

GREAT DESIGNS IN STEEL

**Presentations will be available for
download on SMDI's website on
Wednesday, May 22**

GREAT DESIGNS IN **STEEL**

MSC SMART STEEL® ENABLES LIGHT-WEIGHT VEHICLE BODY STRUCTURES

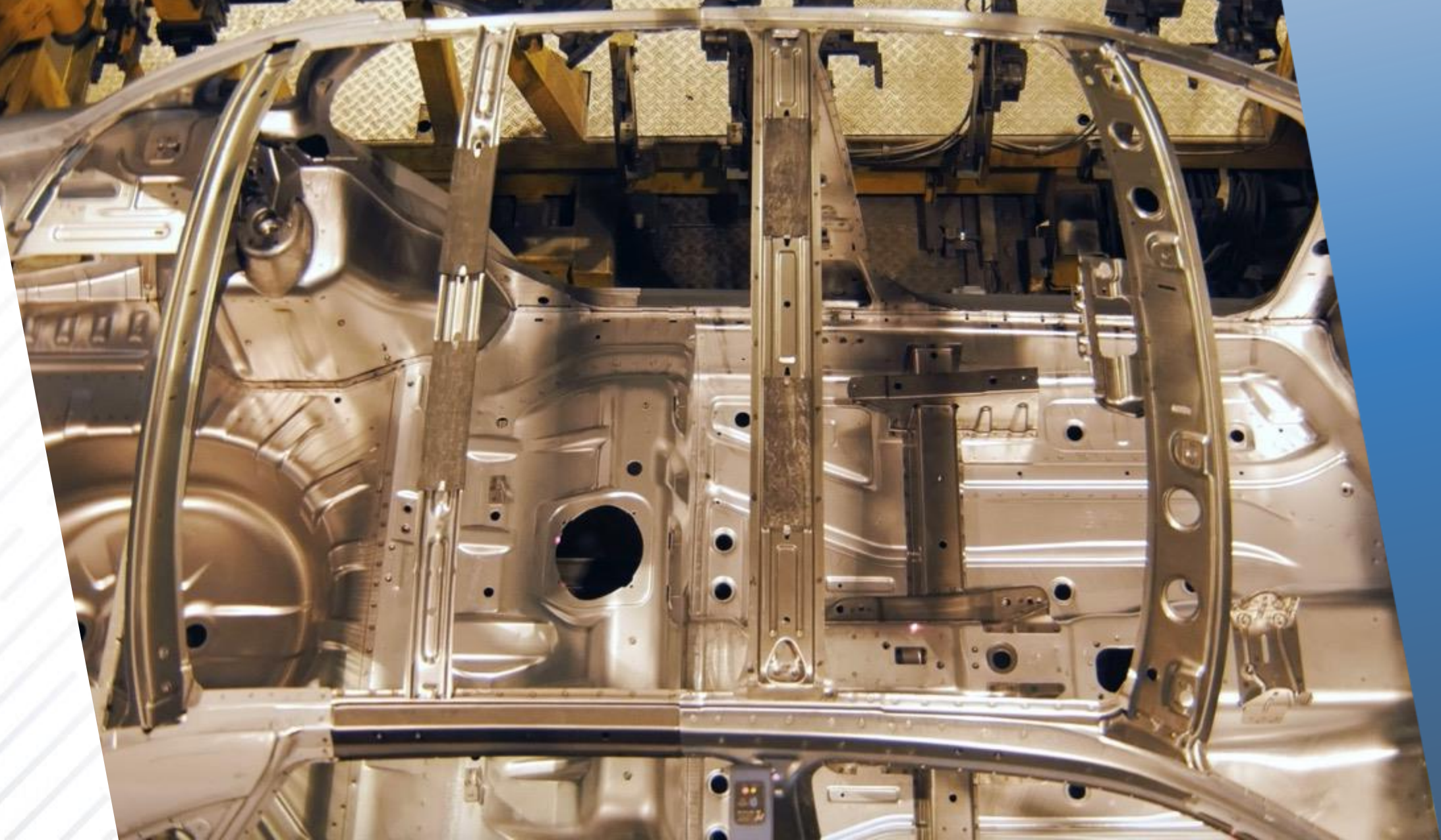
Matt Murphy – Vice President Sales & Engineering

Bryan Tullis – Director Product Development

MATERIAL SCIENCES CORPORATION

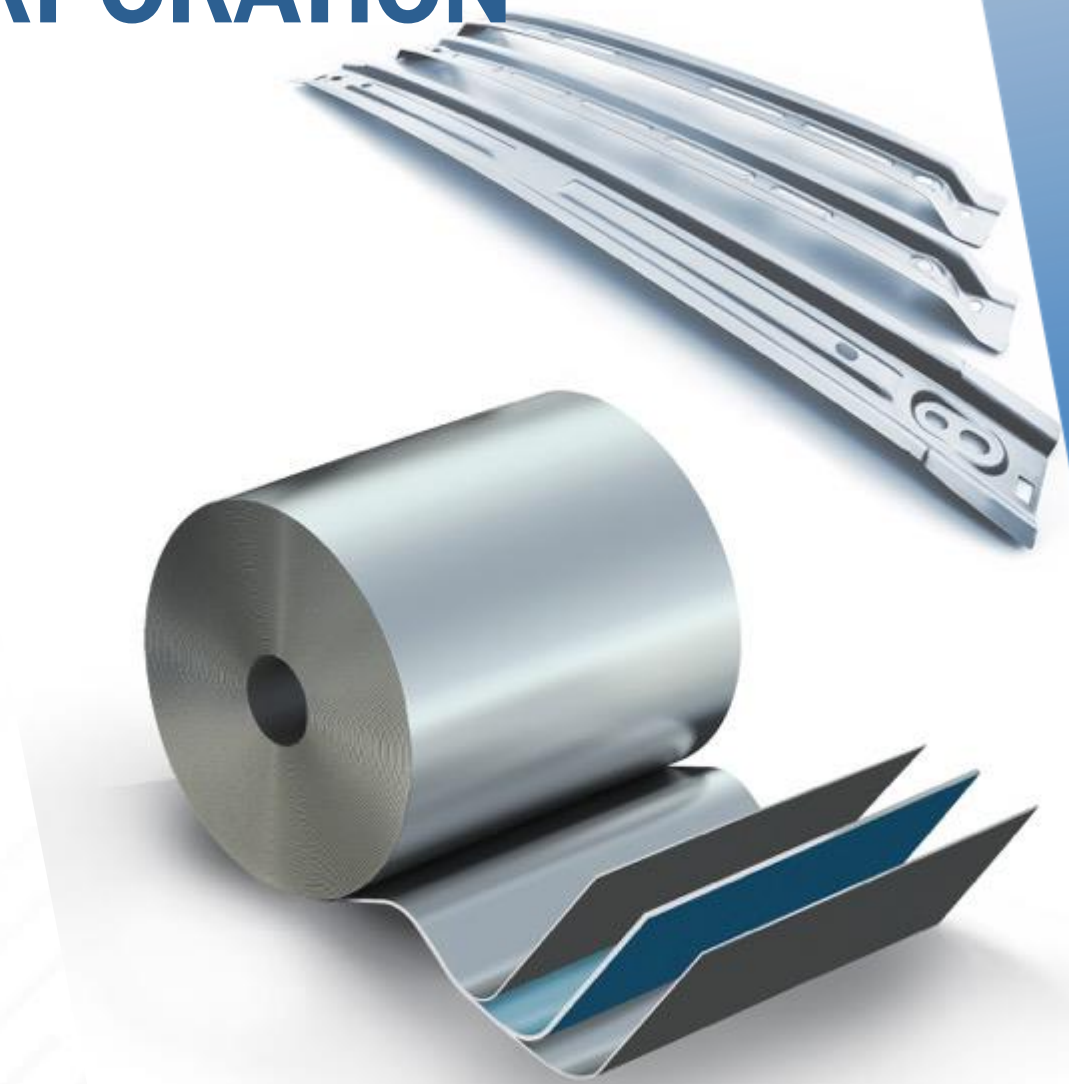
MSC SMART STEEL

GDIS



MATERIAL SCIENCES CORPORATION

- Introduction
- Material Sciences Corporation
- MSC Smart Steel
 - Overview
 - Value Proposition
 - Applications
- MSC Smart Steel Case Study
 - Panel Stiffness / Radiated Noise
 - Resistance Spot Welding
 - Robust Weld Strength
 - Formability



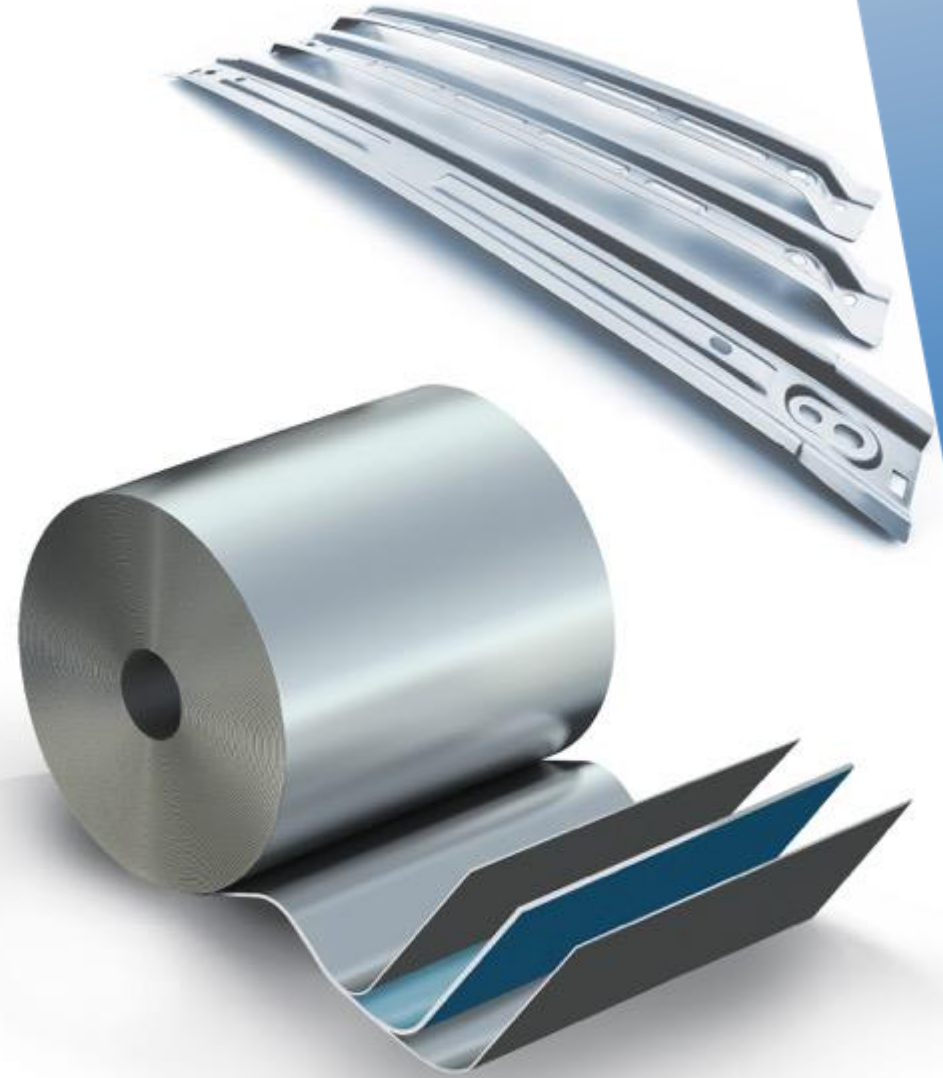
MATERIAL SCIENCES CORPORATION

- Metal Processor Focused on Commercializing Innovative Technologies for Automotive, Consumer and Industrial markets
- HQ: Canton, Michigan
- Five Manufacturing Facilities
- State of the Art NVH / Technical Center
- Key Solutions
 - UHSS – Galvanizing
 - Non Ferrous Treatments
 - Engineered Printing on Metal
 - Painted Steel
 - Acoustic Laminates - Quiet Steel®



MSC SMART STEEL

- Designed to respond to vehicle mass reduction initiatives
- Multi- Layer Laminate
- Steel outer layers / Conductive fiber reinforced polymer core
- Low density substitute for cold rolled steel stampings
- Typical: 20% - 35% Mass save
- Produced as Coil
- Production Launch: 2020MY



VALUE PROPOSITION

- Offers Significant Mass Reduction Compared to Steel
- Process with existing manufacturing infrastructure
 - Spot weld (existing guns, transformers, caps)
 - Stamp in dies
 - Cleaner / E-coat / Paint Compatible
- Recycle with steel
- Match Bending Stiffness of Steel
- Inherently Damped
- Competitive “Weight Buy”



VALUE PROPOSITION

High Strength Steel

Reduce Thickness = Increase Strength
Reduce Thickness ≠ Same Stiffness

MSC Smart Steel®

Lower Mass – Maintain Stiffness

Aluminum

Reduced Density
Match Steel Stiffness Requires 1.4t

Not NVH Friendly
Mechanical Fasteners (Rivet, etc)
Manage Mixed Metal Joints (\$)
Modify Assembly Process

MSC Smart Steel®

Reduced Density
Maintain Stiffness

Damped
Spot Weld Friendly
Compatible with Steel
Same Assembly Process

TARGET APPLICATIONS

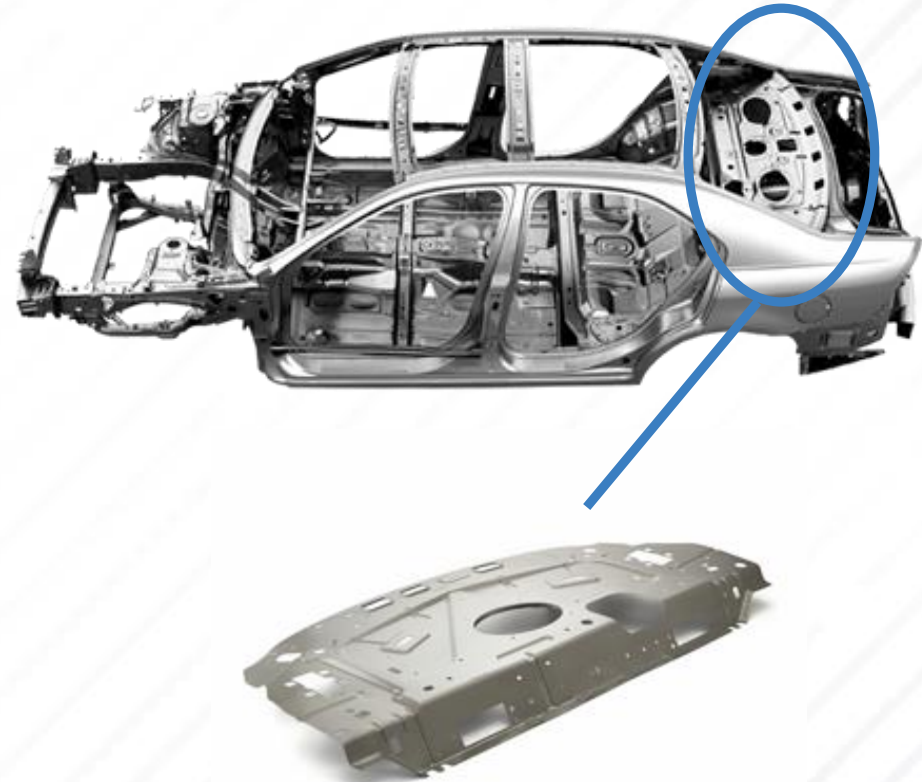
- Body in White – Low Carbon Steel
- Exposed Steel Bumpers / Seat Components / Subassemblies
- Bending Stiffness Critical
- Radiated Noise Contributors - NVH Benefit
- Non-High Strength Steel



CASE STUDY – PACKAGE TRAY

- Low Carbon Stamped Steel (0.66mm – 3.7kg)
- Stamped / Trim in Serial Production Tooling
 - Coil Fed / Transfer Dies
- Spot Welded into the Body
- Assembly contains 175 Spot Welds
 - 13 Brackets

- **MSC Smart Steel (0.74mm – 2.9kg)**
 - **(22% Mass Save)**



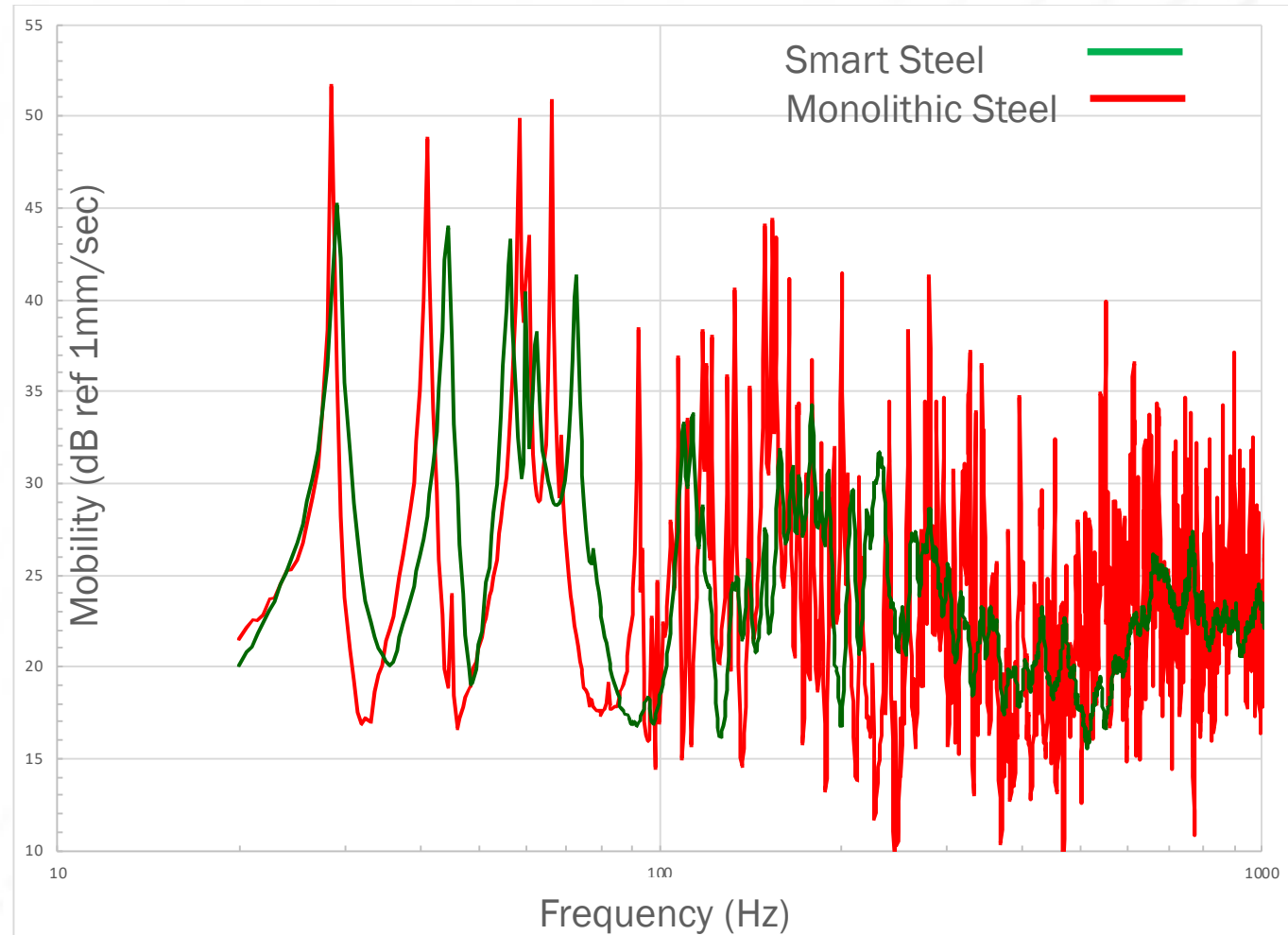
CASE STUDY – PACKAGE TRAY

- Panel Stiffness / Radiated Noise
- Constrained Panels
- Semi-Anechoic Chamber
- Impact at 10 locations
- Microphone and Accelerometer Response
- Average of Responses
 - Measured Spatial Avg NTF (Radiated Noise)
 - Point Mobility (Stiffness)



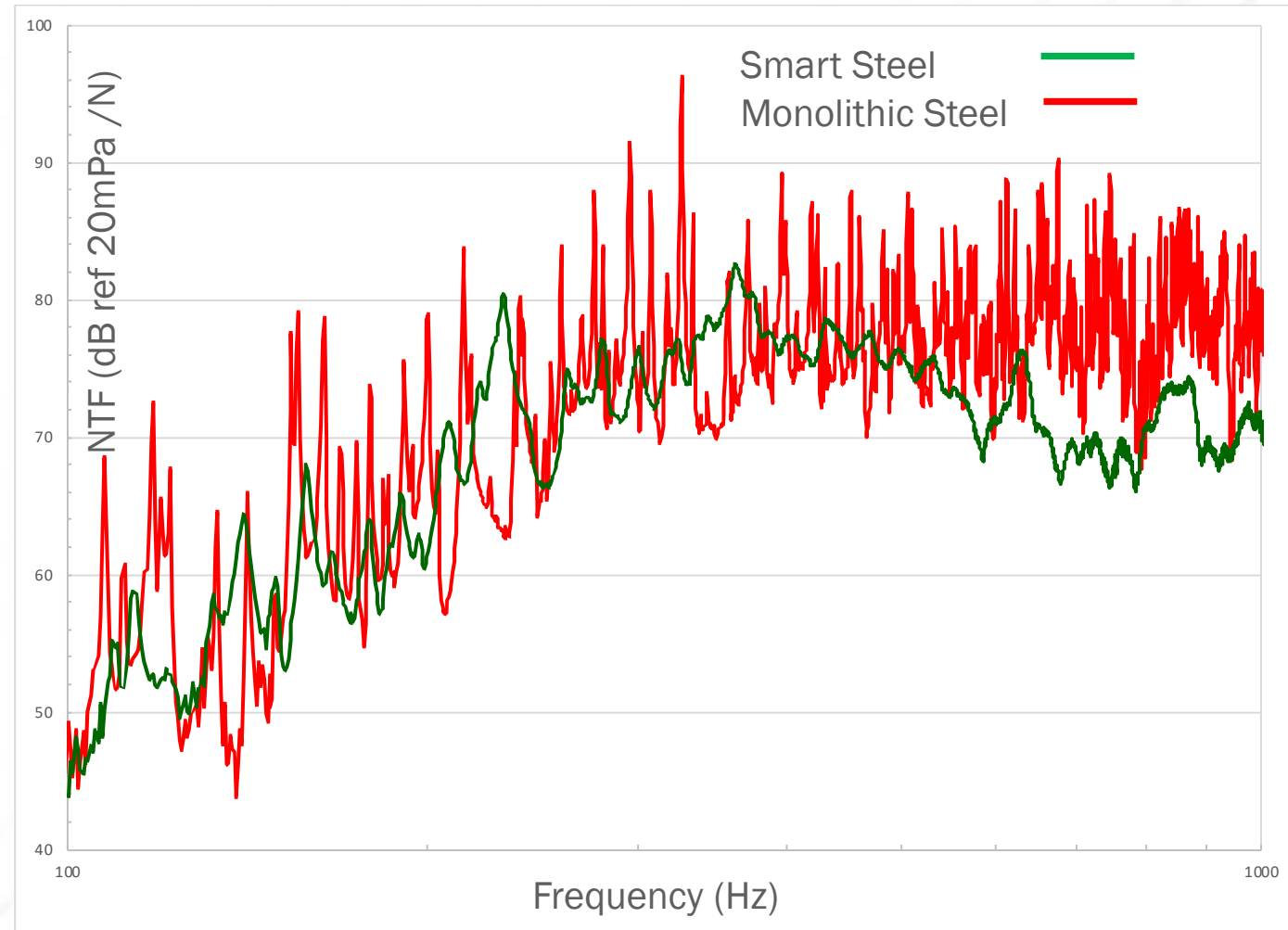
CASE STUDY – PACKAGE TRAY

- Smart Steel exhibits performance that is stiffer than monolithic steel
- Smart Steel contains improved damping
- Opportunity to reduce gauge of Smart Steel resulting in additional mass save



CASE STUDY – PACKAGE TRAY

- Smart Steel exhibits approximately 5-10dB improvement in radiated noise
- Candidate for panels containing input vibration sources such as speaker mount
- Correlation with CAE
 - Nastran



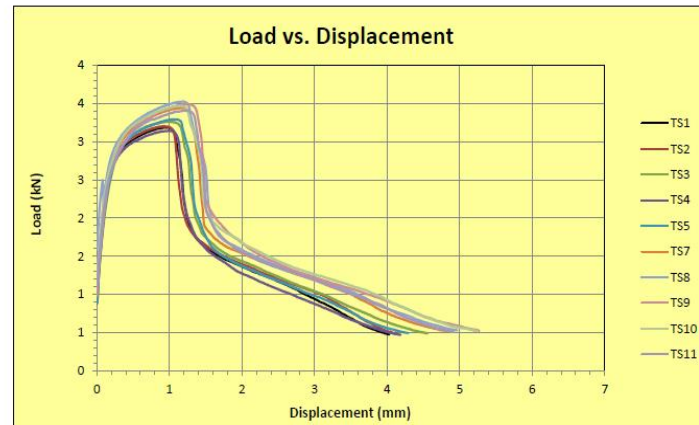
CASE STUDY – PACKAGE TRAY

- Resistance Spot Welding
- 175 Spot Welds / 13 Brackets
 - 2T / 3T Joints
 - Coated and Uncoated
 - HSLA
 - *DP/Boron (Validated)*
- Smart Steel Engineered to be Spot Welded
 - Slope / Pulsing Weld Process
 - Domed Weld Cap
 - AC / DC / Adaptive Feasible
 - 2kA or Greater Current Window
- Meet Coach Peel / Tensile Shear / Cross Tension Requirements



CASE STUDY – PACKAGE TRAY

- Spot Weld Integrity
 - 0.74mm Smart Steel + 0.9mm HSLA340
- Coach Peel / Button
- Tensile Weld Strength
 - Tensile Shear
- Spot Weld Hardness

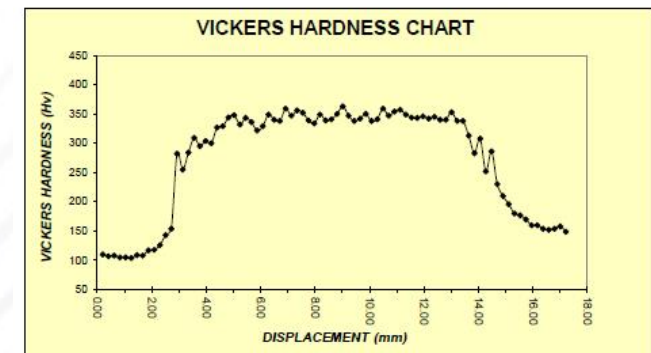


	High Current (I = 11.0 kA)	Low Current (I = 9.6 kA)
	Tensile Shear (kN)	Tensile Shear (kN)
AWS Min Requirement	1.40	1.40
Average Value	3.47	3.22
Min	3.53	3.14
Max	3.41	3.29

Tensile Weld Shear Strength



Nugget Peel



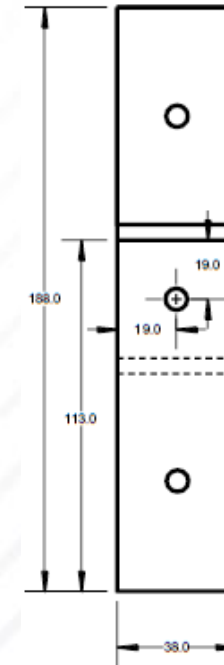
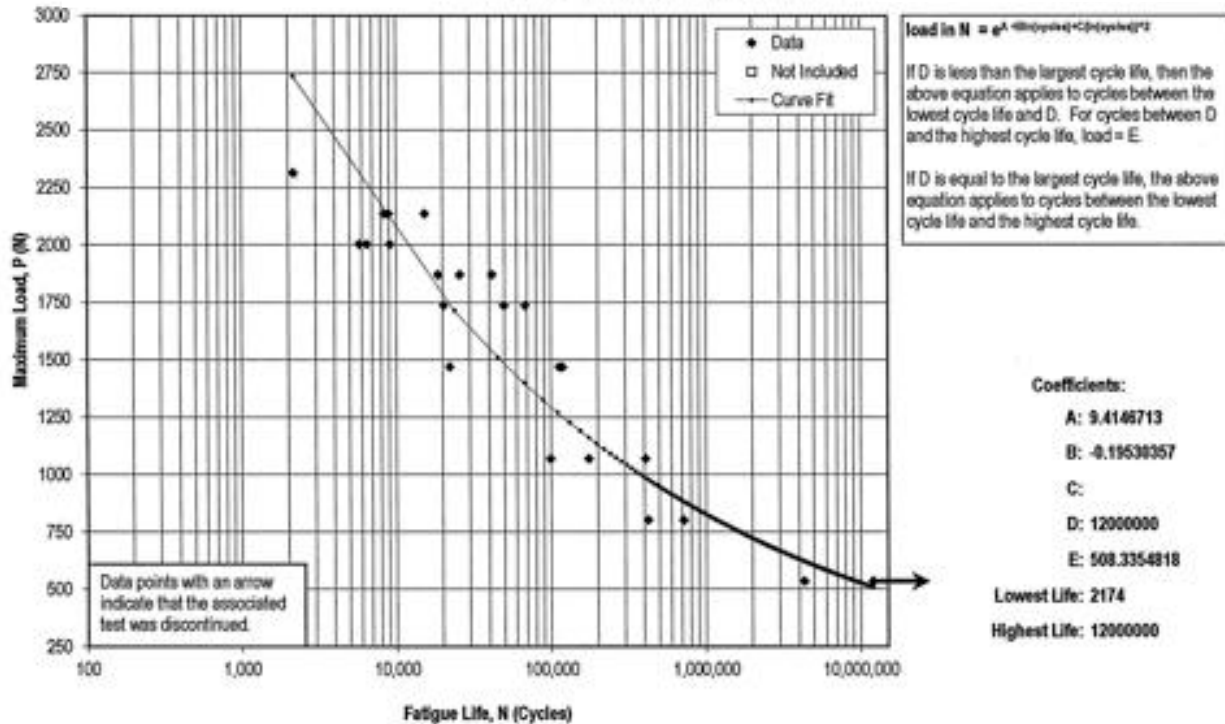
Weld Nugget Hardness

CASE STUDY – PACKAGE TRAY

- Weld Fatigue Life – Overlap Shear
 - 0.74mm Smart Steel + 0.9mm HSLA340
 - 10M Cycles

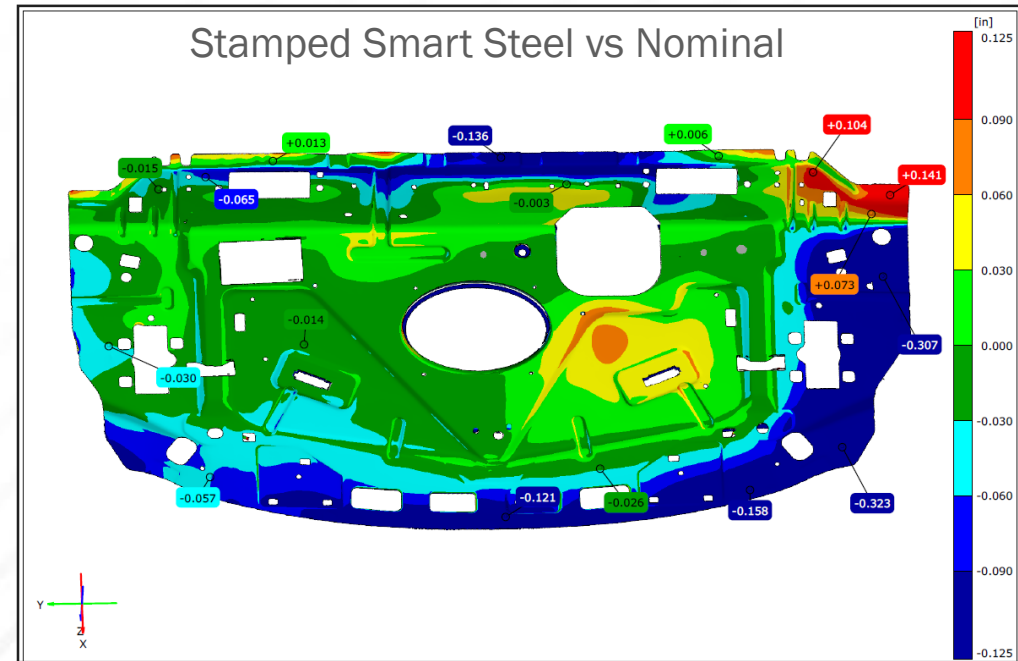
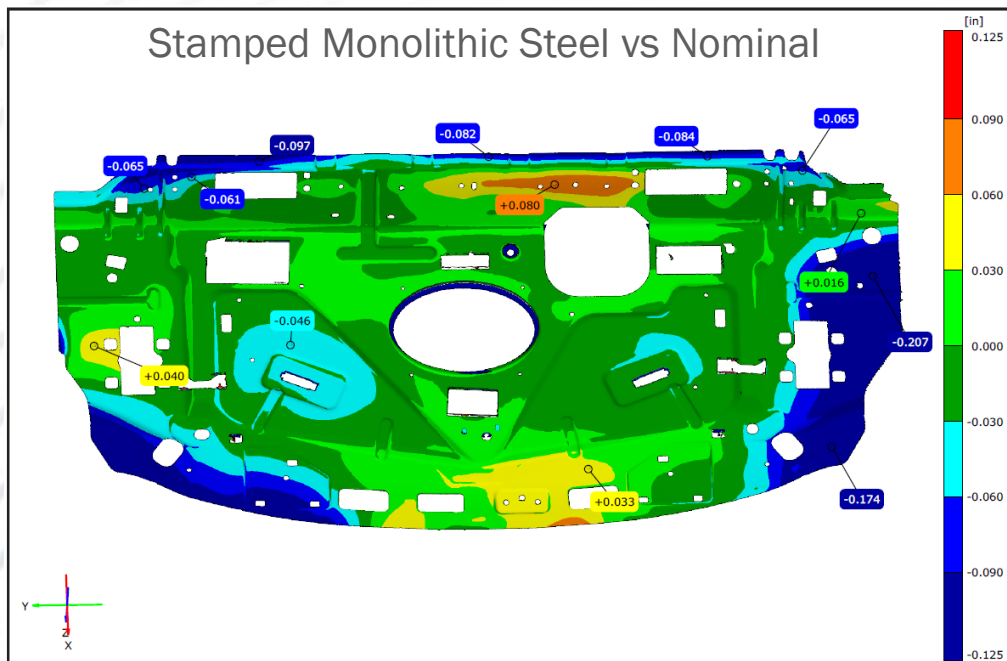


Load Life Data Curve - Metric Units



CASE STUDY – PACKAGE TRAY

- Formability
 - Traditional Stamping Dies
 - Forming Simulation – 3 Layer Data Card
 - Important Die Considerations
 - Trim Clearance
 - Stretch Material



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