Carbon Fiber Technology Facility

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Oak Ridge National Laboratory
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CFTF: An Unique Open Access R&D facility at ORNL

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

2011

- $35 million DOE investment under ARRA
- 42,000 sf facility with 390-ft. long processing line. Flexible unit operation configuration
- 25 tons/yr of fiber from multiple precursors in various forms

2012

- Facility occupancy
- Equipment installation complete
- Start-up testing and commissioning

2013

- Facility fully operational **ahead of schedule** and **under budget**

U.S. DEPARTMENT OF ENERGY | Advanced Manufacturing

Project Objective

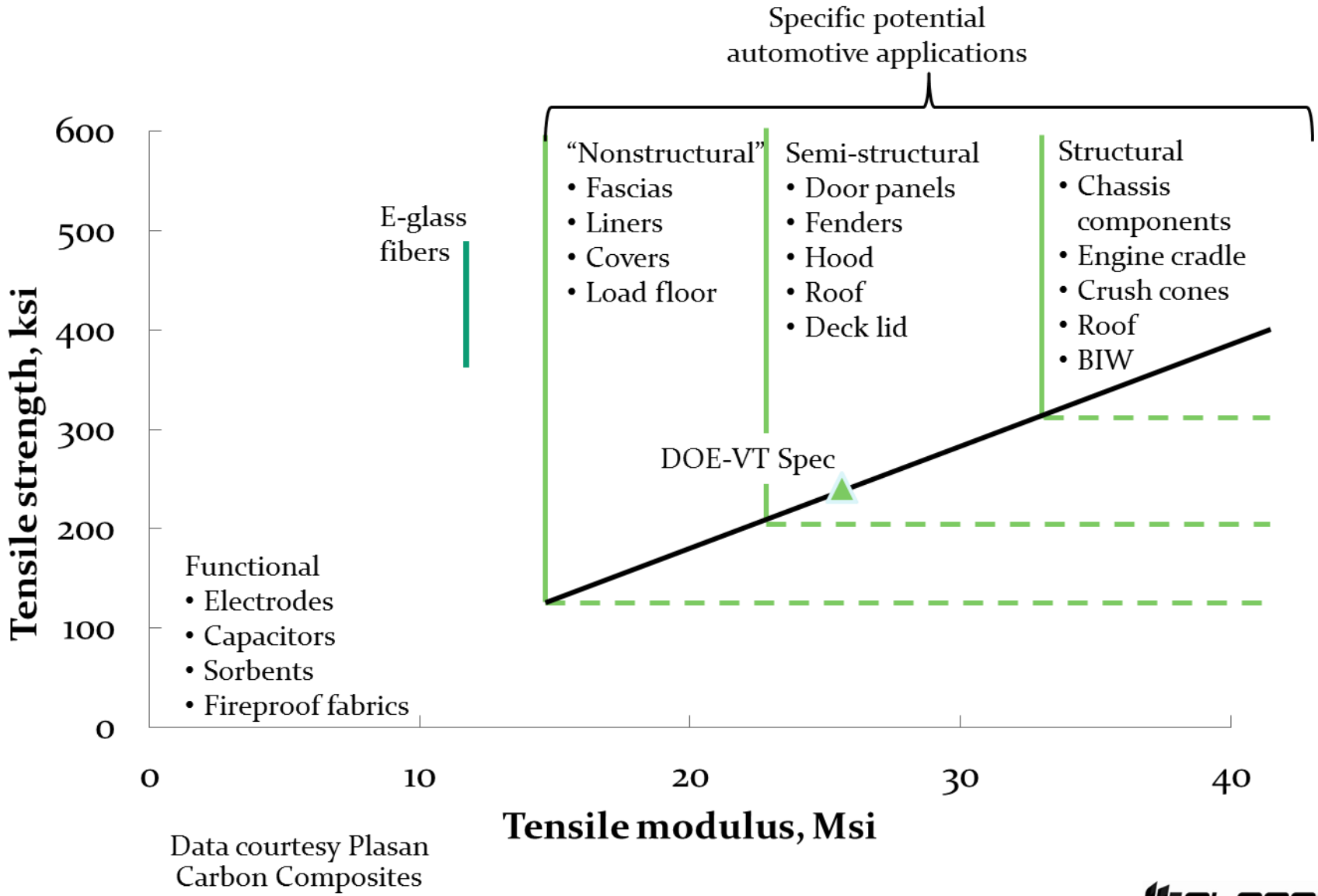
- Demonstrate carbon fiber production using lower-cost precursor materials at semi-production scale.
- Produce and make available low-cost carbon fiber in sufficient quantity to enable evaluation and market development for expanded commercial application of carbon fiber composites.
- Support development of domestic commercial sources for production of low-cost carbon fiber.

Technical Approach

- Identify and develop sources for low-cost precursors
  - Textile polyacrylonitrile (PAN) aka acrylic fiber.
  - Polyolefin
  - Lignin
- Develop processing methodologies to convert low-cost precursors to usable carbon fiber.
- Solicit industrial composites supply chain to evaluate the resultant carbon fiber in their manufacturing processes and help develop market pull.
- Engage and support industrial partners to develop processing methodologies to support investment decisions for new domestic low-cost carbon fiber production capacity.

The Carbon Fiber Technology Facility (CFTF) team has many years combined commercial carbon fiber manufacturing experience and ORNL has been engaged in carbon fiber conversion R&D for nearly 2 decades.

Measure of Success



Data courtesy Plasan Carbon Composites

PLASAN CARBON COMPOSITES

Project Management

FY 2015 Milestones

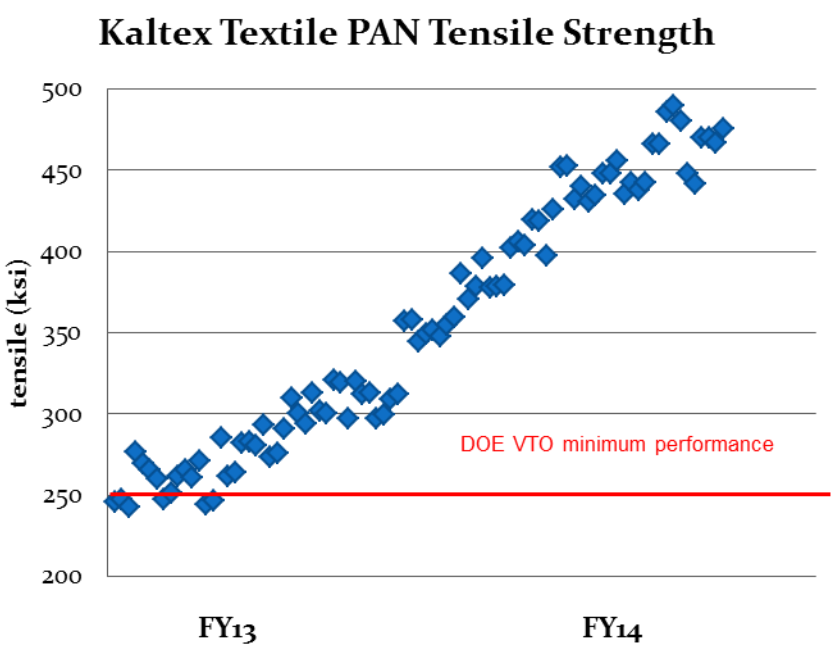
Milestone	Outcome
Execute CRADA to use CFTF to support domestic commercial CF source	CRADA SOW under development.
Develop technique to split large textile tow into multiple smaller tows	Limited success in house. Working with Kaltex to split tow at precursor facility.
Demonstrate 2X increase in throughput for large tow textile carbon fiber	Successfully completed.
Demonstrate production of carbon fiber with a minimum 400 ksi tensile strength and 25 msi modulus from a second source of low-cost precursor.	Preliminary results: 244 Ksi & 29 Msi with new source of textile acrylic fiber. Work ongoing.
Perform continuous 2-week run to demonstrate yield and consistency	Successfully completed. Nameplate capacity and property targets exceeded.

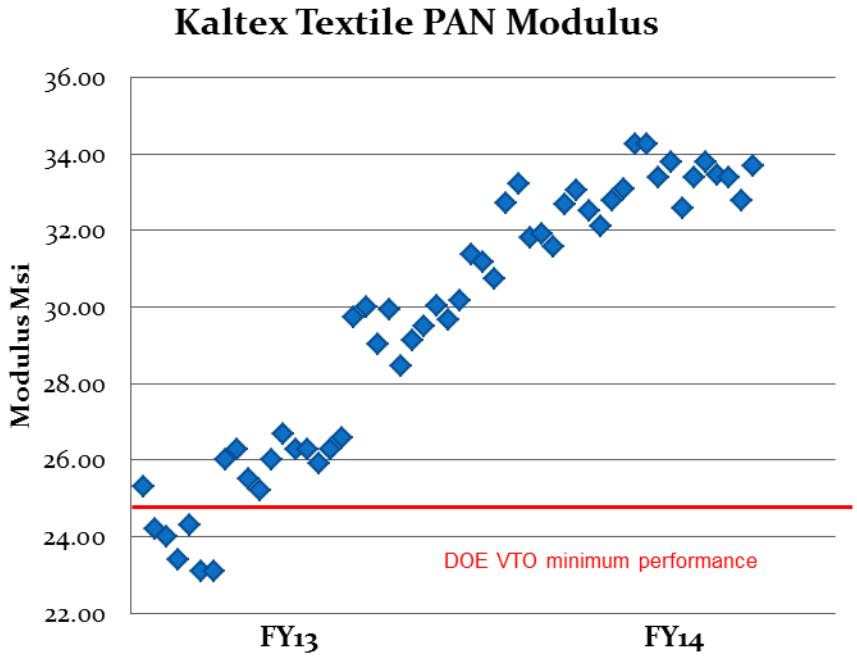
Budget

CFTF is jointly funded by the Advanced Manufacturing Office and Vehicle Technologies Office

	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017
AMO and VTO	$6.2 M	$6.2 M	$5.0 M	$4.5	$3.5
Project and Other				1.5	2.5
Total	$6.2 M	$6.2 M	$5.0 M	$6.0	$6.0

Results and Accomplishments





ASTM D-4018

Results and Accomplishments

Two week baseline run to establish line consistency, scrap rate, and yields

CFTF B24 Two-week Continuous Production Run 2/22/2015 - 3/8/2015 Lot Numbers: PE0241150203 - PU0241150301	
Precursor	
Precursor Input after Zone 4 at S/P - begin production (kg)	3036.62
Start up Precursor Waste (kg)	235.68
Shutdown Precursor Waste (kg)	101.63
Total Precursor Waste (kg)	**337.31**
Carbon Fiber	
CF Tubes (kg)	1267.03
Waste CF (kg)	26.48
Total CF Produced (kg)	**1293.51**
Production Hours/Rates	
Total Hours from Z4 at S/P - begin production	332.5
Total Hours "off series"	8.4
Total CF Production Hours	**324.1**
Total Precursor Throughput **(kg/hr)**	8.1
Total CF Produced **(kg/hr)**	4.0

2% In-Process Waste

Met Design Throughput

Lot Analysis Information	Tensile Strength (ksi)	Standard Deviation	Tensile Modulus (msi)	Standard Deviation	Elongation (%)	Standard Deviation	Linear Density w/size (g/m)	Standard Deviation	Size (%)	Standard Deviation	Density (g/cc)	Standard Deviation
PE0241150203	500.0	48.8	34.1	0.4	1.47	0.14	1.52	0.03	1.09	0.23	1.750	0.003
PU0241150301	534.8	27	34.1	0.4	1.57	0.08	1.49	0.06	0.94	0.23	1.752	0.007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