



MAKING CARBON FIBER MORE  
ACCESSIBLE TO MORE INDUSTRIES



@VartegaCFR



# The BIG Picture - A Sustainable Future



## VISION

*Decarbonizing the future through the transformation of advanced materials to create circular supply chains*

## MISSION

*Solve the world's toughest advanced materials recycling challenges*

## VALUES

*Accountability, Action, Collaboration, Communication, Respect*

# Composites Recycling Platform

## Proprietary Technology

Five US Patents Granted

[US10487191B2](#) [US10610911B1](#) [US10829611B1](#) [US11135743B1](#) [US11142626B2](#)

Three International Patents Granted

[WO2017171753A1](#) [JP6855503B2](#) [JP7031901B2](#)

Two International Patents Pending

### ***Closed loop, low-cost post-industrial fiber recovery process:***

- 95% less energy utilization than virgin carbon fiber
- **Up to 50% cost reduction**
- Increases the supply of lower cost fibers = accelerates the transition to lighter, more efficient products
- Integrates into the existing fiber reinforcement & composite manufacturing ecosystem

# Proprietary Post-Processing



Recycled Carbon Fiber



EasyFeed Bundles

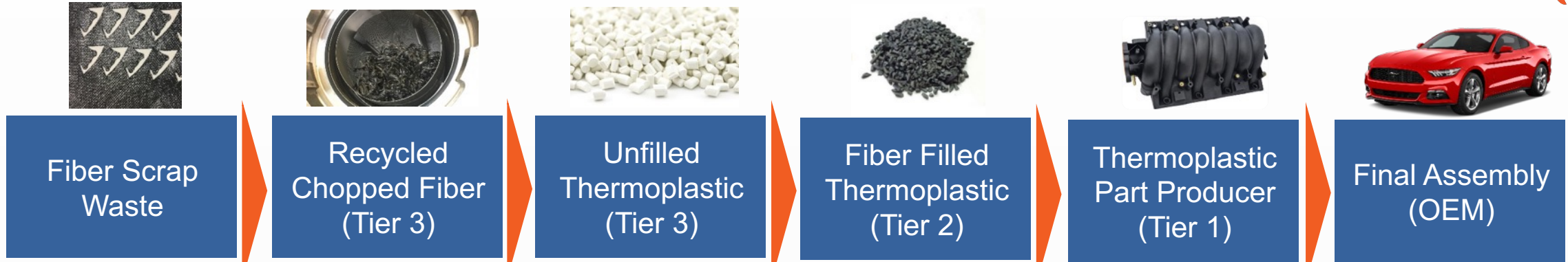


Thermoplastic Pellets



Injection Molded Part

# Value Chain & Market Strategy

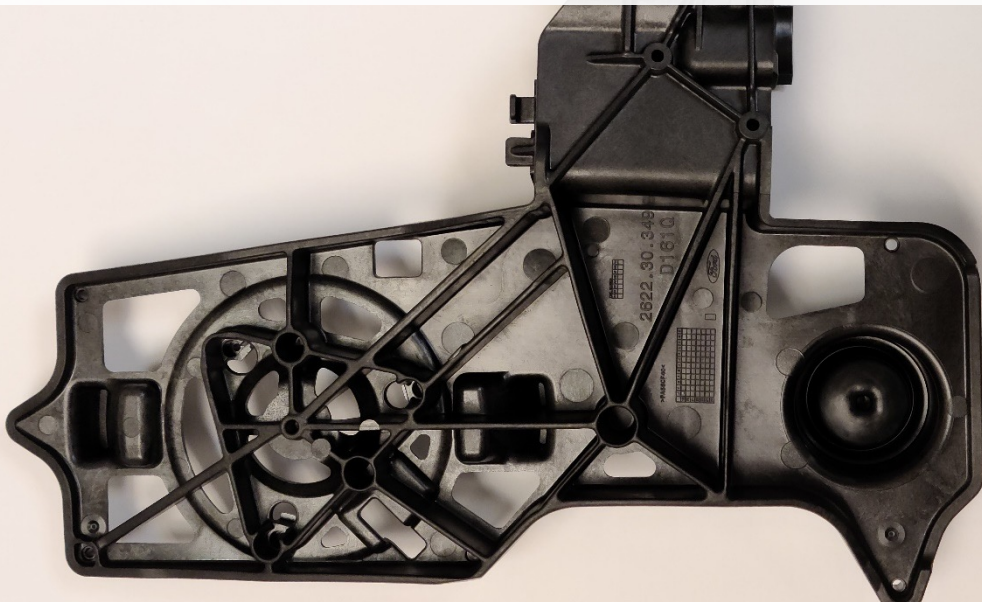


# Applications

Additive Manufacturing / Compression Molding / Injection Molding



All parts shown using Vartega recycled carbon fiber



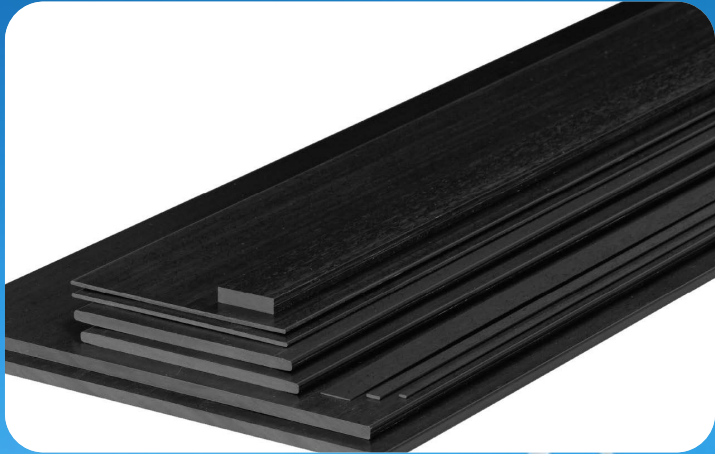
# Case Studies



All parts shown using Vartega recycled carbon fiber



# Vestas Use Case



Recycled carbon fiber enhances mechanical properties such as strength and stiffness. This material is a blend of thermoplastic PA66 and Vartega's carbon fiber recycled from **Vestas** wind turbine manufacturing scrap at a loading of 20% by weight. The product is supplied as a 3-6mm pellet.



**Vestas**<sup>®</sup>

## Physical Characteristics

Pellet Length (mm)	3 - 6
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## Material Properties

Composition	20% recycled standard modulus carbon fiber / 6.2% vinyl ester / 73.8% INVISTA U4820L PA66
Processing Temperatures	270 - 325°C



# Recycled Continuous Fiber Demonstration







GRAND OPENING GRAND OPENING GRAND OPENING GRAND OPENING GRAND OPENING

vartega

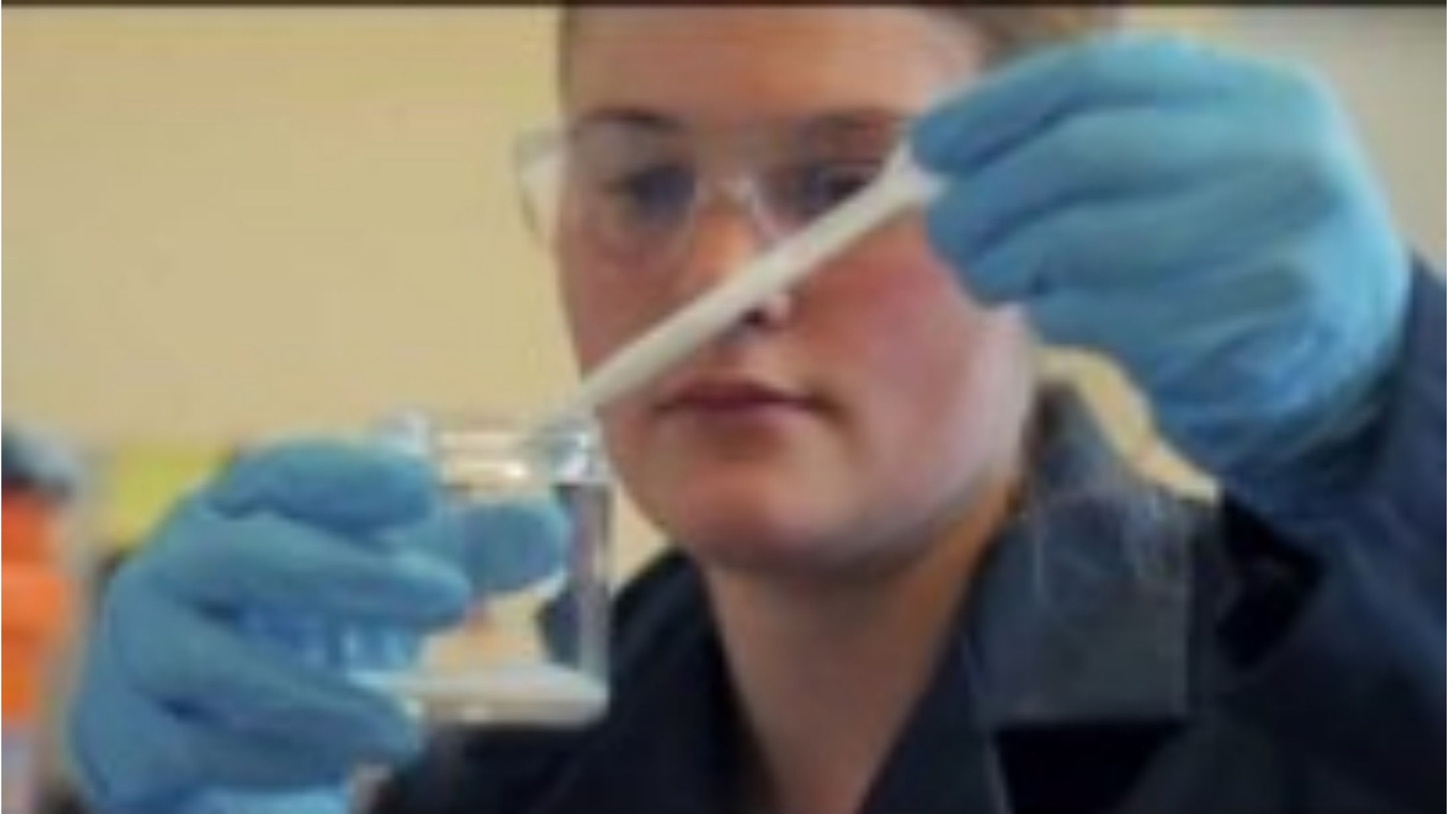
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ING CARB...

ACCESSIBLE

SPORT GO...

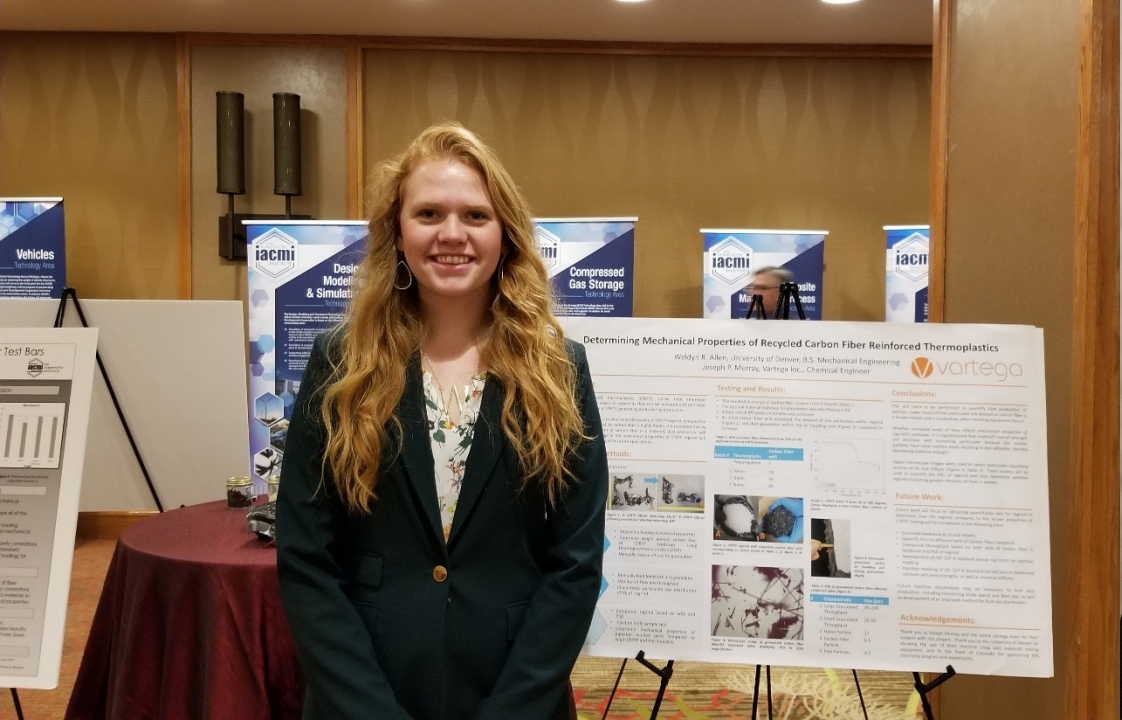
# IACMI Interns



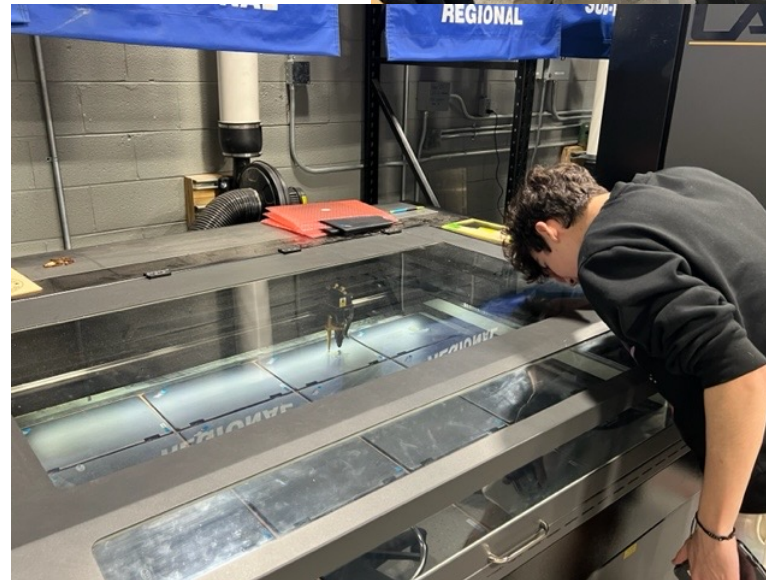
# Workforce Development Success

**Kylie Van Aken – Quality Manager**  
IACMI Intern 2018





# Wildcat Manufacturing



## 6.20 Closing the Loop on Automotive Carbon Fiber Prepreg Manufacturing Scrap



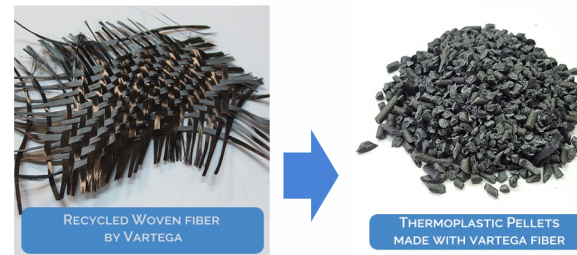
- **Challenge:** Carbon fiber has found limited use in automotive applications due, in large part, to the high material cost and the labor-intensive nature of typical composite manufacturing processes.
- **Approach:** Vartega Inc has developed a chemistry-based recycling process for uncured carbon fiber prepreg manufacturing scrap. Recycled carbon fiber can be made available at lower cost than virgin fiber. In addition, the discontinuous form of recycled material is suitable for higher throughput manufacturing processes such as injection molding.
- **Impact:** *Low-cost recycled carbon fiber will aid in reducing overall CFRP cost and embodied energy while substantially increasing composite recyclability and reducing the prepreg scrap waste stream. Low-cost recycled carbon fiber will be utilized in vehicle lightweighting applications to improve fuel economy and reduce emissions.*

**Team:** Vartega, Michelman, CSM, UDRI, ORNL, UTK, MSU, with Plasan, Ford and BASF as sponsors

**Technical Area:** Material and Process

**Type:** Technical Collaboration

**Budget:** \$1,0447,560 (\$644,260 industry)

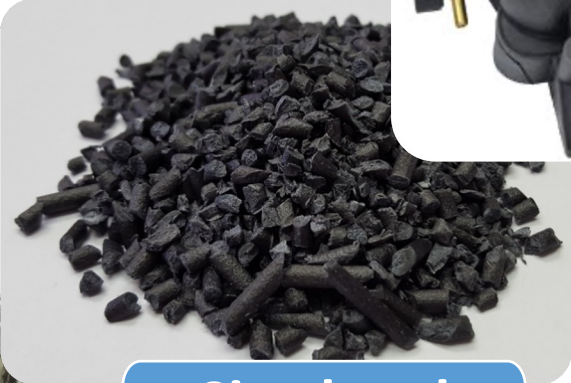




# Injection Molding of an Automotive Part



Injection molded part  
*(to be selected)*



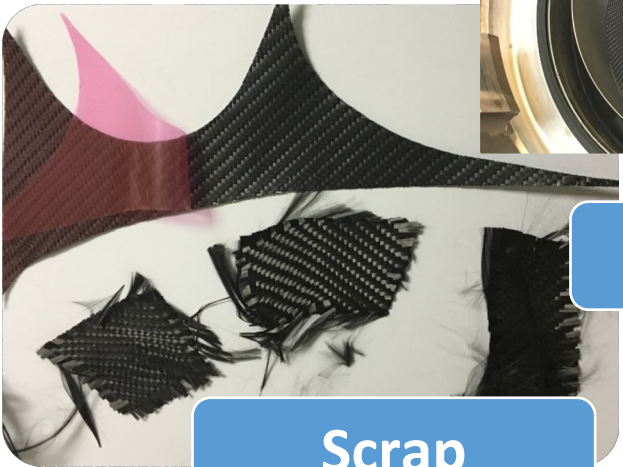
Sized and compounded



Size Reduced



Recycled



Scrap

- Recycling efficiency
- Sizing development
- Material characterization
- Compounding optimization
- Molding parameters
- Process repeatability



**PLASAN**  
CARBON COMPOSITES



 **BASF**  
The Chemical Company



 vartega

**MICHELMAN**<sup>®</sup>



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 **OAK RIDGE**  
National Laboratory

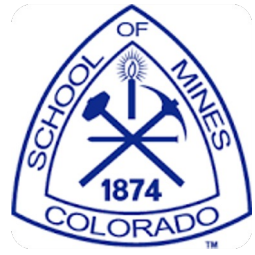
**UDRI** UNIVERSITY  
of DAYTON  
RESEARCH  
INSTITUTE



# A3WC8 seatback



# Acknowledgements



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  - Kenneth Kort
  - Ravi Deo



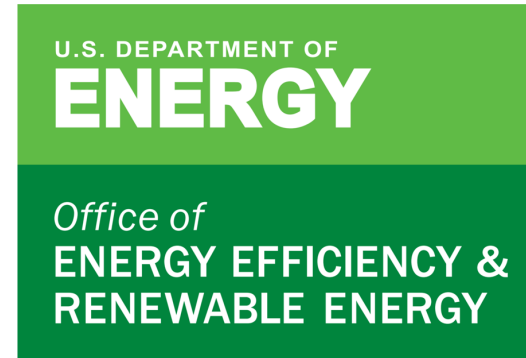
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# Acknowledgements, cont.



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# New Facility in 2023



- Pecos Logistics Park in Denver, CO
  - 82k sqft
  - 2,000 MT per year by December 2023
  - Additional 4,000 MT per year planned for 2024
  - Close to light rail
  - Will be powered by renewable energy



# Open House

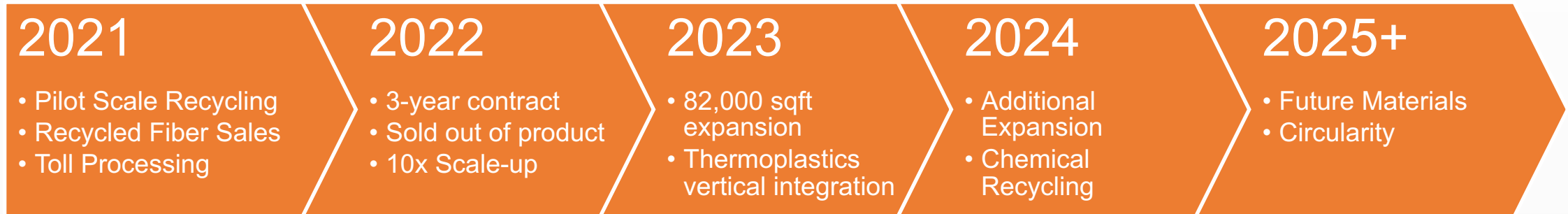


# Ribbon Cutting

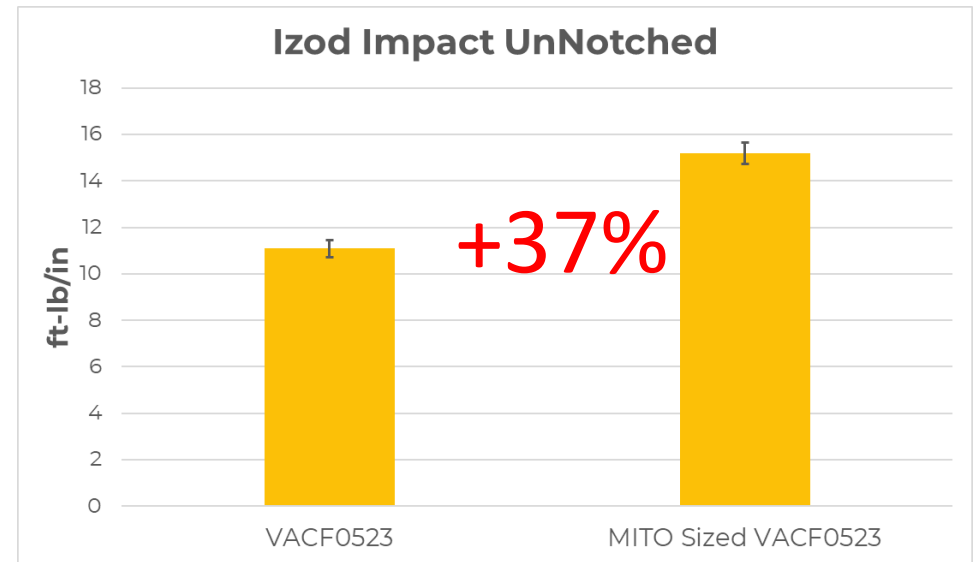
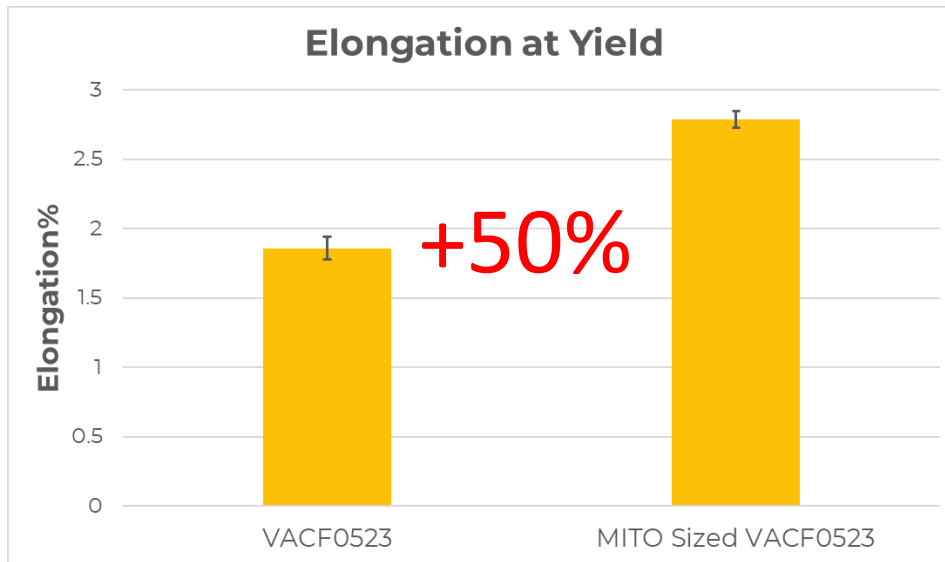
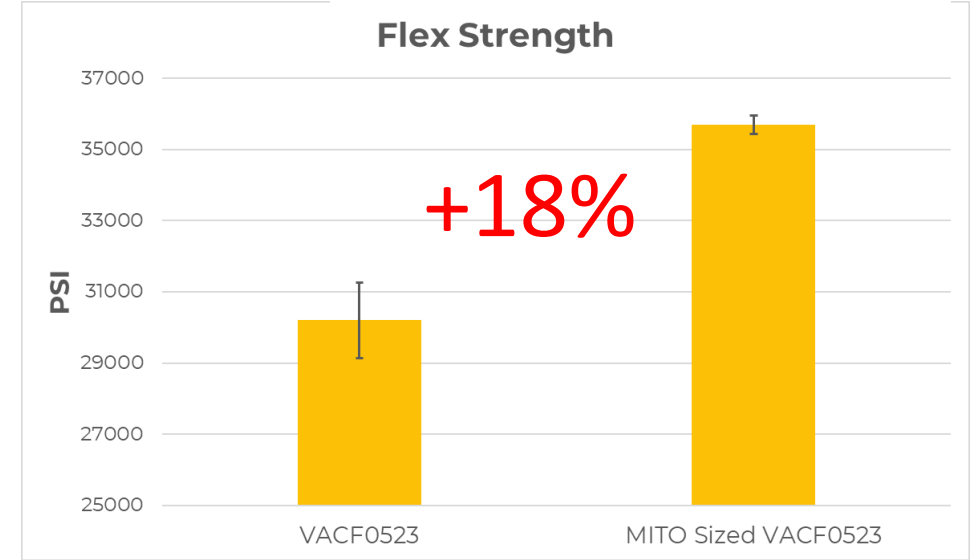
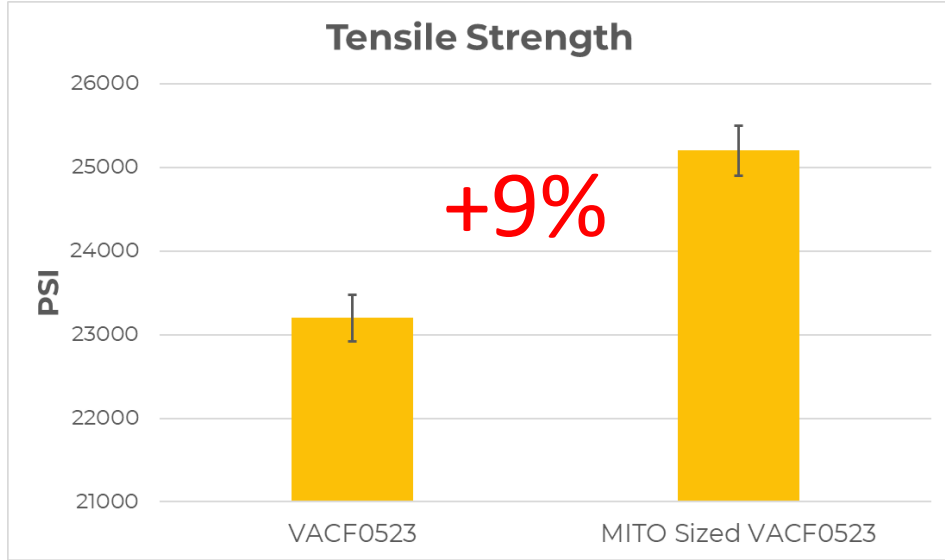




# Trajectory



Pathway to a prosperous future by helping our customers achieve their economic and sustainability goals



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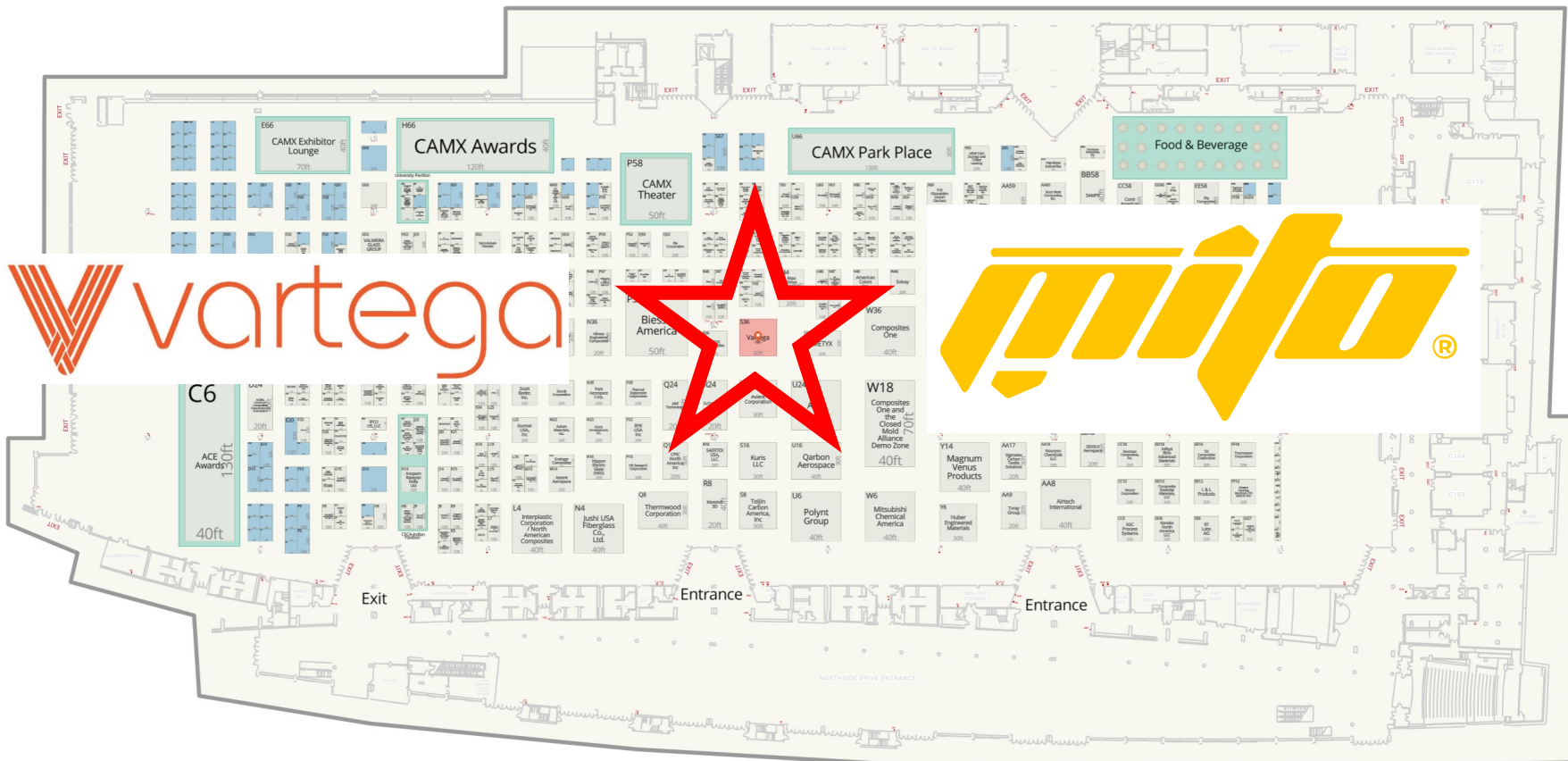
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## SHARED BOOTH EXHIBITORS (2)

Vartega (S36)

MITO Material Solutions (S36)



# SOLVING THE WORLD'S TOUGHEST ADVANCED MATERIALS RECYCLING CHALLENGES

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