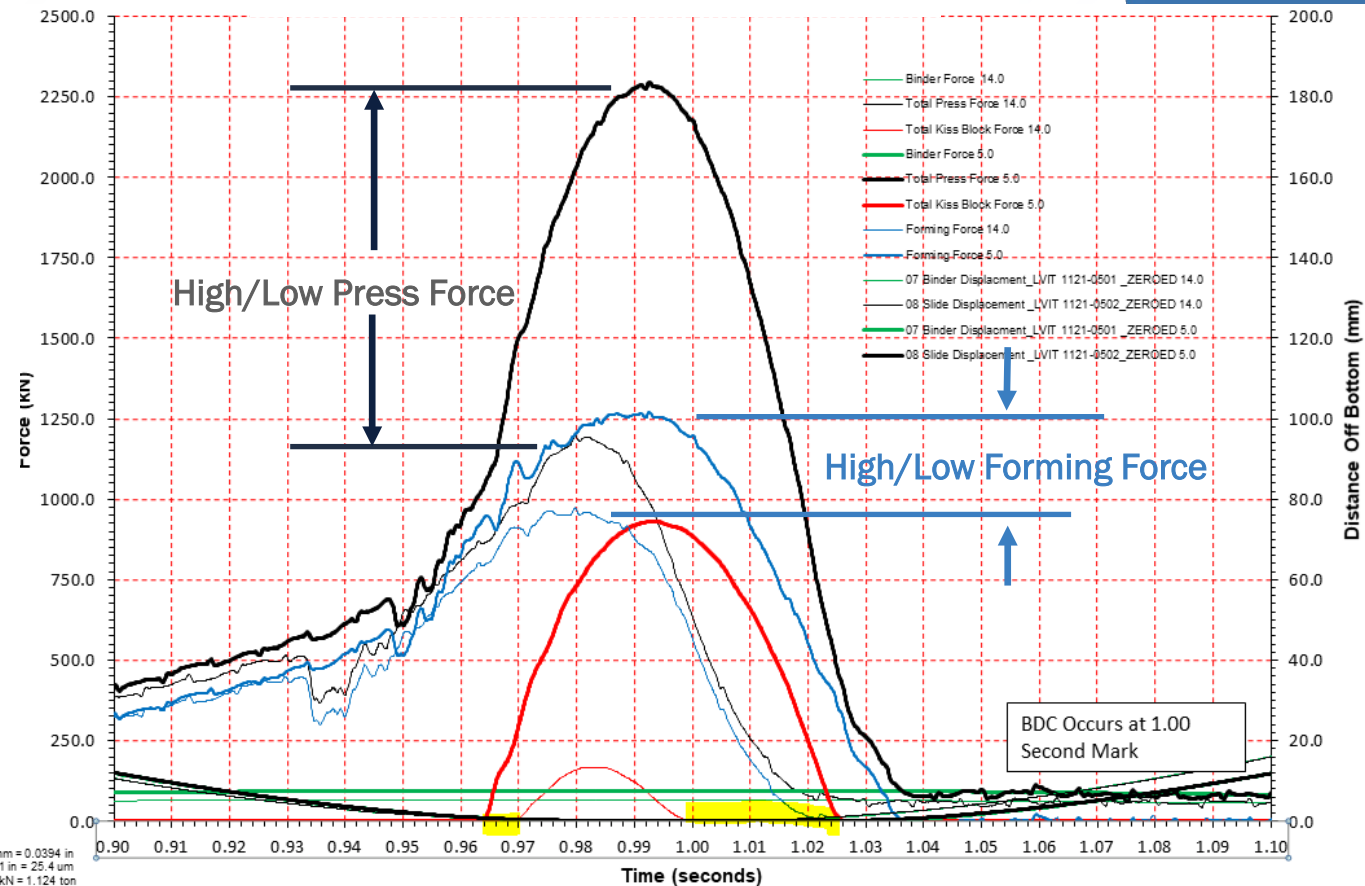
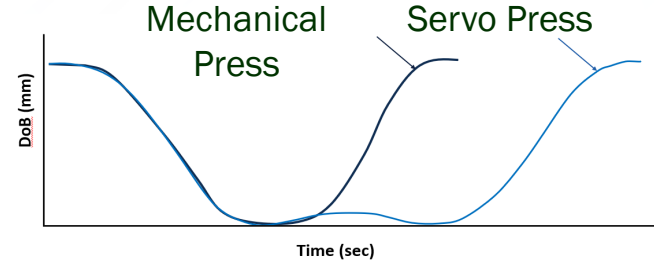
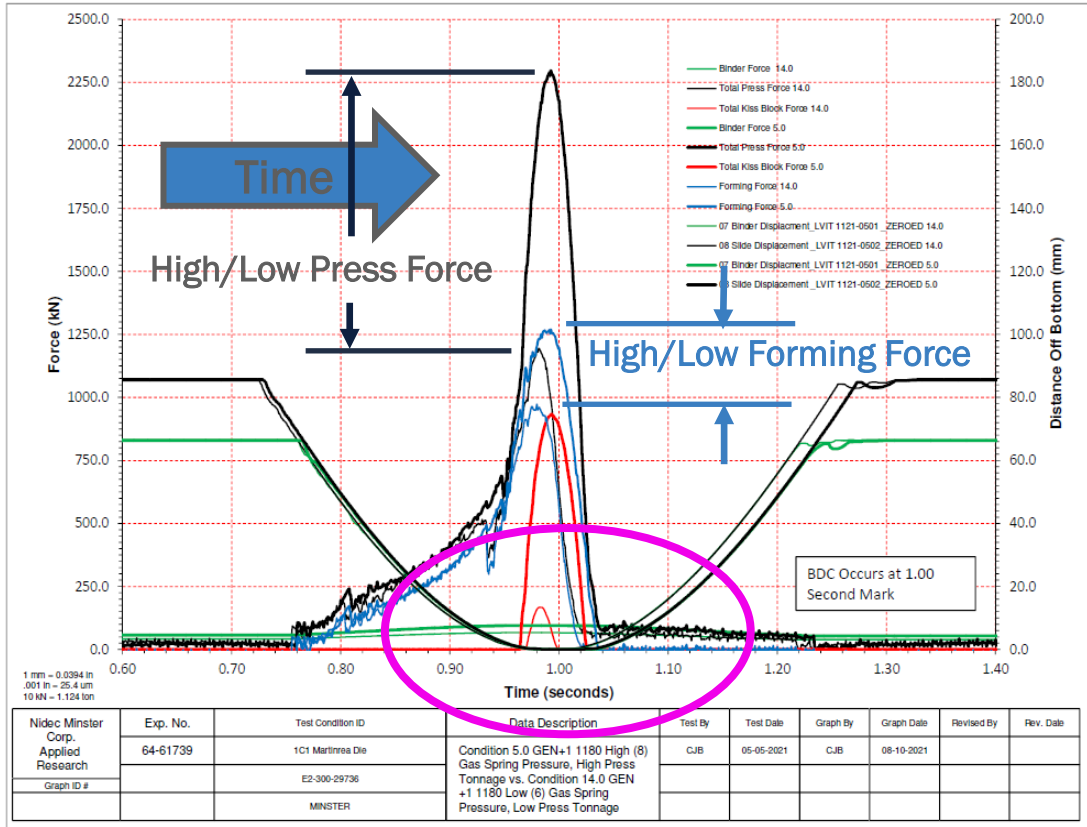
It also needs to be remembered that "Bottom Dead Center" in terms of the predictive models occurs when the relative movement between the upper and lower die ends.

BEYOND BOTTOM DEAD CENTER



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G:\Eng\ARC\64-61739\64-61739_3rd Gen AHSS Press Tonnage - Auto Steel Partnership_Gestamp_NIDEC\RawData\1.0 Martinea Die Data\1C1 Die Trial\5.0 VS. 14.0 .xlsx

Graph1

At the higher press tonnage, the die is on bottom for ~ 0.034 sec's longer forming process due to the press loading and unloading.

1 mm = 0.0394 in
.001 in = 25.4 um
10 kN = 1.124 ton

OFF-CENTER PRESS TONNAGE



Eccentric Loads:

Approximately the same Total Press Forces

On Center	Press Tonnage (H)	Pad Pressure (H)	Material	Test No.	Total Press Force (kN)	Maximum Force Recorded (kN)
						Forming Energy to achieve BDC (kN*mm)
			Gen3 780	3	2229	10038
			Gen3 980	4	2265	11419
			Gen1+ 1180	5	2296	14329

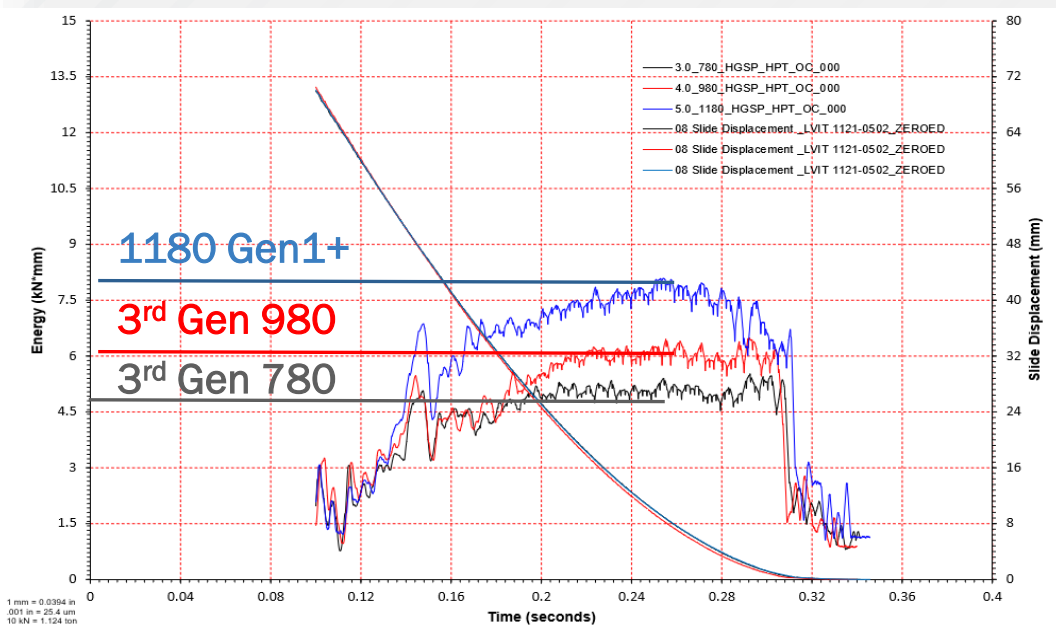
Off Center (1)	Press Tonnage (H)	Pad Pressure (H)	Material	Test No.	Total Press Force (kN)	Maximum Force Recorded (kN)
						Forming Energy to achieve BDC (kN*mm)
			Gen3 780	17	2213	11351
			Gen3 980	18	2270	12620
			Gen1+ 1180	19	2217	16368

Approximately 10% increase in Forming Energy

OFF-CENTER PRESS TONNAGE

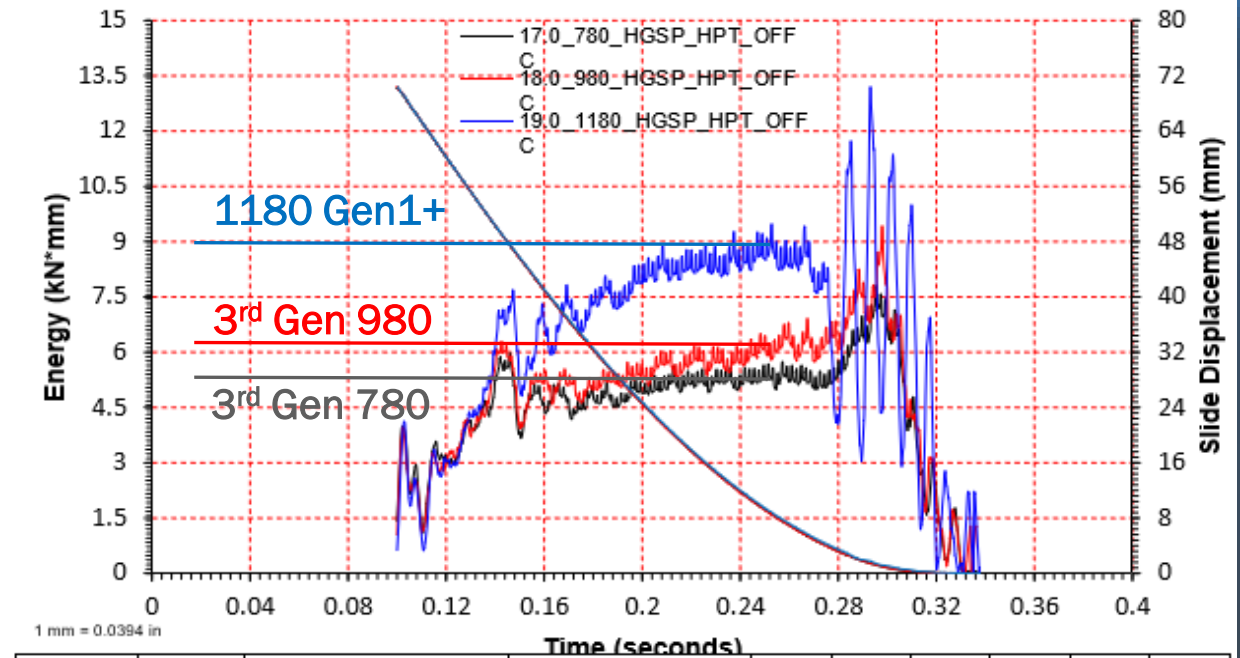


On-Center



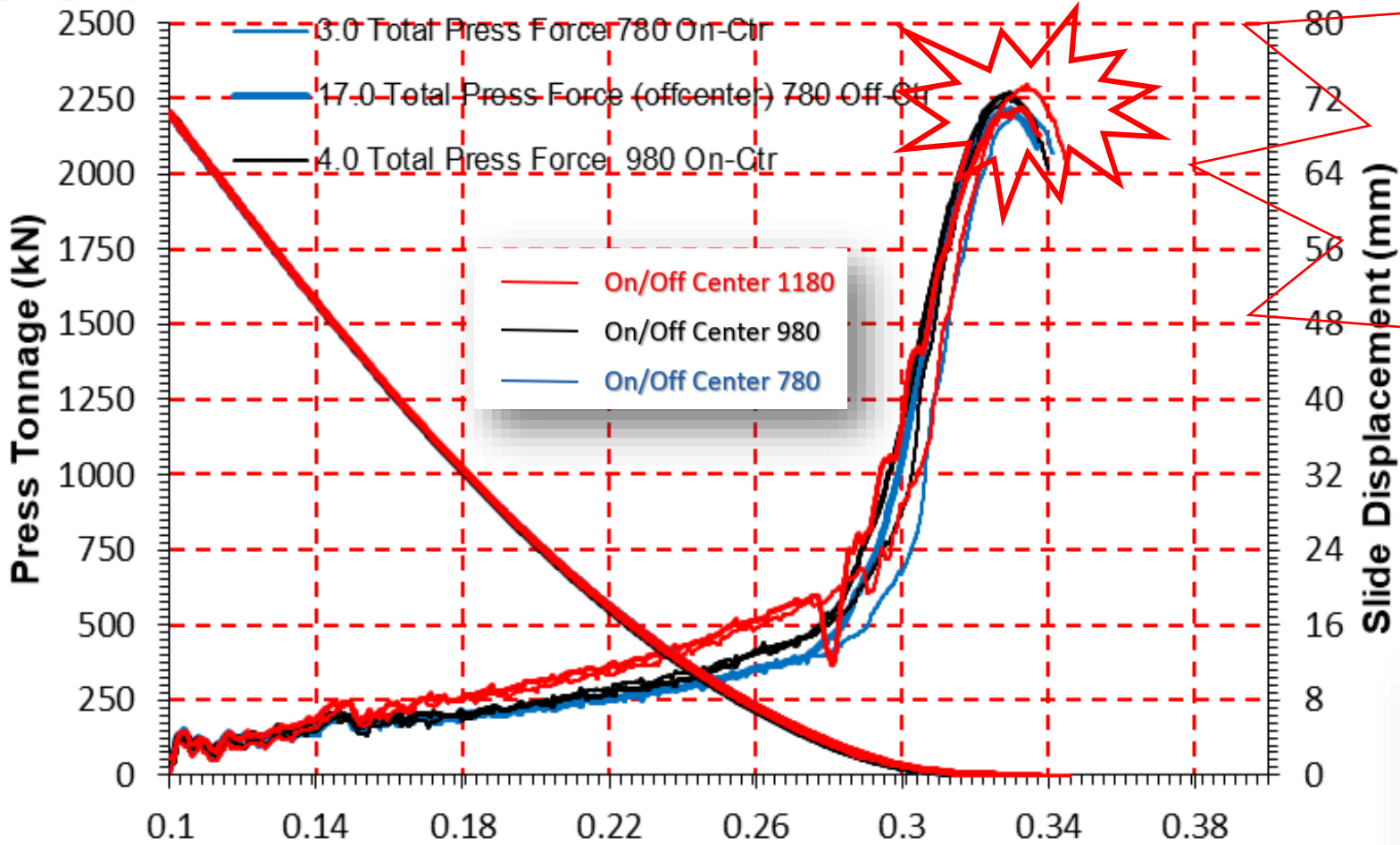
Exp. No.	Test Condition ID	Data Description	Test By	Test Date	Graph By	Graph Date	Revised By	Rev. Date
64-61739	1C1 - Die Trial	Cond. 3, 4, 5 - High (8) Gas Spring Pressure, High Press Tonnage Setting Material Comparison: Energy vs. BDC vs. Time	CJB	05-05-2021	CJB	05-24-2021		
	E2-300-29736							
	MINSTER							

Off-Center

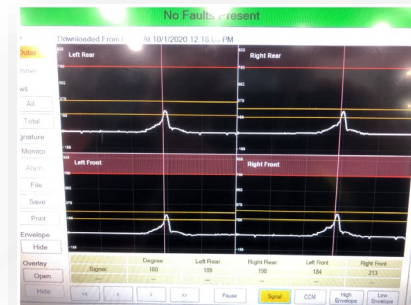
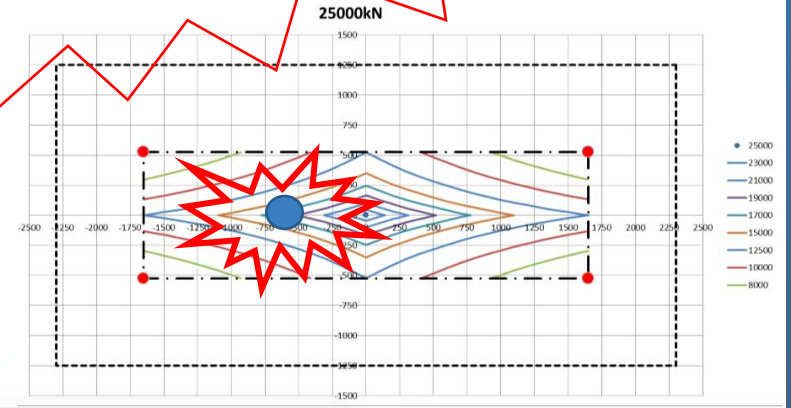


Exp.	Test Condition ID	Data Description	Test	Test	Grap	Grap	Revi	Rev.
64-	1C1 - Die Trial	Cond. 17, 18, 19, - High (8) Gas Spring	CJB	05-	CJB	05-		
	E2-300-29736							
	MINSTER							

OFF-CENTER PRESS TONNAGE



Very Similar Total Tonnages Will Read on the Press Tonnage Monitors with the Possibility of a very Different Press Capacity Going Undetected.

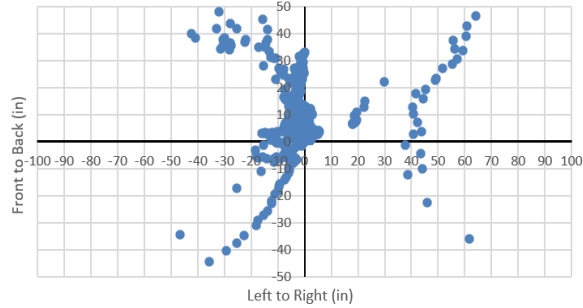


OFF-CENTER PRESS TONNAGE

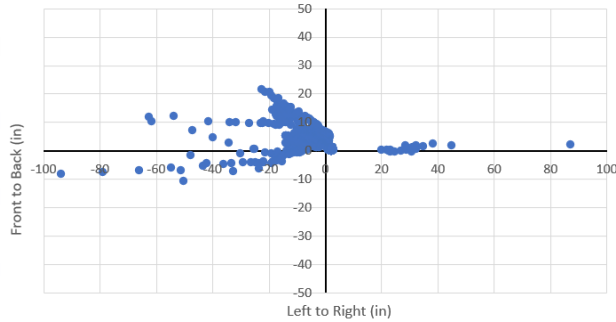


On Center

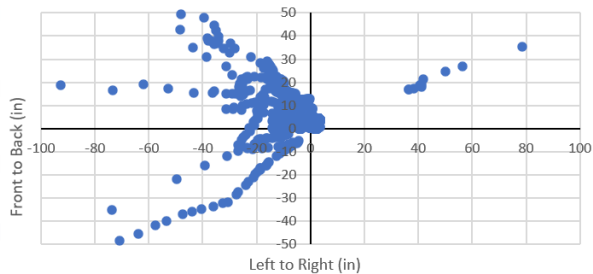
On-Center Loading Gen1+ 1180
Eccentric Load Position on the Bolster



On-Center Loading Gen3 980
Eccentric Load Position on the Bolster

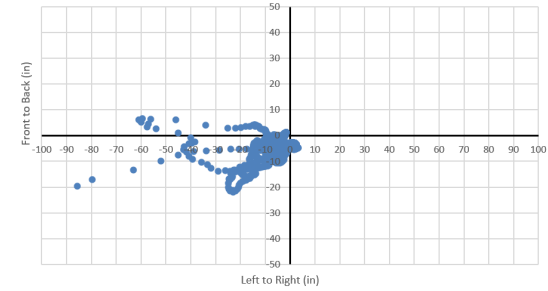


On-Center Loading Gen3 780
Eccentric Load Position on the Bolster

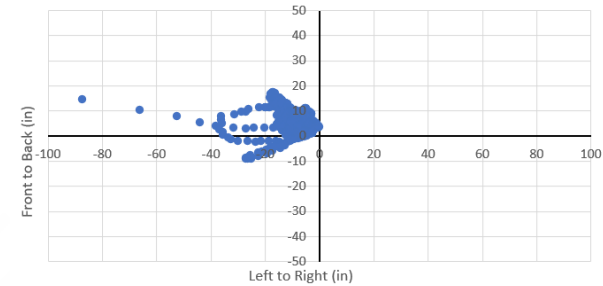


Off Center

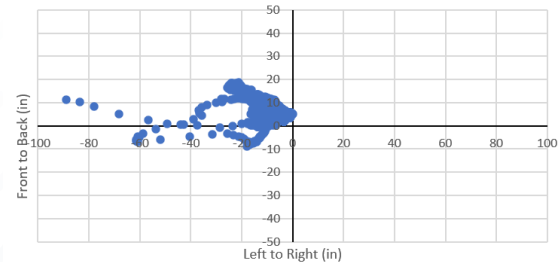
Off-Center Loading Gen1+ 1180
Eccentric Load Position on the Bolster



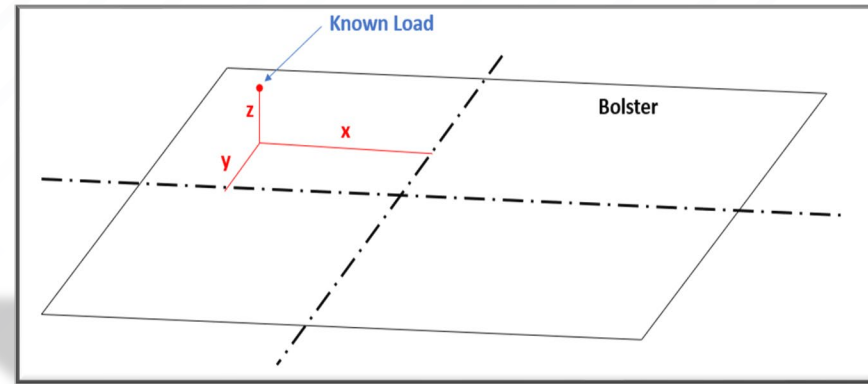
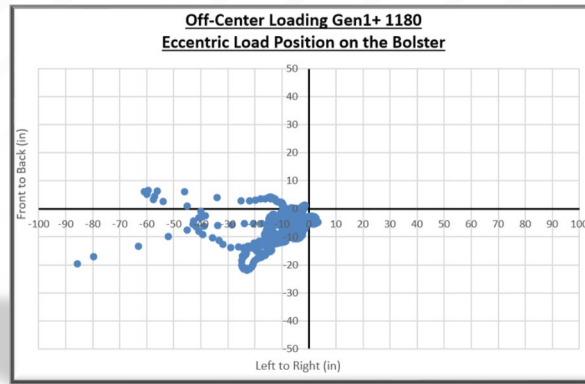
Off-Center Loading Gen3 980
Eccentric Load Position on the Bolster



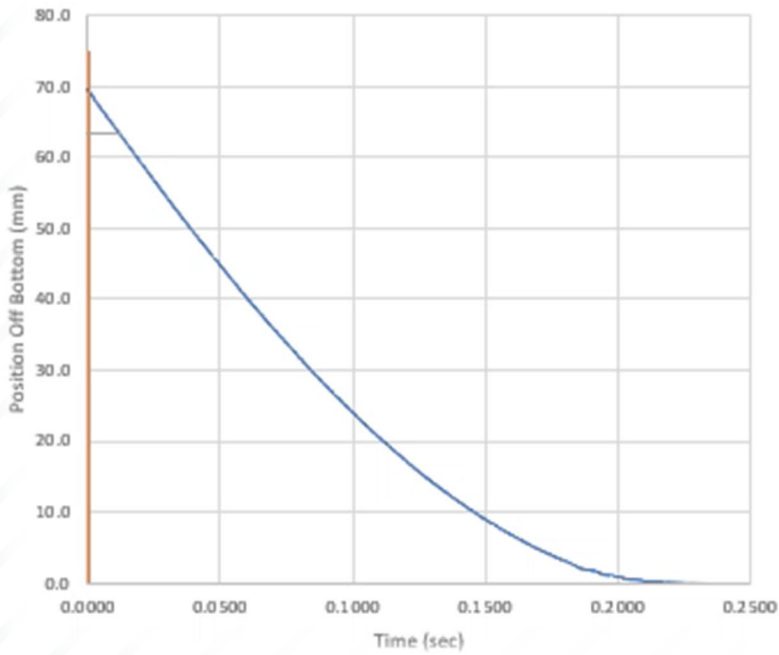
Off-Center Loading Gen3 780
Eccentric load Position on the Bolster



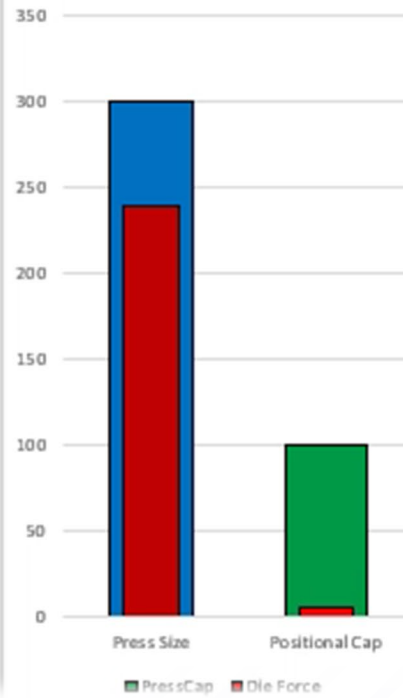
LOAD MAPPING



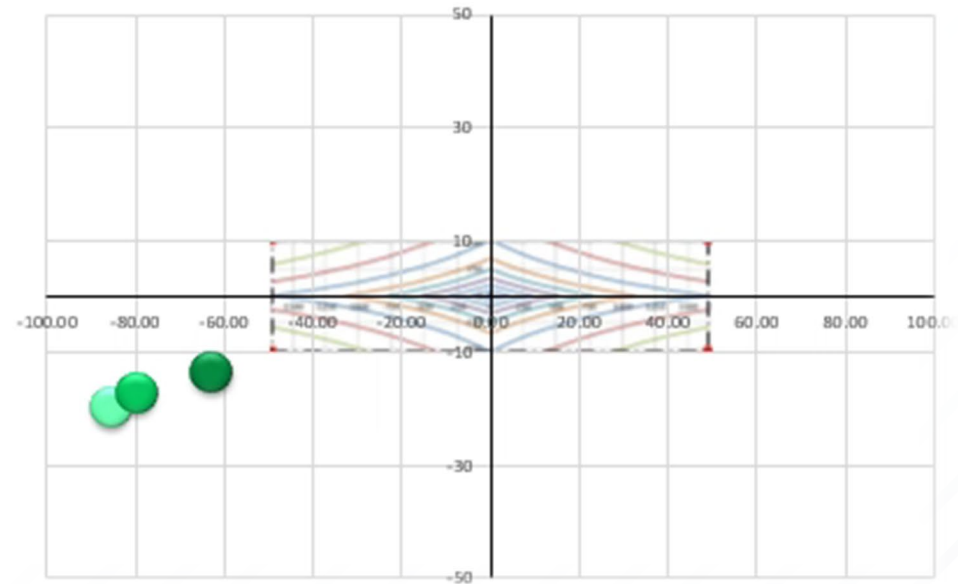
Ram Position at Time of the Force Reading



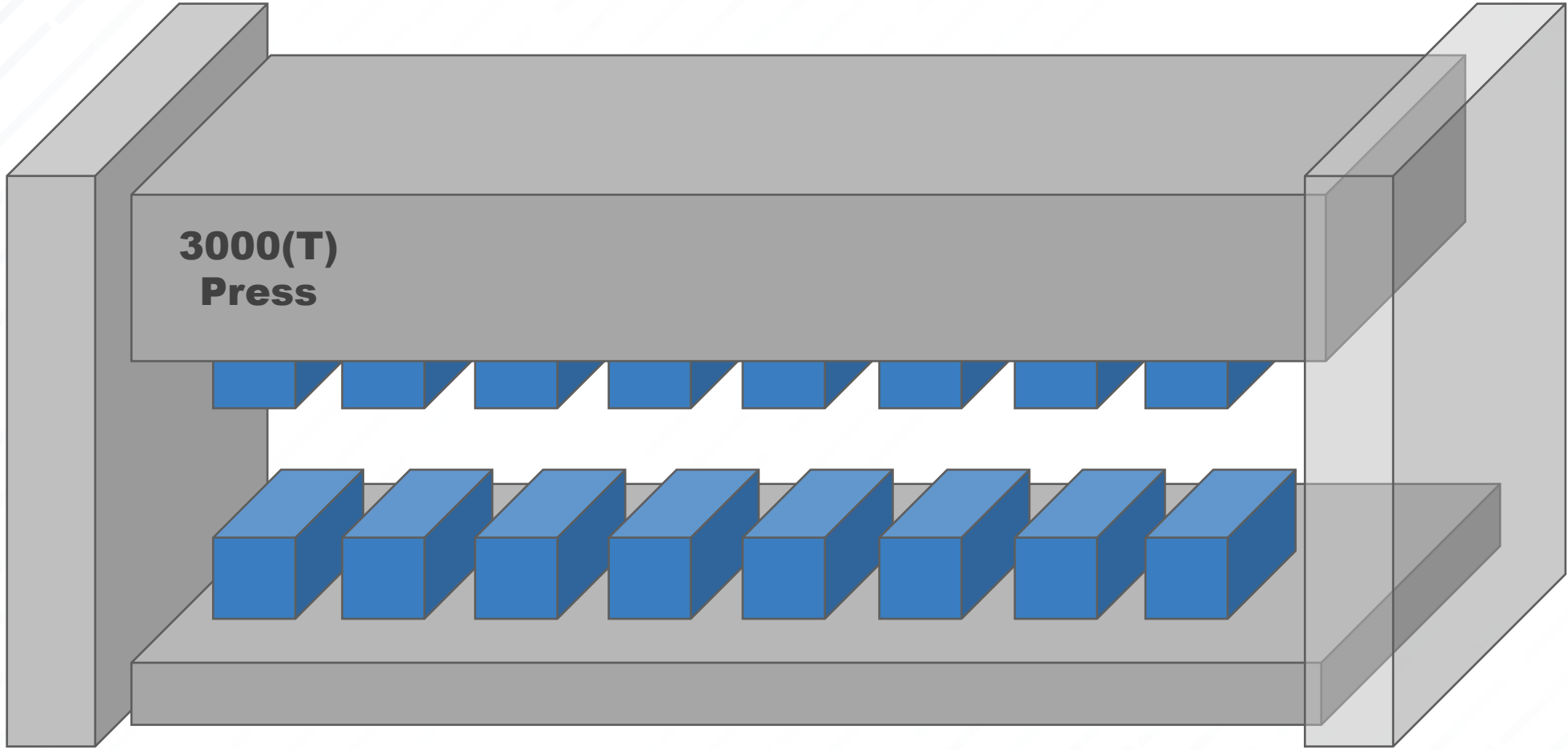
Eccentric Load Evaluation

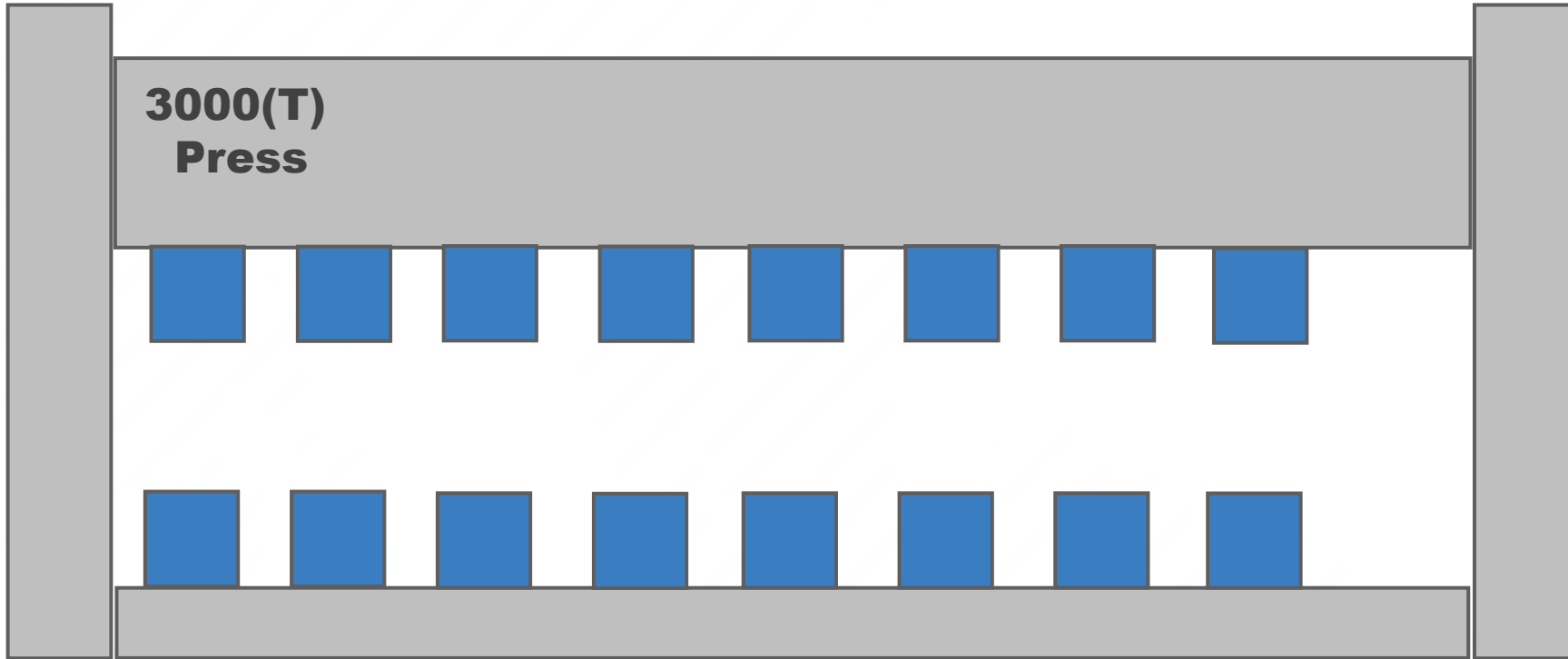


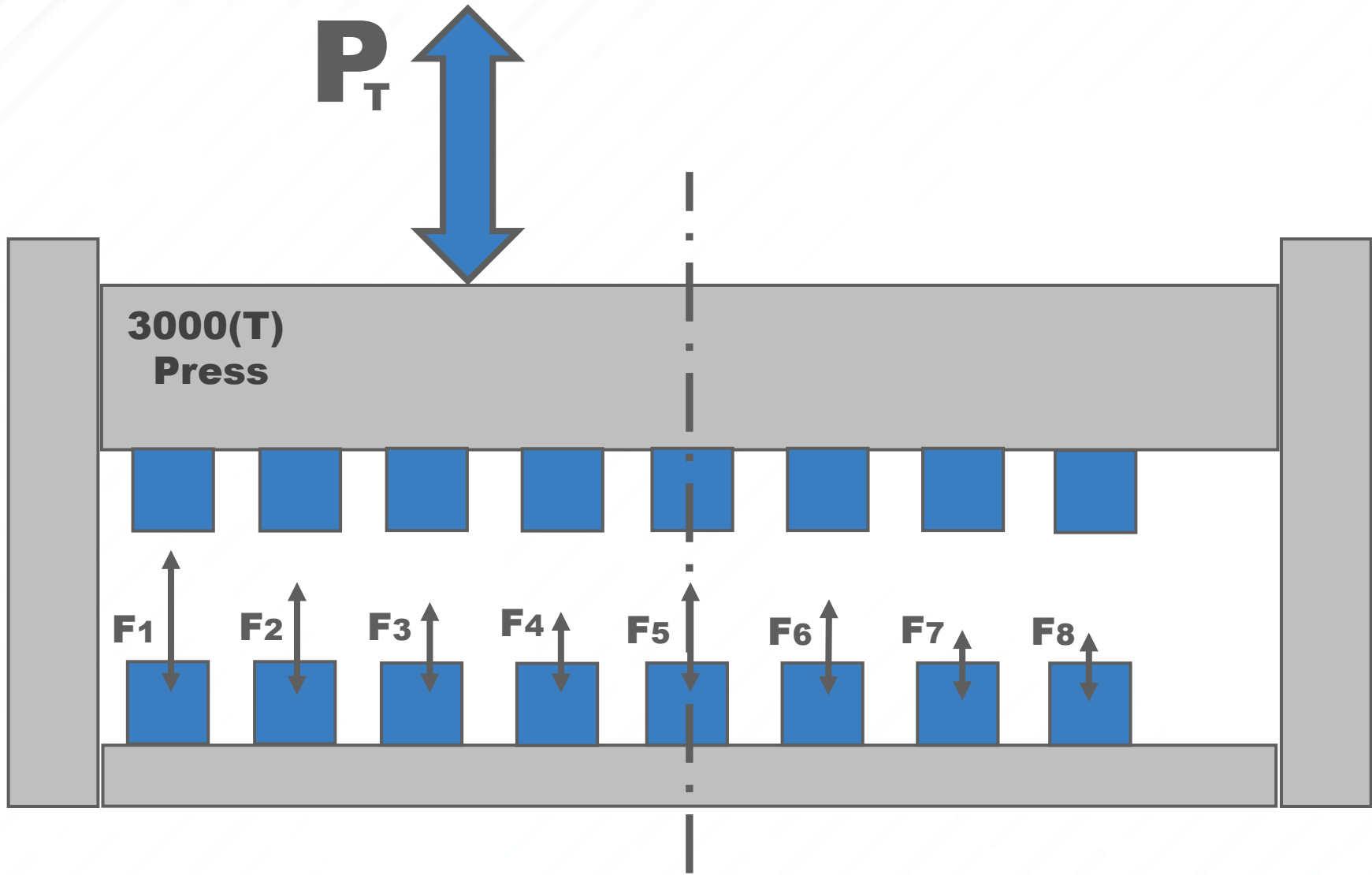
Gen1+ 1180 Die OFF-Center
Eccentric Load Position on Bolster
Load at That Position 6.42(Tons)



Current Development Work







INSIGHTS FROM MEASURING THE “PRESS TONNAGE” OF 3RD GEN AHSS STAMPINGS



Insights & Takeaways:

- “Press Tonnage” is a function of the press setup parameters.
- Peak press tonnage did not increase proportionately with material properties.
- All test parts were formed with Press Forces exceeding the predicted Forming Force required with no part yielded satisfactory quality results.
- The term “Bottom Dead Center” is not a unique event.
- The “Press Tonnage Curve” has both predictable and less-predictable segments.
- Total “Press Tonnage” is not the “Forming Force”.
- Peak Press Tonnage is achieved through the elongation of the stamping press.
- Eccentric loads require additional energy to form similar shapes.

FOR MORE INFORMATION

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More Questions? Meet Vince at the Auto/Steel Partnership booth after this presentation.



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