



Panelist: Dr. Nabil Nasr, Director of the Golisano Institute for Sustainability, Rochester Institute of Technology, and CEO of REMADE Institute





OVERVIEW
Nabil Nasr CEO



ASA/AFR 2017 Conference
JULY 10, 2017

Golisano Institute for Sustainability

Over 25 Years of Applied Research & Industrial Applications



Founded 1992



Founded 2007



Center for Remanufacturing & Resource Recovery

Center of Excellence in Sustainable Manufacturing

Center for Sustainable Energy Systems

Center for Sustainable Mobility

NYS Pollution Prevention Institute

NanoPower Research Laboratories

Clean Technologies
Intelligent Testing & Diagnostics
Design for Remanufacturing
Logistics & Policy

Sustainable Design
Life Cycle Environmental and Economic Assessment
Metrics & Policy

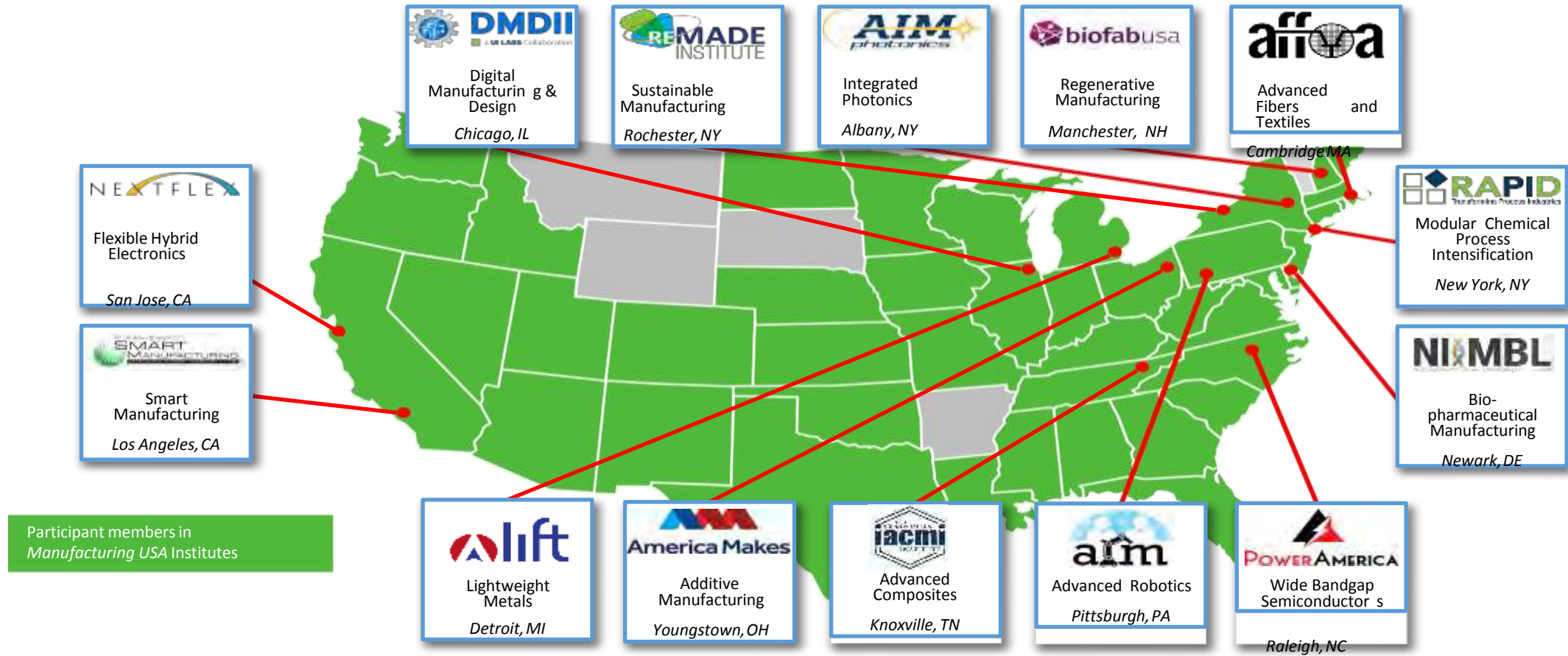
Renewable Energy Building Efficiency
Waste to Energy
Next Generation Grid Smart Cities

Fuel Cells Hybrid and Electric Vehicles
Bio-Fuels Technologies
Manufacturing and End of Life of Mobility Systems

Reduction in Toxic Chemical Use
Reduce Manufacturing Waste and Emissions
Improved Efficiency in Raw Matls, Energy, and Water

Development & characterization of nano-materials for energy conversion & storage

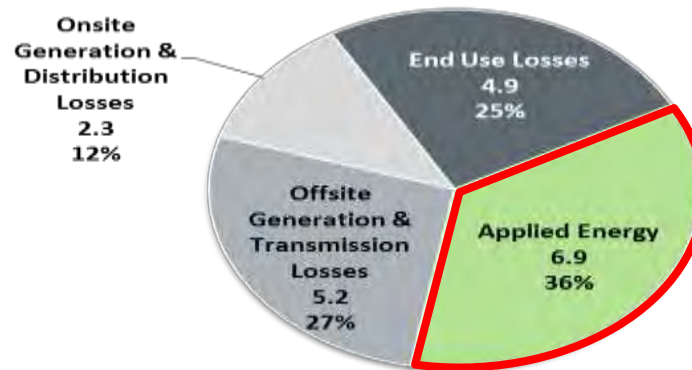
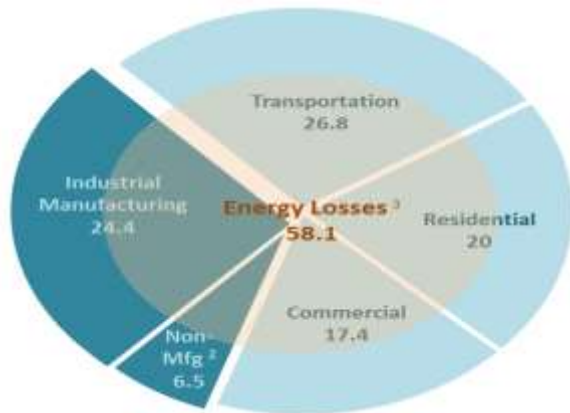
Manufacturing USA® Today



REMADE Institute Mission

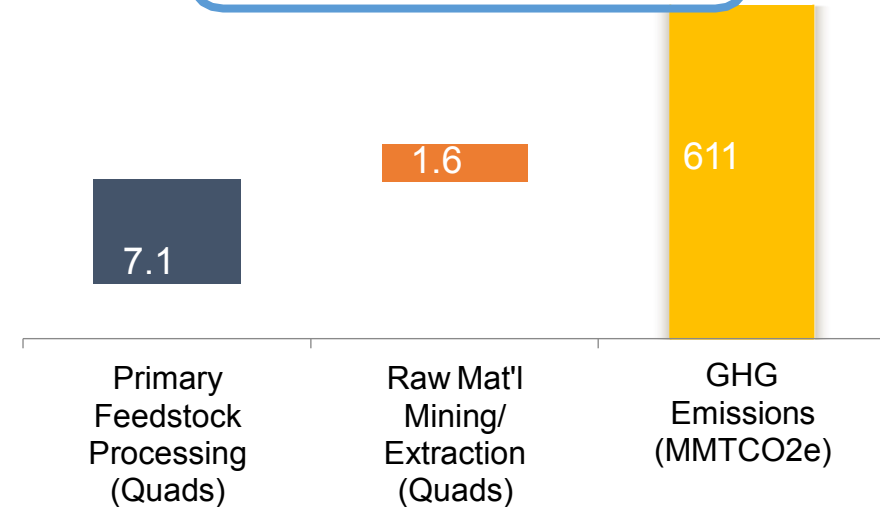
By focusing our efforts on addressing knowledge gaps that will eliminate and/or mitigate the technical and economic barriers that prevent greater material recycling, recovery, remanufacturing, and reuse, the REMADE Institute seeks to motivate the subsequent industry investments that will be required to complete technology development and deploy these technologies across the U.S. manufacturing eco-system.

U.S. Energy Consumption by Sector (2012) - 95.1 Quads¹ (minus feedstocks) – 19.2 Quads **Mfg Energy Consumption**



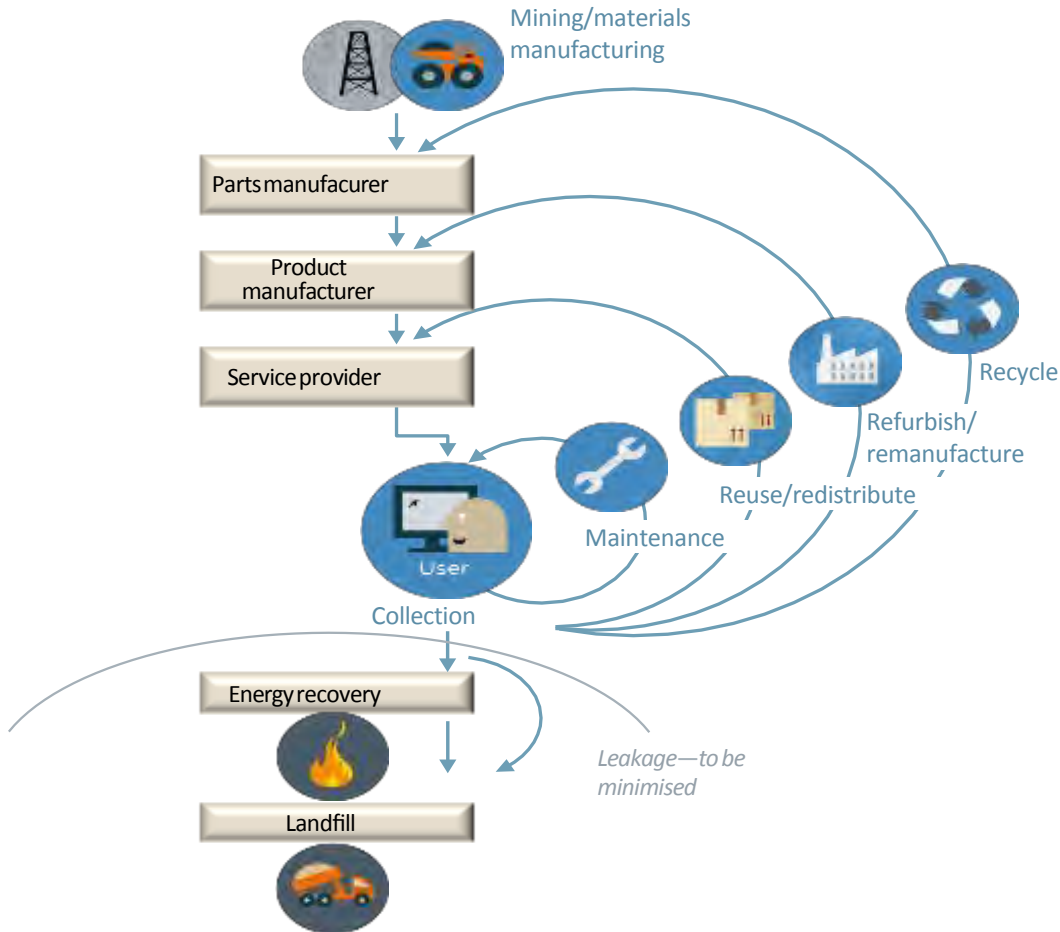
Energy Losses⁴ – 12.4 Quads

Polymers, Metals, Fibers, & e-waste



Technical Innovation – Today's Paradigm

Silos, Low Penetration, Slow Progress



Ellen MacArthur Foundation

} Systems Analysis

- } No comprehensive lifecycle U.S. data sets for polymers and fibers

} Recycling

- } Typical recycling rate < 28%, challenges with separation and recovery

} Remanufacturing

- } Domestic remanufacturing penetration rate is ~ 2%

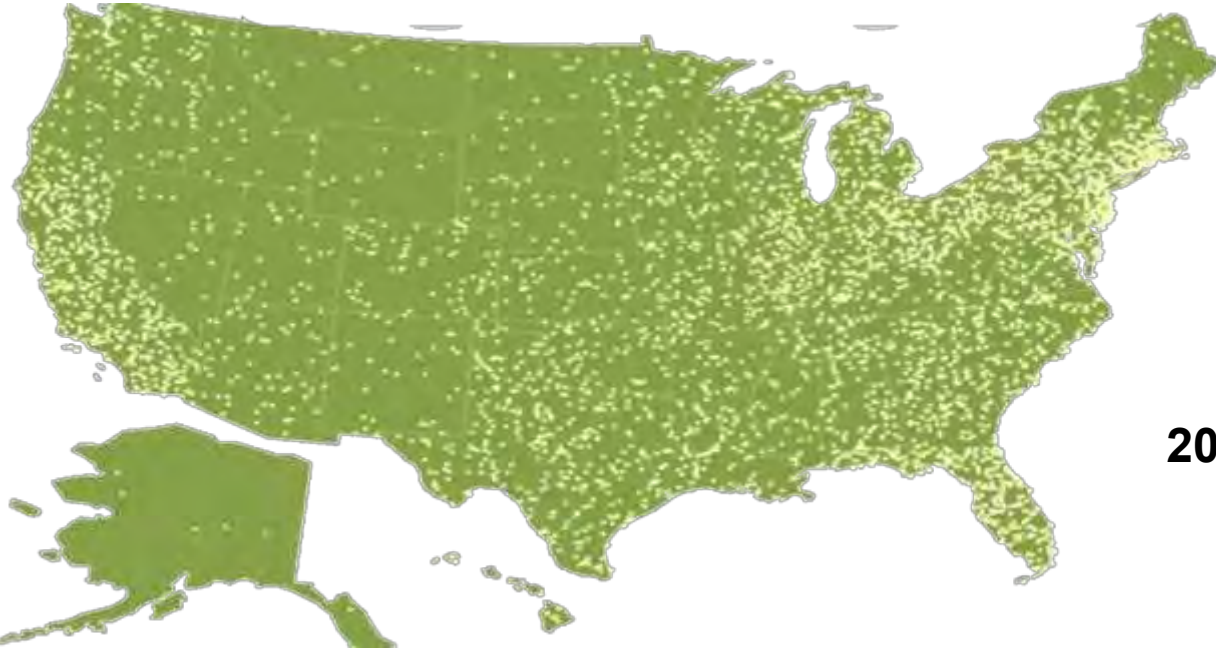
} Design

- } Current design tools do not address reuse/remanufacturing considerations

} Manufacturing

- } Manufacturing scrap treated as waste, often down-cycled.

Remanufacturing



Remanufacturing: Manufacturing process that restores used or EOL products to like new condition.

Typical material reuse efficiency >50% Recovers embodied energy of conversion Provides economic motivation for recovery

2012 Study by US Intern. Trade Commission

- \$43B US Market, **\$12B in exports**
- 2% intensity in primary sectors
- Employment: 180,000
- SME roughly 25% of total revenues

Reman Industry Sectors

Aerospace



Automotive



IT Equipment

Consumer Products



Locomotive Systems

Electrical Apparatus



Machinery

Furniture



Medical Equipment

Heavy Duty/
Construction Equipment



Restaurant Equipment

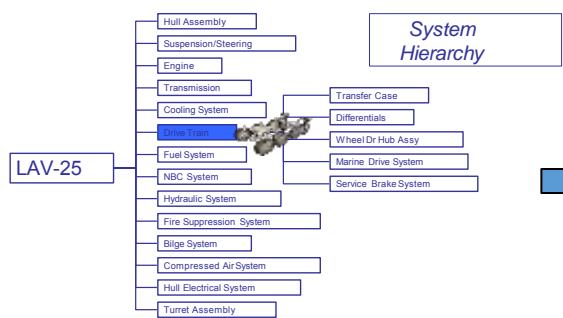
Imaging Products &
Consumables



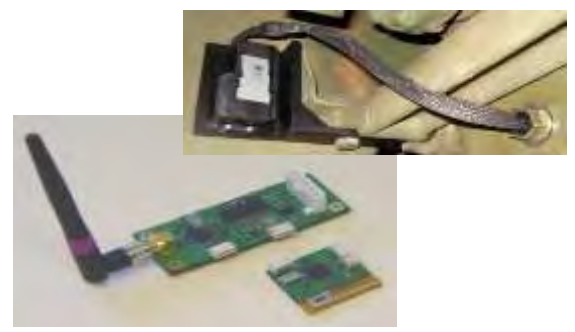
Tires



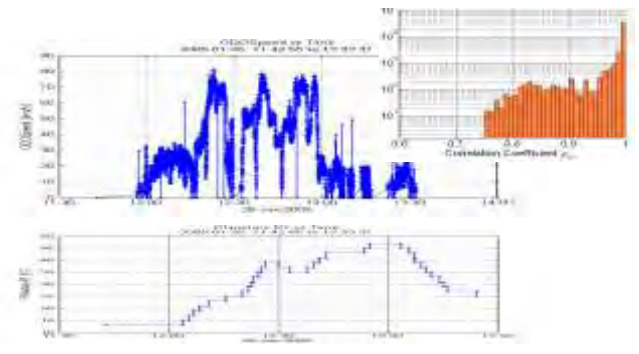
Asset Health Monitoring Technologies



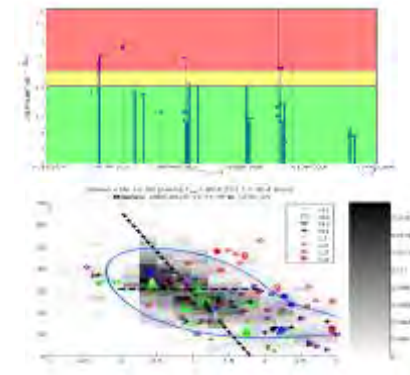
Systems Analysis
FMEA/RCM



Sensor Application and Design



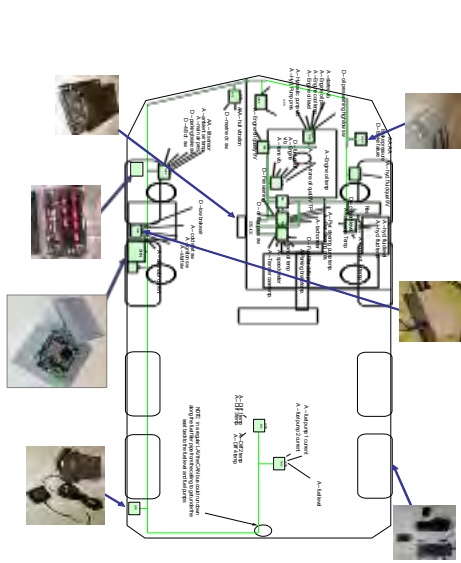
Signature Analysis



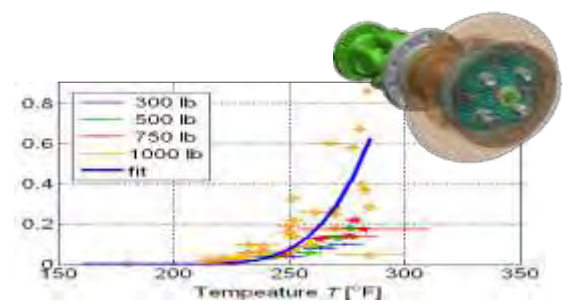
Anomaly Detection
Condition Assessment



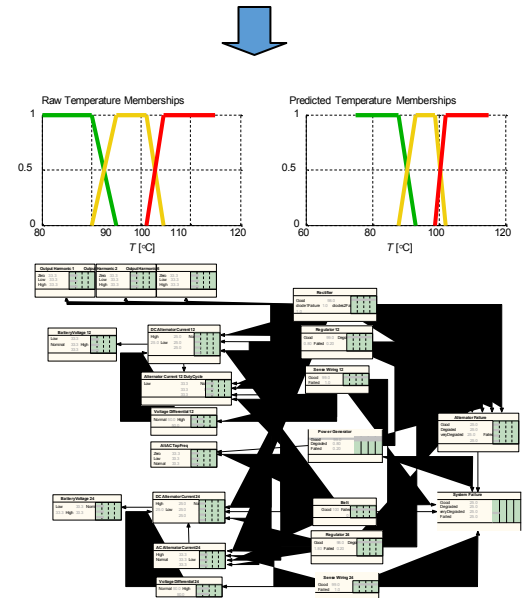
Decision Support



Application & Integration

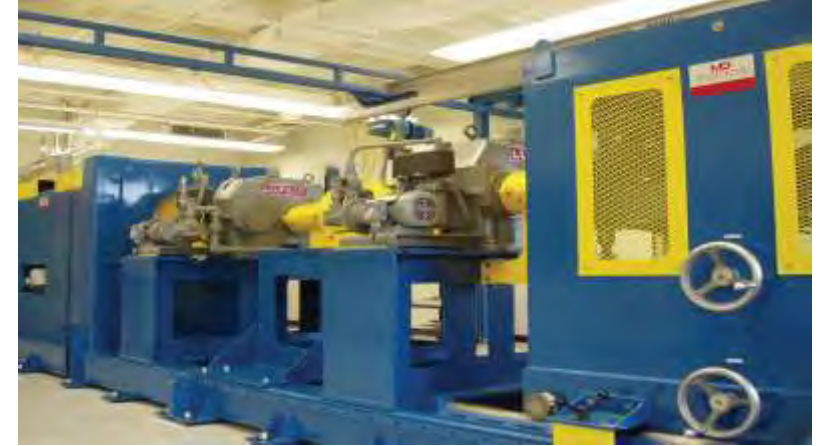


Prognostics

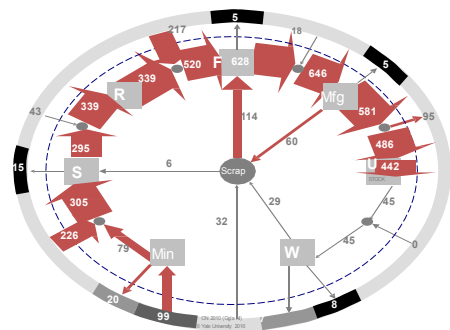


Diagnostics

Reman Process Development



Development of Widespread Technologies



Information Collection & Standardization Tools¹



Design Tools for Reman, Recycling, Disassembly,



Rapid Sorting of Material Streams



Separation of mixed materials



Removal of Trace Contaminants

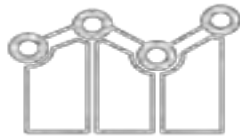


Reprocessing of Recovered Materials

Directed towards innovations that will

- } Dramatically reduce the energy required to manufacture key materials, and
- } Improve overall manufacturing energy efficiency through increased material reuse, recycling and remanufacturing.

5 TECHNOLOGY FOCUS AREAS



SYSTEM ANALYSIS INTERGRATION

Data collection, standardization, metrics, and tools for understanding material flow



DESIGN FOR REUSE & DISASSEMBLY

Design tools for material utilization/reutilization, design for reman or disassembly



MANUFACTURING PROCESSES

Efficient use of materials, near net shaping, and use of secondary feedstock without loss of quality



REMANUFACTURING /EOL REUSE

Efficient and cost effective technologies for cleaning, component restoration, condition assessment, reverse logistics



RECYCLE & RECOVERY

Rapid gathering, identification, sorting, separation, contaminant removal reprocessing and disposal

5-YEAR INSTITUTE GOALS

- Reduce primary feedstock consumption in manufacturing by **30%**
- Achieve **25%** reduction in embodied energy of targeted materials Achieve cost parity for secondary materials
- Improve energy efficiency of secondary material processing by **30%**
- Increase size of remanufacturing industry by **100%**

4 MATERIAL CLASSES

Metals



Polymers



E-waste



Fibers



REMADE Institute Members

26 LEADING UNIVERSITIES

44 INDUSTRY LEADERS & 26 ASSOCIATIONS

7 NATIONAL LABS

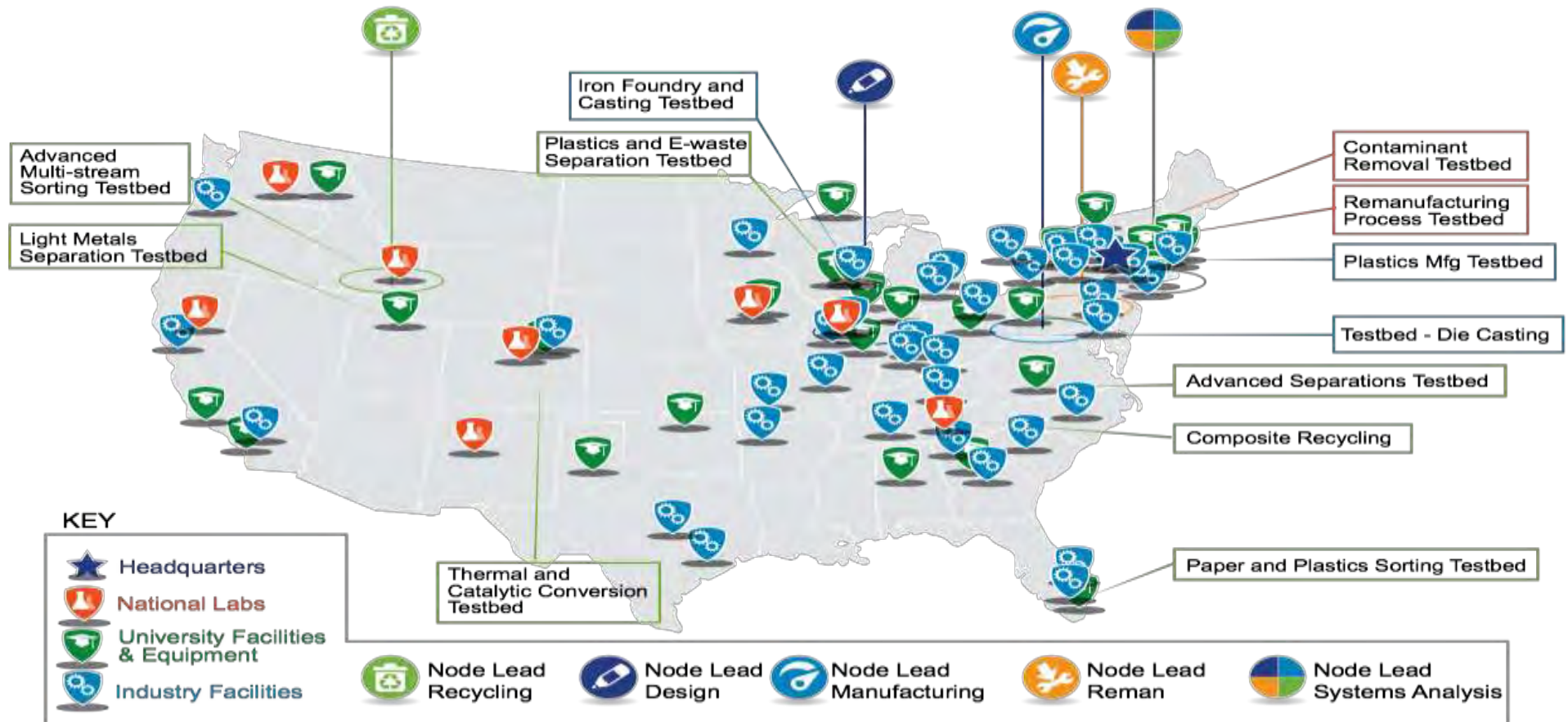


ring Innovati

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Using Testbeds to Aid Technology Transition

- 12 geographically distributed testbeds* provide mechanism to scale up early stage applied R&D



* Enable feasibility and validation in a relevant environment and are applicable to the four material classes and four material lifecycle stages targeted by REMADE.

How Institutes Create Value for Members

Leveraged R&D

- A legal framework for multi-party collaboration to solve common problems and challenges
- Potential for sharing R&D project costs/risk between project partners
- Access to government funds to pay for company projects consistent with Institute investment plan

Project Outcomes

- Program management to assure timely and efficient execution
- License to use all Institute-funded IP for business and R&D uses for Tier 1 Members
- License to project-specific IP and other IP only for internal R&D uses for Tier 2 Members

Access to wide range of sources of innovation

- Broad and diverse membership
- Members at the forefront of innovation in their industries
- Broad set of academic and national labs expertise
- New ecosystems to tap for proprietary needs (industry funded)

Panelist: Dale Smith, Strategy Manager, Advanced Materials & Fabrication, Product Development for Boeing Commercial Airplanes





Panelist: Tim Zemanovic, President of Jet Yard, LLC



What are your day-to-day challenges for aircraft recycling and how do they affect the environment and human health?



Q & A





Contact AFRA as your resource for information on:

- Aircraft Dismantling & Recycling
- Industry Best Management Practices
- Audit and Accreditation Services
- Industry Contacts/Networking

Aircraft Fleet Recycling Association (AFRA)

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