Innovative materials and solutions for automotive components

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ANFIA
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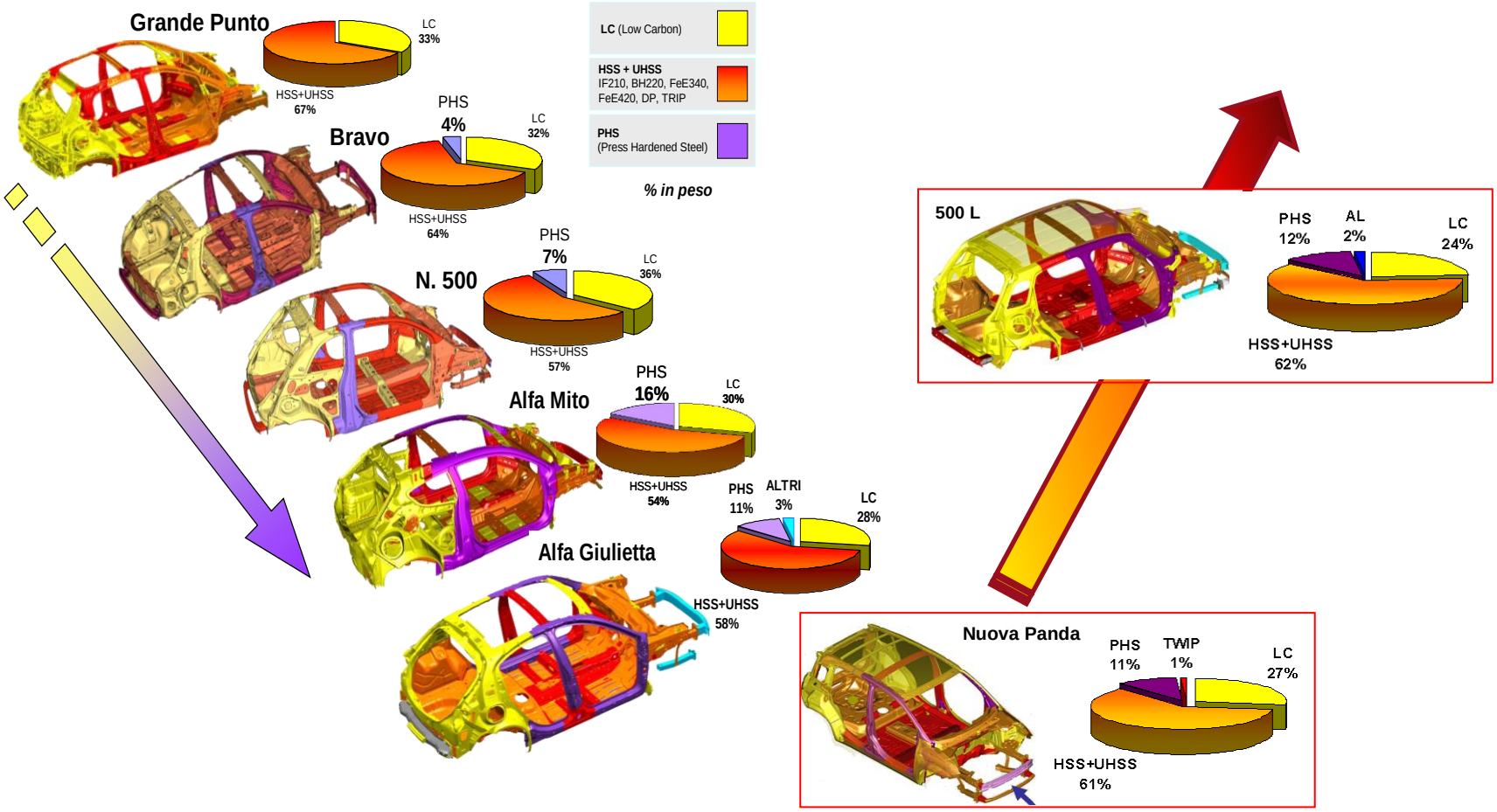
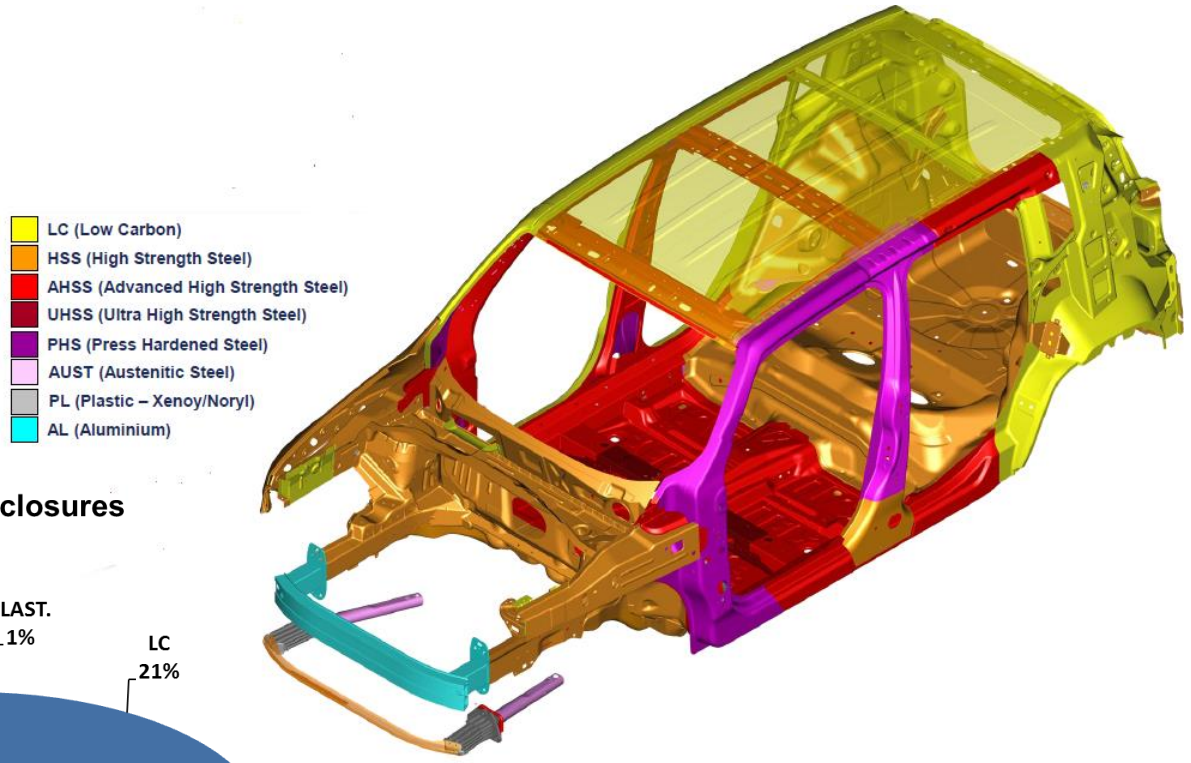
Materials Overview

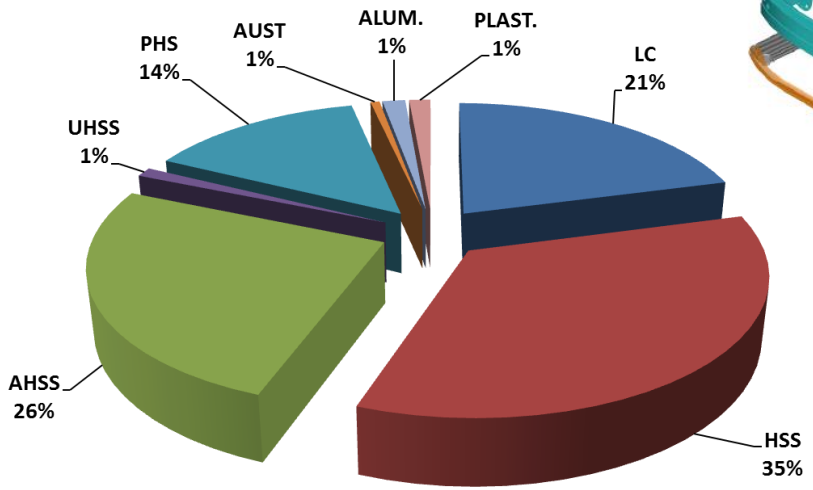
FCA work very hard to reach the maximum lightweight. Following the trend of steel in FCA mass production car:



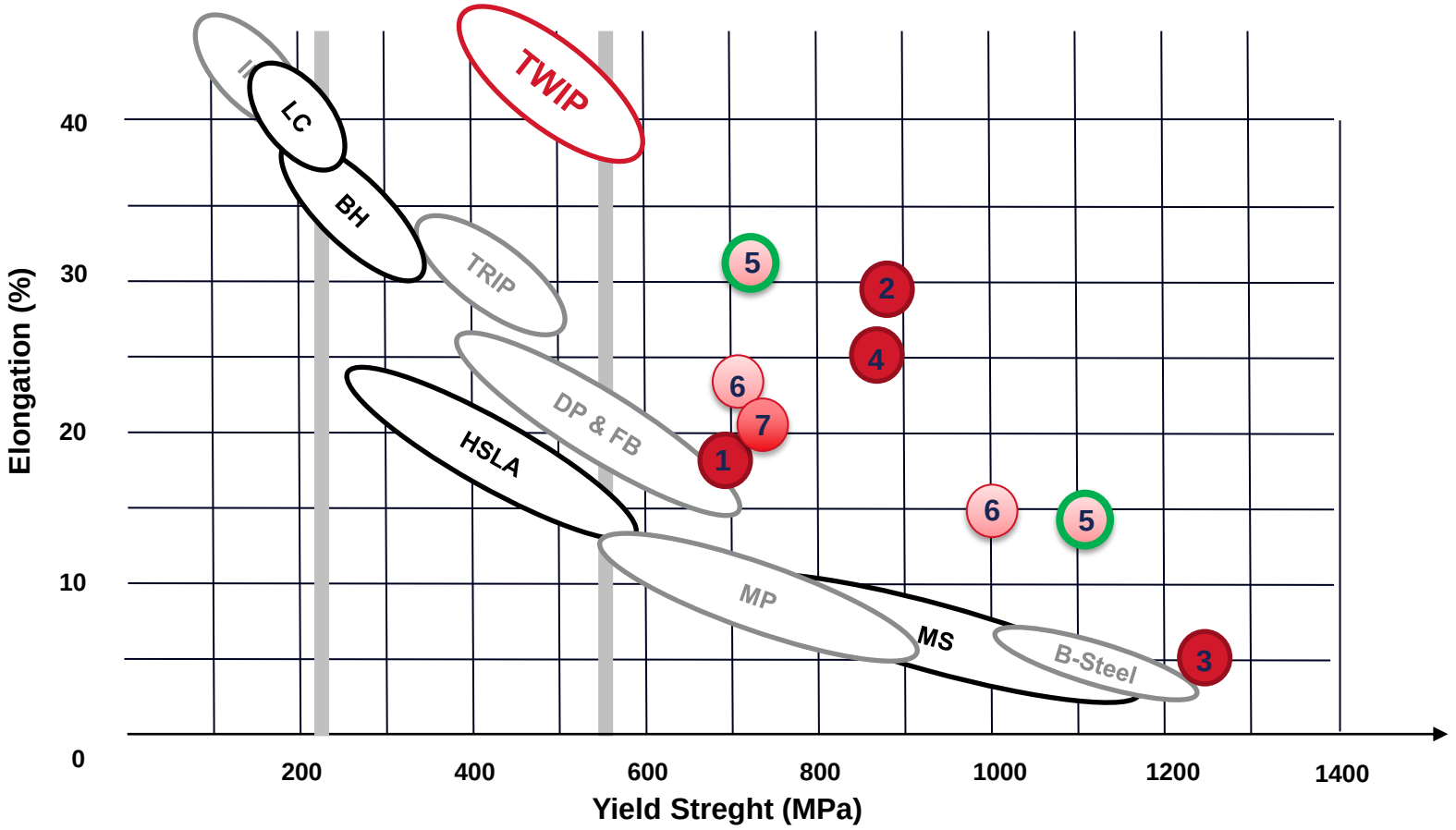
Jeep Renegade



520 model: BIW without closures

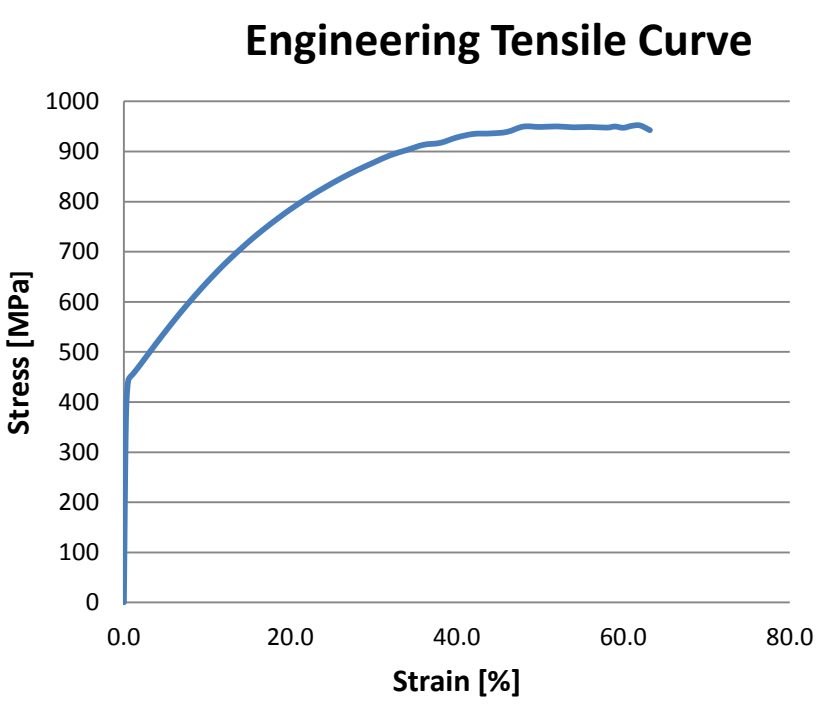


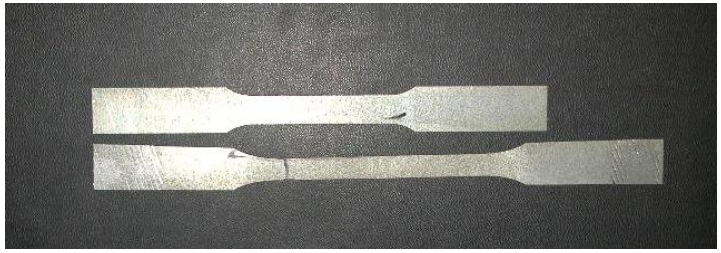
Material development plan
1 st steel generation
2 nd steel generation
3 st steel generation

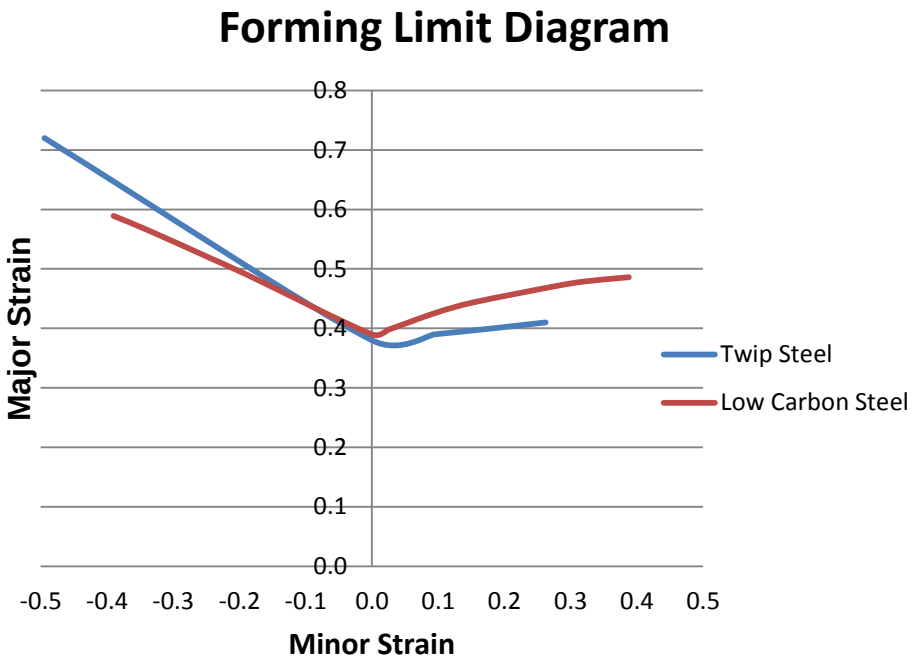


Innovative material – static characterization

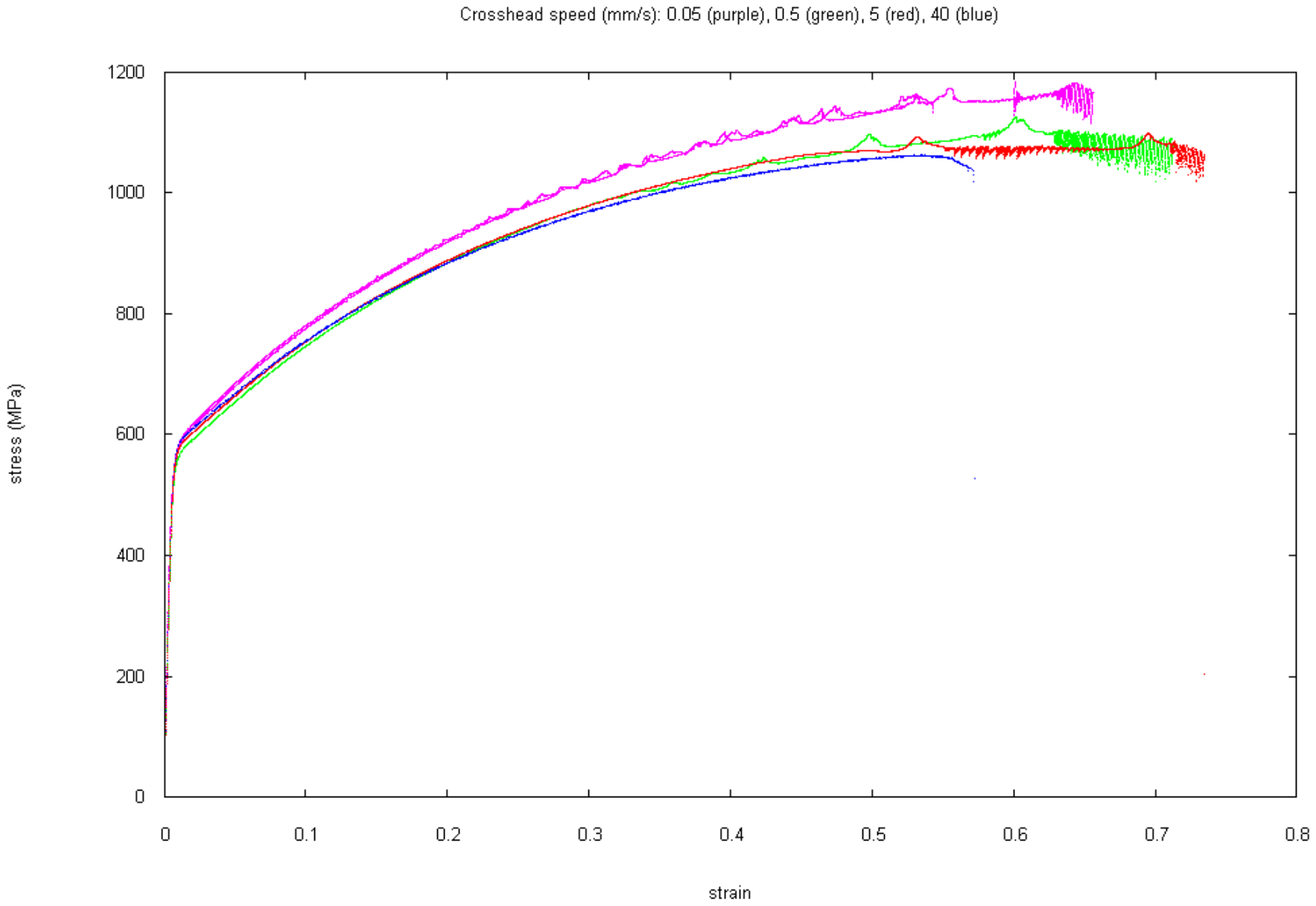
Twip steel mechanical characteristic



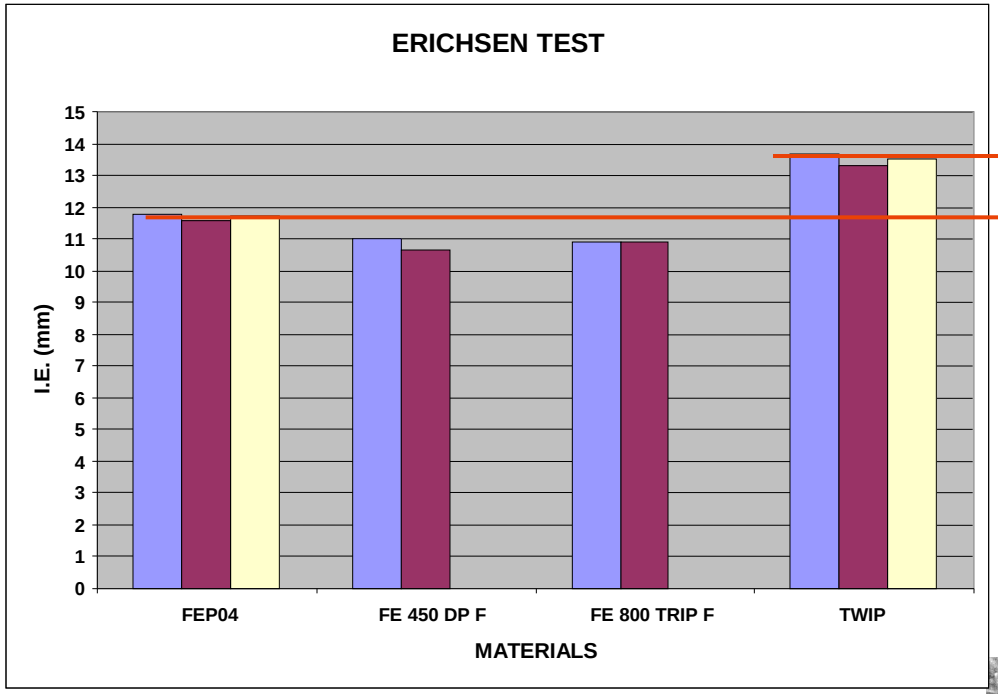




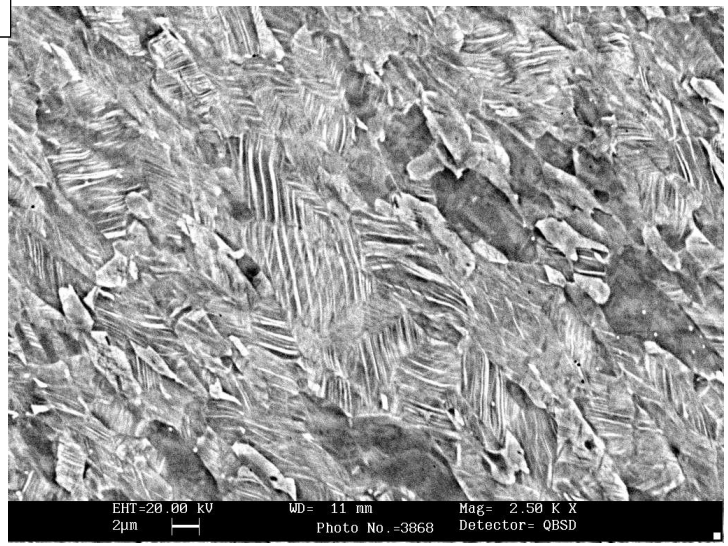
Innovative material – dynamic characterization



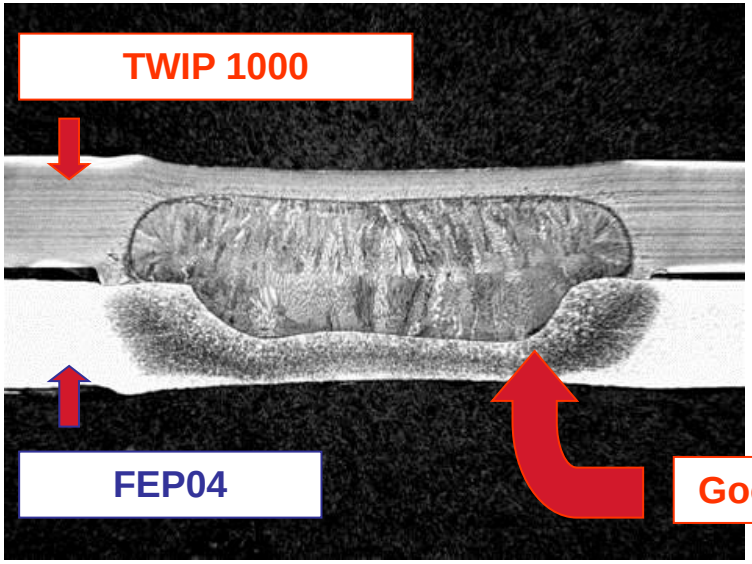
Innovative material – Erichsen & twinning



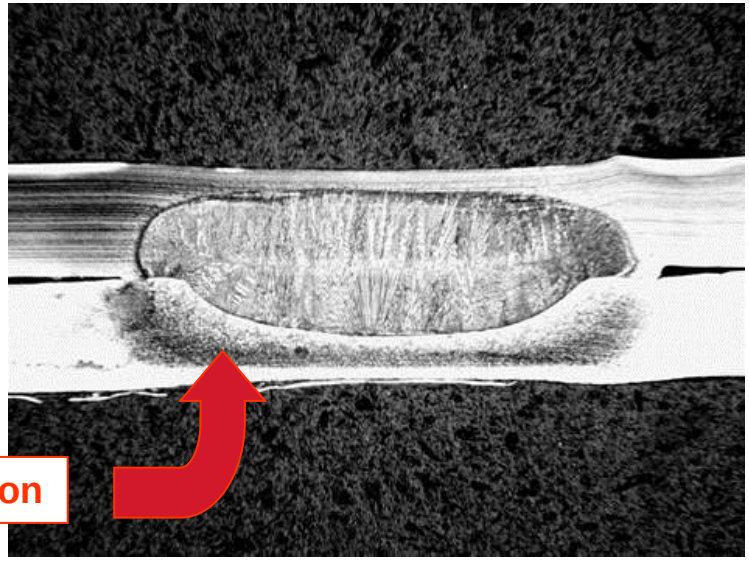
BETTER FORMABILITY RESPECT TO FEP04



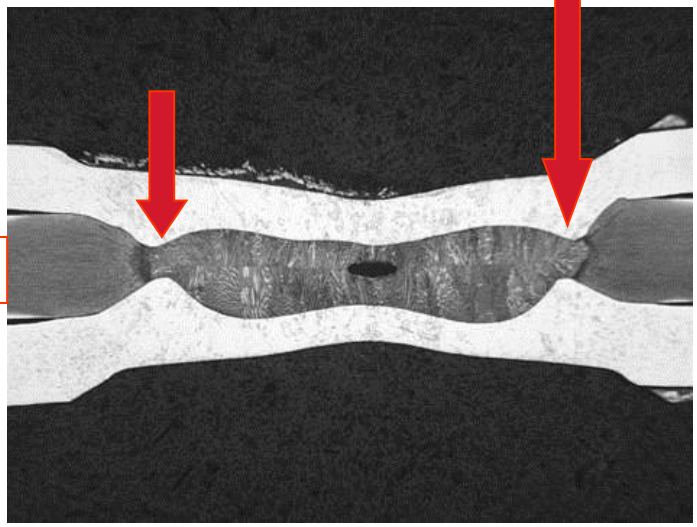
Innovative material – welding



Good penetration



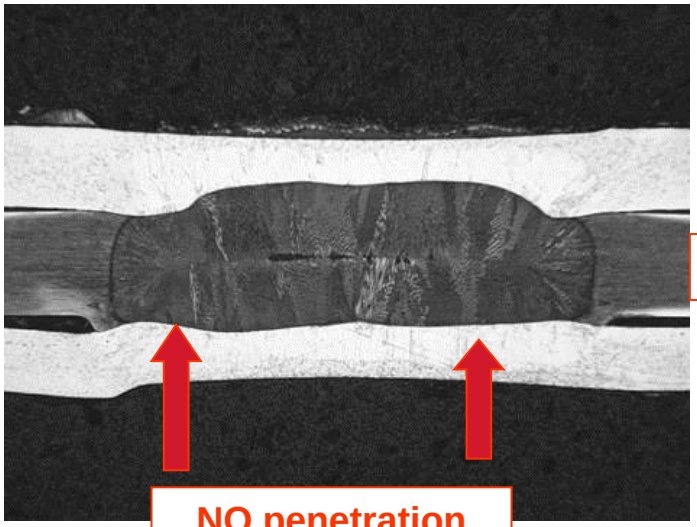
NO resisting section



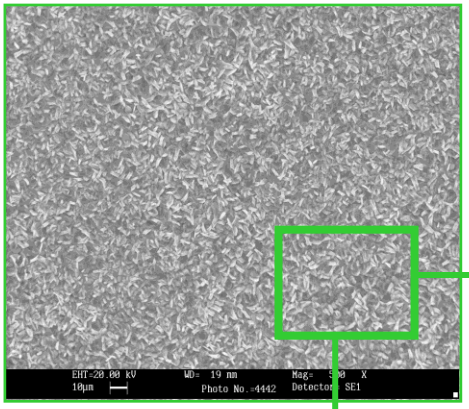
FEP04

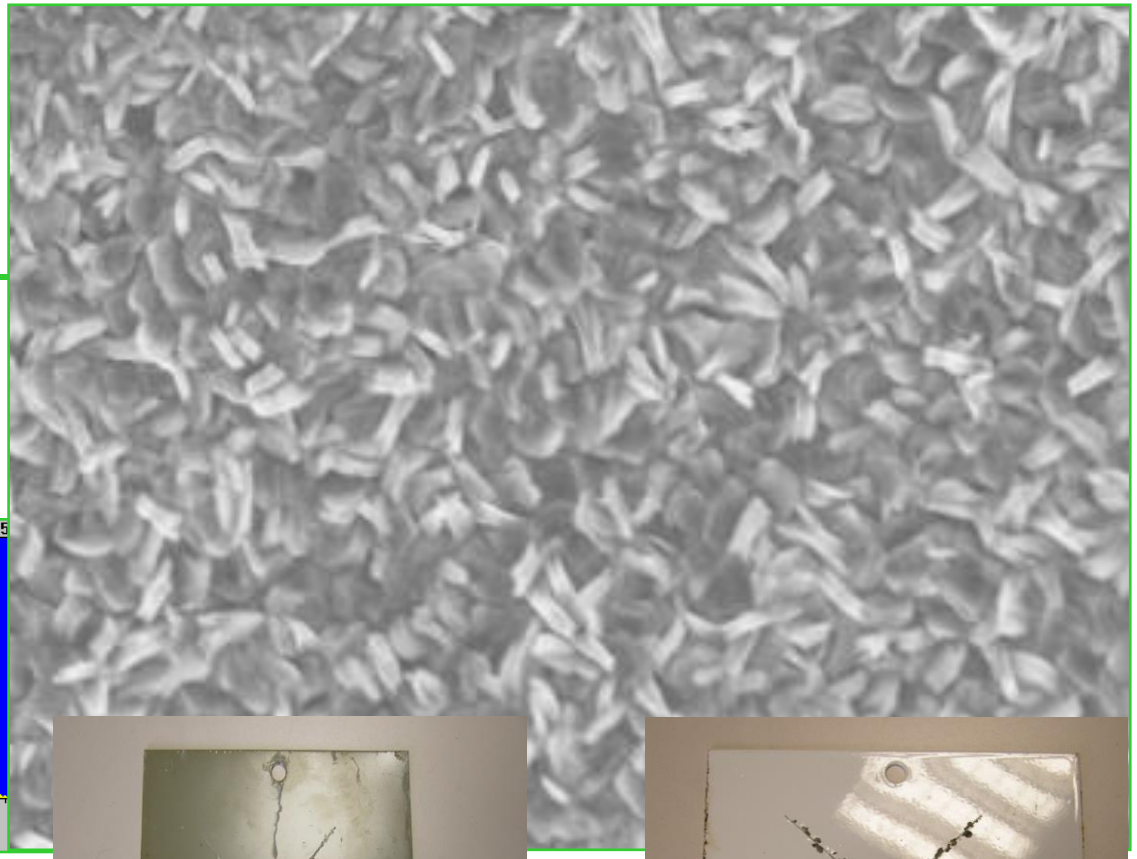
TWIP 1000

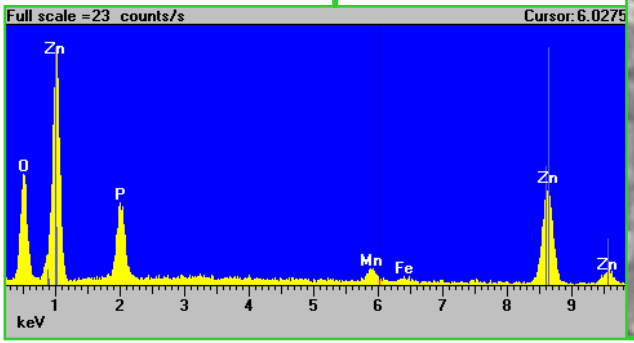
FEP04



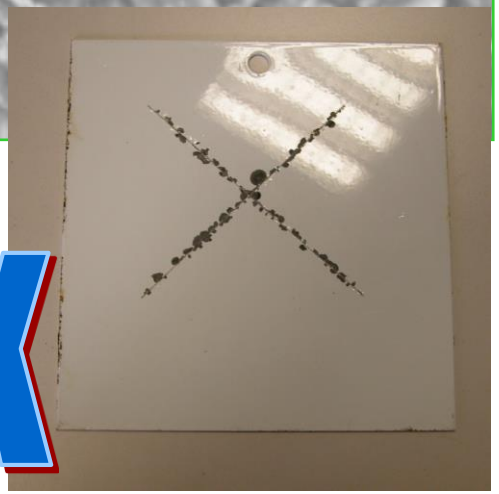
Innovative material – paintability



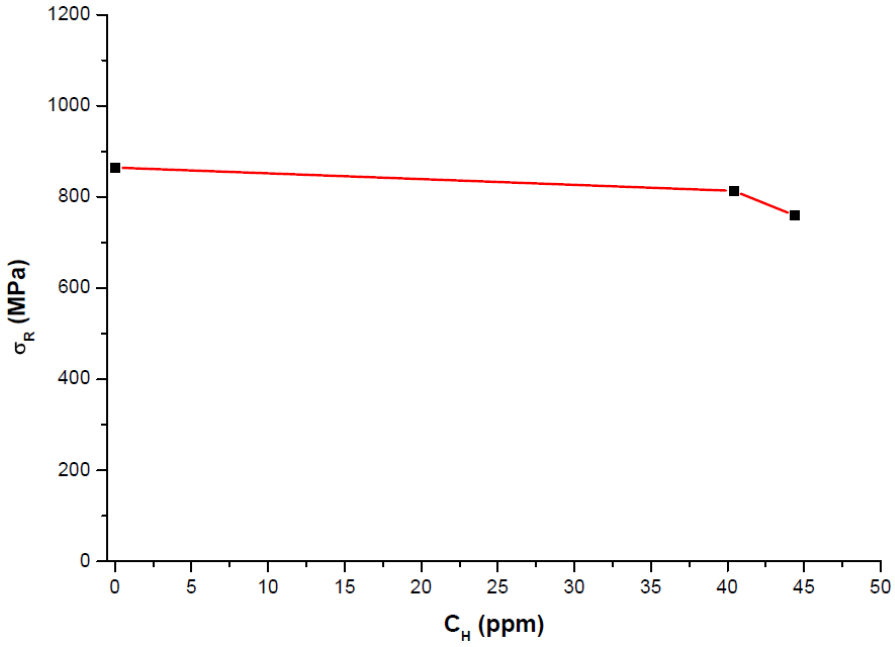


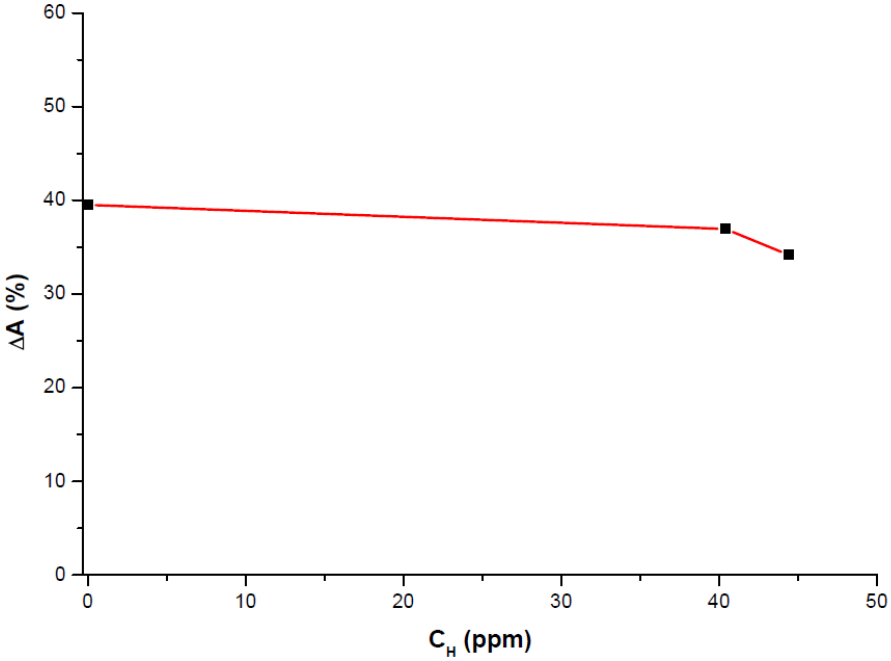


OK



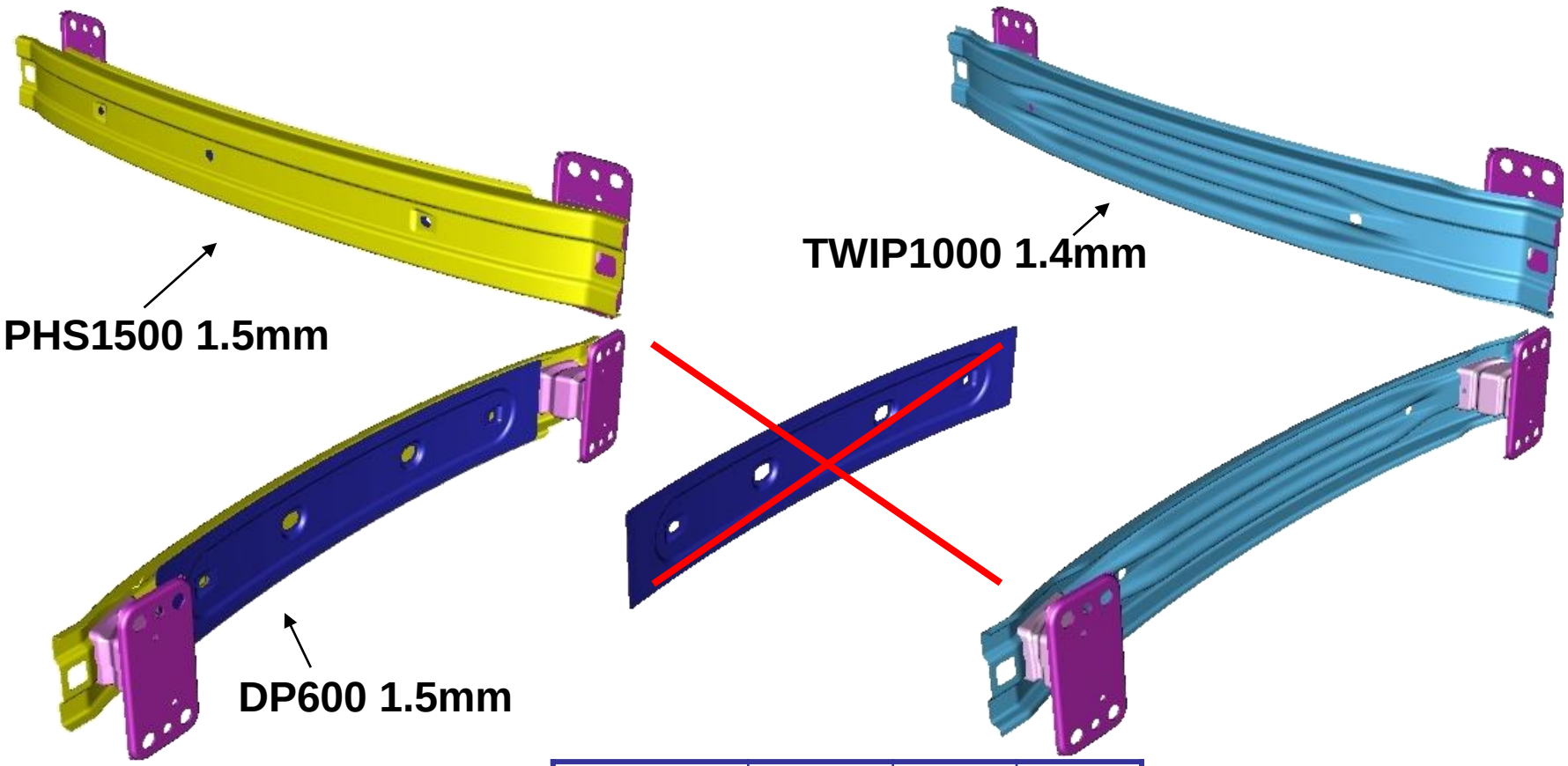
Innovative material – hydrogen embrlittment





Front…

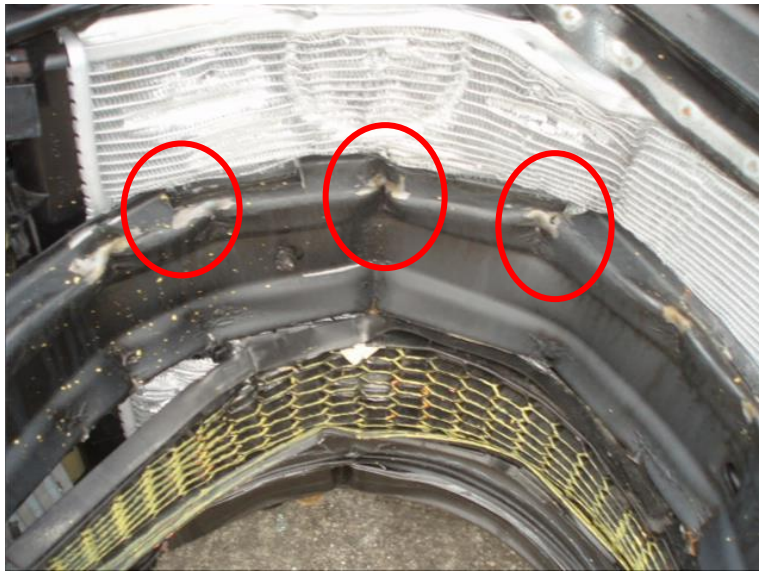
… remind … front crash beam …1° twip application for automotive component – Panda model…



	Hot formed	Allum.	TWIP
Weight [kg]	4.3	2.8	3.8
Cost [€]	14	20	14
Inv. [k€]	1100	550	900

Panda Front crash beam

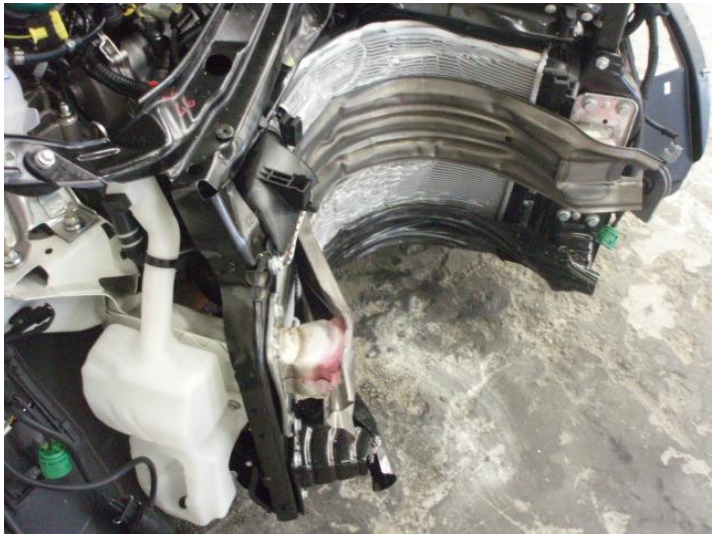
FRONTAL POLE TEST



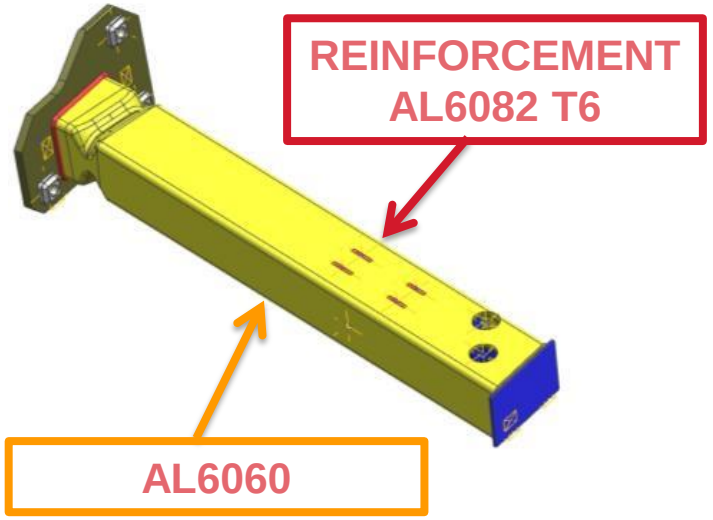
HOT FORMED

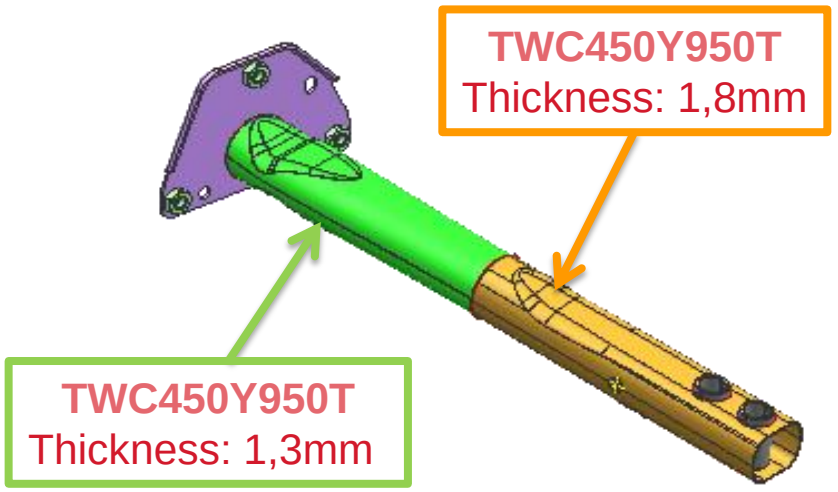
TWIP

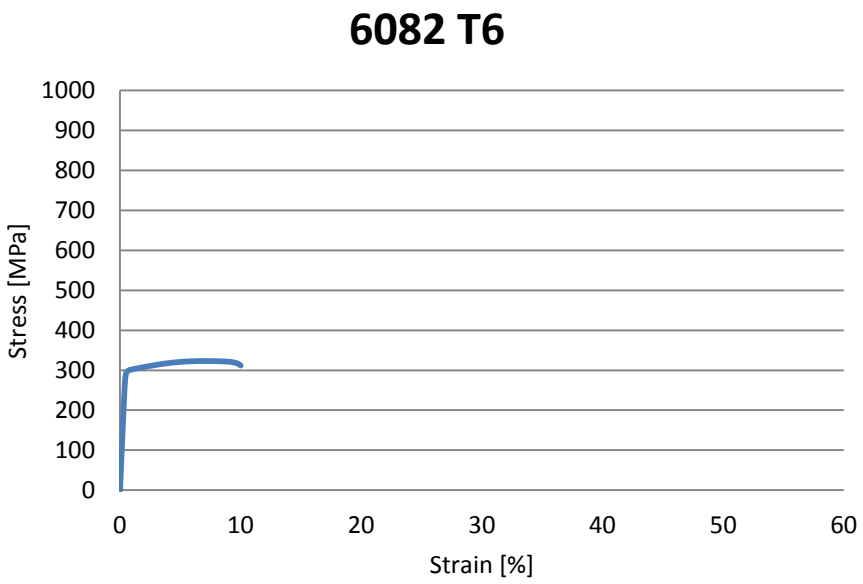
no craks

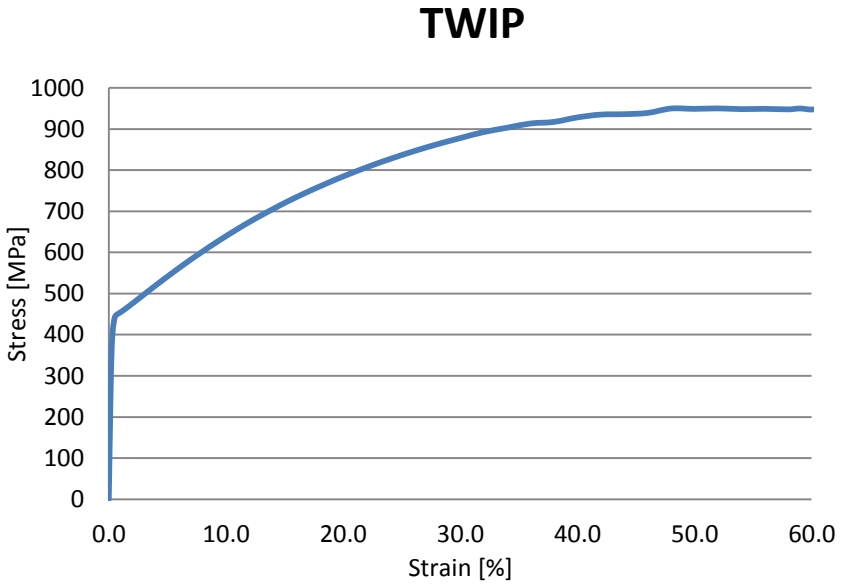


2° FCA twip application – first worldwide twip tubular & TWB application - Jeep Renegade

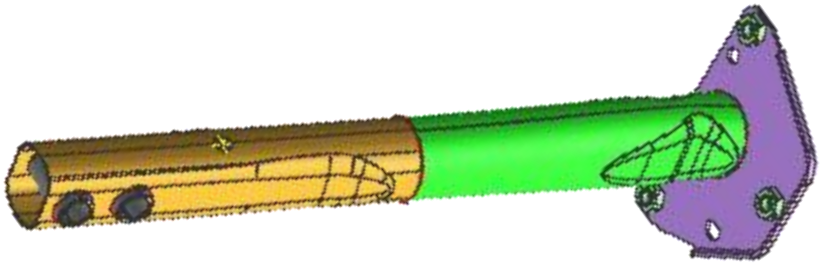


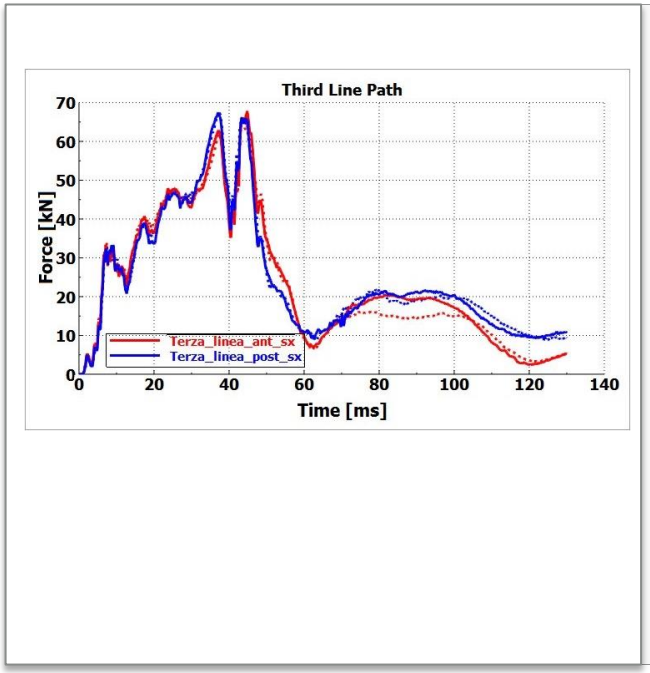


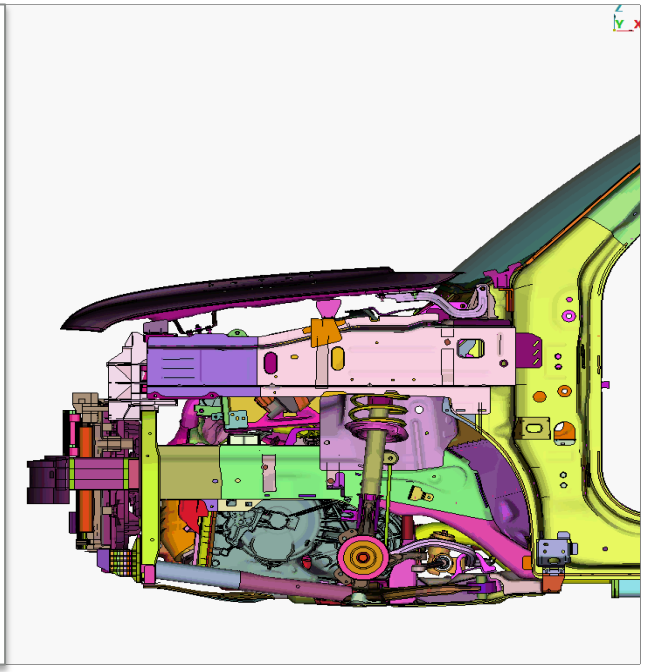




500X OFFROAD Third Loading Line



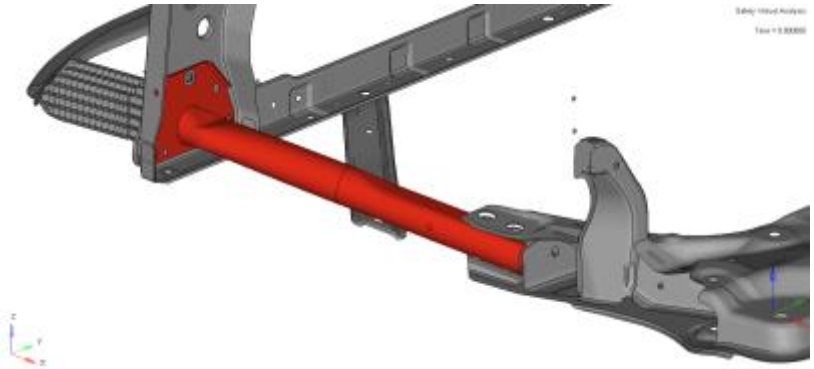




Benefit of New Third Loading Line

Adopting Twip Solution:

- Increased the off-road performance than aluminum solution
- Weight reduction
- High stability of front-end

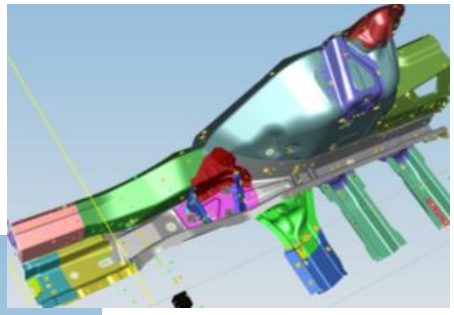


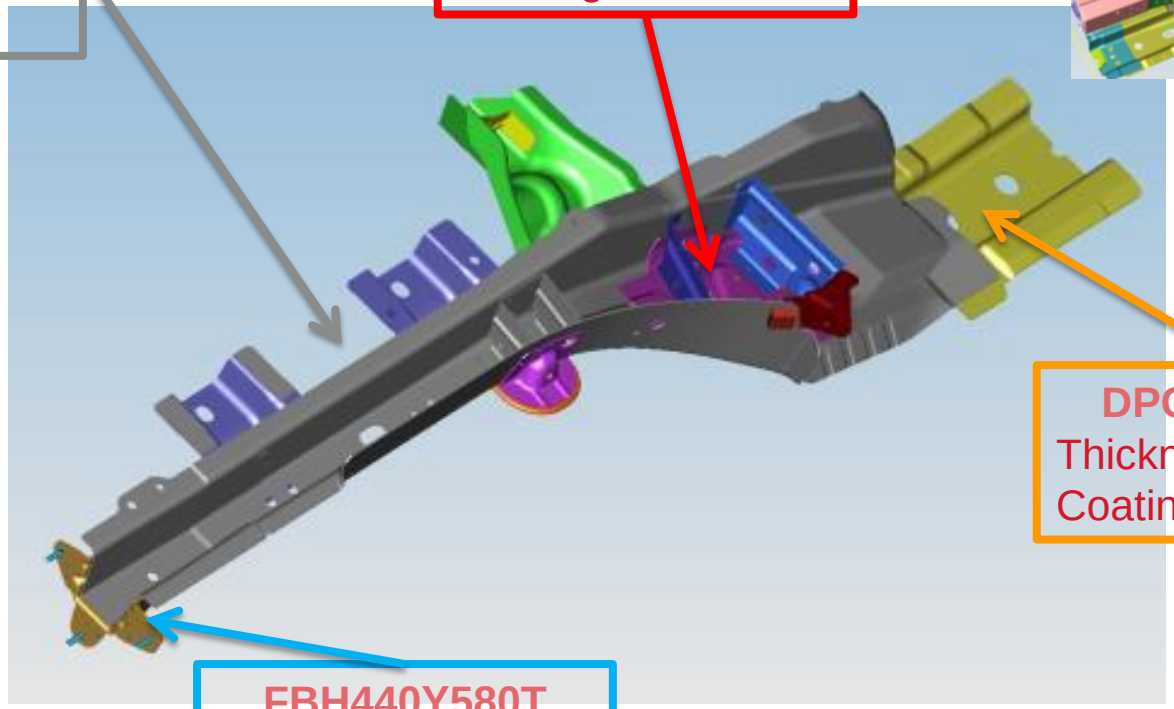
Rear Rail Fiat 500L

Rear Rail Fiat 500L Europe Version

LAC340Y410T
Thickness: 2,1mm
Coating: HDG

DPC340Y590T
Thickness: 1,6mm
Coating: HDG





DPC340Y590T
Thickness: 2,5mm
Coating: HDG

FBH440Y580T
Thickness: 3,0mm
Coating: HDG

Rear Rail Fiat 500L U.S.A. Version

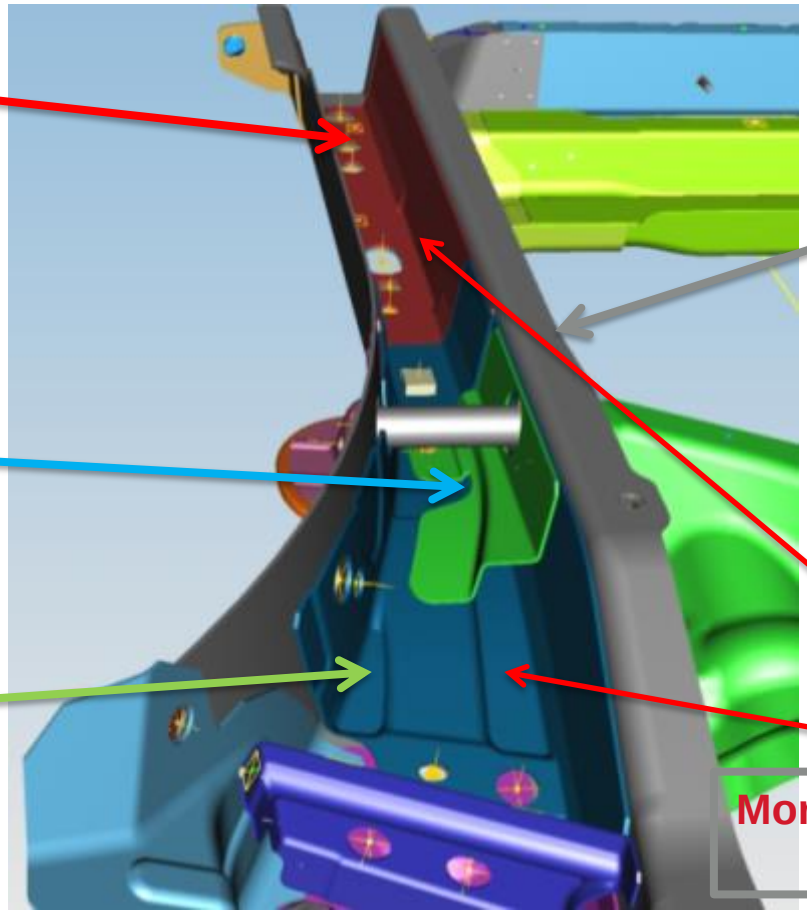
In U.S.A. crash requirements are harder than Europe:

No material changes respect Europe version for same component … more reinforcement are add

DPC340Y590T
Thickness: 1,8mm
Coating: HDG

LAC340Y410T
Thickness: 1,5mm
Coating: HDG

FBC440Y580T
Thickness: 2,2mm
Coating: HDG



LAC340Y410T
Thickness: 2,1mm
Coating: HDG

More reinforcements are add to Rear Rail

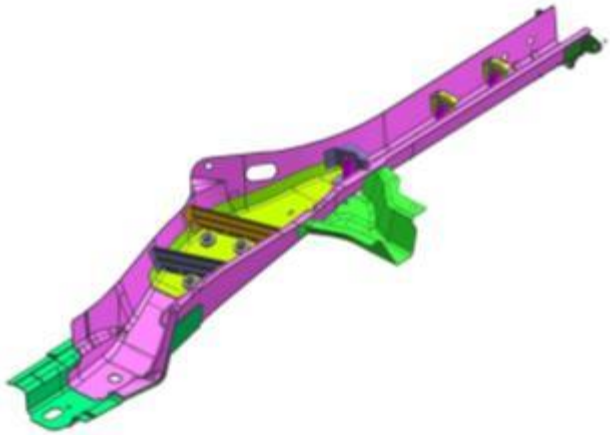
Rear Rail Fiat 500X

First World Wide Platform for FCA.

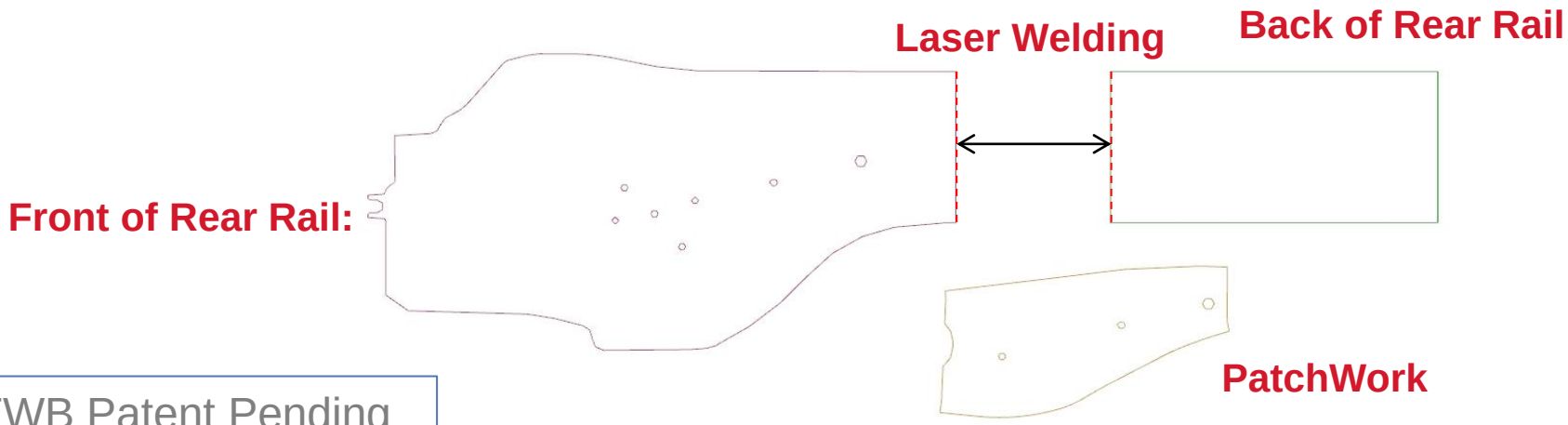
Rear Rail Fiat 500X

Fiat 500X Rear Rail adopts innovative Solution:

Tailored Welding Blank



"Tailored blanks are semi-finished parts, which are typically made from sheets with different alloys, thicknesses, coatings or material properties"

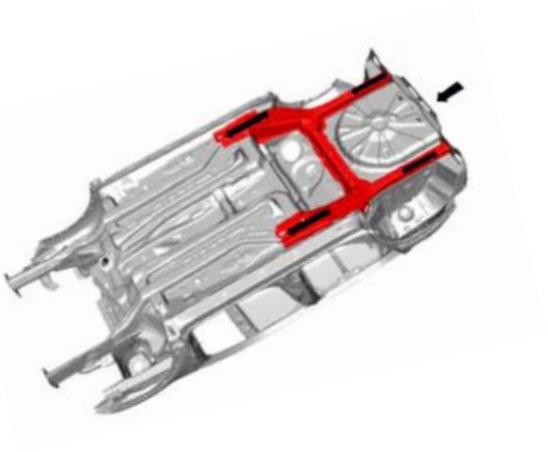


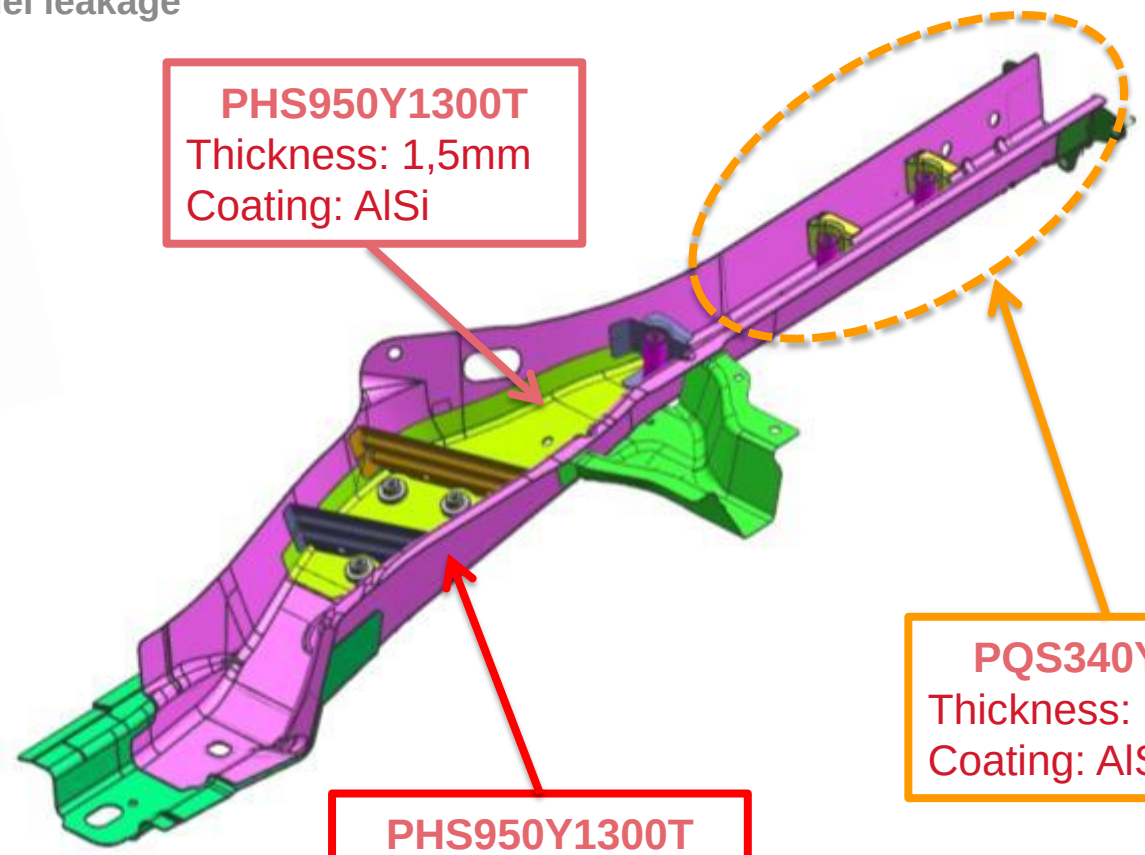
TWB Patent Pending

Rear Rail Fiat 500X

Rear impact Std. 301 at 80km/h main advances:

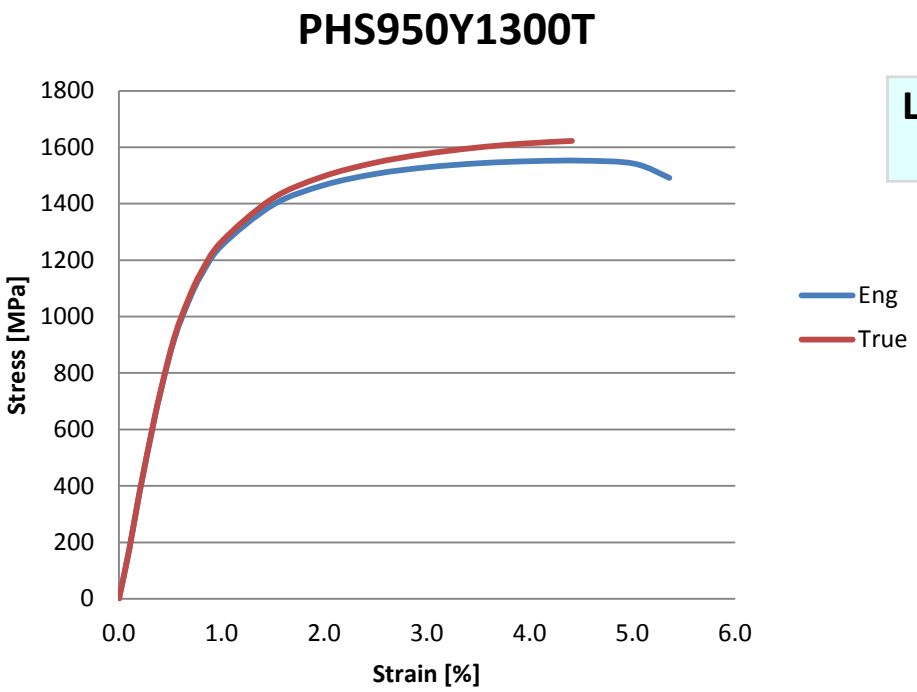
- **High stability of rear rail and rear occupant compartment**
- **Fuel tank safety – no fuel leakage**



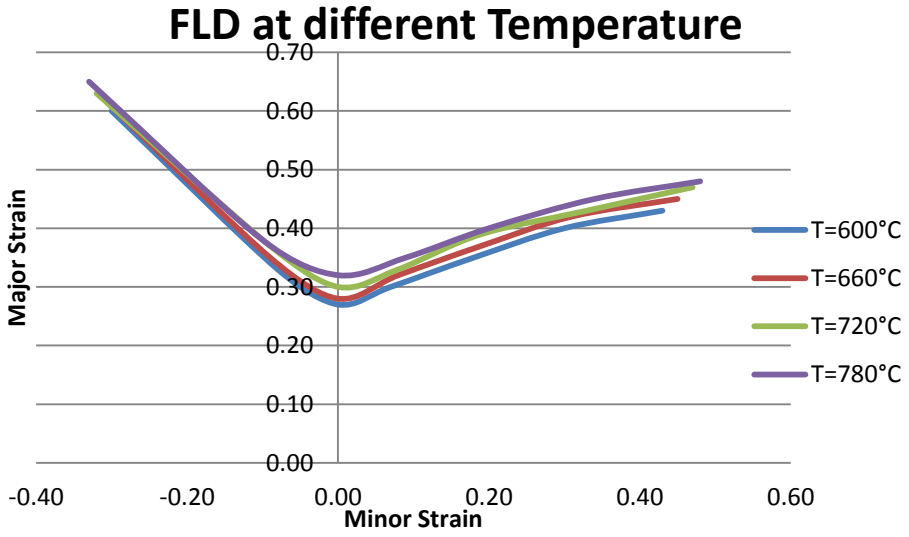


Rear Rail Fiat 500X

Mechanical characteristic of PHS950Y1300T:

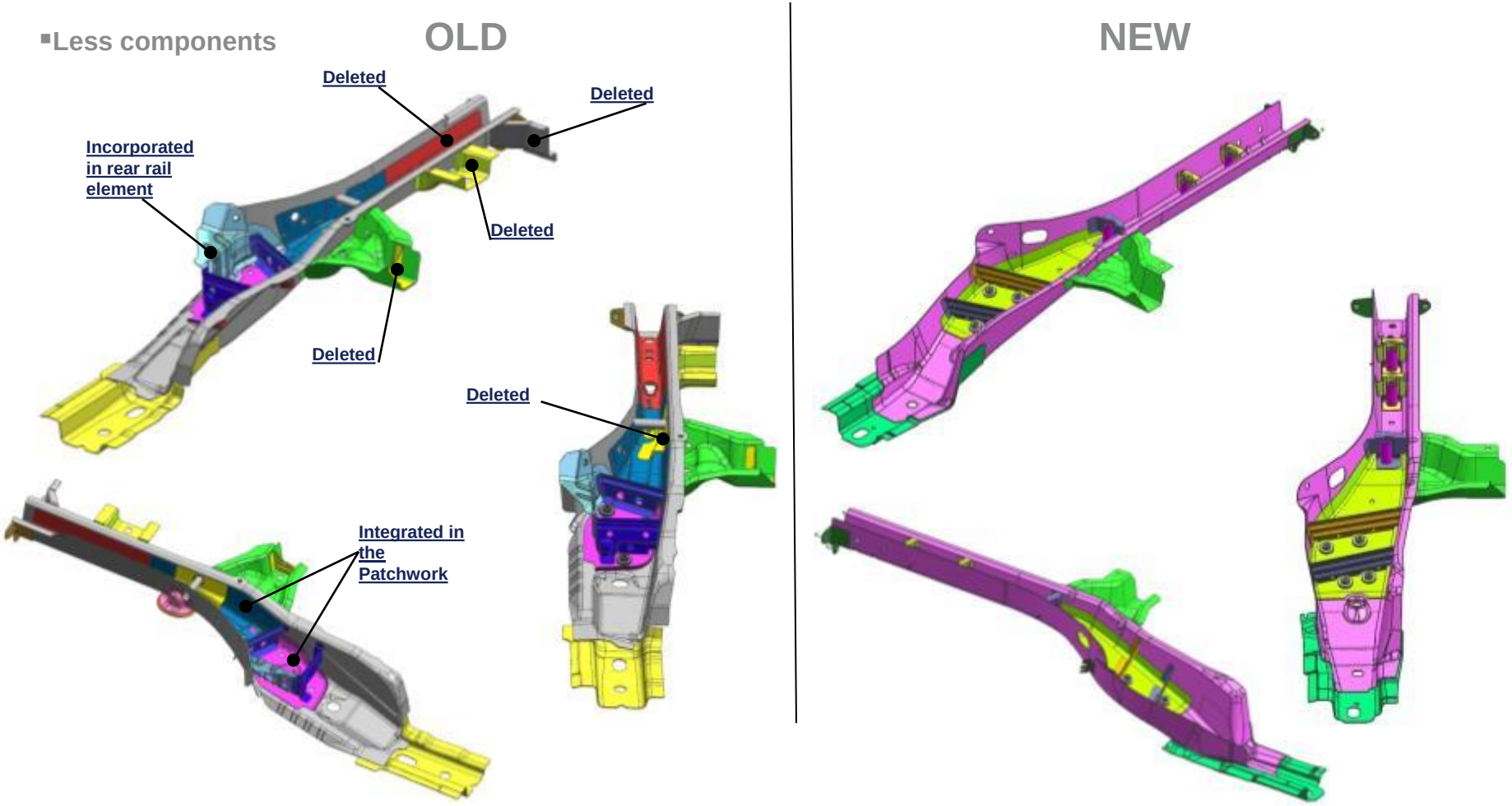


	$R_{p0.2}$ [MPa]	R_m [MPa]	Elongation %
Longitudinal respect RD	950 - 1250	1300 - 1650	min. 6



Differences between Old and New New Rear Rail

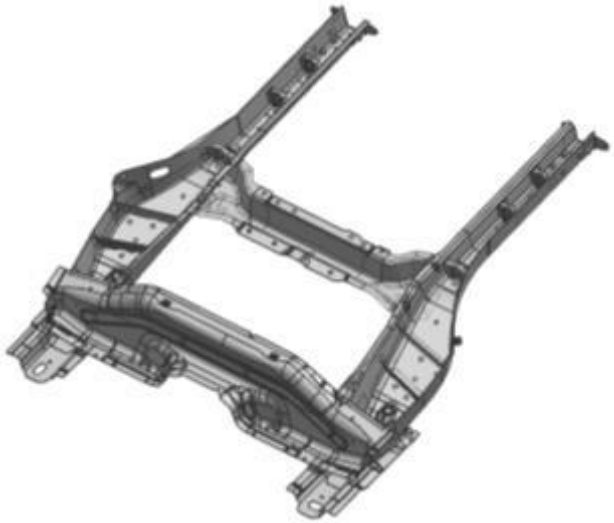
- Rear rail longer than previous model to increase the load transmission to underfloor rear during crash impact
- Reinforcement deleting due to PHS steel
- Better joining to side sill
- Less components



Benefit of New Rear Rail

Rear Frame 500L U.S.A. Weight**: 39,8 kg**

Rear Frame 500X Weight: **28,7 kg**



Weight saving = **11,1 kg**

In addiction to this, with lower number of component the assembly is simpler.

Conclusions

- Steel has the best compromise cost-performance for high volume
- 3 rd generation steel will be used for next car generation
- Aluminium use will increase for weight reduction and premium segment
- Composite material is useful for premium car
- All materials are important…but every component need a specific material, related to the mission

Thanks for the attention