



Auto/Steel
Partnership
Foundation



Leading Through Collaboration

2023-24 Annual Report

Current Members



Table of Contents

From Our Director.....1
About A/SP2
Our mission.....2
Our strategy3
Value Statements.....3
Governance and Staff.....5
Financial Health6
Project Teams.....7
National Laboratory Collaborations17
Student Initiatives and A/SP Partners.....18
Awards and Recognitions.....20
Become a Member21



Celebrating a Year of Innovation and Collaboration: The Auto/Steel Partnership 2023-24 Annual Report

I am delighted to welcome you to the Auto/Steel Partnership's Annual Report for 2023-24, a testament to our year of remarkable accomplishments and collaborative spirit, as well as a commemoration of the rich history that has shaped our collective efforts.

Originally founded in 1987 as an informal organization, the Auto/Steel Partnership has evolved into a cornerstone of collaboration between the automotive and steel industries. In 2022, we took a significant step forward by incorporating as an IRS-recognized 501(c)(3) non-profit organization, reinforcing our commitment to industry success.

Our gratitude extends to every stakeholder, partner, and contributor who has played a pivotal role in our success. Special appreciation goes to our Directors, Joint Policy members, team and project leads, and company representatives for their unwavering commitment.

The synergy between the automotive and steel industries has driven technological advancements and laid the foundation for a sustainable future. This year our achievements, from cutting-edge technologies to forward-thinking projects, exemplify the strides we've made together.

In our pursuit of sustainability, we've championed initiatives beyond industry norms. The formation of a new Design Team in 2023 signifies our commitment to exploring manufacturing technologies and their environmental impact.

Facing industry challenges head-on, the Auto/Steel Partnership has demonstrated resilience and adaptability. Together, we've turned obstacles into opportunities for growth.

Our leadership team shares a collective optimism for the future. Their insights and vision underscore our commitment to continued success, and we are grateful for their guidance as we navigate the evolving landscape of our industries. We express our heartfelt thanks for your integral role in the Auto/Steel Partnership's journey. Together, we've achieved remarkable milestones, and we'll continue to drive innovation, sustainability, and excellence in the years to come.

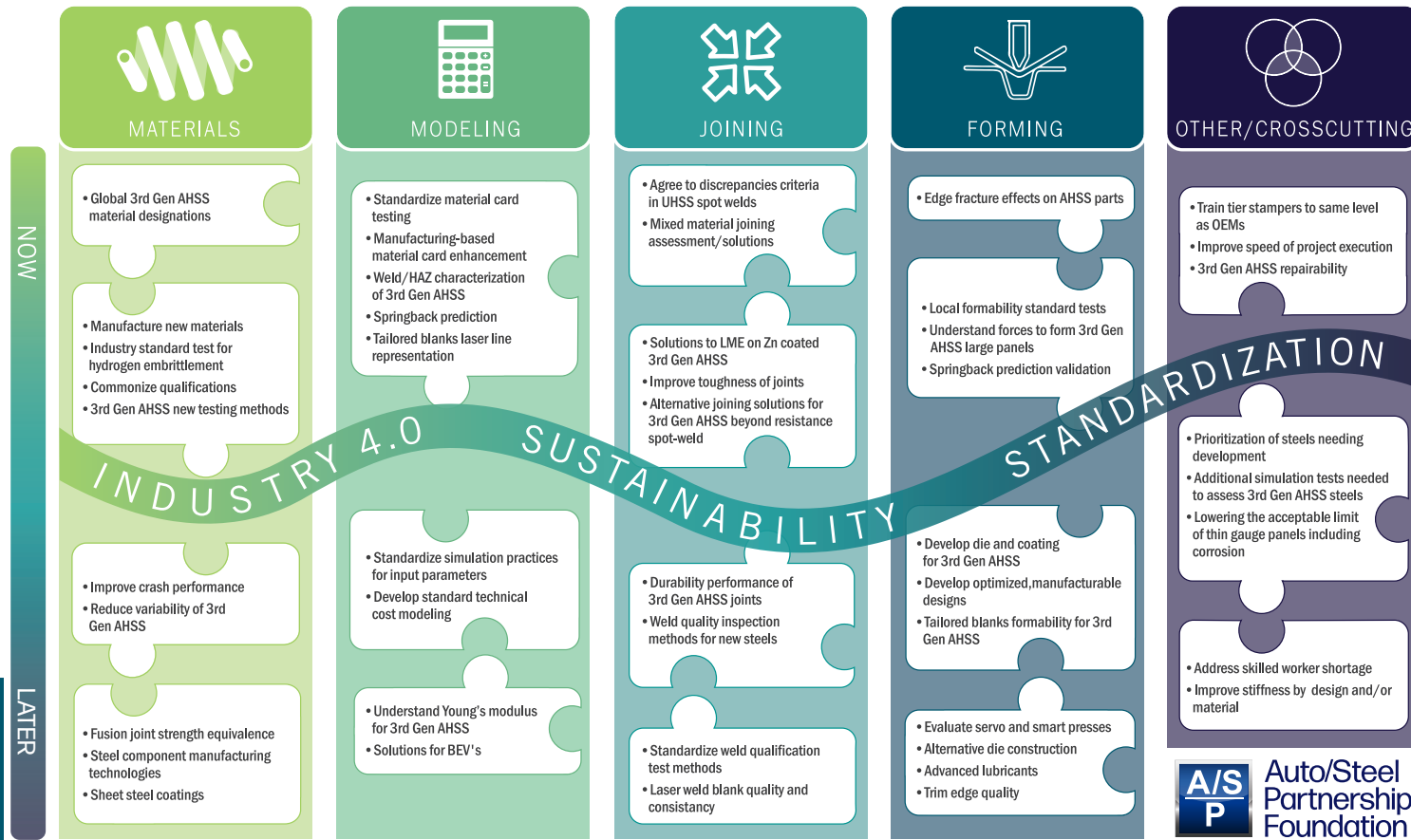
In gratitude, Michael Davenport



The Auto/Steel Partnership Foundation (A/SP) is a pre-competitive research consortium of automakers, sheet steel producers and tier suppliers. For more than 35 years, A/SP members work to drive improvements from concept through realization in vehicles on the road today, as well as to support an educated workforce.

OUR MISSION

Auto/Steel Partnership (A/SP) leverages the resources of automotive, steel and related organizations to enable innovations in design optimization and manufacturing technologies for achieving sustainable mobility solutions. We pass on these innovations through education for the industry and community, supporting the realization of technology and sustainability benefits through a skilled workforce.



STRATEGY: How we achieve our mission

A/SP focuses on pre-competitive technical development of sustainable lightweight steel technologies and applications, that include:

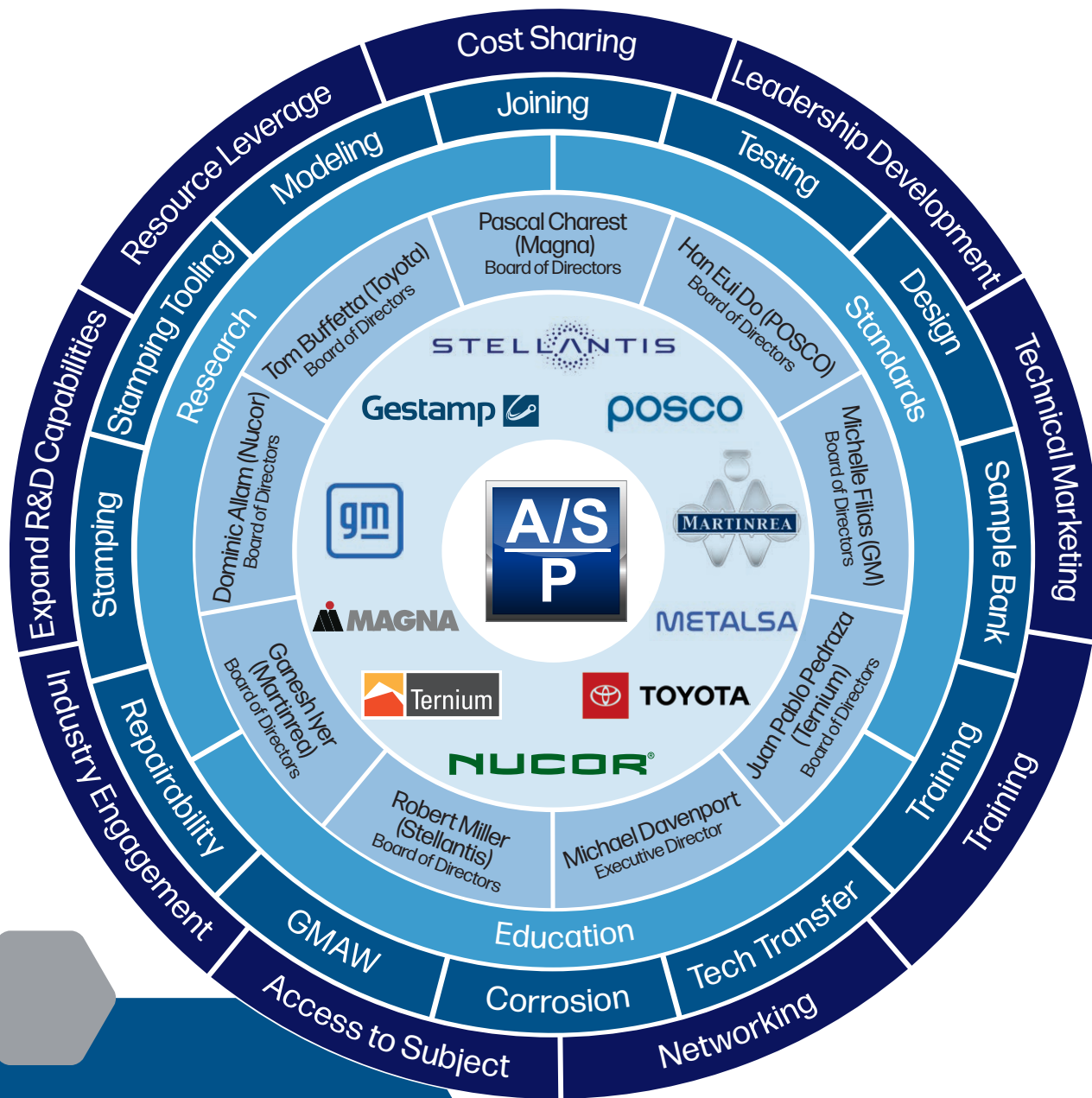
- Aligning manufacturing-enabling technologies with steel development;
- Utilizing existing and emerging steel grades through vehicle mass reduction projects to support the need for lightweighting, product performance and other metrics;
- Leveraging existing manufacturing infrastructure technology as practicable, while developing stretch technologies as needed;
- Working collaboratively within the research community (e.g., universities, national laboratories) to effectively leverage technical resources and education; working with academia, companies, and communities to support workforce training/education; and maintaining an A/SP Technology Roadmap to help drive annual project plans.
- Our Technology Roadmap keeps projects focused on goals and informs other organizations on A/SP priorities.

VALUE STATEMENTS

- The global shift towards electric vehicles is actively supported by A/SP, with a focus on reducing carbon footprint. This commitment to the transition drives collaborative research and development efforts, leading to innovative steel solutions that enable the production of lighter, more energy-efficient vehicles.
- As part of sustainability efforts, comprehensive life cycle assessments are now being conducted by A/SP to evaluate the environmental impact of steel and vehicle manufacturing processes. This data-driven approach provides valuable insights for original equipment manufacturers and other stakeholders to make informed decisions, including choices between stampings and giga castings in vehicle production, ultimately contributing to Carbon Net Zero (CNZ) goals.
- A/SP steel vs. giga casting project assesses lightweighting, repairability, and recyclability, aiming to optimize global warming potential (GWP) and achieve best-in-class results.
- Leveraging steel's inherent strength as the structural metal with the lowest Global Warming Potential (GWP), A/SP drives advancements in CNZ manufacturing. Progress is achieved through a focus on lightweighting, efficient steelmaking, and optimized joining technologies.
- A/SP's extensive efforts in lightweighting, repairability, and recyclability are key to achieving best-in-class life cycle GWP.

A/SP's Technology Roadmap

The A/SP agenda is based upon a technology roadmap which directs research project prioritization and resource allocation. More than 30 projects are currently underway across 9 project teams. In the Project Teams section, you can read more about our teams, including active projects and highlights of their 2023 achievements.



Auto/Steel Partnership (A/SP) strives to be the premier automotive steel research organization. A/SP is incorporated as a non-profit in the state of Michigan and led by a dedicated Board of Directors. With research efforts divided amongst nine research teams and three support teams, A/SP focuses on advanced research, standardizing material qualification specifications, and supporting an educated workforce. Members benefit from the Partnership's ability to leverage resources to enhance the members R&D capabilities as well as to further their influence in the industry.

- Who we are
- Leadership
- What we do
- How we do it
- How members use A/SP

Leadership



Dominic Allam
General Manager -
Automotive Solutions
Nucor Corporation



Tom Buffetta
Vice President
Production Engineering
Toyota Motor North
America (TMNA)



Pascal Charest, P.Eng.
General Manager
Magna International



Han Eui Do
President
POSCO America



Michelle Filias
Director ME Body -
Global Stamping Center
General Motors Company



Ganesh Iyer
Chief Technology Officer
Martinrea International
USA Inc.



Bob Miller
Sr. Manager
Die Engineering Center NA
Stellantis



Juan Pablo Pedraza
Global Director of Research
and Development
Ternium



Michael Davenport
Executive Director
Auto/Steel Partnership



John Catterall
Board Secretary
Auto/Steel Partnership

Joint Policy Board (JPB) Members

- Christopher Michaels
Director of Product Development
General Motors Company
- Faye Zaski, General Manager
Materials Engineering Department
Toyota Motor North America (TMNA)

A/SP Staff



Michael Davenport
Executive Director



John Catterall
Project Manager
• Design Team
• Training Team



Kathleen Hickey
Project Manager
• Technology
Transfer Team



Eric McCarty
Project Manager
• Constitutive and
Fracture Modeling Team
• Joining Team
• Stamping Team



Jonathan Smith
Project Manager
• Steel Sample Bank
• Steel Testing and
Harmonization Team



Michael White
Project Manager
• Corrosion Team
• GMAW of AHSS Team
• Repairability Team
• Stamping Tooling
Optimization Team



Cherie Van Allen
Financial Consultant, CAR VP
Administration and Finance

Joint Policy Council (JPC) Members

- Nathan Blandford, **A/SP JPC Chairman**, Senior Engineering Manager, Toyota Motor North America
- Eric deNijs, Engineering Manager, Magna International
- Jiwoong Ha, Principal Researcher & General Project Manager, POSCO America
- Dean Kanelos, Market Development and Product Applications Manager - Automotive, Nucor Corporation
- Bryan Macek, Senior Technical Specialist, Stellantis
- Rafael Mercado, R&D Senior Manager, Ternium
- Jamil Niazi, Senior Engineering Manager, Toyota Motor North America
- Joseph Polewarczyk, Strategic Body Innovation Lead, General Motors Company
- JP Singh, Technical, Integration Engineer - Steel, Advanced Manufacturing, General Motors Company
- Pat Walsh, Vice President, R&D, Martinrea International USA Inc.

Affiliate Member Representatives

- Paul Belanger, R&D Director North America - Gestamp
- Miguel Angel Quiñones Salinas, Advanced Materials Engineering Specialist, Metalsa Mexico

Revenue and Support

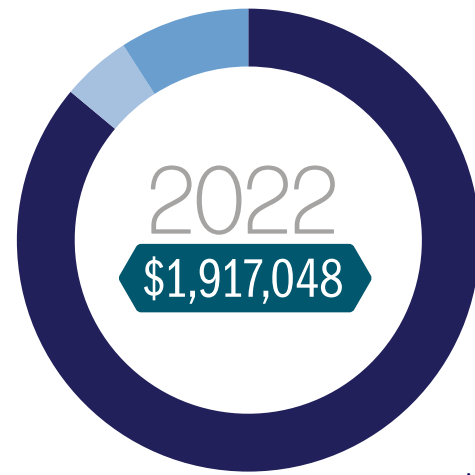
Expenses

Revenue and Support

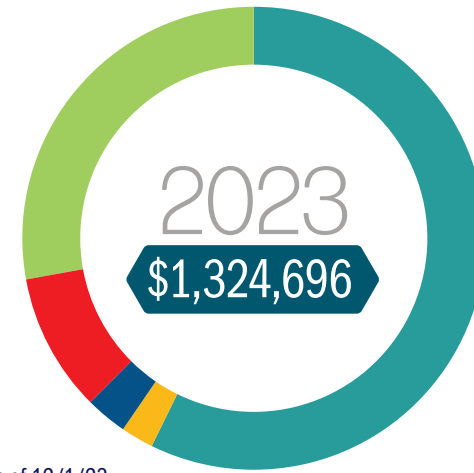
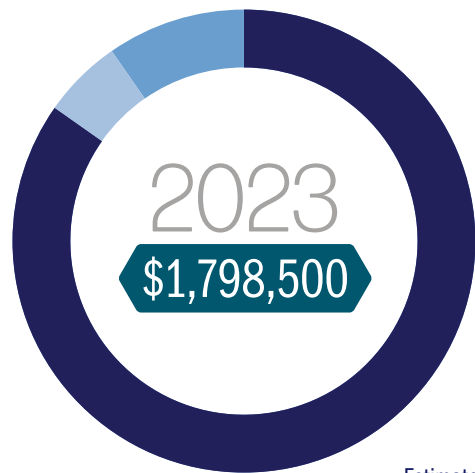
- Membership
- In-Kind Value
- NSERC Match

Expenses

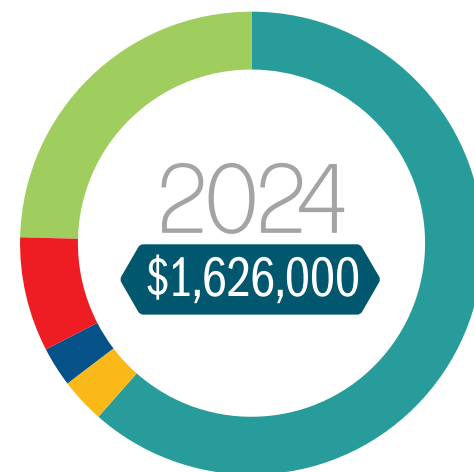
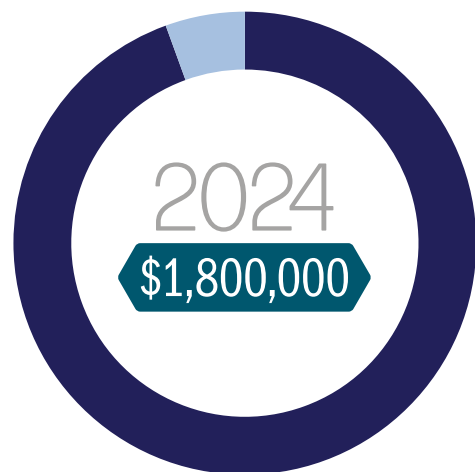
- Research
- Steel Sample Bank
- Training
- Tech Transfer / Industry Events
- Administrative



Audited



Estimated as of 12/1/23



Projected

A/SP's Project teams are the heartbeat of our organization. Within each, collaboration is at its highest level among the best in the industry, addressing the issues that matter most to our members and the success of their manufacturing operations. In the pages that follow, you'll learn more about each team and highlights of their 2023 work.

Constitutive and Fracture Modeling

Team Lead: Steven Sheng, General Motors Company
Project Manager: Eric McCarty, A/SP

The Advanced High-Strength Steel (AHSS) Constitutive & Fracture Modeling Team is developing and validating robust computer-aided engineering (CAE) material models for predicting fracture in AHSS/Ultra High-Strength Steel (UHSS) components. The Team's primary focus includes the development of material test procedures to develop constitutive information for forming and fracture material models with an emphasis on anisotropy, accumulated work history and nonlinear strain paths. The benefits of this project team will be the continued use of newer grades of AHSS/UHSS to meet safety and crashworthiness performance targets while still achieving the desired mass reductions.

Active Projects:

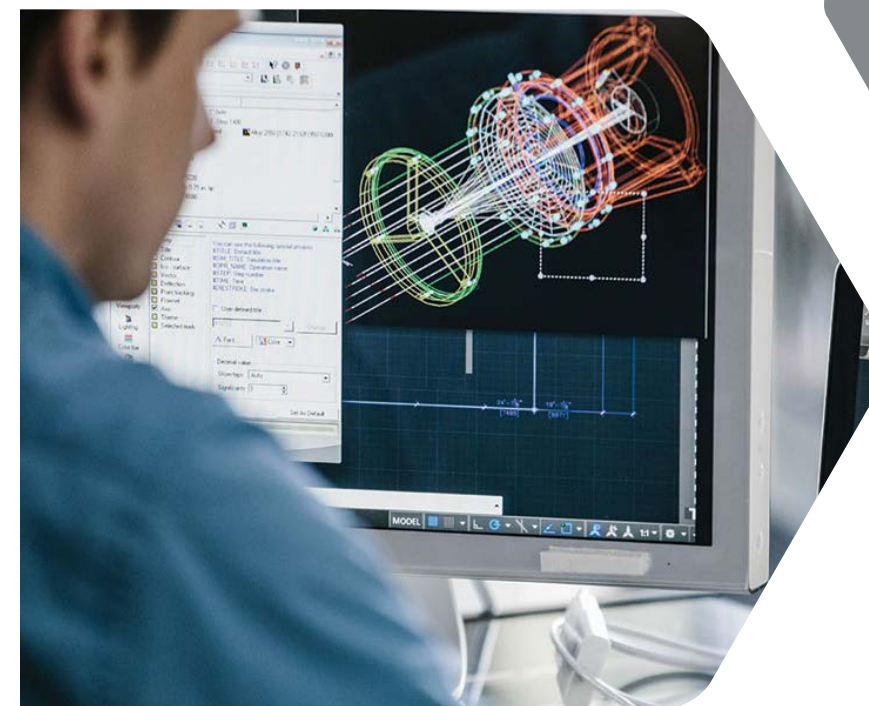
- CFM#01: DIC Test Procedure (NIST Crada)
- CFM#2.2: Damage Accumulation Modeling, Phase II
- CFM#3: Benchmarks and Material Testing, Phase II

2023 Team Project Highlights:

AHSS Constitutive & Fracture Modeling Team project CFM#02: Damage Accumulation developed experimental characterization techniques, with an emphasis on Digital Image Correlation (DIC) strain measurement, to characterize fracture in proportional stress states without necking by exploiting through thickness strain gradients and tool contact. New methodologies were developed to directly obtain the hardening response to large strains and to calibrate anisotropic yield functions using shear and plane strain tension tests. Emphasis was placed upon investigating anisotropic non-linear strain paths (NLSP) and the critical evaluation of the current state-of-the-art fracture models in LS-DYNA. The current fracture models, based upon a non-physical damage indicator related to the equivalent strain, can provide a first order prediction of fracture in NLSP but are challenged by anisotropic path changes and when the pre-straining was done in plane strain tension. New material models were proposed based upon using work and stress-based metrics to adapt proportional fracture surface to generalized loading conditions.

“The CFM Team develops scientifically valid solutions to improve simulation and predictions of constitutive and failure material models for simulation of any manufacturing process and product performance, taking into account the impact of manufacturing on product performance.”

Tom Stoughton, General Motors Company



“Our involvement and participation keep us on the cutting edge of technologies that are important to Nucor's automotive growth.”

Dominic Allam, Nucor, A/SP BOD



Corrosion

Team Leads: Dean Kanelos, Nucor; Ulrich Haus, General Motors Company
 JPC Mentor: Michael Davenport, A/SP
 Project Manager: Michael White, A/SP

AHSS Corrosion Protection Team addresses corrosion resistance requirements that may present a roadblock to further implementation of AHSS in lightweighting chassis component applications. The team develops procedures, materials and method processes to accomplish 15-year corrosion adequacy for lightweight chassis AHSS applications, as well as thin panel corrosion.

Active Projects:

- C#02: Corrosion - Body & ZMAG Corrosion
- C#03: Corrosion - Interface/Bolted Bi-Metallics

2023 Team Project Highlights:

The Corrosion team evaluated the elimination of paint shop sealers for typical underbody sections. Utilizing a representative test specimen, the team evaluated low alloying, high alloying, hot-dipped galvanized, electro-galvanized, and aluminum specimens to rank corrosion prevention.

“The A/SP Corrosion Team has been a valuable tool in understanding the corrosion resistance of coatings. This allows OEMs to consider the appropriate coatings and design features on future applications to meet their corrosion requirements.”

Dean Kanelos, Nucor

Stamping

Project Manager: Eric McCarty, A/SP

The AHSS Stamping Team is investigating a wide array of studies supporting the accelerated application of innovative AHSS products to reduce vehicle weight and to improve structural performance. The approach is to divide the broad project spectrum of possibilities into three categories: evaluating steels using baseline industry tools; address production challenges; and improve capabilities for analysis methods. The Team's priorities are springback prediction, control and validation,

local formability of AHSS and 3rd Generation AHSS (3rd Gen), and on predicting press tonnage needed to trim and form 3rd Gen AHSS.

Active Projects:

- ST#15.3: Press Tonnage, Phase III
- ST#16.2 Machine Learning Model for LWB Formability (NSERC)
- ST#22: Local and Global Material Card Development
- ST#23: Trim Edge Quality

2023 Team Project Highlights:

As the “Era of Electrification” takes hold of the automotive industry, it promises to challenge more than just the powertrain paradigm. Mega and giga castings are finding their way into a growing number of automotive Body-In-White (BIW) architectures. In keeping with those trends, the next generation(s) of stamped components are likely to be larger in size and made from the latest AHSS grades. Inevitably, part quality and press tonnage concerns will dominate the list of challenges that will need to be overcome to enable this part class.

“The Stamping Team's continued work in understanding the nature of press tonnage focuses on the accuracy of the data collection and the alignment of the predictive tools to ensure the viability of traditional processes and existing capital equipment for years to come.”

Vince Millioto, Martinrea International USA Inc.

“As we are now expected to do more, faster with less people, leveraging funds and personnel resources through A/SP collaboration allows the delivery of quality and timely solutions. The challenges placed in front of us are more easily resolved by having the best minds in the industry working together on them.”

John Catterall, Auto/Steel Partnership



“As a board member of the Auto/Steel Partnership, I firmly believe in the tremendous value of our investment in collaboration between the automotive industry and the steel sector. Our partnership has played a pivotal role in driving innovation and excellence by leveraging the strengths of each stakeholder. By working together, we have developed and implemented cutting-edge technologies. Our investment in collaboration is a testament to our commitment to innovation and the long-term success of our industry.”

Ganesh Iyer, Martinrea International USA Inc., A/SP BOD

Stamping Tooling Optimization

JPC Mentor: J.P Singh, General Motors Company
 Project Manager: Michael White, A/SP

Stamping Tooling Optimization addresses the need to fully realize the benefits of AHSS, which depends upon the ability to aggressively form, trim and pierce these steels into complex geometries needed for automotive applications. The goal of this project team is to determine cost-effective and durable die materials, surface treatments, coatings and die designs for stamping AHSS by developing and implementing tests that simulate die tool environments and failure modes.

Active Projects:

- STO#8.4 Laser Hardening of Cutting Die Semi-Industry Trial
- STO#8.5 Laser Hardening of New Trim Steels
- STO#10.4 Die Wear - Pin on Disc vs. Impact Fatigue vs. Sliding Die Wear Correlation Study
- STO#12.2 Additive Metals - Direct Energy Deposition
- STO#12.3 Additive Metals - Direct Energy Deposition (Trim Steel Testing - Phase II)

2023 Team Project Highlights:

The **STO#8.4 Laser Hardening Team** conducted a durability study using a trim die in a mechanical press, exploring three material and manufacturing process routes. The study focused on typical trim steels, ranging from lower-cost options to higher alloyed steel grades. Trim inserts, typically through-hardened to over 50 HRC, can also be surface-hardened to 60 HRC or more using flame or induction hardening. The team proposed laser hardening as an alternative surface-hardening process, known for inducing less distortion and being more repeatable

than flame and induction hardening. Although laser hardening offers opportunities to eliminate post-hardness machining, it may result in shallower case depth and sharper hardness gradients than induction hardening, potentially affecting insert durability. The team evaluated a number of hardening combinations, gathering valuable data.

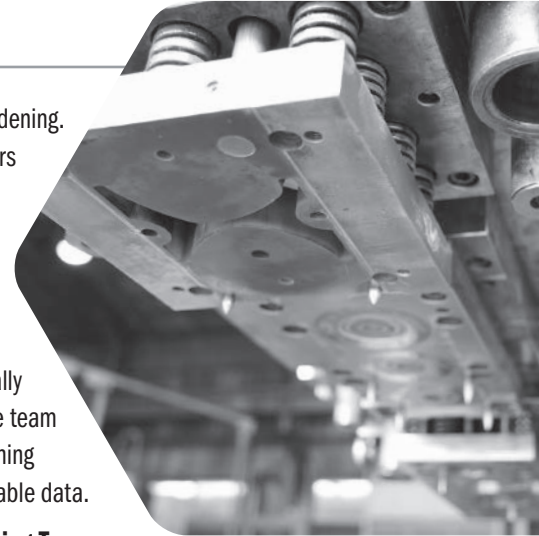
The STO#10.3 Die Wear Testing Team

evaluated the effect of sheet coating and tool coating to sheet-die friction, sliding energy, and wear pattern/mechanism, which can guide UHSS stamping processes and die design.

The **STO#12.2 Additive Metals Team** is evaluating the Directed Energy Deposition metal additive manufacturing process as a method to assist in the fabrication of trimming inserts. The project will include mechanical testing and a low-volume trial. Successful use of additive manufacturing to produce these inserts will result in cost reduction, a potential for easy repair operations, as well as flexibility in material selection.

“The A/SP Stamping Tooling Optimization team provides the opportunity to test and evaluate new materials and manufacturing technologies. This is a valuable necessity when working in the additive manufacturing industry.”

Jonathan Ellert, General Motors Company



Gas Metal Arc Welding of Advanced High-Strength Steels

JPC Mentor: Mike Davenport, A/SP
Project Manager: Michael White, A/SP



Gas Metal Arc Welding (GMAW) of AHSS develops and validates a GMAW approval process for AHSS for use by automakers and steel companies. Projects include GMAW of AHSS, Fatigue Characterization and Modeling. A/SP CAE models have been developed and validated for predicting weld performance in AHSS grades typically used in automotive applications.

Active Projects:

- G#4: GMAB - LME Susceptibility
- G#7: Investigation of RSW, GMAB, and GMAW Processes Effects on LME Mechanisms in Zinc Coated Sheet Steel
- G#8: GMAW - Machine Learning

2023 Team Project Highlights:

The GMAW team demonstrated Liquid Metal Embrittlement (LME) susceptibility of 3rd Gen AHSS and compared them to conventional and AHSS using a modified version of a previously developed A/SP spot weld test method. The team determined the effects of LME cracking on fatigue performance of Gas Metal Arc Brazing (GMAB) plug braze joints and evaluated total crack length propagation due to LME in six different conventional steels, AHSS and 3rd Gen AHSS. The GMAB test method appears to produce data with sufficient resolution and reproducibility to quantitatively rate LME susceptibility by total crack length for all sheet steel grades.

“A/SP has been a valuable catalyst for furthering the understanding of coated retained austenite (RA) steels and their GMAW weldability. Through this industrial collaboration, faster testing methods have been developed to detect the LME phenomenon. These standardized tests will not only help the partner automotive OEMs quickly identify and classify these steels, but also aid the partner steel manufacturers in creating less LME-susceptible grades of RA steels. This is indicative of the win-win outcomes that consortiums such as the A/SP produce.”

Spyros Mellas, General Motors Company



“Auto/Steel Partnership represents a unique opportunity in the industry. It is a place that OEMs, steel mills and stamping affiliates can create pre-competitive industry solutions, together – a great example of ‘a rising tide raises all ships.’”

Michael Davenport, Auto/Steel Partnership

Design

Team Lead and JPC Mentor: Joe Polewarczyk, General Motors Company
Project Manager: John Catterall, A/SP

The Design team’s goal is to demonstrate the benefits of steel in structural execution, using metrics such as mass, overall cost, manufacturability, sustainability and package efficiency. This should be achieved without compromising reparability, in-process quality, design flexibility, recycling and logistical considerations.

By leveraging the expertise within A/SP, design projects can be executed to provide information to the member companies for the efficient application of steel into their products.

Design projects will be lucrative for leveraging outside funds such as: DOE, National Labs and Partners (e.g. WorldAutoSteel).

2023 Team Project Highlights:

Using a polling approach to identify an appropriate project subject, the team is studying a steel alternative for a front-end giga casting. It will focus on the assessment and replacement of a generic front giga casting, while evaluating performance, mass, cost and sustainability. The target baseline comparison will be the Tesla 2023 Model Y casting. Project details were scoped and requests for proposal were submitted to potential engineering partners. The project began in November 2023 and is expected to be completed before the end of 2024.

“The general goal of design projects is to demonstrate the benefits of using new steels in an automotive application, as opposed to large castings in this case.”

Joe Polewarczyk, General Motors Company



“What appeals to me regarding the A/SP is the ‘P’. A Partnership between a diverse group of experts within the automotive and steel industry to work on common initiatives and with the common goal of finding a better way.”

Tom Buffetta, TMNA, A/SP BOD



“Auto/Steel Partnership creates technically meaningful and value-added outcomes which can be implemented for the auto industry. Going forward, more analysis should be done on steel’s contribution to manufacturing innovation in an EV era.”

We must extend our work scope to steel manufacturing innovation. We are proud of being a part of this collaboration.”

Han Eui Do, POSCO America, A/SP BOD

Repairability of Advanced High-Strength Steels

Team Lead: Justin Hunt, Stellantis
 Team Mentor: Dean Kanelos, Nucor
 Project Manager: Michael White, A/SP

Repairability of AHSS is a continuation of two earlier phases of an A/SP project which sought to develop repair and serviceability technologies for various AHSS grades having tensile strengths greater than 780 MPa. Phase 3 of the project has developed automotive repair guidelines for Martensite UHSS grades having tensile strengths between 1500 MPa and 1700 MPa. Phases 4 and 5 dealt with the development of repair techniques utilizing 3rd Gen 980 and 1180 AHSS, coated and uncoated materials.

Active Projects:
 R#6: AHSS Zinc Removal & Hole Size Study
 R#7: 3rd Gen AHSS - LME Mitigation Techniques

2023 Team Project Highlights:
 The Repairability team demonstrated repair procedures for 3rd Gen 980 coated and uncoated AHSS Resistance Spot Welds (RSW) used in/for production, repair, GMAW and Mechanical Fastening. Using radiographic inspection, the specimens’ internal cracks were evaluated and documented.



“The A/SP Repairability Team generates valuable welding and joining repair process data to assist OEMs in defining appropriate repair strategies for the latest steel grades.”

Justin Hunt, Stellantis

Steel Testing and Harmonization

Team Leads: Jugraj Singh, Stellantis; Derek Bross, Nucor
 JPC Mentor: Dean Kanelos, Nucor
 Project Manager: Jonathan Smith, A/SP

Steel Testing and Harmonization pursues the development of common qualification and test procedures for sheet steel material. The primary goal of this project team is to avoid future OEM testing divergence and associated costs. A secondary goal is to help streamline the evolving product development cycle. Efforts include development of standardized local formability testing and reviewing all related automotive and steel qualification and testing procedures.

Active Projects:
 STHT#06: Strain and Bake Procedure, additional labs & materials
 STHT#07: Hole Expansion Ratio (HER) variation reduction
 STHT#08: Cut Edge Fissures

2023 Team Project Highlights:
 The Steel Testing and Harmonization Project #06 – Strain & Bake Behavior of AHSS embarked on a mission to redefine steel testing standards for steel, including DP590 and 3rd Gen 1180 steels.

The primary aim was to reevaluate the existing ASTM strain and bake process. Initial testing took place at POSCO Laboratories in South Korea and was subsequently replicated by General Motors Company.

The project established a new standardized laboratory test procedure for determining the material Bake Hardenability Index (BHI), a critical parameter for understanding steel behavior during pre-straining and bake treatments. The new test procedure potentially replaces the existing ASTM process with a more effective approach, ensuring a uniform distribution of pre-strain throughout the final specimen. The proposed procedure is now available publicly at a-sp.org and on the [A/SP Member site](http://a-sp.org) to encourage industry evaluation and confirmation.



Dr. Haea Lee, POSCO, presents STHT#06 project results to members at A/SP Technology Day

“Introduction of this innovative test procedure promises more accurate BHI assessments and advancements in the manufacturing sector. Collaborations like this will continue to drive progress, improving our understanding of material behavior under various conditions.”

Derek Bross, Nucor



“A/SP allows us to leverage our resources thru collaboration with peers across the industry, collectively working together to solve complex processing issues that otherwise might prevent usage of next generation steels.”

Robert Miller, Stellantis, A/SP BOD

Steel Sample Bank

JPC Mentor: John Catterall, A/SP
Project Manager: Jonathan Smith, A/SP

“The Steel Sample Bank plays a vital role in A/SP’s project work, obtaining materials from the A/SP member steel companies and others that are needed by our various project teams, while protecting the original source of the materials and the proprietary details. The mix of materials in the Bank is continually evolving, based on the needs of the project teams.”

Michael Davenport, Auto/Steel Partnership



Joining

Team Lead: Hassan Ghassemi-Armaki, General Motors Company
JPC Mentor: Dean Kanelos, Nucor
Project Manager: Eric McCarty, A/SP

The Joining Team is developing joining strategies to enable the application of AHSS and 3rd Gen AHSS in automotive applications. The Joining Team’s investigations include development of LME-resistant weld schedules for 3rd Gen AHSS, improving the toughness of welds in AHSS, FEA-based crash modeling of resistance spot welds and fusion weld process modeling.

“As the lead of our team, we are dedicated to developing solutions for joining automotive sheet steels. With seven active projects, including three automakers as project leaders, our team has made significant contributions. We have successfully developed LME solutions, weld/Heat Affected Zone crash modeling, alternative joining processes, and addressed challenges such as low nugget penetration and weld toughness in difficult stackups.”

Hassan Ghassemi-Armaki, General Motors Company

Active Projects:

- J#1.5: Liquid Metal Embrittlement IV
- J#2.3: Industrial Welding Solutions II
- J#2.5: LME Process Mapping
- J#3.3: Spot Weld Crash Modeling
- J#4.2: Alternative Joining, Phase II, Fatigue Testing
- J#7.2: Fusion Welding Process Modeling and Simulations, Phase II
- J#8: High Thickness Ratio Welding Techniques
- WorldAutoSteel: LME Mitigation Demonstration (Partner)

2023 Team Project Highlights:

The J#7: Fusion Welding Process Modeling project developed a predictive model for LME as a supplement to the process model previously developed. The model is the first of its kind, incorporating industrial weld factors such as gap and electrode misalignment, and comes complete with a user guide.

Technology Transfer

Team Lead: Deanna Lorincz, Martinrea International USA Inc.
JPC Mentor: Joe Polewarczyk, General Motors Company
Project Manager: Kate Hickey, A/SP

The Tech Transfer Team oversees the communication of project results to the members, recording project summaries and providing tool kits for disseminating information within member companies. In addition, this team is responsible for the public and member websites, as well as promoting A/SP in social media and at conference events. The Tech Transfer Team also, in tandem with the Training Team, organizes and hosts each year’s Technology Day, a members-only conference with presentations and exhibits of the latest A/SP project findings.

2023 Team Project Highlights:

In 2023, the Tech Transfer team established a new member portal that enables access to the pertinent project team information and delivers current information. It also includes a Training Center that aggregates video and presentations of project summaries for all completed projects, and training courses in AHSS Metallurgy and Forming. In addition, October 24 marked another Technology Day, with over 100 members hearing 10 technical presentations and key notes from industry influencers.



“A/SP projects enhance the collective expertise of its members by delivering solutions and breakthroughs to advance steel utilization in the automotive sector. Through collaboration with the Technology Transfer Team, committee members guarantee the broad dissemination of outcomes across member companies, optimizing the benefits and enabling full leverage of their investment.”

Deanna Lorincz, Martinrea International USA Inc.



Training Team

Team Lead: Dean Kanelos, Nucor
 Project Manager: John Catterall, A/SP

The Training Team is responsible for organizing and implementing A/SP's training programs, which include Metallurgy, Forming and Joining webinars for member companies, as well as several public training opportunities throughout the year. Members can schedule private training for their staff and related departments at any time by contacting the team project manager.

“The A/SP Training Modules have been a great tool that we can offer to our customers and new teammates who wanted to gain a better understanding of the metallurgy, forming and application of Advanced High-Strength Steels (AHSS). This not only strengthens their careers, but it also enables them to be more comfortable with incorporating these steels in future vehicle designs.”

Dean Kanelos, Nucor

2023 Team Project Highlights:

Utilizing a suite of 13 Metallurgy and Forming class modules, over 1400 people attended virtual classes facilitated through GoToWebinar. All the classes were recorded and made available through the A/SP public website. These have been viewed more than 900 times.

In addition, a Leadership Series was initiated to enable recognized industry leaders to share with both early and later career engineers what they have learned through their experiences about executing steel solutions. Topics covered this year were Career Management Concepts for Design Engineers and Technical Leaders and Vehicle Life Cycle Assessment 101.

Examples of Industry (non member) represented at A/SP training:

- Autoform
- Honda
- Schuler
- autoliv
- John Deere
- Shape Corporation
- CAT
- Mazda Navistar
- Tenigal
- Electrolux
- Rivian
- Variform

National Laboratory Collaborations

A/SP actively collaborates with national laboratories, embodying a dedication to innovation in the automotive and steel sectors. These labs offer unique resources, expertise, and cutting-edge technologies, crucial for research and development. Leveraging state-of-the-art facilities, we explore new materials, manufacturing processes, and sustainable technologies. This collaboration facilitates a dynamic exchange of knowledge, fostering a synergistic environment that accelerates technological progress. Ensuring our position at the forefront of innovation, this partnership addresses industry challenges and contributes to efficient, sustainable, and resilient solutions. The ongoing collaboration promises further breakthroughs, reinforcing our commitment to excellence and driving the future success of both industries.

While A/SP is currently engaged in finding new areas of mutual interest with the labs, following are a few examples of currently supported programs that are representative of this valuable cooperation:

- Pacific Northwest National Lab (PNNL) High Velocity Joining (A/SP in-kind support)
- Oakridge National Lab (ORNL) Friction Pressure Welding (A/SP in-kind support)
- Natural Science and Engineering Research Council of Canada (NSERC) cost match for J#3.3: Spot Weld Crash Modeling project with the University of Waterloo, entitled “Microstructure-based modelling of spot weld failure in third generation advanced high strength steels.” This project represents more than \$1 million in research investment.



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**Michigan
Technological
University**

2023 Student Initiatives

A/SP's sponsorship of Senior Capstone Design projects at Michigan Technological University is driven by a dual commitment to cultivating the next generation of talent in the automotive and steel industries while strategically enhancing member companies' recruitment endeavors. This engagement not only serves to highlight the innovative and dynamic aspects of these industries but also facilitates a direct connection between the students and the sponsoring companies. The Auto/Steel Partnership's investment in these capstone projects underscores a proactive approach to talent development and recruitment, contributing to the sustained growth and innovation of both sectors.

Moreover A/SP extends its commitment to innovation and research by leveraging the expertise of numerous universities as research partners for a myriad of projects. Collaborating with institutions, beyond Michigan Technological University capstones shown here, broadens the scope of A/SP's initiatives, tapping into diverse pools of knowledge and fostering a collaborative approach to tackling industry challenges (see University Partners opposite for a 2023 list). This expansive network of research partnerships not only enhances the quality and depth of A/SP's projects but also enriches the educational experience for students across various universities, reinforcing the benefits of collaboration. By actively involving academic institutions, A/SP fosters a dynamic ecosystem of research, development, and learning, creating a ripple effect that benefits the automotive and steel industries as a whole.

Michigan Technological University Senior Design Capstone Projects

MTU Steel E-Motive Side Door Functionality, Door Hinge Assessment

This capstone project, sponsored by A/SP with cooperation from WorldAutoSteel, challenged the student team to design a new door hinge for the Steel E-Motive (www.steelemotive.world) side closure mechanism. The existing hinge design was provided as a reference, but a few operational issues were identified for this team's assessment and engineering study. The students' design solution uses a four-bar linkage hinge design to keep the door parallel to the body of the vehicle to avoid damage to either the door or the body. The team used a 4:1 gear ratio for the drive motor to open the door. Finally, one of the pins in the secondary arm linkage is accessible by passengers and removable, allowing users to manually push the door open in the event of an emergency. The team 3D printed a working model of the hinge design, which was displayed at several industry events, including Great Designs in Steel (GDIS) and CAR Management Briefing Seminar (CAR MBS). This project was recognized with an Altair Enlighten Award Honorable Mention in the Future of Lightweighting category.



MTU Students Gavin Sheffer (left) and Leander Daavettila displaying their working model at GDIS

MTU BEV Front Bumper Project

A second Michigan Technological University Senior Design Capstone project began in 2023, tasked with developing a design for the front bumper and crush cans, referencing the Tesla Model 3 aluminum bumper package space, and conducting crash simulation load cases. Work is in progress and will be completed by January 2024.

This collaborative model not only reinforces A/SP's position as an industry leader but also underscores the importance of interdisciplinary cooperation in driving innovation and progress.



“My MTU professor emphasized the Senior Capstone Design Project as our first job, not our last class. A/SP's Capstone project provided real-world experience, solving industry problems and honing skills from teamwork to computer-aided design. It also helped clarify my post-graduation path to the automotive industry and enabled a continuous connection with Martinrea International USA Inc. as a prospective employer. Now, as part of A/SP's Design Team, I collaborate and learn from top talents across companies, establishing a solid foundation for my future at Martinrea.”

Gavin Sheffer, Project Engineer, Martinrea International USA Inc.

A/SP Project Partners

We are proud to partner with academia and industry experts to accomplish project goals that result in viable solutions and innovation. This list for 2023 represents those organizations that have contracted and/or provided in-kind services towards that aim.

University Partners

Clemson University
Michigan Technological University
Oakland University
University of Michigan
University of Waterloo
University of Windsor
Wayne State University

Industry Partners

AET Integration, Inc.
American Iron and Steel Institute
Alro Steel Corporation
Altair
Arnold Fastening Systems Inc.
Autodie LLC
Autoform
Bruker Alicona
Clark Hill, PLC
Diehl Steel
Element
EQS Group
Billur Makine
EWI
Ionbond
Metalsa
Michigan Metrology, LLC
Motor City Testing
National Institute of Standards and Technology (NIST)
North American Deep Drawing Research Group (NADDRG)
Oakridge National Laboratory (ORNL)
Pacific Northwest National Laboratory (PNNL)
R&E Automated Systems, LLC
Senai Cimatec
Stanley® Engineered Fastening
Swiss Federal Institute of Technology (ETH)
Synergy Additive Manufacturing LLC
Tailor Welded Blank Company
Thomas Seel
TOX® Pressotechnik LLC
Voestalpine



Award of Excellence: Honoring our peers

In 2023, Auto/Steel Partnership recognized 21 recipients of the Partnership's Awards of Excellence as part of October's Technology Day event.

The peer-chosen Award of Excellence acknowledges project findings and results by honoring Auto/Steel Partnership members who have demonstrated outstanding contributions, leadership and innovation in the applications of emerging steels.

This year's certificate and trophy recipients were as follows:

Individual Category

- Jonathan Ellert, General Motors Company
- Lu Huang, General Motors Company
- Efraín Rodríguez, Ternium
- Nan Wang, Toyota Motor North America

Most Valuable Player Category

- Justin Hunt, Stellantis
- Dr. Haea Lee, POSCO
- Kevin Teng, General Motors Company

Key Collaborator Category

IonBond

Project Team Category

Steel Testing and Harmonization Team, with Members:

- Dean Kanelos, Nucor (Mentor)
- Jugraj Singh, Stellantis (Lead)
- Derek Bross, Nucor (Lead)
- Ming Shi, General Motors Company
- Jiwoong Ha, POSCO America
- Dr. Haea Lee, POSCO
- Juan Pablo Pedraza, Ternium
- Efraín Rodríguez, Ternium
- Jaciel Herrera, Ternium
- Jose Galaviz, Stellantis
- Miguel Quiñones Salinas, Metalsa
- Eric McCarty, A/SP
- Jonathan Smith, Project Team Manager, A/SP

Become a Member

With A/SP membership you can

- Supplement your R&D department,
- Contribute project suggestions that directly relate to your business,
- Work with subject-matter experts to develop real-world solutions,
- Get access to world-class training for your personnel and community.

Membership is open to:

- **Original Equipment Manufacturers (OEM).** Automotive OEMs with product engineering and manufacturing engineering responsibilities with captive/Tier 1 stamping operations in North America.
- **Steel Mills.** Steel companies which have made shipments to the North American automotive market in each of the past three years from their North American business units making, coating or continuously annealing automotive sheet steel products.
- **Automotive Suppliers.** Tier suppliers with product engineering, manufacturing engineering and R&D facilities in North America in support of automotive OEMs. Tier suppliers can be full members or affiliates with nonvoting rights.

Ready to learn more about membership? Already a member and want to know how to get involved? Contact A/SP Executive Director Mike Davenport at mdavenport@a-sp.org.



Auto/Steel Partnership is an IRS-recognized 501(c)3 non-profit organization.

Have you accessed the Members-only website?

- Gain access to project documentation and results
- Review meeting reports
- Stream or download a wealth of training in the Training Center
- Keep track of important events and dates
- Stay connected to A/SP benefits!

Visit a-sp.org/request-access to get your login and start exploring.

Technology Day 2024 Save the Date!

Your exclusive opportunity to connect with:

- Project results and innovation
- Team experts
- Fellow A/SP members

Mark your calendars:

Tuesday, October 29, 2024, 7:30 a.m. to 4 p.m.
Laurel Manor Banquet and Conference Center,
Livonia, Mich.

Registration opens September 1, 2024.



**Auto/Steel
Partnership
Foundation**

Auto/Steel Partnership is an IRS-recognized 501(c)3 non-profit organization.

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