

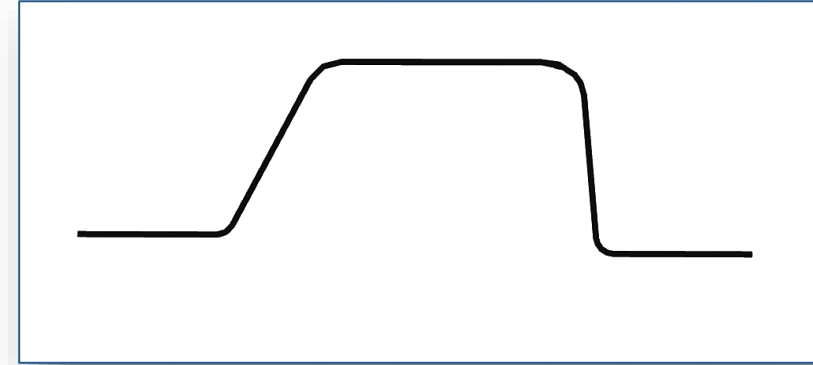
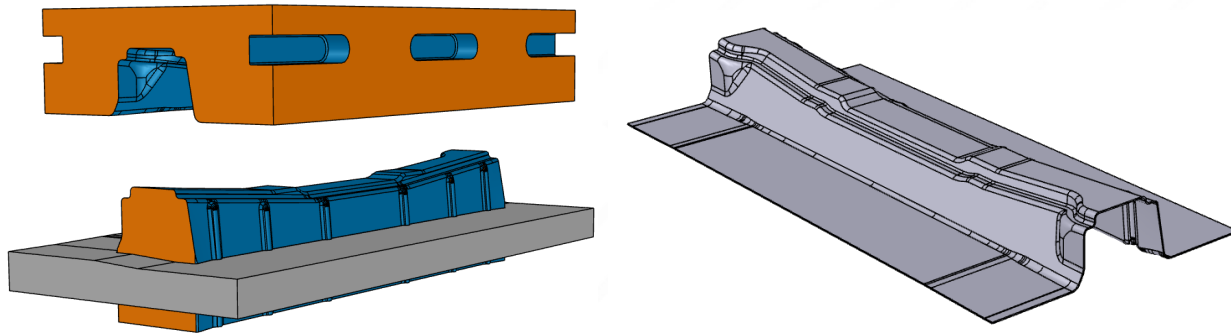
GREAT DESIGNS IN **STEEL**

INSIGHTS FROM MEASURING THE "PRESS TONNAGE" OF 3RD GEN AHSS STAMPINGS (PHASE II)

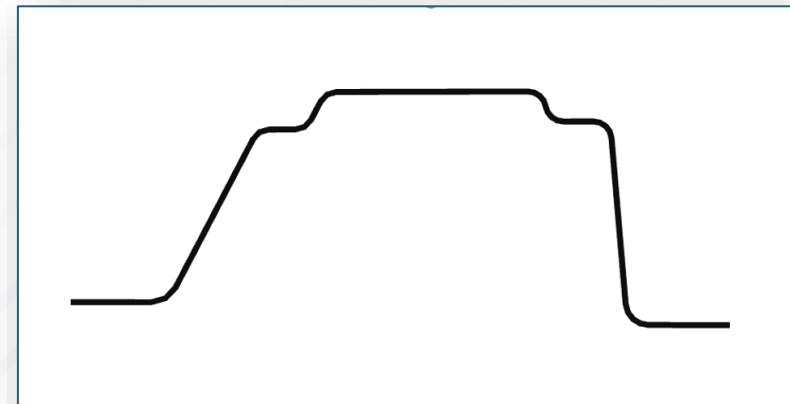
Vince Millioto, Senior Specialist – Technical (BIW)
Martinrea International
On Behalf of Auto/Steel Partnership

INSIGHTS FROM MEASURING THE "PRESS TONNAGE" OF 3RD GEN AHSS STAMPINGS - PHASE II

- Brief Review
- Press and Die Set-Up
- Tonnage Results
- Quality Results
- Bonus Tests



Standard Hat Section
Phase I



"S" - Corner
Phase II

INSIGHTS FROM MEASURING THE "PRESS TONNAGE" OF 3RD GEN AHSS STAMPINGS - PHASE II

PROJECT GOAL:

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

"PRE-CLUSIONS":

Press tonnage and forming tonnage are not the same

Forming Tonnage = Press Force – Load Cell Force – Nitro Force

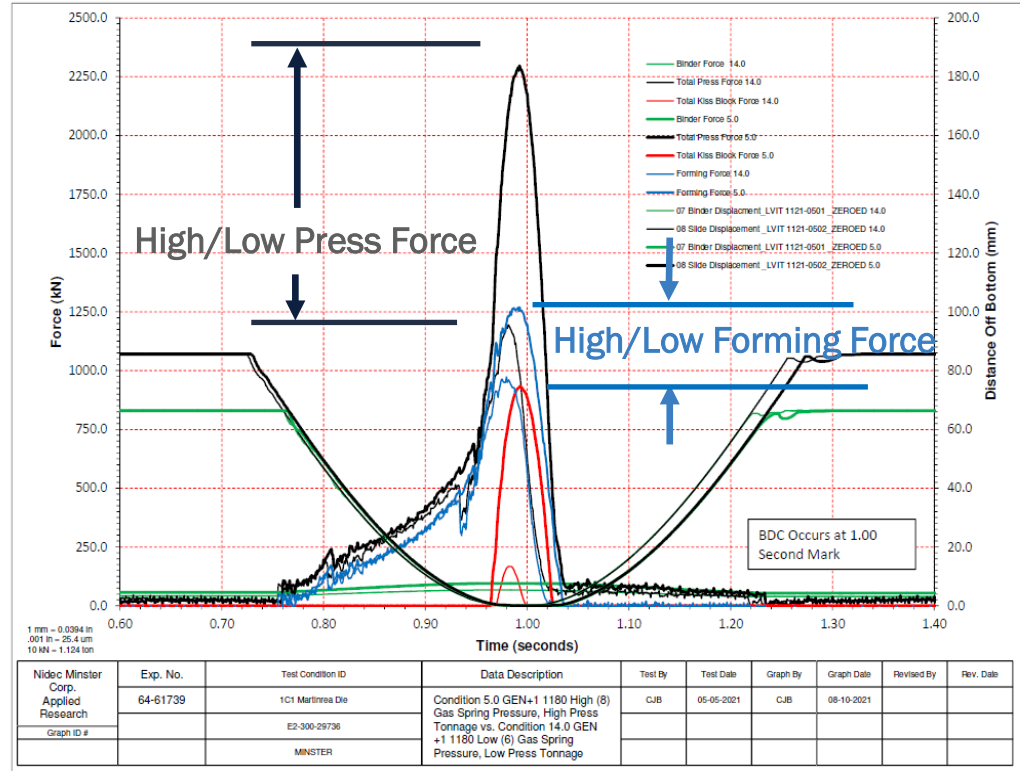
The term "Bottom Dead Center" is not a unique event

The "Press Tonnage Curve" has both predictable and less-predictable segments

INSIGHTS FROM MEASURING THE "PRESS TONNAGE" OF 3RD GEN AHSS STAMPINGS - PHASE II

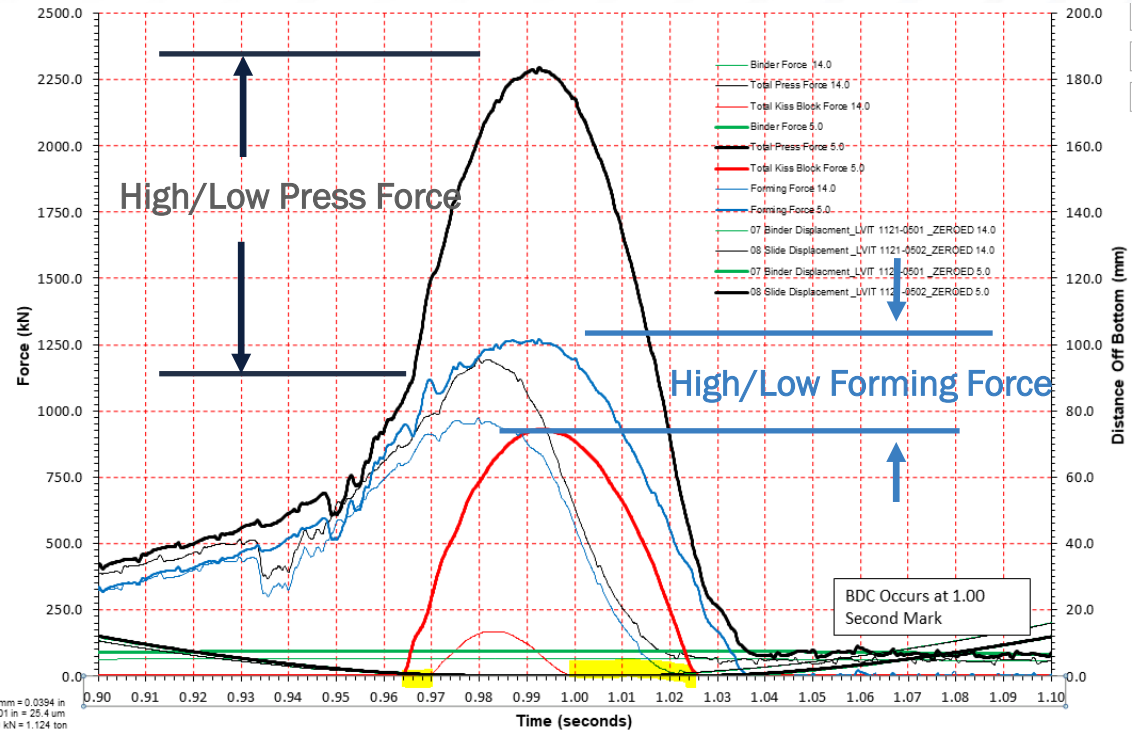
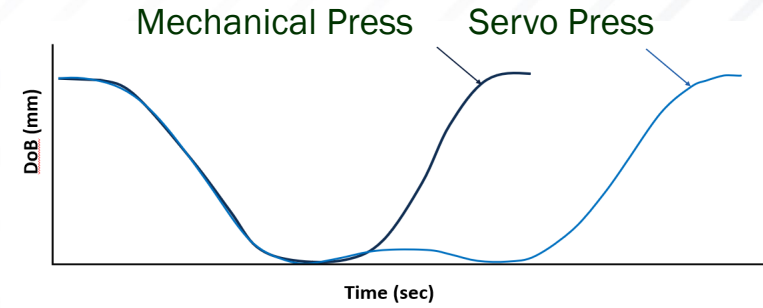
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printed: 08/10/2021



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

Graph1



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

INSIGHTS FROM MEASURING THE "PRESS TONNAGE" OF 3RD GEN AHSS STAMPINGS - PHASE II

INSIGHTS & TOP TAKEAWAYS:

- A longer “Dwell Time” does produce a higher quality stamping
- The upfront “Predictive Tool” needs to account for elastic deformations in the Press and Die System (Even rudimentarily)
- The “Predictable” area of the press tonnage curve will decrease because of this omission.

INSIGHTS FROM MEASURING THE "PRESS TONNAGE" OF 3RD GEN AHSS STAMPINGS - PHASE II

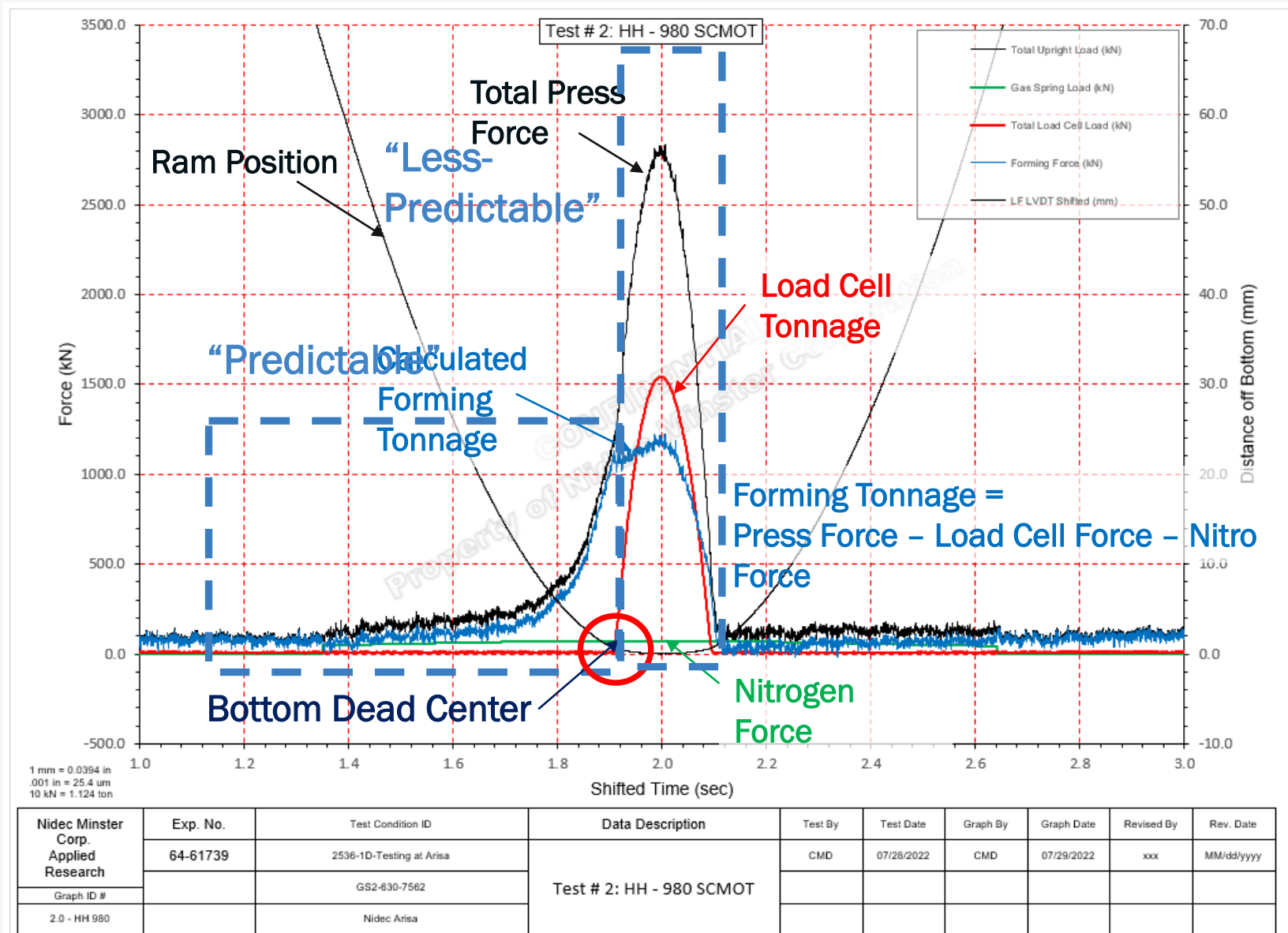
Servo Press "Mechanical Mode"			Test Number
Press Tonnage (H)	Pad Pressure (H)	Gen3 780	1
Press Tonnage (H)	Pad Pressure (H)	Gen3 980	2
Press Tonnage (L)	Pad Pressure (H)	Gen1+ 1180	3
Press Tonnage (L)	Pad Pressure (H)	Lot #122	4
Press Tonnage (H)	Pad Pressure (L)	Gen3 780	5
Press Tonnage (H)	Pad Pressure (L)	Gen3 980	6
Press Tonnage (L)	Pad Pressure (L)	Gen1+ 1180	7
Press Tonnage (L)	Pad Pressure (L)	Lot #122	8
Press Tonnage (H)	Pad Pressure (L)	Gen3 780	9
Press Tonnage (H)	Pad Pressure (L)	Gen3 980	10
Press Tonnage (L)	Pad Pressure (L)	Gen1+ 1180	11
Press Tonnage (L)	Pad Pressure (L)	Lot #122	12
Press Tonnage (H)	Pad Pressure (H)	Gen3 780	13
Press Tonnage (H)	Pad Pressure (H)	Gen3 980	14
Press Tonnage (L)	Pad Pressure (H)	Gen1+ 1180	15
Press Tonnage (L)	Pad Pressure (H)	Lot #122	16
Press Tonnage (H)	Pad Pressure (H)	Gen3 780	17
Press Tonnage (H)	Pad Pressure (H)	Gen3 980	18
Press Tonnage (L)	Pad Pressure (H)	Gen1+ 1180	19
Press Tonnage (L)	Pad Pressure (H)	Lot #122	20
Press Tonnage (H)	Pad Pressure (L)	Gen3 780	21
Press Tonnage (H)	Pad Pressure (L)	Gen3 980	22
Press Tonnage (L)	Pad Pressure (L)	Gen1+ 1180	23
Press Tonnage (L)	Pad Pressure (L)	Lot #122	24
Press Tonnage (H)	Pad Pressure (L)	Gen3 780	25
Press Tonnage (H)	Pad Pressure (L)	Gen3 980	26
Press Tonnage (L)	Pad Pressure (L)	Gen1+ 1180	27
Press Tonnage (L)	Pad Pressure (L)	Lot #122	28
Press Tonnage (L)	Pad Pressure (L)	Gen3 780	29
Press Tonnage (L)	Pad Pressure (L)	Gen3 980	30
Press Tonnage (L)	Pad Pressure (L)	Gen1+ 1180	
Press Tonnage (L)	Pad Pressure (L)	Lot #122	

Load Cells
(1) Shown & (1) Sym Opp



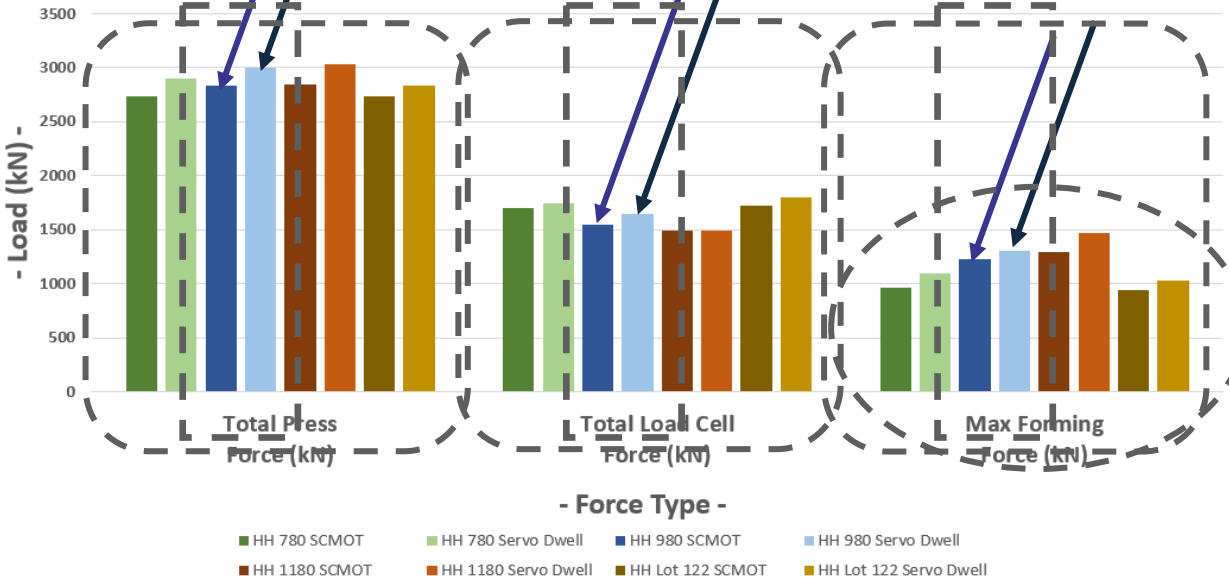
~ 66mm of pad travel

INSIGHTS FROM MEASURING THE "PRESS TONNAGE" OF 3RD GEN AHSS STAMPINGS - PHASE II

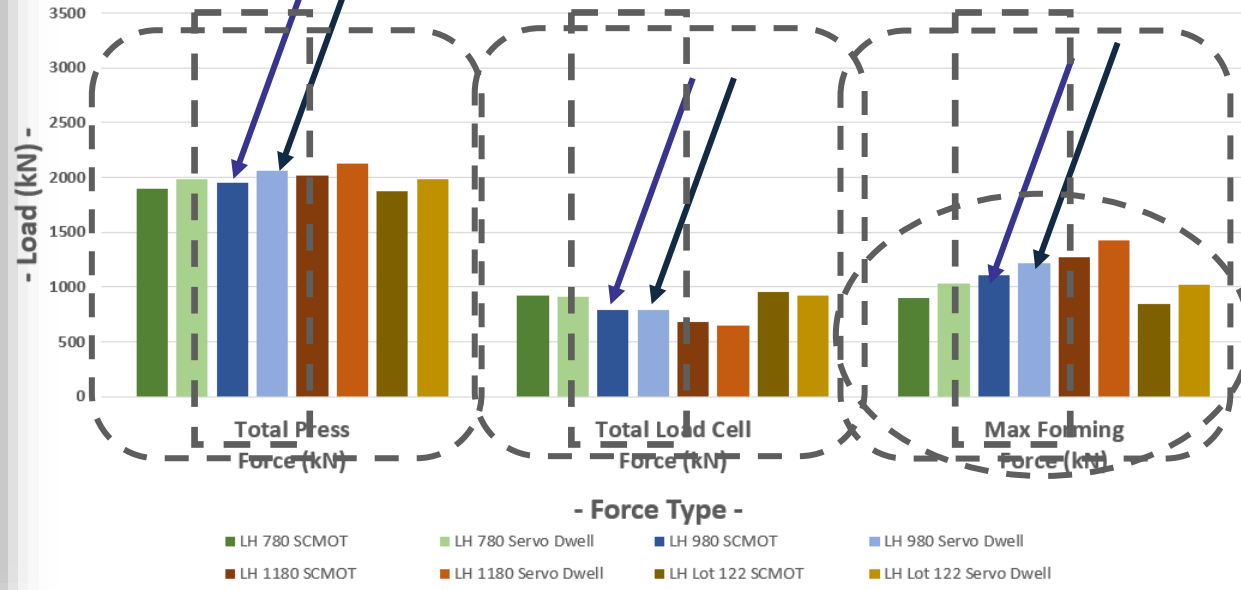


INSIGHTS FROM MEASURING THE "PRESS TONNAGE" OF 3RD GEN AHSS STAMPINGS - PHASE II

Comparison of the Forces Generated During the Mechanical Motion and Servo Dwell Motion for the **High/High** Condition

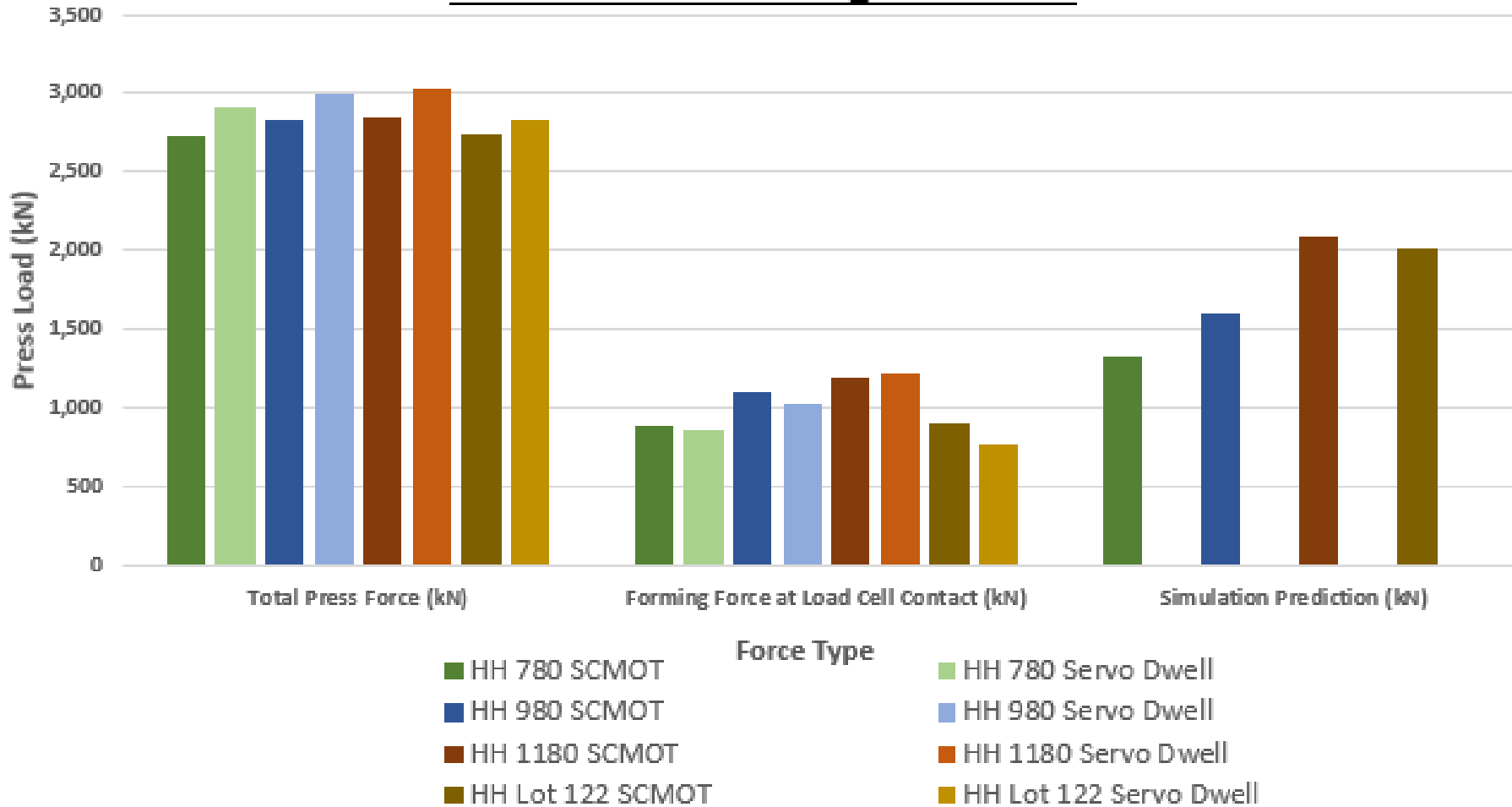


Comparison of the Forces Generated During the Mechanical Motion and Servo Dwell Motion for the **Low/High** Condition



INSIGHTS FROM MEASURING THE "PRESS TONNAGE" OF 3RD GEN AHSS STAMPINGS - PHASE II

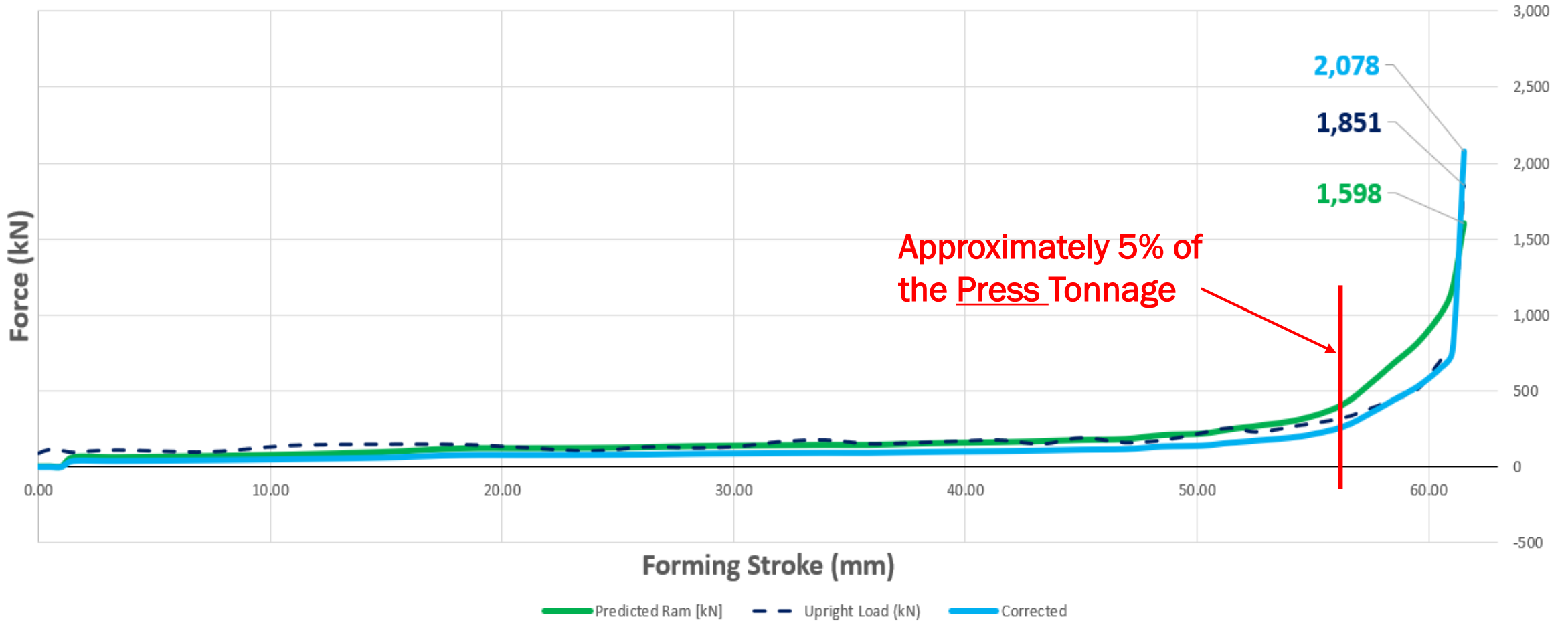
Comparison of the Forces Generated During the Mechanical Motion to the Forming Simulation



INSIGHTS FROM MEASURING THE "PRESS TONNAGE" OF 3RD GEN AHSS STAMPINGS - PHASE II

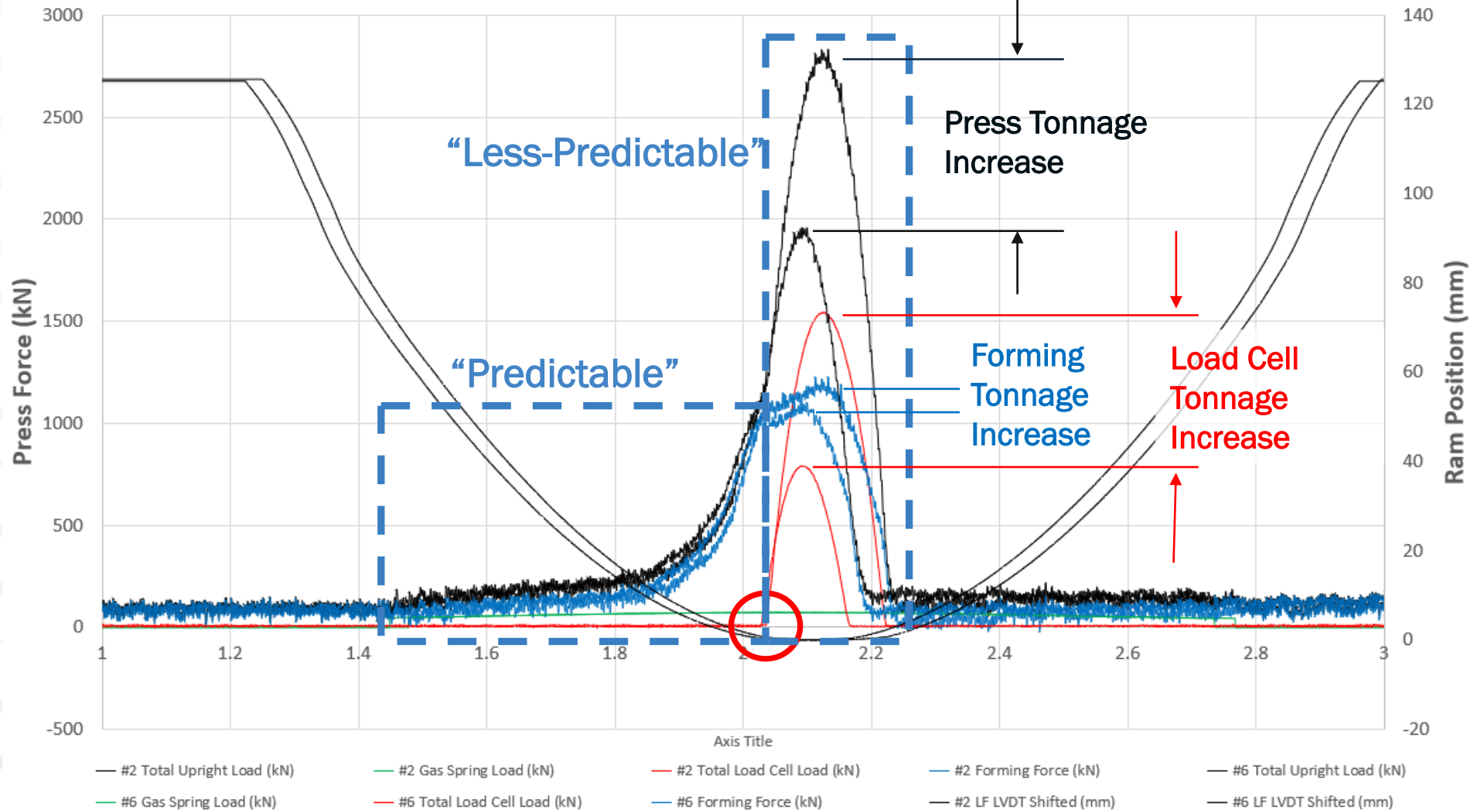
Lott#122 Low Press/Low Nitro Force

Actual Press Tonnage vs Calculated Forming Force



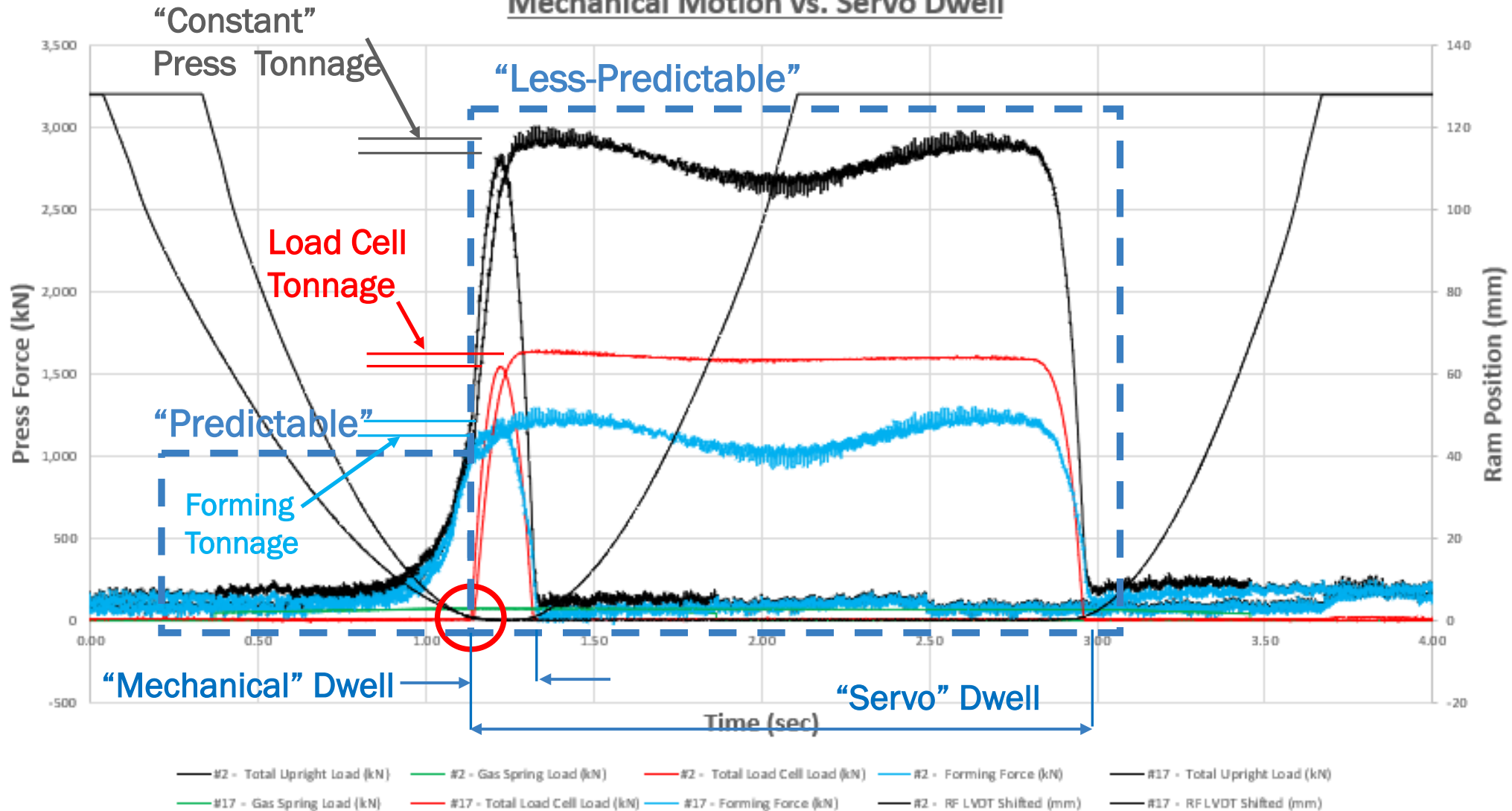
INSIGHTS FROM MEASURING THE "PRESS TONNAGE" OF 3RD GEN AHSS STAMPINGS - PHASE II

3rd Gen 980 AHSS Press Force Comparison
High vs. Low Tonnage



INSIGHTS FROM MEASURING THE "PRESS TONNAGE" OF 3RD GEN AHSS STAMPINGS - PHASE II

3rd Gen 980 AHSS Press Force Comparison
Mechanical Motion vs. Servo Dwell



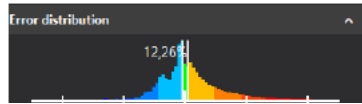
INSIGHTS FROM MEASURING THE "PRESS TONNAGE" OF 3RD GEN AHSS STAMPINGS - PHASE II

20145298 – TEST02- NIDEC ARISA



DISTRIBUCIÓN DE LAS DESVIACIONES POR INTERVALO DE TOLERANCIA

1-TOLERANCIA ± 0.25 mm



+/- Tol (mm)	"S" 980 HH Mech (%)
0.25	12.26
0.50	27.44
1.00	50.40
2.00	76.88
3.00	89.94
4.00	95.08

2-TOLERANCIA



MPS Soluciones 3d - JOB 90-2022

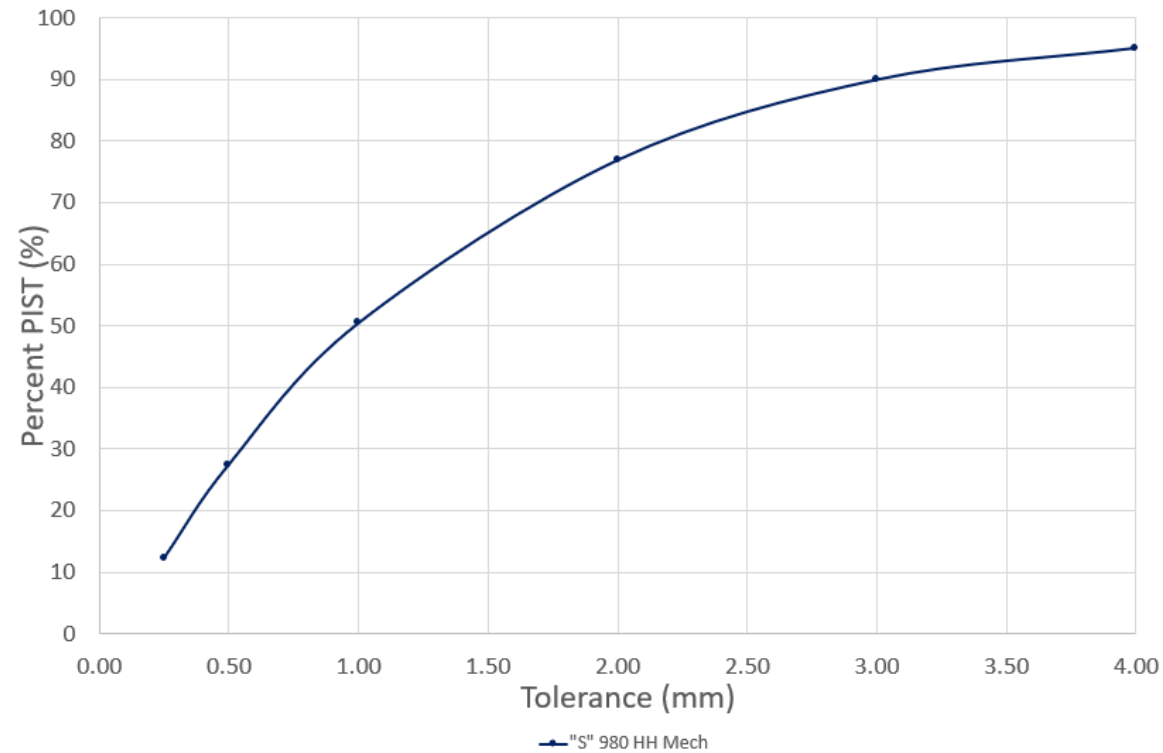
4

20145298 – TEST02- NIDEC ARISA



3-TOLERANCIA ± 1 mm

Gen3 980 "S"-Corner High Press/High Pad in Mechanical Mode



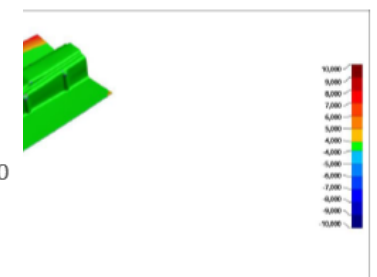
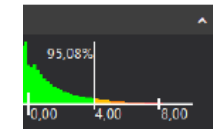
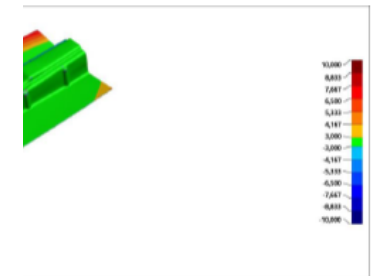
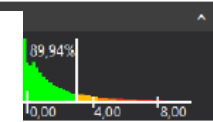
MPS Soluciones 3d - JOB 90-2022

5

20145298 – TEST02- NIDEC ARISA



5-TOLERANCIA ± 3 mm

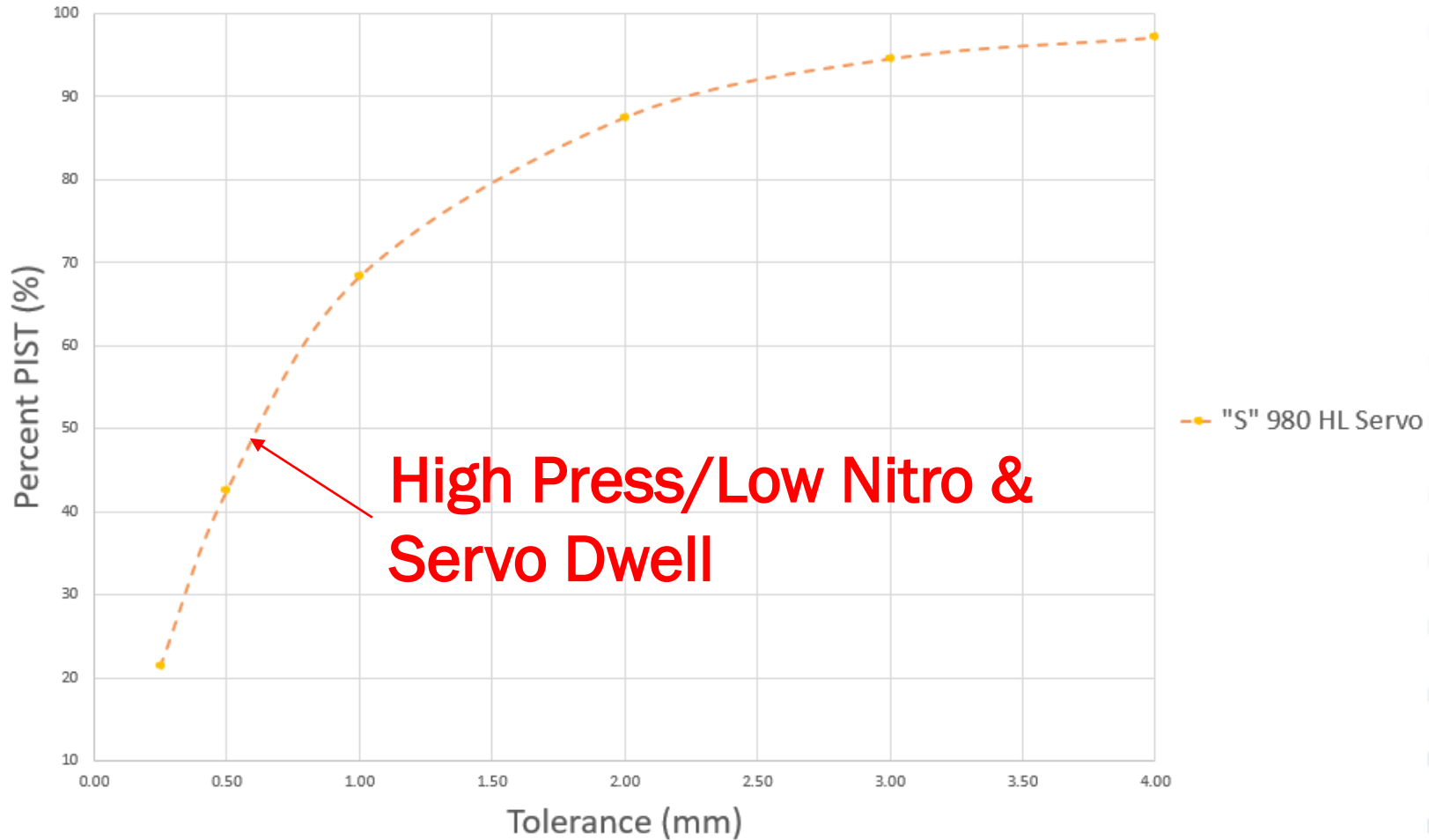


MPS Soluciones 3d - JOB 90-2022

6

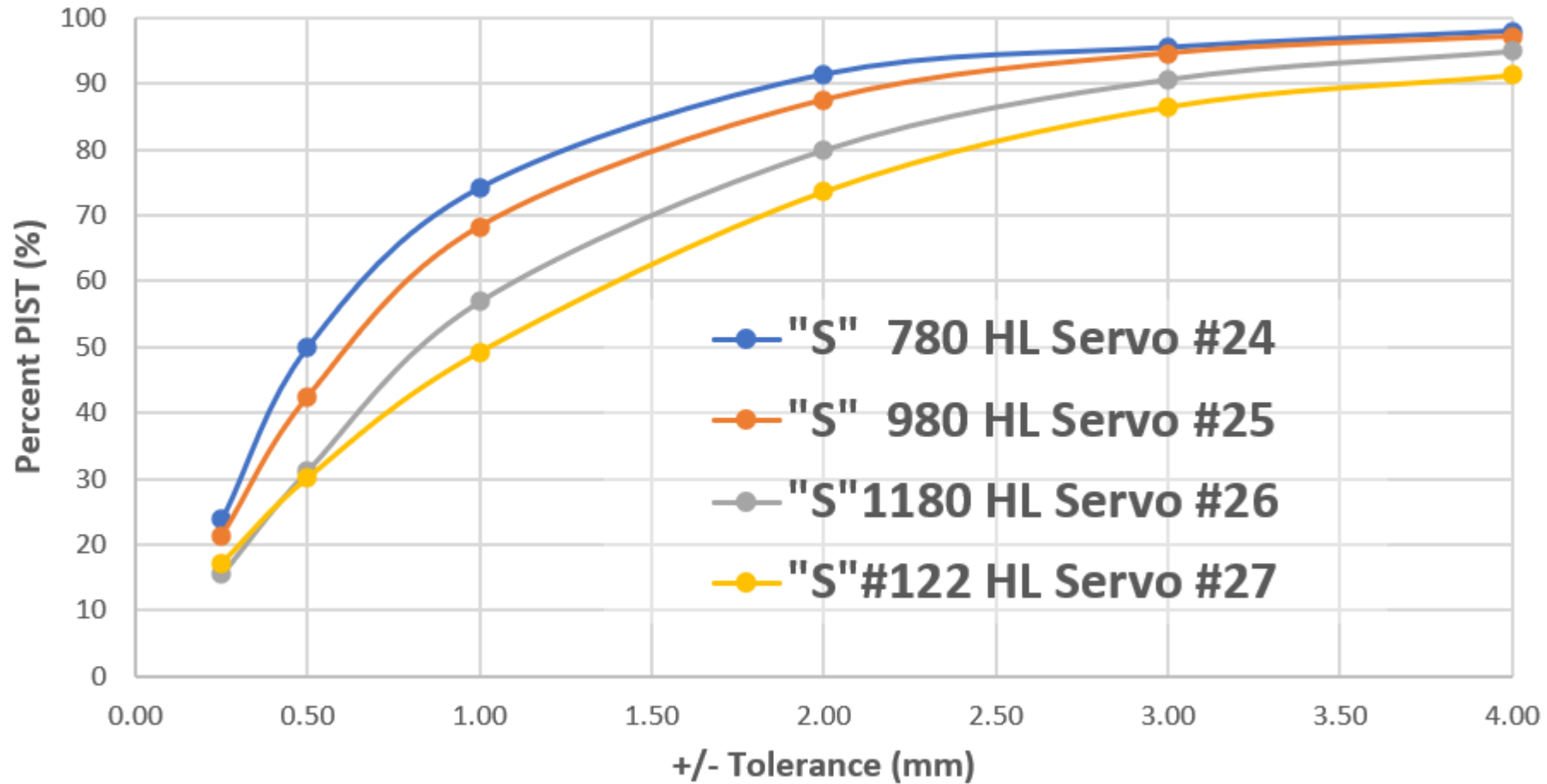
INSIGHTS FROM MEASURING THE "PRESS TONNAGE" OF 3RD GEN AHSS STAMPINGS - PHASE II

Gen3 980 "S"-Corner in Mechanical Mode &
Gen3 980 "S"-Corner in Servo Dwell Mode



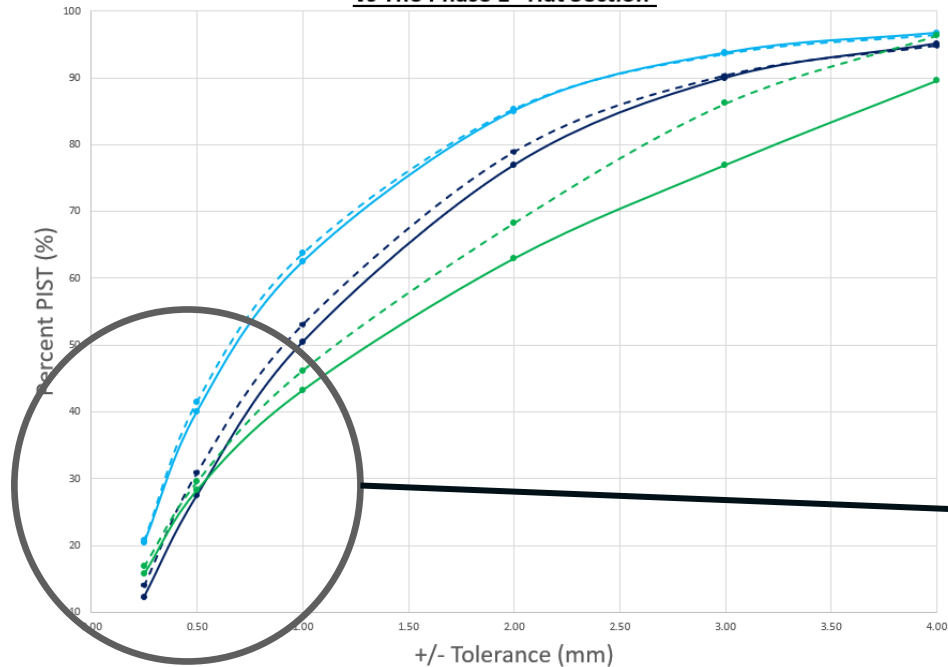
INSIGHTS FROM MEASURING THE "PRESS TONNAGE" OF 3RD GEN AHSS STAMPINGS - PHASE II

Highest PIST Score for Each Material Tested



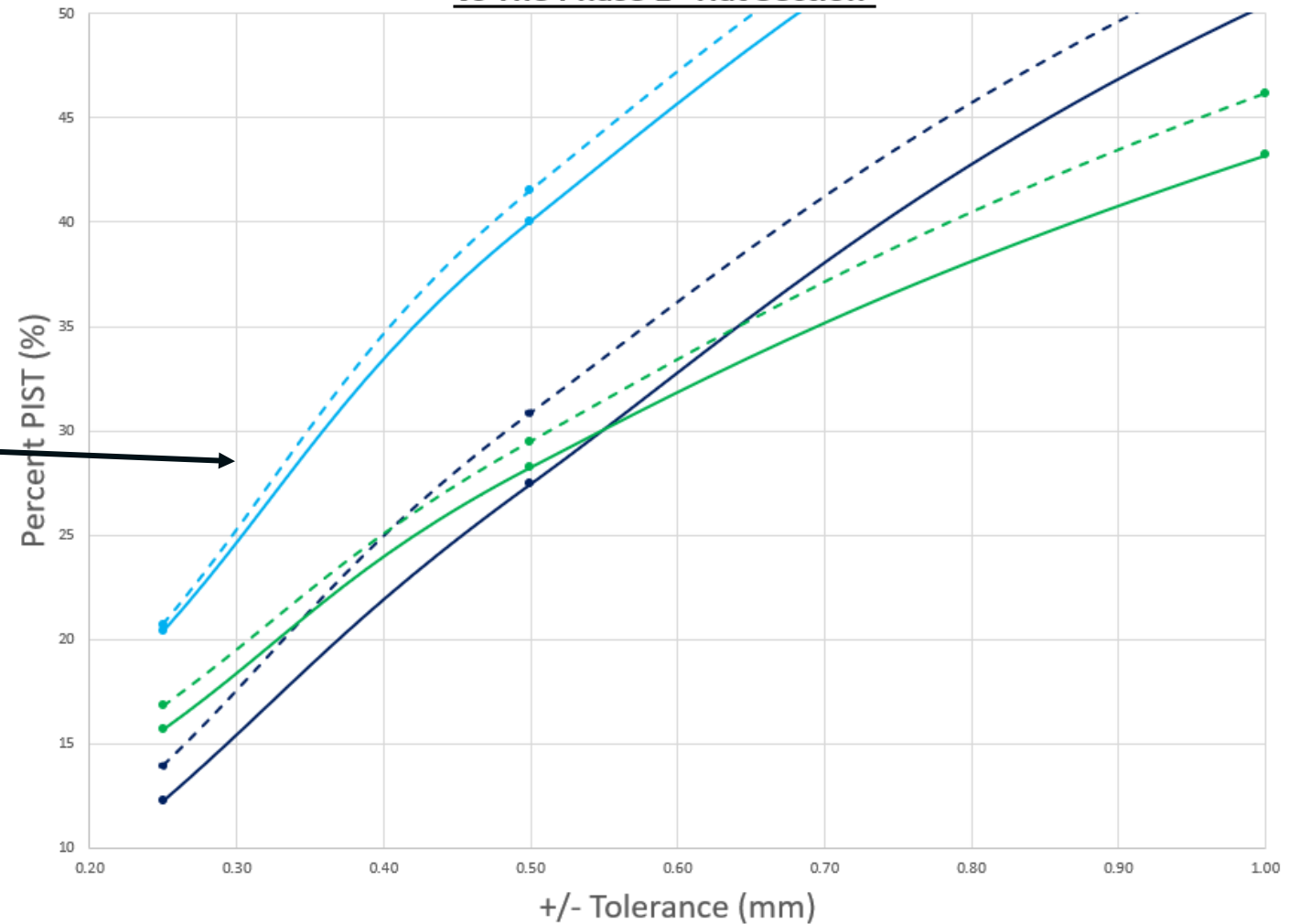
"S"-CORNER TONNAGE & SPRING-BACK STUDY – TONNAGE & QUALITY INVESTIGATION

Gen3 980 "S"-Corner High Press/High Pad in Mechanical Mode & Gen3 980 "S"-Corner Low Press/Low Pad in Servo Mode vs The Phase 1 "Hat Section"

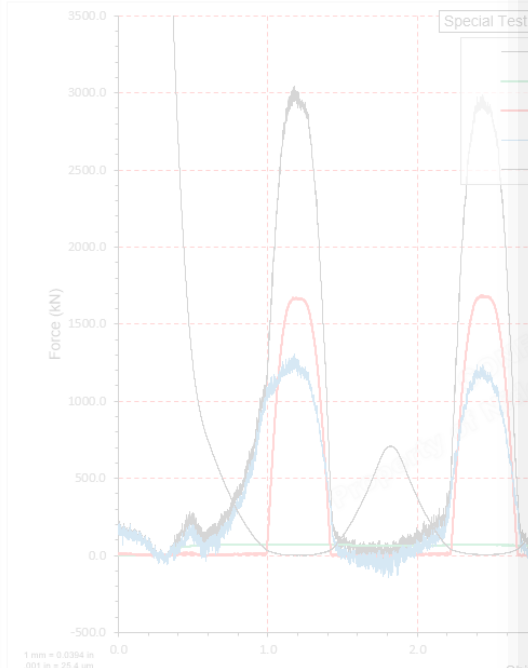


- "S" 980 HH Mech
- -●—"S" 980 HH Servo
- "S" 980 LL Mech
- -●—"S" 980 LL Servo
- Hat Sect HH Mech
- -●—Hat Sect LL Mech

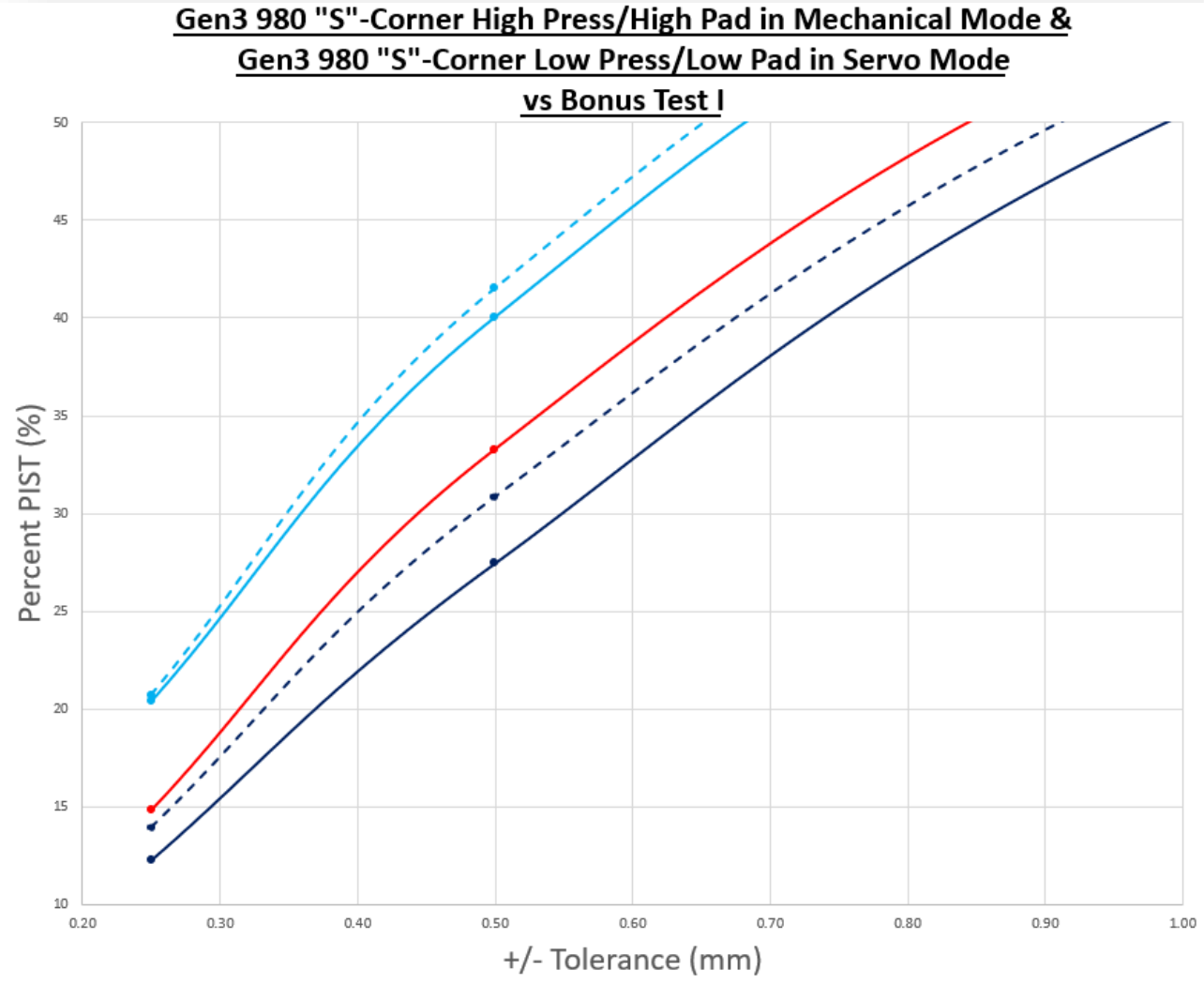
Gen3 980 "S"-Corner High Press/High Pad in Mechanical Mode & Gen3 980 "S"-Corner Low Press/Low Pad in Servo Mode vs The Phase 1 "Hat Section"



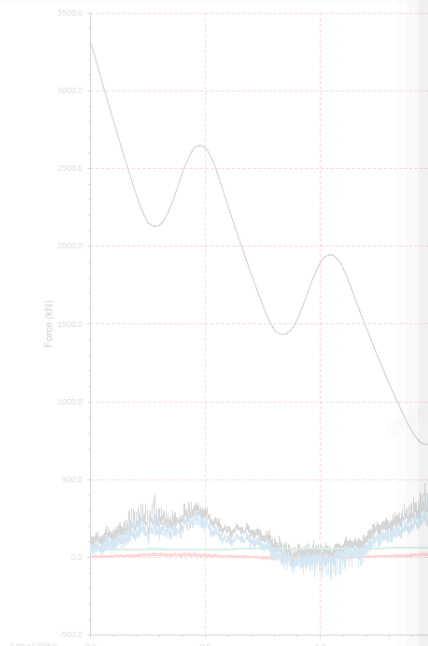
INSIGHTS FROM MEASURING THE "PRESS TONNAGE" OF 3RD GEN AHSS STAMPINGS - PHASE II



Nidec Minster Corp. Applied Research	Exp. No.	Test Condition ID	Special Restri
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Graph ID #		GS2-630-7962	
2.0 - HM 980		Nidec Arisa	

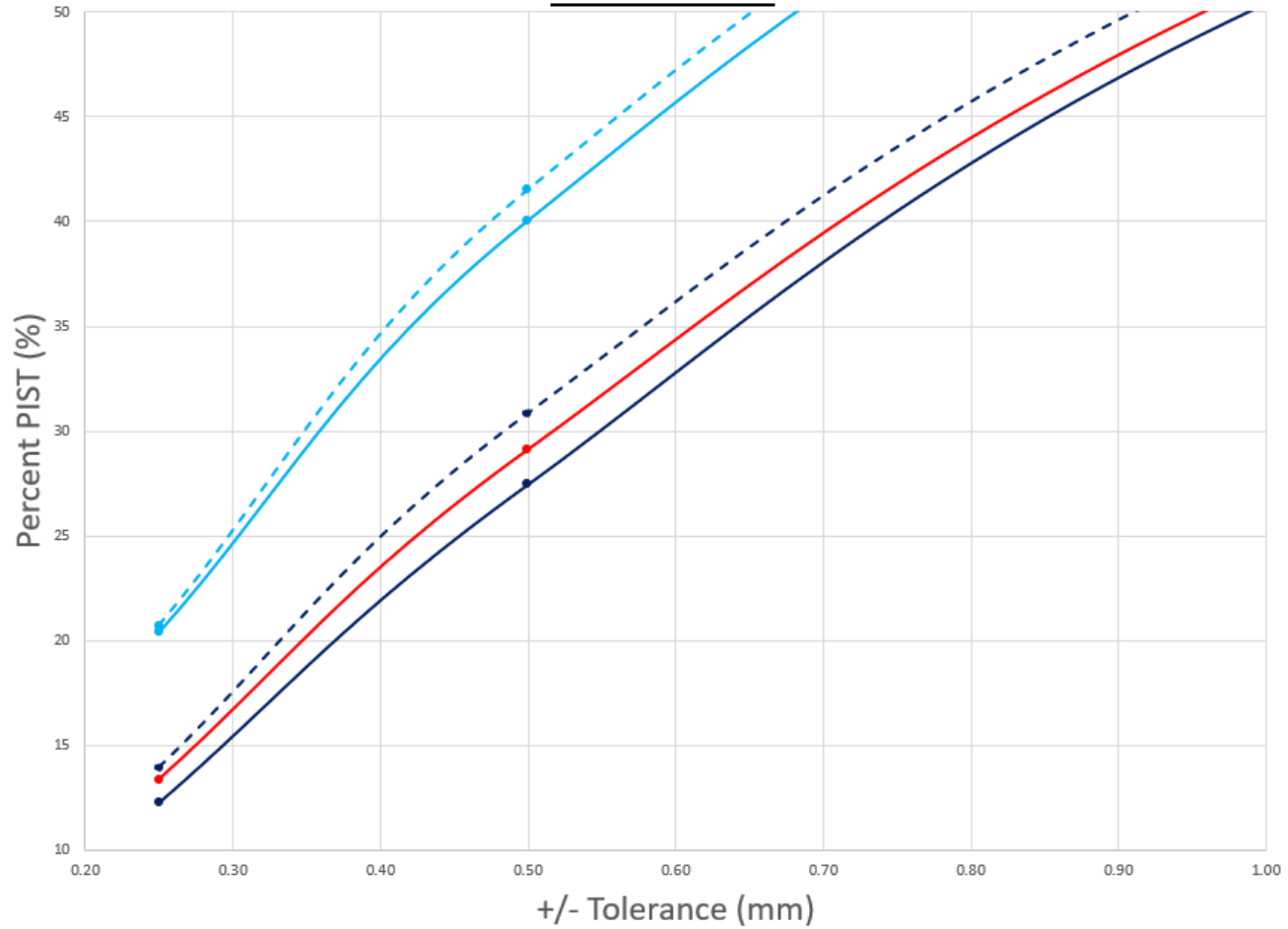


INSIGHTS FROM MEASURING THE "PRESS TONNAGE" OF 3RD GEN AHSS STAMPINGS - PHASE II



Nidec Minster Corp. Applied Research	Exp. No.	Item Description ID
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Stamp 91-6		629 400-7100
2.00 - 100.000 000000 0000		None Area

Gen3 980 "S"-Corner High Press/High Pad in Mechanical Mode & Gen3 980 "S"-Corner Low Press/Low Pad in Servo Mode vs Bonus Test II



INSIGHTS FROM MEASURING THE "PRESS TONNAGE" OF 3RD GEN AHSS STAMPINGS - PHASE II

OTHER CONCLUSIONS

- A longer “Dwell Time” does produce a higher quality stamping
- The upfront “Predictive Tool” needs to account for elastic deformations in the Press and Die System (Even rudimentarily)
- The “Predictable” area of the press tonnage curve will decrease because of this omission.
- **Forming Tonnage =**
Press Force – Kiss Block Force – Nitro Force – (Press & Die Stiffness)
- The “Forming Force” does not **vary** directly with press tonnage
- The “S”-Shape Corner does improve the PIST Score of a stamping in many but not all press set-ups.

INSIGHTS FROM MEASURING THE "PRESS TONNAGE" OF 3RD GEN AHSS STAMPINGS - PHASE II

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Auto Steel Partnership

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More Questions? Meet the speaker(s) at the Auto/Steel Partnership booth.