North Central Pennsylvania
**Pressed Materials** Consortium

**NOVEMBER 2025**

# From Powder to Power: Positioning the Pressed Materials Industry as an Engine for U.S. Innovation and Growth

**A STRATEGIC ACTION PLAN FOR THE NORTH CENTRAL PENNSYLVANIA PRESSED MATERIALS CONSORTIUM**

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# Acknowledgements

This project was led by the North Central Pressed Materials Strategy Development Consortium, a recently formed partnership including representation from:

- Penn State DuBois
- North Central Pennsylvania Regional Planning and Development Commission
- North Central Workforce Development Board DBA Workforce Solutions for North Central PA
- Ben Franklin Technology Partners of Central & Northern PA
- Advantage Metal Powders
- Höganäs AB
- Horizon Technology

TECH HUBS
U.S. Economic Development Administration

2023 Tech Hubs Strategy Development Grant Recipient

The strategy development consortium engaged Fourth Economy Consulting, along with its partners Connect the Dots and Dr. Allison Beese, Professor of Materials Science and Engineering and Mechanical Engineering, Penn State University Department of Materials Science and Engineering to assist in planning for the future of the pressed materials industry as a critical sector for regional economic health and productivity in North Central Pennsylvania.

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# Executive Summary



## A Call to Action

Never before has the Pressed Materials industry stood at such a crossroads between opportunity and risk. As a renewed focus on “Made in America” sweeps the country and a growing body of research demonstrates the benefits of Pressed Materials use, the sector has an open path to seize opportunities that align with areas of national importance and growth in the U.S., specifically in the North Central PA region. The risks come from a sector that has relied on low-margin production, which has limited investments in innovation, automation, and next-generation opportunity development, paired with regional economic decline more broadly.

North Central Pennsylvania employs 9,000 workers in the pressed materials industry, representing 43% of industry employment nationwide and 10% of employment in North Central Pennsylvania. The region is home to over 64 companies specializing in powdered metallurgy and emerging manufacturing processes, representing approximately 40% of all such companies in the United States. The region also hosts approximately one-third of the world’s powdered metallurgy and carbon manufacturing facilities.

> “Horizon Technology is here because this is where the powder metal industry was born. North Central Pennsylvania offers a strong supporting infrastructure of people, raw materials, technical expertise, education, and access to capital. For generations, this region has built an ecosystem that fuels innovation and collaboration. It’s more than just where we do business, it’s the foundation of who we are.”
>
> *- Eric Wolfe,*
> *President of Horizon Technology, Inc.*

This Pressed Materials Strategic Action Plan, developed with broad industry and network participation, focuses on the retention of these employment opportunities for the region and a plan for benefiting from growth in expanding markets and applications. The plan's two core initiatives focus on the **formation of a regional industry organization** and the c**reation and management of a new collaborative R&D facility for the industry.**

- **Pressed Materials Consortium**: An entity that will unite the existing Strategy Development Consortium with an expanded network of industry, academic, nonprofit, workforce, and government partners. It will serve as the central coordinating body—identifying strategic opportunities, managing programs, and driving the region's long-term competitiveness in advanced manufacturing. Structured as a 501(c)(3), a subsidiary of an existing entity, or another collaborative model, the organization will provide the governance, accountability, and cross-sector leadership needed to position NCPA as a national leader in the pressed materials sector.
- **Pressed Materials Center for Innovation**: A cutting-edge R&D hub for collaborative research, advanced manufacturing, and workforce development focused on pressed materials. The facility will bring together industry leaders, academic researchers, and technology developers to advance the science and applications of pressed materials, improve competitiveness and position NCPA as a global leader in precision manufacturing. This public-private initiative would share both the cost and benefit of research, accelerating innovation while reducing risk for individual stakeholders. By centralizing R&D efforts at the Center for Innovation, the industry will be able to focus on material characterization and development, process optimization, tooling innovation, and product characterization and testing—serving as a proving ground for next-generation pressed components.

These two overarching initiatives create the organization and collective action necessary to drive future growth, considering the broader need for governance, programming, and dedicated facilities that can serve as the bedrock for achieving these priority projects and the focus areas they represent. Through coordinated implementation and investment from government, academia, private industry, and more, this path forward will help the industry grow - and continue to thrive - in North Central PA and the United States as a whole.

### About the Strategy Development Effort

In 2023, the North Central Pressed Materials Strategy Development Consortium was awarded a Strategy Development Grant from the U.S. Economic Development Administration (EDA) via the Tech Hubs program to create a future-focused roadmap for the industry moving forward. This roadmap - a byproduct of an 18-month planning process - aims to achieve four major goals focused on:

- Strengthen the pressed materials sector by diversifying the production of pressed materials and machined parts;
- Explore emerging applications, such as national defense, medical devices, and electrification in transportation applications.
- Enhance the region's capacity to manufacture, commercialize, and deploy pressed materials products and processes; and
- Identify how the industry contributes to national competitiveness, regional supply chains, and global positioning

The North Central Pressed Materials Strategy Development Consortium spearheaded the initial planning efforts that led to the grant award from the EDA. This group included representation from Penn State University DuBois Campus, North Central Pennsylvania Regional Planning and Development Commission, North Central Workforce Solutions Development Board, Ben Franklin Technology Partners, Advantage Metal Powders, Höganäs AB, and Horizon Technology. The consortium engaged Fourth Economy Consulting and a team of advisors to provide strategy development, planning, and communications support that includes the development of this report and recommendations.

# What are Pressed Materials?

The pressed materials industry is not only the backbone of North Central Pennsylvania's economy but also a vital component of the broader U.S. manufacturing base and global industrial and advanced manufacturing supply chain. Globally, pressed materials is an aggregate industry that includes activities related to powder metallurgy, press-and-sinter manufacturing, metal additive manufacturing, metal injection molding, isostatic pressing, and encompasses a broad range of substances that are shaped, pressed, or compacted to form solid objects. These technologies enable the production of complex, high-precision components critical to industries such as automotive, aerospace, medical devices, defense, energy, and industrial tooling, many of which require materials with stringent performance and tolerance specifications.

Pressed materials are a form of manufacturing that utilizes an additive process that involves compacting feedstock (or source material); rather than milling, grinding, melting, or other subtractive processes that reduce a raw material into a desired shape. This process enables the creation of intricate shapes and complex geometries by compacting net-shape or near-net-shape parts. This is a key selling point in the industry because it minimizes or eliminates the need for additional machining, reducing waste and cost.

Pressed materials, particularly those created through powder metallurgy, can also offer comparable or sometimes superior strength to traditionally manufactured components. The pressed materials production process allows off spec parts to be re-ground and recycled much easier than parts produced by other processes.

## Advantages of Pressed Materials

From strong, lightweight components, to self lubricating parts and high performance devices - pressed materials offer many advantages over other manufacturing processes.

### Reduced Waste & Cost

Pressed materials compact source material into the desired shape, unlike subtractive methods, and can reuse waste feedstock to further reduce cost.

### Controlled Porosity

Pressed materials can be tailored by density or porosity, making them ideal for filters, self-lubricating parts, and more.

### Complex Geometries

Pressed materials processes create intricate shapes with superior accuracy and efficiency.

### Strength

Pressed materials can offer comparable or superior strength to many traditionally manufactured components.

# From Powder to Product

Pressed material processed encompass a range of methods and technologies - each with its own advantages. Products and components made using pressed material processes can be found in many of the products we use every day.

1

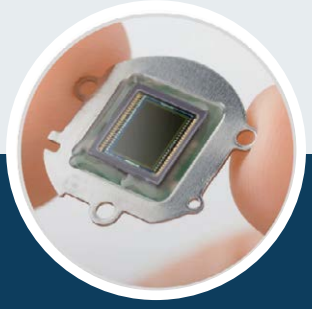
Feedstock is refined and processed through one of several Pressed Materials methods. Though the industry originates from powdered metallurgy, this process can involve different types of materials and various pressing techniques.

2

Pressed Material processes encompass a range of methods and technologies - each with its own advantages. Often, multiple Pressed Material processes can be combined or have synergies with other manufacturing processes to improve strength, cost, or quality.

3

Pressed Materials are used to produce high-volume, high-performance components used in cars, appliances, and more. Pressed materials are used in thousands of components we rely on every day.



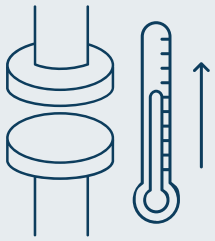
Pressed materials are ideal for high-performance parts used in medical devices and electronics. If it's small, strong, and shaped in a complicated way it might be made using pressed material processes.

Offering uniform density, superior mechanical properties, and minimal internal stress — pressed materials can be used in medical applications where strength, precision, and reliability are non-negotiable.

Pressed material processes allow for the production of strong, lightweight, and complex components ideal for aerospace, defense, and other applications where rapid prototyping and high-performance are a requirement.

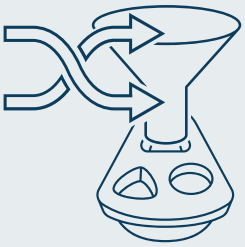
# Pressed Material Processes

Pressed Materials offer several benefits and characteristics over other manufacturing processes. These processes can be used in connection with other processes as a first step to increase manufacturing speed and standardization and reduce cost by minimizing waste.



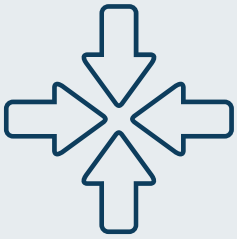
## Press-and-Sinter

Press-and-sinter is a pressed materials technique where powdered materials are compressed at high pressures and then heated below their melting point to form solid components. This method enables the creation of intricate, near-net-shape parts from materials challenging to process using conventional melting or machining techniques.



## Metal Injection Molding

Metal injection molding is a metalworking process in which finely-powdered metal is mixed with binder material to create a feedstock. The feedstock is then solidified and shaped to produce the final product. Metal injection molding is ideal for simplifying the production of high-volume products or products that have complex shapes.



## Isostatic Pressing

Isostatic pressing is a manufacturing process that applies equal pressure in all directions to a powder to compact it into a solid. Isostatic pressing is used in aerospace, automotive, industrial, and medical applications. It can be performed at room temperature (cold isostatic pressing) or elevated temperatures (hot isostatic pressing).

## Additive Manufacturing

Additive manufacturing, also known as 3D printing, is a process that creates three-dimensional objects from digital files by depositing and fusing materials layer by layer. Key benefits of AM include the potential for part consolidation – reducing the number of components in an assembly, customization and rapid prototyping capabilities

# The Pressed Materials Industry Now

Pressed materials play a critical role in the global manufacturing ecosystem, supplying essential components to a wide range of industries.[1] Common end-uses for these products include automotive components, industrial machinery, power tools, lawn and garden equipment, recreational vehicles, aerospace and aviation components, medical devices, defense and sporting equipment. Historically, global demand for pressed materials was driven primarily by the growth of the internal combustion engine automobile industry which necessitated the increased supply of pressed materials in the form of gears. Today, automotive parts comprise 66% of global sales for pressed materials. [2]

However, as the global automotive market undergoes a dramatic transition toward electric vehicles (EVs), it is important to note that EVs do not require the same component parts. As EVs continue to grow in market share of automobiles,[3] the largest segment of the pressed materials market will likely shrink, necessitating pressed materials companies to pursue new markets and applications for their products to maintain competitiveness. While emerging uses in aerospace, medical devices, defense, and recreational equipment show promise, the industry and its companies must continue to adapt their products and overhaul their processes to remain relevant in increasingly competitive manufacturing markets. The future of the global pressed materials industry will depend on its ability to evolve rapidly, innovate collaboratively, and meet the advanced performance requirements of next-generation systems.

1. Fourth Economy Analysis
2. 2023 Industry Roadmap, MPIF
3. Trends in electric car markets – Global EV Outlook 2025 – Analysis - IEA

## Why Pressed Materials Matter for U.S. Manufacturing

Pressed materials are a core strength for American manufacturing. They enable the production of high-performance parts that are essential in aerospace, defense, energy, medical, and advanced manufacturing applications. Pressed Materials offer many advantages for U.S. manufacturing including:

**Supply Chain Security:** Reduces dependence on overseas production and strengthens U.S. industrial resilience.

**Job Creation:** Supports high-quality careers at every education level, from shop floor to R&D.

**Competitiveness:** Keeps America ahead as other nations expand investment in this capability.

**Innovation:** Drives breakthroughs in aerospace, energy, defense, and medical technologies.

The U.S. has the know-how, the workforce, and the regional ecosystems —what is needed now is to elevate the industry's visibility, investment and value to ensure we lead the global market instead of falling behind.

# Advancing the Future of American Manufacturing from the Heart of Pennsylvania

"North Central Pennsylvania is a cornerstone of the powder metal industry, driving innovation and supporting a significant portion of the region's manufacturing employment. The area's unique concentration of talent, infrastructure, and supply chain capabilities makes it an essential engine for economic growth, not just locally, but nationally and globally. For our company and the broader industry, this region is more than a hub; it's a vital ecosystem that fuels competitiveness, resilience, and long-term success."

*- Tim Robinson,*
*Vice President of North American Höganäs Co.*

North Central Pennsylvania (Cameron, Clearfield, Elk, Jefferson, McKean, and Potter counties) has been a national leader in pressed and powdered materials for over 100 years earning its title as the "Powder Metals Capital of the World". What began as a regional cluster of powdered metallurgy manufacturers has grown into a highly specialized, globally competitive sector. These companies, many of them family-run or multi-generational, have quietly built the components that power cars, appliances, heavy equipment, medical devices, and even aerospace systems.

**North Central Pennsylvania (NCPA) is home to the largest domestic cluster of the pressed materials industry in the United States**, representing the nation's largest and most concentrated cluster of companies, production capacity, and workforce.

Nearly 9,000 regional workers are employed in the industry, representing 43% of industry-wide employment nationwide and 10% of the jobs in NCPA underscoring the industry's foundational role in the region's economy. The region is home to over 64 companies specializing in powdered metallurgy and emerging manufacturing processes, representing approximately 40% of all such companies in the United States. The region also hosts approximately one-third of the world's powdered metallurgy and carbon manufacturing facilities.

As the nation seeks to reinforce its domestic manufacturing capacity, secure supply chains and expand high quality employment opportunities in rural regions, Pennsylvania's pressed materials industry offers a proven, scalable platform to deliver regional economic revitalization and national industrial significance. Pressed materials technologies contribute to an estimated $24 billion global market,[4] with Asia-Pacific and Europe being the dominant regions. Nations such as Germany, Japan, and China are aggressively advancing capabilities in this field to support the transition to high performance transportation, precision engineering, and next-generation defense platforms.

4. Fourth Economy Analysis

A promising path to revitalization is emerging for the NCPA region's pressed materials industry, despite recent challenges. The decade between 2013 and 2023 saw the loss of nearly 700 jobs in the sector, a significant challenge for the local economy. However, with renewed focus on innovation and workforce development, the region is now in a strong position to build a more resilient future.

The key lies in leveraging new strategies to overcome historical economic challenges, such as population decline and low wages, by targeting emerging markets and investing in new technologies. This forward-looking approach can not only stabilize the industry but also create new, high-value employment opportunities, setting the stage for a period of sustained and inclusive growth.

No other part of the country rivals NCPA in density, specialization, or institutional knowledge in this critical field. As national priorities increasingly focus on reshoring manufacturing, securing supply chains, and leading in defense and industrial technologies, NCPA's pressed materials ecosystem stands as a strategic asset of national significance.

North Central Pennsylvania's pressed materials ecosystem reflects the historic strength of American manufacturing, innovation, precision, and perseverance. As the nation works to rebuild domestic capacity, this region stands as proof that rural industry is essential to America's global competitiveness. By advancing next-generation pressed materials technologies, from advanced alloys to additive manufacturing, critical minerals and smart production, North Central Pennsylvania strengthens the foundation of the American-made supply chain. These innovations support U.S. leadership in defense, energy, medical, and transportation systems while reducing dependence on foreign sources.

## Why North Central PA?

### R&D

**For five consecutive years, Penn State has been nationally ranked #1 in materials science and #2 in materials engineering in NSF total research expenditures (as of January 2023 data).**

Having this research powerhouse in our "backyard" gives us significant advantage in shaping the future of the Pressed Materials industry and creating new technologies and processes.

### Workforce

**North Central PA boasts a high concentration of skilled workers with 43% of all powdered metallurgy jobs in the U.S. located in the region,**

This workforce is continually supported by local Career and Technical Centers (CTCs) high schools, colleges, and universities providing vital training and a steady pipeline of talent.

### Industry

**With a nationally significant concentration of powdered metallurgy companies and a growing presence in advanced techniques like isostatic pressing and additive manufacturing, this region is at the forefront of innovation.**

Companies here benefit from deep-rooted expertise, a highly skilled workforce, and a collaborative ecosystem that fosters cutting-edge solutions.

# Where Does the Industry Go From Here?

Pressed materials are a crucial economic engine for North Central Pennsylvania and a nationally significant sector within U.S. advanced manufacturing. As the largest domestic hub for pressed materials production, NCPA plays a critical role in sustaining American supply chains, enabling national defense manufacturing, and driving innovation in high-performance components. Extensive analysis and direct engagement with manufacturers, industry leaders, and support organizations have identified key findings that underscore the urgency—and strategic potential—of strengthening this sector to advance both regional growth and national competitiveness. Findings include:

- Both the industry and the region face hurdles to future prosperity including an aging workforce, limited access to capital, and slow technology adoption that threaten private sector competitiveness;
- Historically, the region's pressed materials companies have not communicated their competitive advantages such as technical expertise, production scale, and material innovation, limiting the industry's ability to attract new markets and investment;
- Companies have been averse to collaborating on R&D efforts, hindering innovation, growth, and commercialization, leading to missed opportunities to collectively address shared industry challenges or access to new markets;
- Local companies in the industry do work with flagship academic institutions on technology innovation, but these efforts often take significant amounts of time and could be better coordinated;
- Many companies in the industry are small to mid-size operations that lack the resources necessary to modernize their equipment and utilize new technologies creating a barrier to evolving markets;
- Mergers and acquisitions of generational local businesses have shifted decision-making from the local/regional level to national or international headquarters, reducing local influence, weakening community ties, and requiring new strategies for economic developers to retain, engage, and advocate with remote corporate leadership; and
- Overall, the industry suffers from low public visibility and outdated perceptions, resulting in limited awareness among workers and students. A lack of industry-specific promotion and marketing, branding and workforce development programming limits the volume of new workers entering the industry despite strong regional job demand and career pathways.

Failure to invest in American manufacturing, particularly in regions like NCPA, carries significant consequences that extend far beyond a single industry or community. Without proactive strategies focused on collaboration, innovation, and modernization, we risk a domino effect that could weaken the U.S. economy along with the country's national security.

On a regional level, not investing in NCPA would mean a continued decline in the pressed materials industry, leading to more job losses and a shrinking tax base. This disinvestment creates a cycle of economic hardship, as a smaller population and lower wages lead to less local spending and a weaker support system for remaining

businesses. The potential for the region to become a manufacturing hub would be lost, along with the jobs and economic stability it would provide.

Nationally, the lack of investment would erode the competitiveness of American manufacturing on the global stage. We would become increasingly dependent on foreign goods, making our domestic supply chains more vulnerable to disruption. This could lead to higher prices for consumers, a reduced capacity for innovation, and a long-term decline in the high-skill jobs that are essential for a strong middle class. On top of this, this disinvestment would harm our country's defense industrial base, leading to a weaker warfighting capability. Ultimately, a failure to invest in our manufacturing base is a failure to invest in a secure and prosperous future for the United States.

# The Pressed Materials Path Forward

NCPA's pressed materials industry needs a plan to help increase innovation and commercialization, attract capital investment, and see through industry and job growth.

Two overarching strategies can help to catalyze growth in NCPA's pressed materials industry, and strengthen America's leadership moving forward. First is the **creation of a formal regional industry organization** - including robust involvement from existing Strategy Development Consortium members and an expanded list of industry, academic, nonprofit, and government partners - that can work to jumpstart industry growth through the identification of key opportunities, program management, and broader management of the industry's competitiveness in NCPA and the United States.

This new entity would enhance regional collaboration, elevate the industry as a global leader, and pursue four primary goals:

- **Industry Promotion:** Make pressed materials a household name and symbol of American strength in manufacturing;
- **Workforce Development:** Attract the next generation of pressed materials workers to the industry and ensure they are prepared to succeed;
- **Business Support:** Empower companies to succeed and grow in the pressed materials industry; and
- **Regional Growth:** Ensure that NCPA is a great place to live, work, and play—with a strong focus on innovation, research, and economic opportunity—while also offering a high quality of life.

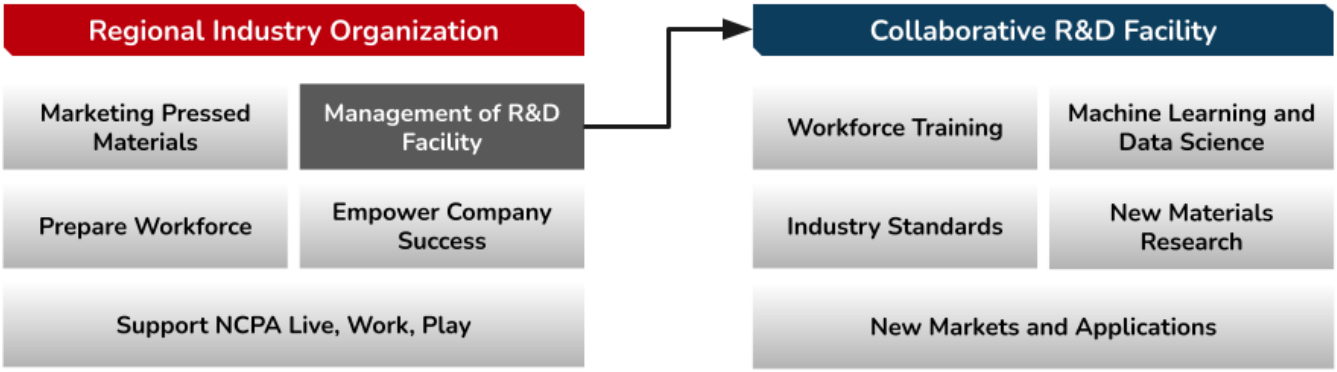
A second strategic focus of the organization is the development of a **collaborative industry R&D and workforce facility**: a Center for Innovation, located at the sunsetting Penn State University DuBois Campus or another nearby location. The Center for Innovation is envisioned as a cutting-edge R&D hub that would bring together industry leaders, academic researchers, and technology developers to advance the science and applications of pressed materials and workforce development. This public-private initiative would accelerate innovation while reducing risk for individual stakeholders.

This public-private initiative would share both the cost and benefit of research, accelerating innovation while reducing risk for individual stakeholders.

Core goals to pursue include:

- **Workforce Development:** Craft future-focused workforce training, upskilling, and apprenticeship programs to cultivate a pipeline of pressed materials workers;
- **Emerging Markets:** Expand pressed materials use into new applications and markets such as aerospace, defense, energy generation, and medical devices;
- **Material Research:** Lead cutting-edge research into new materials, developing and testing high-performance alloys, including electromagnetic materials and materials for hypersonics, modernizing manufacturing processes to drive innovation and market growth;

## The Path Forward: Priorities and Catalytic Projects




- **Industry Standards:** Establish industry-wide standards for emerging materials and applications critical to accelerating commercialization and bring products to market faster; and
- **Technological Modernization:** Leverage the power of artificial intelligence, machine learning, and data science to optimize manufacturing processes and accelerate development of next-generation materials.

# Defining Success

Future success for the pressed materials industry in North Central Pennsylvania relies on continued capital investment, coalition development, breakthrough innovations, storytelling, and trust-building among key partners, ranging from industry to academia to government. Key determinants of success for the pressed materials industry in NCPA include:

| Metric | Existing Figure |
|---|---|
| Industry Contribution to GDP | $1.1B (2024) |
| Total Industry Employment | 8,924 (2023) |
| Average Earnings Per Job | $74,799 (2024) |
| Industry Patents Produced in a 5-Year Period | 11 (2020-2024) |
| Annual Volume of Industry Exports | $106M (2024) |

Source: Fourth Economy Analysis of Lightcast™and PatentsView Data

GDP contribution and annual volume of industry imports can indicate the economic demand and influence seen in the industry. Total industry employment and average earnings can demonstrate the pressed material industry's capacity to create jobs and attract and retain talent through good compensation. Patents are a key indicator of innovation and R&D activity in a sector, highlighting the potential for future growth in the pressed materials industry. worldwide, contributing to trade balances and economic influence. Together, these metrics paint a holistic picture of the financial health of the pressed materials industry in terms of its contribution to the workforce, its innovative capacity, and its position in the economy, all of which are essential for demonstrating success.

The work of the North Central Pressed Materials Strategy Development Consortium has served as the first step towards success. Now, partners from across NCPA and beyond must step up and work together to continue this momentum. The future pressed materials industry, the economic vitality of North Central Pennsylvania, and America's global manufacturing leadership as a whole, all depend on innovative and coordinated action. Now is the time to invest, innovate and lead, ensuring this critical sector and rural America thrive, compete globally and remain drivers of the nation's economic strength and security.

# Introduction and Opportunity Overview



The North Central Pressed Materials Strategy Development Consortium, comprised of industry leaders, educational, and economic development partners in North Central Pennsylvania, is launching this strategic roadmap **to position the region as a national engine and global leader in the production of pressed materials and machined parts.**

With over 64 companies specializing in powdered metallurgy and emerging manufacturing processes, representing approximately 40% of all such companies in the United States, North Central Pennsylvania is uniquely positioned as a global leader in pressed materials application and technology. These businesses are a critical sector of American manufacturing and are pivotal to the regional economy and the ability of NCPA to succeed.

> "Considering North Central PA is a relatively rural area, the amount of world class manufacturing located in this type of area is very unique. We have the best of both worlds - the safe small town lifestyle along with the opportunities to travel the world selling and promoting our products. The amount of employment and annual revenue the Pressed Materials Industry provides this rural area is truly phenomenal, playing a huge role in everyone's daily life."
>
> - Jason Gabler,
> President of Advantage Metal Powders

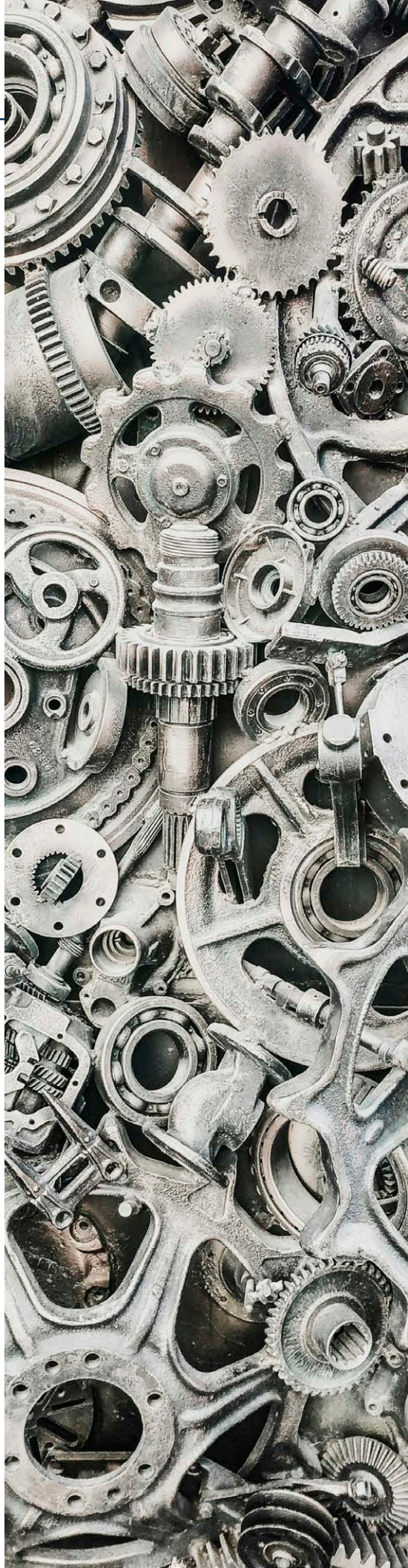
These businesses are not only pivotal to the regional economy—they are vital to the United States' ability to maintain technological leadership, manufacturing self-reliance, national security, and global competitiveness in sectors such as defense, aerospace, automotive, energy, and medical devices. However, **the pressed materials industry in NCPA is at a critical juncture.** If it continues as it is now, companies will struggle to remain profitable as the cost of materials and production increases, workforce shortages continue, and international competition stifles this domestic industry. Companies will see their business decrease as the combustion-engine related automotive industry declines while electric vehicle adoption grows. The lack of business modernization and new market diversification puts additional pressure on local companies. A shrinking population in NCPA and the lack of interest in careers in manufacturing will continue to make it difficult for pressed materials companies to find and retain workers, further stifling the ability to maintain operations.

North Central Pennsylvania has the expertise, infrastructure and determination to lead into the future. If the industry in the region rises to the challenge by taking the following actions, **NCPA will be able to write a new narrative of growth and prosperity in the pressed materials industry.**

- **Lead with innovation**, being aspirational about company and market efficiency, and allocating resources to R&D to drive further growth.
- **Invest in the workers of today and tomorrow** with accessible, high impact programs that make residents want to be a part of pursuing meaningful careers in American-made manufacturing.
- **Think big about new markets**, understanding and actively pursuing a wide array of potential applications for the products and processes included in the industry and across high growth sectors.
- **Work together,** harnessing the collaborative resources, expertise, and power of the private, nonprofit, and public sectors to work in tandem.

# A Strategic Action Plan

This Strategic Action Plan advances a forward-looking vision of the pressed materials industry. It is the result of extensive research, data analysis, and ongoing engagement with industry experts, educators and regional leaders. Through collaborative thinking, the action plan offers realistic yet aspirational solutions. It outlines two overarching strategies, each supported by catalytic projects, to be implemented in the short and long term to drive success. It is followed by a comprehensive appendix containing documents that support its foundation and guide implementation.



# SOAR Analysis

This SOAR (Strengths, Opportunities, Aspirations, Results) analysis was developed using information gathered from a robust market analysis of regional and global strengths, in-depth research into pressed materials processes and products, a review of regional economic trends, and stakeholder engagement with industry representatives and supporters. The findings are categorized through five specific lenses to help assess varying degrees of impact.

## Strengths

- **Regional Industry Leadership:** The region holds a prominent national and global position in the pressed materials industry, particularly in press-and-sinter products and associated processes such as heat treatment and surface finishing.
- **Regional Economic Contribution:** The industry plays a vital role in regional employment and overall economic productivity accounting for 10% of all local employment and 43% of the national industry workforce.
- **Deep Sector Expertise:** The regional pressed materials industry benefits from generations of skilled labor, a well established workforce development system and extensive institutional knowledge within its supporting ecosystem.
- **Market Expansion:** Key sectors utilizing pressed materials, such as automotive, aerospace and defense are experiencing increased global demand with North Central Pennsylvania positioned to capture a greater share of this expanding domestic and international market.
- **New Market Adoption:** A growing number of emerging industries, including aerospace, defense, and energy production, are increasingly integrating pressed materials products into their operations presenting a tremendous opportunity for the region.

## Opportunities

- **Ecosystem Enhancement:** Developing a more robust ecosystem to support R&D, technology adoption, industry promotion, and workforce development presents a significant opportunity. The region's rural character provides ample space for necessary infrastructure expansion and further industry clustering.
- **Process and Product Innovation:** Breakthroughs in manufacturing processes and product design can enable the pressed materials industry to better align with the evolving demands of emerging industries such as defense, aerospace, and medical technology.
- **Industry Standards:** Both existing and new industry standards can be leveraged to regulate pressed materials and their diverse applications, promoting wider adoption and consistency. Recently developed new materials and processes are poised to address new markets, but require wider industry adoption and new standards to be developed for wide adoption to occur.
- **Additive Manufacturing & National Security:** The global growth of additive manufacturing presents a significant growth opportunity for pressed materials products in defense, aerospace and medical technology. Additionally, the industry's relevance to national security can attract a future workforce.
- Regional Talent Initiatives: Collaborative and increased efforts to attract and retain a skilled workforce by scaling training programs, expanding partnerships with technical schools and universities across the entire NCPA region can lead to positive, long-term generational impacts on the workforce.
- Increased Academia Involvement: Harness opportunities to include other universities in critical research and development, problem solving, and industry advancement. Strategically bring in additional universities based on their strengths (for example, in Materials, Advanced Manufacturing, Additive Manufacturing, or Data Science).

# Aspirations

Drawing from the strengths and opportunities, the pressed materials industry in NCPA aspires to:

- **Cement Global Leadership:** Solidify the region's position as a global leader in advanced pressed materials by embracing modernization and continuous innovation across products and processes, challenging the Asia-Pacific region's dominance and reinforcing U.S. competitiveness.
- **Achieve Sustainable Growth and Profitability:** Drive significant and sustained growth by diversifying market presence beyond traditional sectors, improving operational efficiency, and enhancing profitability in a historically low-margin industry.
- **Cultivate a Future-Ready Workforce and Ecosystem:** Develop a vibrant, adaptable, and highly skilled workforce that is consistently renewed with new talent, supported by a collaborative and resilient regional ecosystem capable of fostering continuous innovation and overcoming competitive challenges.
- **Catalyze Regional Economic Revitalization:** Leverage the pressed materials industry as a cornerstone for broader regional economic recovery, addressing challenges in population, productivity, housing, and job creation.

# Results

Success in achieving aspirations will lead to the following measurable results:

- **Increased Market Share:** Demonstrable growth in global market share for pressed materials, particularly in emerging industry applications such as defense, aerospace, and energy.
- **Enhanced Innovation Metrics:** A significant increase in patents filed, new product and process developments, and the rate of technology adoption across companies that demonstrate American leadership in R&D.
- **Workforce Expansion & Vitality:** Measurable growth in the manufacturing workforce size within the NCPA region, alongside increased presence of and enrollment in workforce training programs, expanded apprenticeship opportunities and industry alignment to equip workers with the skills to succeed in advanced manufacturing.
- **Improved Company Competitiveness:** Higher average profit margins for companies, reduced operational costs through modernization, and increased investment in R&D and infrastructure.
- **Strengthened Regional Economy:** Positive trends in key regional economic indicators, including population growth, increased productivity, improved housing market stability, and overall job creation attributable to the pressed materials industry.
- **Robust Collaborative Network:** Evidence of increased inter-company and industry-ecosystem collaboration, leading to shared resources, knowledge transfer, and joint ventures designed to strengthen U.S. Manufacturing.

# Strategic Action Plan

The Strategic Action Plan for North Central Pennsylvania's Pressed Materials industry includes two core initiatives and a set of projects under each that can jumpstart future growth, maintain cluster-wide competitiveness, and ensure that companies have a broader ecosystem in which they can thrive. These initiatives position North Central Pennsylvania not only as a regional leader but as a national asset in the advancement of pressed materials manufacturing—a sector vital to U.S. economic and industrial security.

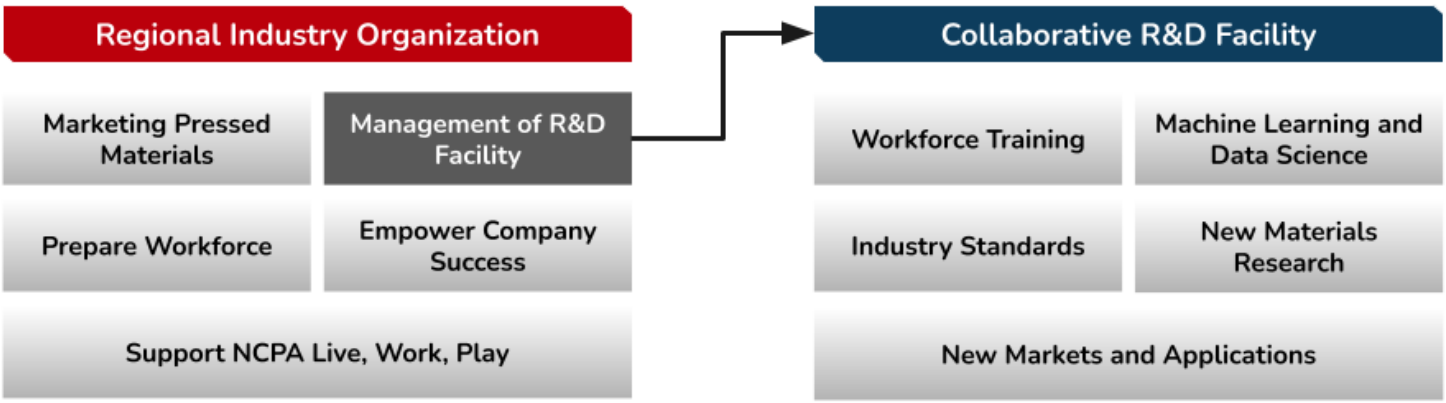
The projects are also aligned with the four focus areas that resulted from the planning effort and extensive stakeholder engagement:

1. Innovation;
2. Collaboration;
3. Promotion; and
4. Workforce Development

These focus areas and their corresponding recommended actions range from ideas that can directly help companies and develop a regional pressed materials ecosystem to initiatives that aim to improve the products and processes behind pressed materials manufacturing, enabling them to access new and emerging markets and expanding workforce pipelines. Ultimately, the initiatives and projects focus on providing broad support for the pressed materials industry to ensure growth and sustainability over time.

The Strategic Action Plan has two core initiatives that include: the **creation of a regional industry organization** and the **creation and management of a new collaborative R&D facility for the industry.** These two initiatives consider the broader need for governance, programming, and dedicated facilities that can serve as the bedrock for achieving these priority projects and the focus areas they represent. Without these two overarching initiatives, the region's pressed materials industry may lack the organization and collective action necessary to drive future growth.

## Strategic Action Plan Priority Initiatives

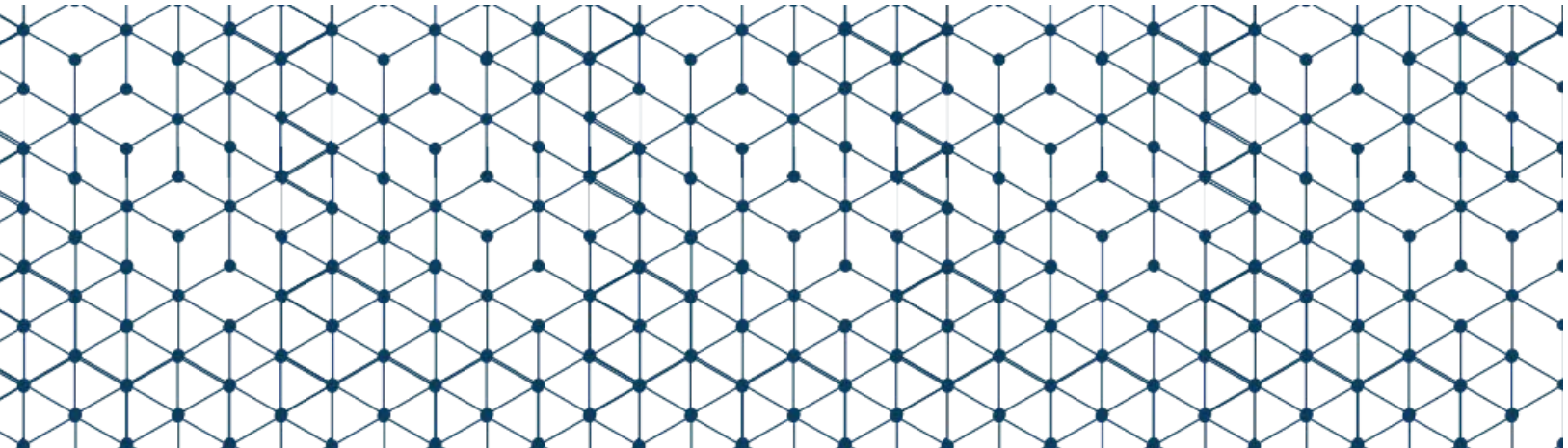


The **creation of a regional industry organization** focuses on formally organizing industry, education, workforce leaders, and economic development partners and other stakeholders around a set of common goals, programs, and initiatives that will support regional industry development. Priority projects under this initiative include leading industry promotion, developing targeted workforce strategies to attract and train the next generation of skilled workers, providing technical support to companies (from startups to large companies), and working towards broader regional economic improvements that benefit and reinforce the long-term competitiveness of the pressed materials industry and North Central PA as a whole.

The **creation of a collaborative R&D facility** will work to catalyze innovation between companies and advance the opportunities available for the industry to leverage. At the core of this initiative is the opening and program management of a new facility, equipped with high-tech equipment, test beds, and space for workforce development training and programming. The facility could repurpose the Penn State University DuBois campus, which is scheduled to close in Spring 2027, or could be housed in another strategically located space. This center for collaboration and innovation will provide skills development for the pressed materials workforce, advance the industry capabilities such as identifying routes for increased part density, refinement and production techniques for rare earth element magnets, or developing processing methods for high temperature refractory alloys, helping to explore new markets for the industry, developing and testing new materials, and continuing to develop industry standards for emerging materials and technologies. It will also serve as an area to explore how AI and machine learning technologies can help pressed materials companies be at the forefront of "smart" manufacturing.

Together, these initiatives and the catalytic projects under them directly interplay with each other to create a comprehensive suite of action items focused on increased and improved industry innovation, collaboration, marketing, and workforce development. By establishing the new entities and executing the strategic priorities outlined in this action plan, North Central Pennsylvania can not only continue to be America's hub for pressed materials but also discover new opportunities, methods, and routes for growing the industry in new emerging markets and applications.

> The U.S. has the know-how, the workforce, and the regional ecosystems —what is needed now is to elevate the industry's visibility, investment and value to ensure we lead the global market instead of falling behind.



# Priority Initiatives and Projects

Our Strategic Action Plan identifies two priority initiatives and nine projects essential to fully realizing the potential of NCPA's Pressed Materials industy. Details for each priority area and its corresponding projects are detailed on the following pages. The Implementation Matrix outlines the anticipated impacts, outcomes, costs, and additional details about each Initiative and project.

## Project Implementation Key:

Focus Areas:

- Workforce Development
- Promotion
- Collaboration
- Innovation

Cost:

- ● $0 - $500,000
- ● ● $500,000 - $1,000,000
- ● ● ● $1,000,000 - $10,000,000
- ● ● ● ● $10,000,000+

Difficulty:

- ● Easy
- ● ● Challenging
- ● ● ● Difficult
- ● ● ● ● Very Difficult

Impact:

- ● Low Impact
- ● ● Medium Impact
- ● ● ● High Impact
- ● ● ● ● Critical Impact

# Priority Initiative: Regional Industry Organization

Pressed materials are North Central Pennsylvania's most crucial industry. Yet, the Pressed Materials Strategy Development Consortium is the region's first formal foray into a coordinated effort to unite key stakeholders around a shared vision for industry growth. While regional manufacturers have long participated in respected professional networks such as the American Powder Metallurgy Institute (APMI) and the Metal Powder Industries Federation (MPIF), which provide technical resources and national level advocacy, NCPA lacks a formal industry organization that helps to see through regional industry visioning, strategic planning, programming, workforce coordination and overall industry growth. Leveraging the strength of existing associations, this new entity will operationalize local collaboration and turn shared vision into scalable action.

**The Problem:** Like much of the U.S. manufacturing sector, NCPA's pressed materials industry faces systemic barriers that limit innovation, slow modernization, and hinder long-term competitiveness. Companies in this industry face thin margins that prohibit them from investing in R&D on their own without federal or state support through grants as well as collaborative R&D efforts. Companies in the region are largely siloed from one another with limited collaborative research and development (R&D), shared marketing of the region's industry, and coordinated efforts to enter into new markets that could benefit businesses across the region.

This fragmentation mirrors national trends in U.S. manufacturing—particularly among small and mid-sized firms—which often lack the scale, infrastructure, and support systems to innovate, adopt new technologies, or compete globally. In NCPA, these challenges are further compounded by macroeconomic factors, a declining regional workforce and lagging population growth which has led to a gradual decline in the region's pressed materials advanced manufacturing industry.

**Project Description:** To advance North Central Pennsylvania as a globally competitive Pressed Materials Tech Hub, the region will establish a formal industry organization to lead implementation of the Strategic Action Plan. This entity will unite the existing Strategy Development Consortium with an expanded network of industry, academic, nonprofit, workforce, and government partners. It will serve as the central coordinating body—identifying strategic opportunities, managing programs, and driving the region's long-term competitiveness in advanced manufacturing. Structured as a 501(c)(3), a subsidiary of an existing entity, or another collaborative model, the organization will provide the governance, accountability, and cross-sector leadership needed to position NCPA as a national leader in the pressed materials sector.

**Anticipated Benefits:** This organization can undertake longer-term projects that foster industry growth, support companies, facilitate knowledge sharing, and provide opportunities throughout the NCPA region. It will help unify currently disconnected efforts, ensuring companies have access to the resources, talent, and innovation needed to grow and adapt.

In its origins, this industry organization can serve four key roles that help establish this industry cluster more effectively and work collaboratively towards stability and growth. Additionally, it would also serve as the programmatic operator of the R&D facility initiative. Priorities for the regional industry organization include:

1. **Industry-Wide Promotion**— Promote the region and its capabilities nationwide;
2. **Next Generation Workforce Development** —Build strong talent pipelines and connect workers to quality jobs;
3. **Business Growth Services** — Support companies in adopting new technologies and entering new markets; and
4. **Regional Economic Improvements** — Align efforts to improve infrastructure, supply chains, and local economies.

Projects associated with the Regional Industry Organization are detailed on the following pages.

**This entity will unite the existing Strategy Development Consortium with an expanded network of industry, academic, nonprofit, workforce, and government partners to identify strategic opportunities, manage programs, and drive the region's long-term competitiveness.**

# 1. Make Pressed Materials a Household Name and Symbol of American Strength in Manufacturing

| | |
|---|---|
| **Focus Area** | Promotion |
| **Cost** | ● ● ○ ○ |
| **Difficulty** | ● ● ○ ○ |
| **Impact** | ● ● ● ● |

**The Problem:** Despite being foundational to advanced manufacturing in North Central Pennsylvania and beyond, the term "pressed materials" lacks national visibility and global brand recognition and a clear definition. This presents a challenge in effectively promoting the unique benefits and applications of pressed materials to manufacturers, decision-makers, and consumers. It also underrepresents U.S. industry capabilities in global forums, and hinders efforts to attract talent, investment, and collaboration. Without a unifying identity, companies remain siloed, under-marketed, and disconnected from the broader national movement toward advanced manufacturing resurgence.

**Project Description:** This project will launch a strategic promotion campaign to establish "Pressed Materials" as a nationally recognized and globally competitive manufacturing identity. The pressed materials term serves as a unifying term for a range of advanced manufacturing processes that encompass powdered metallurgy, metal injection molding, and additive manufacturing and related methods. With little existing brand recognition today, this campaign will introduce a dedicated marketing and branding campaign that will introduce pressed materials to broader markets, highlight their benefits, emphasize their critical applications, and build excitement among manufacturers, decision-makers, and consumers. Targeted marketing will also help align existing companies that fall under the pressed materials designation to recognize and adopt the shared industry identity. Focused outreach will help these manufacturers, helping them see their role within the broader pressed materials industry and promoting consistent use of the term to strengthen industry alignment and visibility.

**Anticipated Benefits:** This project is expected to raise awareness and drive adoption of "pressed materials", strengthening national branding and market presence for a critical U.S. industrial cluster and unifying the industry under a unique identifier using modern terminology and encompassing the processes and applications of pressed materials. A cohesive promotion strategy for pressed materials can expand the widespread use and adoption of the pressed materials term into new applications by demonstrating their potential to new sectors and investors.

**Potential Risks:** Potential risks of this promotion campaign include an unwillingness from existing companies to consider themselves "pressed materials" and a hesitancy to collaborate with other manufacturers to build a cohesive, marketable brand. Additionally, some manufacturers may be wary of increased collaboration or skeptical of shared marketing initiatives, particularly in a competitive environment.

# 2. Prepare the Next Generation of Pressed Materials Workers

| | |
|---|---|
| **Focus Area** | Workforce Development, Collaboration |
| **Cost** | ● ● ● ○ |
| **Difficulty** | ● ○ ○ ○ |
| **Impact** | ● ● ● ○ |

**The Problem:** The pressed materials workforce is aging, and population decline in North Central Pennsylvania threatens the talent pipeline for the region's pressed materials companies. Pressed materials companies have already reported challenges filling entry-level roles, many of which could be filled by regional high school graduates with short to moderate vocational training. While many programs - including PA SIX Careers, PA CareerLink, SkillUp PA, and more - are already providing opportunities for workforce development more broadly, a n industry-specific approach is needed.

**Project Description:** This project will develop a coordinated talent pipeline to attract and promote careers in Pressed Materials to the next generation of workers in NCPA. A central feature will be the creation of an organized group apprenticeship and pre-apprenticeship program, allowing multiple manufacturers to share training resources and offer high-quality, hands-on learning experiences. In collaboration with Workforce Solutions, Penn State DuBois, Northern Pennsylvania Regional College, Pennsylvania College of Technology (Penn College), local schools, and regional employers, the initiative will promote career awareness, outline training pathways, and connect students and jobseekers to local job opportunities in the industry.

Through targeted outreach, including materials and presentations to participants, this initiative will share entry-level positions, potential career pathways, and opportunities to acquire the skills and experience for each career path. Talent recruited through the program will then have the opportunity to participate in apprenticeship or pre-apprenticeship opportunities at pressed materials companies, facilitated through existing programs at partner institutions like Penn College, Northern Pennsylvania Regional College, and other career and technology centers (CTCs).

**Anticipated Benefits:** By promoting careers in pressed materials through North Central Pennsylvania schools and facilitating participation in workforce development programs, the consortium expects to generate interest in the industry and recruit workers to fill the talent pipeline needed in the industry. In the short term, this program will introduce high school students and other young workforce participants to jobs in the pressed materials industry, increasing awareness and recruiting new workers. In the longer-term, this project can help to facilitate more school-to-industry connections within the industry.

**Potential Risks:** This project requires buy-in from pressed materials companies, regional schools, and workforce development partners. To achieve the most significant impact, companies must commit to supporting apprenticeships and/or pre-apprenticeships. Without apprenticeships, the project could still conduct the promotion campaign in schools and workforce development programs. There is also the potential for workforce investments to spur competition between companies for talent.

# 3. Support NCPA as a Great Place to Live, Work, and Play

| | |
|---|---|
| **Focus Area** | Workforce Development, Collaboration |
| **Cost** | ● ● ● ● |
| **Difficulty** | ● ● ● ○ |
| **Impact** | ● ● ● ○ |

**The Problem:** Quality of life and a sense of place in NCPA are lacking, evidenced by a declining population. Pressed materials companies, already facing workforce shortages, struggle to attract and retain talent due to lack of amenities, accessible childcare, and reliable transportation.This leads to an overall lack of community vitality, pride, and identity.

**Project Description:** Improving the quality of life of North Central PA can increase the appeal of the region, making it a more attractive place for the current and future workforce. Specifically, the consortium should encourage investment in transportation access, employer-based childcare, and outdoor recreation infrastructure that leverages the region's natural assets and the nationally recognized PA Wilds brand to increase the appeal of the region to attract and retain employees.

**Anticipated Benefits:** Improved access to transportation in rural areas, increased childcare access and affordability provided through manufacturing employers (especially care that accounts for the nontraditional schedule of employees' shifts), advanced outdoor recreation infrastructure, and marketing and preservation of dark sky locations, among other areas of focus, would benefit pressed materials companies by helping them to address barriers to workforce development by strengthening recruitment and retention in rural Pennsylvania.

**Potential Risks:** Risks to consider include a lack of dedicated funding for initiatives under this project, differing priorities, a lack of buy-in among industry members that stymies development, and the potential for this project not to attract additional workforce.

# 4. Empower Companies to Succeed and Grow in the Pressed Materials Industry

| | |
|---|---|
| **Focus Area** | Workforce Development, Collaboration |
| **Cost** | ● ● ● ● |
| **Difficulty** | ● ● ● ○ |
| **Impact** | ● ● ● ○ |

**The Problem:** Businesses in the pressed materials sector in NCPA are primarily small and mid-size manufacturers that have small profit margins and thus limited internal capacity and resources to frequently assess their operations, efficiency, productivity, and broader market opportunities. Due to this reality, companies often fail to maximize their revenue potential and achieve long-term growth. To build a globally competitive Tech Hub, the region must equip its manufacturers with the tools, knowledge, and technical assistance needed to grow, drive innovation, and strengthen supply chain resilience.

**Project Description:** The Pressed Materials Business Growth Assessment and Support Program is a comprehensive assessment tool that directly measures company performance across various key variables. This assessment is then used to craft company-specific recommendations for process improvements. To conduct assessments, the industry organization would engage a local team of experts to assess companies across a pre-set listing of criteria, including:

- **Overall Business Criteria:** Organizational Vitality, Workforce Capacity, Succession Planning, Capability Maturity
- **Business Strategy Criteria:** Product Portfolio Diversification, Operational Excellence, Equipment Capacity, Marketing and Communications, Export Capacity, and Readiness
- **Design, Innovation, and Research and Development Criteria:** R&D, Design in Manufacturing, Automation, Emerging Markets, Intellectual Property, Technology Migration, and AI.
- **Supply Chain:** Upstream and Downstream dependencies/ risks, Supplier Relations, Procurement

Each company will receive an assessment that will be scored under a specific set of criteria that help to evaluate overall company maturity, innovation, efficiency, and more. These insights will then be categorized and used to create a unique prioritization of recommendations and avenues to receive technical support. The assessment is designed to help companies integrate Industry 4.0 technologies and align with national priorities in reshoring, defense readiness, and domestic supply chain security. In a future iteration of the program, a companion match grant program could provide grants and/or low-interest loans to help companies implement these recommendations.

To leverage existing programming and relationships, this assessment program could be led in partnership with the Northwest Industrial Resource Center (NWIRC). Their programming and services, along with their existing capacity and industry relationships, position them to help take the lead on development assessment criteria and leading business visits. Pressed materials experts would be added to NWIRC's existing capacity to help ensure companies are receiving specialized support.

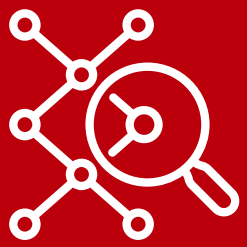
**Anticipated Benefits:** This assessment and its corresponding recommendations will help companies modernize and scale their operations, achieve better efficiency and optimization in their manufacturing, reduce unnecessary costs, and increase revenue and profitability over time. This assessment will also leave companies with a feasible, vetted roadmap for growth, that reduces barriers to innovation, boosts competitiveness, and supports supply chain resiliency - something companies are rarely able to produce themselves due to cost and capacity constraints.

**Potential Risks:** The primary risk is that some companies may receive these in-kind services and still fail to scale, leading to potential concern about the use of resources in the short term and questions about the effectiveness of the program overall. Other forms of manufacturing companies not involved in the pressed materials industry may also be upset by a lack of specialized support for their sector. Another risk is company privacy - many companies will not want the results of their assessment to be publicly discussed, requiring non-disclosure agreements (NDAs) or another form of privacy protection between assessed companies and individual assessors.

# Priority Initiative: Collaborative R&D Facility

The creation and operation of a collaborative R&D facility for NCPA's pressed materials industry can jumpstart innovation, collaboration, and future-focused initiatives that help to inspire company and industry growth in the long term. This facility, which could be located at the sunsetting Penn State DuBois campus or elsewhere in the region would be a marquee project and facility for North Central PA. Working to centralize various forms of R&D, the facility would be the de facto R&D and collaboration hub for the industry. This center would provide a space for companies to collaborate and accelerate innovation, while reducing individual costs and risks. By providing state-of-the-art training in pressing technologies, materials science, and automation, the Center for Innovation will equip the local workforce with skills essential for modern manufacturing demands. This initiative ensures the region's continued prominence in producing critical components for sectors like national security, automotive, energy, aerospace, and healthcare, thereby bolstering both regional economic vitality and national manufacturing capabilities.

**The Problem:** Despite being home to the densest concentration of pressed materials companies in the United States, North Central Pennsylvania's industry remains fragmented in its approach to research and development. Currently, most pressed materials companies in NCPA work independently; limiting their ability to collaborate on breakthroughs in products, processes, and materials. This siloed approach to R&D hinders the industry's ability to modernize the manufacturing process, explore new high-performance materials and enter emerging global markets such as aerospace, defense and energy. The lack of collaborative R&D is a barrier to the industry's growth and evolution as it attempts to stay competitive with modernized processes, equipment, materials, and products.



**By providing state-of-the-art training in pressing technologies, materials science, and automation, the Center for Innovation will equip the local workforce with skills essential for modern manufacturing demands**

**Project Description:** The Center for Innovation is envisioned as a cutting-edge R&D hub for collaborative research, advanced manufacturing, and workforce development focused on pressed materials. The facility will bring together industry leaders, academic researchers, and technology developers to advance the science and applications of pressed materials, improve competitiveness and position NCPA as a global leader in precision manufacturing. This public-private initiative would share both the cost and benefit of research, accelerating innovation while reducing risk for individual stakeholders.

By centralizing R&D efforts at the Center for Innovation, the industry will be able to focus on material characterization and development, process optimization, tooling innovation, and product characterization and testing—serving as a proving ground for next-generation pressed components. These capabilities will support breakthroughs in critical sectors such as defense, aerospace, energy, and healthcare. While competition and confidentiality issues need to be overcome, there are many successful models of such centers, including those that operate under the Manufacturing USA network. Additionally, products in these new markets will typically garner much higher profit margins than what the automotive market currently provides. And in some cases (for example REE magnets) are in high demand outstripping supply, allowing several companies in the region to produce these products without significant competition concerns.

The Center for Innovation would also include classroom and test-bed space that houses specialized workforce development training (e.g., for die setters for the PM industry). Additionally, the center can serve as both an incubator and accelerator-style space for the nationwide pressed materials industry, using programming to host innovation challenges that attract global talent to the region and incubate new joint or entrepreneurial ventures. Beyond R&D, the Center for Innovation will house workforce training labs, equipping workers with hands-on experience in cutting-edge production techniques. Programs could include training for high-demand roles such as die setters, metallurgists, and automation technicians.

Strategically, the Center is currently proposed to be located at the soon-to-be closed Penn State DuBois campus preserving and expanding the legacy of the site as a regional hub for innovation and education. The campus infrastructure, including classrooms, labs, office space and the NCPA LaunchBox—which supports manufacturing competitiveness and workforce needs, growing and attracting talented innovators and entrepreneurs, and creating new high-knowledge, high-technology businesses—is ideally suited for rapid transformation into a high-impact innovation facility. While the Penn State DuBois campus would be a natural home for the Center for Innovation, other sites could also house the Center with additional capital investment.

**Anticipated Benefits:** The Center for Innovation will work to catalyze innovation and growth at the regional level while simultaneously deepening NCPA's identity as the domestic hub for pressed materials and advanced manufacturing. The Center would become the epicenter of the pressed materials industry in NCPA, bringing together partners for shared gain and enable local manufacturers to compete in high-value sectors such as defense, aerospace, energy, and healthcare. The benefits that stem from pursuing this catalytic project are extensive and are solidified by numerous sub-projects. These include the creation and pursuit of:

1. Workforce Development Programs Aligned with Industry Needs
2. Access to New Applications and Markets
3. Expanded Materials and Alloy Research
4. Industry Standards Development
5. Research on AI and Data Science Applications

Projects associated with the Collaborative R&D Facility are detailed on the following pages.

# 1. Craft Future-Focused Workforce Training Programs to Cultivate a Pipeline of Pressed Materials Workers

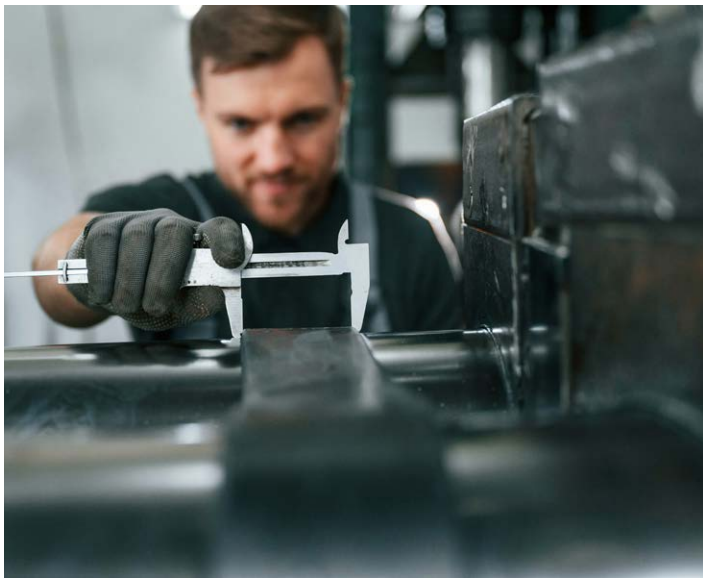
| | |
|---|---|
| **Focus Area** | Workforce Development |
| **Cost** | ● ○ ○ ○ |
| **Difficulty** | ● ○ ○ ○ |
| **Impact** | ● ● ● ● |

**The Problem:** As North Central Pennsylvania experiences population decline and the looming loss of anchor educational institutions, such as Penn State DuBois, pressed materials companies must invest in maintaining a pool of skilled labor for current open jobs, anticipated future jobs, and openings from retirements.

**Project Description:** For this project, the consortium will work with local workforce development institutions, including Pennsylvania College of Technology, Workforce Solutions, and the Northern Pennsylvania Regional College, to invest in expanding and creating workforce training programs for the Center for Innovation. With these partners, the consortium will develop specialized, industry-aligned programs for Pressed Materials careers, such as custom die setting, equipment maintenance, and automation. Integrating workforce development into the R&D facility will give trainees hands-on experience with cutting edge technologies with programs serving both new and incumbent workers seeking upskilling. An additional component of this strategy involved forming “mobile manufacturing labs” that bring technology from the facility out into classrooms and workforce centers across the region, increasing exposure to the industry and its machinery.

**Anticipated Benefits:** This program will increase the pool of skilled workers for different positions within pressed materials companies. It will also allow for upskilling of existing workers and training of new workers in the industry. Overall, it will also support a steady talent pipeline that will allow the industry to grow and thrive in NCPA. Placing workforce development programs in the R&D facility will also train students on modern equipment and connect them to innovation happening in the industry. In the short term, this program will establish a training program focused on skills needed to fill existing jobs, particularly in roles with newer presses or other technologies.

**Potential Risks:** There is a risk that workers may participate in new training programs at the R&D facility and take the skills to other industries or jobs outside the region. Establishing early connections to companies and job opportunities or requiring a commitment to work in the regional pressed materials industry could help mitigate this risk. The continued emergence of robotics and AI in a manufacturing setting also pose a risk to human employment in the long term.



# 2. Expand Pressed Materials into New Applications and Markets

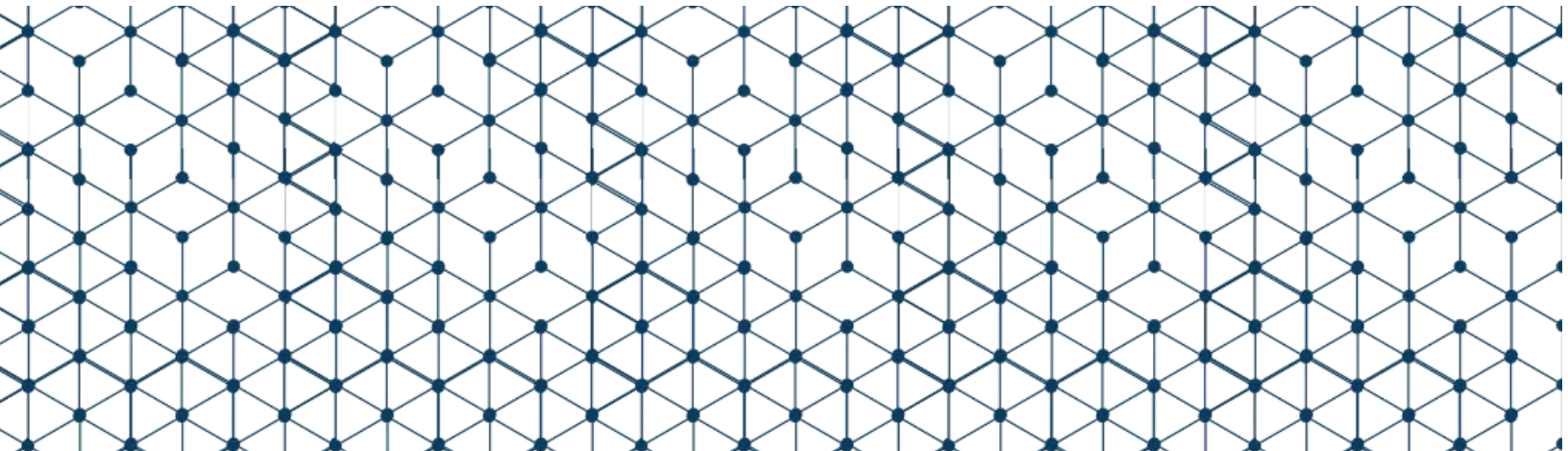
| | |
|---|---|
| **Focus Area** | Innovation |
| **Cost** | ● ● ● ● |
| **Difficulty** | ● ● ● ○ |
| **Impact** | ● ● ● ● |

**The Problem:** The market for pressed materials is limited by manufacturers' lack of awareness and understanding of the viability of the industry products and processes as alternatives to raw materials in new applications, hindering market growth. As hybrid and electric engines continue to replace traditional internal combustion engines, the primary source of demand for the pressed materials industry is shrinking. The pressed materials industry must find innovative new uses for its products and processes. The limited current market use of pressed materials is one of the most significant challenges facing the industry today threatening both regional economic vitality in North Central Pennsylvania and America's ability to lead in future-critical manufacturing sectors.

**Project Description:** This project will utilize the Center for Innovation R&D facility to explore new applications and high-growth markets for the pressed materials industry, including aerospace, naval defense, broader defense applications, consumer products, biomedical applications, and clean energy. Research at the Center for Innovation will explore how existing products and processes can be easily applied in untapped markets. Research will explore new technology, products, and processes that can open up additional market potential and allow the industry to better compete and access new markets.

**Anticipated Benefits:** This project will strengthen U.S. industrial global competitiveness by equipping domestic pressed material manufacturers with the knowledge and capabilities to diversify their customer base and tap into strategic, fast-growing markets. Utilizing the Center for Innovation to collaboratively understand and harness new market opportunities will equip local pressed materials companies with what they need to succeed. It would allow companies to diversify their revenue streams, reducing their dependence on traditional uses of their products. More companies in the industry and region accessing new markets would drive individual company growth and increase the market share of the industry regionally, nationally, and internationally.

**Potential Risks:** Although working through the Center for Innovation would enable local companies to leverage collective resources and brainpower to access new markets, companies would still need to dedicate their own funds and time to exploring new markets, which could be a challenge. Without federal or state funding, most pressed materials companies cannot afford to invest in R&D.



# 3. Lead Cutting-Edge Research into New Materials to Drive Innovation and Market Growth

| | |
|---|---|
| **Focus Area** | Innovation |
| **Cost** | ● ● ● ○ |
| **Difficulty** | ● ● ○ ○ |
| **Impact** | ● ● ● ○ |

**The Problem:** The pressed materials industry needs to identify methods for processing advanced alloys, and/or adopt new alloys, as well as novel materials like rare earth elements to remain competitive and meet the demands of evolving industries like defense, energy, aerospace, and biomedical.

**Project Description:** Through the Center for Innovation, the R&D facility will conduct research on the processing of alloys qualified for various industries (e.g., defense, energy, aerospace, biomedical) but not yet readily accessible in PM/MIM (e.g., titanium alloys). It will also research which alloys can meet emerging needs (e.g., consolidation of high-temperature alloys and refractory metals for defense/hypersonic applications) or the design of new alloys and additives that could be used to advance the pressed materials industry (e.g., those that result in high specific strengths with additives that aid in optimizing part density). This research will engage higher-education partners, focusing on research institutions with engineering departments that are already conducting industry research.

Types of new alloys to research include:

- High-temperature refractory alloys: research is needed to enable the processing of dense parts; if successful, it would open up partnerships with the Department of Defense and/or markets with higher-performance engines.
- Low-alloy and rare earth content materials: North Central PA holds rare earth potential, but research is needed to determine routes for reducing alloying content (and therefore, cost) in alloys while still maintaining their properties. If successful, this would reduce cost, decrease reliance on imports and support the development of high-performance materials for advanced pressed materials.
- Lightweighting: research is needed to enable efficient processing of lightweight materials (e.g., Ti, Al, Mg) in PM/MIM processes; if successful, this research will open up applications in aerospace, space, and biomedical markets.

Additionally, the facility will conduct research on novel materials development and processing for energy production including rare earth element magnets, battery components, and soft magnetic composites, opening up opportunities to develop new motor topologies and provide magnets and battery components critical for defense, energy, aerospace, and transportation applications .

**Anticipated Benefits:** Creating new alloys could enhance the functionality of materials produced in this industry. With higher-performance materials, the pressed materials industry could achieve higher standards, allowing entry into new markets such as the Department of Defense, higher-performance engines, aerospace, and the biomedical fields.

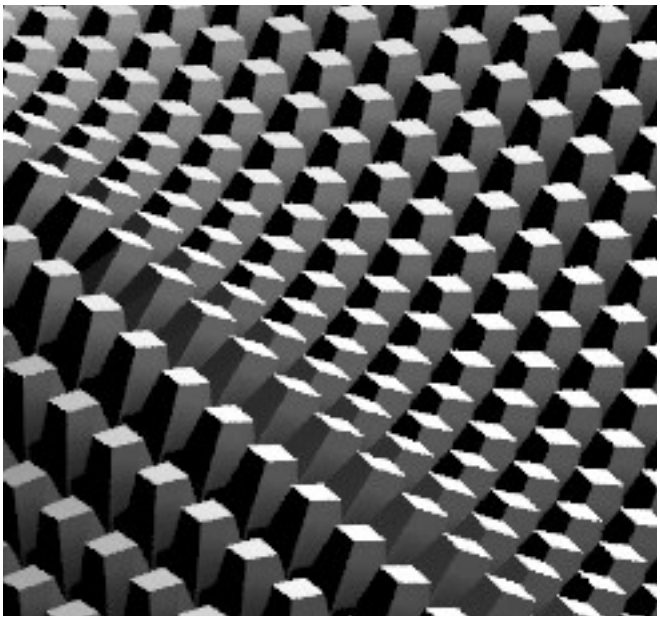
Additionally, new alloys could be more sustainable, reducing the carbon footprint of the pressed materials industry, considering the entire material lifecycle of sourcing, processing, use, and re-use/recycle. Finally, new alloys could have the potential to reduce production costs and allow manufacturers to increase their profit margins.

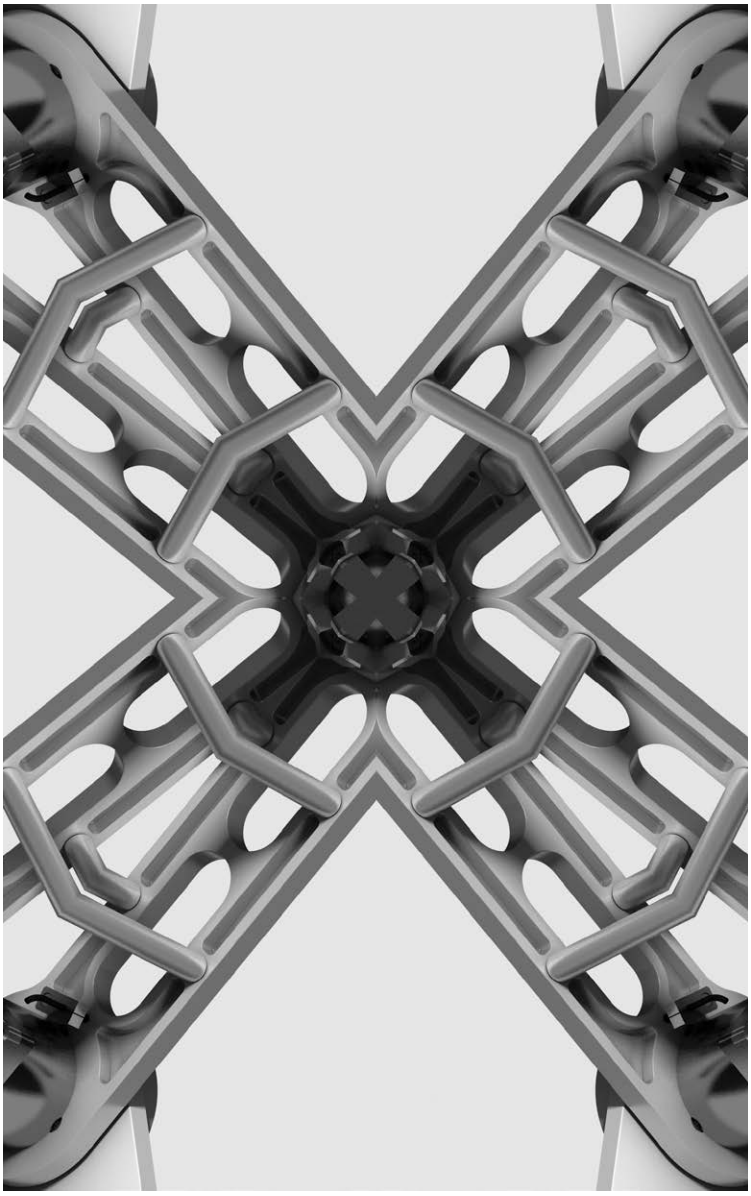
Currently the production of rare-Earth magnets is in its nascent stage and would open a large opportunity for companies that master the processing of the novel materials. Additionally new magnet and battery chemistries will be developed requiring new processing techniques, benefitting companies capable of producing products with new/novel material characteristics. And soft magnetic

composites open the pathway to novel motor designs, lowering weight, and offering a clean electric motor option for many applications. All of these opportunities will lead to increased profit margins for the industry adopters.

**Potential Risks:** Research and development into new alloys will take a long time, due to R&D time as well as industry acceptance, and likely not provide a substantial impact in the industry for 5+ years. Furthermore, research into new alloys will necessitate substantial investment. Collaboration will also be an essential element for research into the processing of existing alloys or the design of new alloys. And, though the initial R&D has been ongoing for soft magnetic composites, additional R&D remains, and is limited to a handful of the pressed materials companies. The same is true for batteries, while the rare earth element magnets are a new opportunity for the region. Advancement of all of the areas will require building trust between companies and academic partners to allow shared research to happen. Managing intellectual property will also be critical to trust building.

U.S. limitations in rare earth mining and refining could further complicate this work as there is only one mine in the U.S., and no ability to refine rare earths in the U.S.; necessitating considerable investment out of state, likely not in PA, or collaborative partnerships with foreign countries.





# 4. Establish Industry-Wide Standards for Emerging Materials and Applications

| | |
|---|---|
| **Focus Area** | Innovation |
| **Cost** | ● ● ○ ○ |
| **Difficulty** | ● ● ● ○ |
| **Impact** | ● ● ● ○ |

**The Problem:** While some standards exist for traditional materials, the pressed materials industry lacks updated, industry-wide standards for emerging materials and applications. This gap limits innovation, consistency, and acceptance in high-growth sectors like defense, aerospace, and medical devices. Industry standards play a crucial role in the advancement and innovation of the pressed materials industry. By establishing clear benchmarks and guidelines (i.e., for new alloys for PM or components), these standards can drive efficiency, quality, and growth within the sector, and provide confidence in and reliability of manufactured components. To compete globally and and reach new markets, the industry must develop new, shared standards that reflect evolving technologies and ensure quality, safety, and interoperability.

**Project Description:** To address the lack of modern, comprehensive standards for new pressed materials, this project will establish a formal process for developing industry-wide benchmarks essential for product quality, regulatory acceptance, and global competitiveness. Using the Center for Innovation as the convening and testing hub, the initiative will bring together manufacturers, academic researchers, and technical experts to identify gaps in current standards—particularly for emerging materials, alloys, and applications not fully covered by existing frameworks like ASTM's Additive Manufacturing Standards.

A key function of the Center for Innovation R&D facility will be to convene industry partners and experts to identify where new or upgraded standards are needed. The R&D facility should also include appropriate testing equipment and facilities. Consortium staff, supplemented by industry and other partners, will then develop the standards in a collaborative process. The Consortium will identify the appropriate Standards Development Organizations (SDOs) to work with and be the key point of contact. Potential SDOs include one or more of the following:

- ANSI (American National Standards Institute)
- ASTM International (Advancing Standards Transforming Markets)
- ASME (American Society of Mechanical Engineers)
- BSI (British Standards Institution)
- DIN (German Institute for Standardization)
- ISO (International Organization for Standardization)
- SAE International (automotive/aerospace)

**Anticipated Benefits:** Establishing industry-wide standards is essential for fostering innovation, accelerating commercialization, and positioning North Central Pennsylvania's pressed materials industry as a global leader. They define a baseline for current technology, allowing researchers and developers to identify gaps and opportunities for improvement. By having shared standards, companies can collaborate more easily, build upon existing knowledge, and access new markets.

By creating rigorous performance benchmarks, these standards will not only improve product quality and reliability but also increase the adoption of pressed materials in critical, high-growth sectors such as aerospace, defense, and biomedical manufacturing.

**Additional benefits include:**

- Improved product quality and consistency
- Reduced manufacturing costs
- Enhanced safety
- Increased market access
- Greater customer confidence

**Potential Risks:** Developing industry-wide standards requires industry players to provide input and cooperate to create standards for emerging sectors, which has historically been difficult. Some companies may view collaboration around standards as limiting and unnecessary, making it hard to secure their participation. Creating standards also presents a challenge because of the lack of generalizability across alloy systems, processing routes, and products.

Additionally, formal standardization also takes time. The timeline for ASTM can be as short as 1.5 years, while the timeline for ISO standards is typically 3 years. Additionally, there is the potential for market rejection, so securing buy-in from end users will be critical.

# 5. Leverage the Power of Machine Learning and Data Science to Accelerate Success

| | |
|---|---|
| **Focus Area** | Innovation |
| **Cost** | ● ● ● ○ |
| **Difficulty** | ● ● ○ ○ |
| **Impact** | ● ● ● ○ |

**The Problem:** The pressed materials industry, composed mainly of small operations with limited resources, faces challenges in optimizing processes, maintaining equipment, ensuring quality control, and developing innovative materials. Many regional firms do not leverage learning or data science to optimize production, predict maintenance needs, improve materials, or identify emerging market trends. Additionally, these companies face difficulties in investing in R&D. This challenge is further compounded by the US scaling back its public investment in R&D, resulting in less available funding. Without intentional investment in data-driven manufacturing, the NCPA region risks falling behind national and global competitors who are rapidly integrating AI and analytics into advanced production systems.

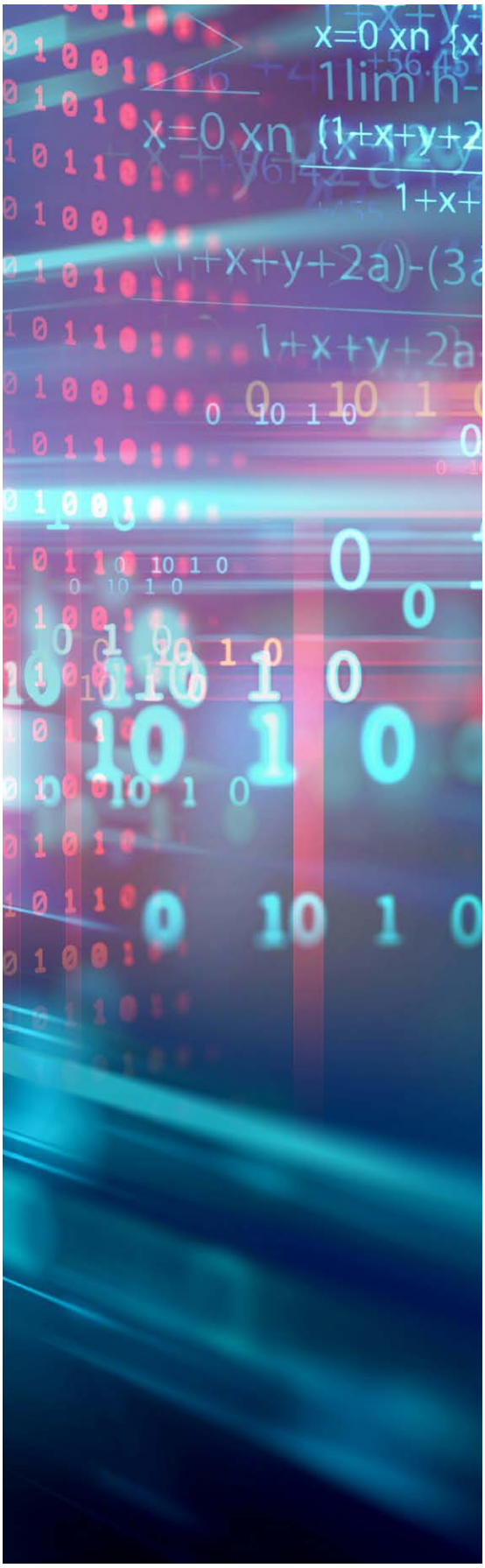
**Project Description:** To position North Central Pennsylvania as a global leader in advanced manufacturing, the Center for Innovation will serve as a national Center of Excellence for AI and Data Science in Pressed Materials. The application of machine learning and data science could be used to reduce R&D costs while speeding up the development of new applications, process improvements, and products. For example, AI/ML could be used to develop predictive maintenance for equipment to reduce downtime, optimization of sintering process parameters using machine learning, analysis of customer data to identify market trends, development of AI-driven quality control systems, and data analysis to improve material composition and performance.

The Center for Innovation will operate as a pressed materials industry-led hub for Data Science and Machine Learning with activities guided by direct input and needs of manufacturers. Key activities and services include:

- Industry-guided technical assistance and guidance on the application of data science and machine learning in pressed materials ranging from production to material performance.
- Manage data platforms to facilitate data science and machine learning.
- Support collaborative processes and product improvement. Companies monitoring their processes could share that data (confidentially) into the consortium data platform to identify what factors to monitor and help predict what anomalies result in good or bad parts, and improve their processes. This would consist of: (1) companies collecting whatever pre-process/in process/post-process data they normally do, (2) depositing this into a data repository, (3) a team of data scientists connecting the process data with part performance/ properties/geometry, and then (4) some rulebook or model that all companies can benefit from for increased product performance
- Provide shared access to in-house specialized expertise - in effect, a Data Science and Machine Learning Department that companies can use lowering barriers to adoption until they can afford to staff their own.
- Offer workshops and targeted training to upskill the workforce.

**Anticipated Benefits:** Investing in this project at the Center for Innovation would result in industry wide access to AI and data science tools, accelerating Industry 4.0 and smart manufacturing in the pressed materials sector. Increased production will boost efficiency through process automation, leading to substantial reductions in material waste and improved product quality. Consequently, businesses can realize significant cost reductions. These technologies will enable predictive maintenance, in-process mitigation, correction, and improvement, as well as optimized inventory management. This data-driven approach also fosters accelerated research and development, empowering regional businesses to make informed decisions and maintain a competitive edge.

**Potential Risks:** Data privacy and security concerns, implementation costs, model bias, reliance on data quality, integration challenges, need for specialized skills, potential for job displacement, over-reliance on technology, and resistance to change.



# Conclusion



The growth of the pressed materials industry is not only vital to the future of North Central Pennsylvania, but also is critical to national economic competitiveness and national security. As the region's largest and most specialized form of manufacturing, pressed materials are a component of the past, present, and future of the region's opportunity and broader prosperity. However, a lack of collaboration among companies, industry promotion, and forward-thinking innovation has stunted growth within some of the industry's legacy verticals. With the region concurrently suffering from economic headwinds, the pressed materials industry in Pennsylvania faces a critical juncture - collaborate and innovate, or be left behind.

There is cause for optimism within the industry itself. Through strategic investment in the NCPA Pressed Materials Tech Hub, the region can transform this legacy sector into a globally competitive powerhouse. By aligning efforts around increased R&D into materials, process innovation, equipment modernization, workforce development, and the integration of AI and smart manufacturing, the industry can expand into emerging applications, sectors, and end-users like aerospace, defense, energy and biomedical.

While momentum exists, future outcomes are reliant on the enhanced collaboration and communication of industry partners, economic development groups, workforce and educational entities, and government. A collective, aligned push for the growth and modernization of the industry can be an economic windfall for the region. Now is the time to capitalize on these opportunities. This is a once-in-a-generation opportunity to modernize and secure the long-term competitiveness of a critical industry, reverse rural economic decline, and establish North Central Pennsylvania as a global leader in pressed materials innovation. Now is the time to invest, innovate, and lead—ensuring this strategic sector thrives and continues to power both regional prosperity and national strength.


North Central Pennsylvania
Pressed Materials Consortium
pressedmaterials.org