Annual Member Meeting 2020

A New Decade.
A New Outlook on Manufacturing.

Howard Goldberg, COO
CESMII Anti-Trust Statement

As participants in this meeting, we need to be mindful of the constraints of antitrust laws. There shall be no discussions of, agreements or concerted actions that may restrain competition. This prohibition includes the exchange of information concerning individual prices, or any other competitive aspect of an individual company’s operation. Each participant is obligated to speak up immediately for the purpose of preventing any discussion falling outside these bounds.
Agenda

1. Power of our Network
2. Current State and Offerings of our SM Innovation Centers (SMICs)
3. Plans for Affinity Groups 2.0
4. Plans for Building our Network of SMIC’s
Power of CESMII’s Network
Accelerate the Democratization of Smart Manufacturing

Enable frictionless movement of **information** – data and context – between **real-time** operations and the people & systems that can **create value** for your organization.

- **Technology**
  Platform infrastructure
de facto standards for industry

- **Knowledge**
  Data-driven culture, education
citizen technologist

- **Innovation**
  Business practices
  safe harbor collaboration
National Presence – CESMII’s Original Network
Engage Manufacturing & Supply Chains where they are - local presence, test beds, training...

- UCLA
- TAM
- NC
- SU
- RPI
- HQ & SM Innovation Center
- Current SM Innovation Centers (SMICs)
- SMIC Satellites
Power of the Network: Key Assets & Capabilities

• $22.3M in awarded Research Projects (see Note)
• $4.4M in RFP’s for Research Projects (see Note)
• SM Innovation Platform: first-of-its-kind vendor agnostic OT/IT integration and currently represents $5M/year of partner contributions (see Note)
• 160+ individuals/year involved in EWD training programs
• 15+ industries represented
• Many of the Fortune-500 companies, leading SMM’s and top universities
• Access to several supercomputing networks

Note: Free access to Institute IP and SMIP for internal use (R&D testing and evaluation) and non-production purposes
Power of the Network of Networks: COVID-19 Response

- Honeywell is adding a new N95 mask plant in Phoenix
- ExxonMobil is maximizing its supply of IPA and other chemical products used in making hand sanitizers and other essential tools
- ExxonMobil helps accelerate the production of masks.
- NCSU - Nonwovens Institute ramps up to create mask filters and masks for health care workers
- Rensselaer Polytechnic Institute offers supercomputing capabilities to battle COVID-19
- LA Mayor’s office reached out to Jim Davis for connection to UCLA chemistry expertise required for retooling a local distillery to produce hand sanitizer
- Open Source Medical Guide from our MEP partners
- Goodwill SoCal Best Practice Guide for Manufacturers
Evolution of CESMII Network of Networks
Transitional from Regional Manufacturing Centers to Smart Manufacturing Innovation Centers

• **Previously: Regional Manufacturing Center (RMC)**
  • Geographic coverage, no industry focus
  • Center of Excellence + Membership Services
  • Members assigned to RMC’s based on regional location

• **Now: Smart Manufacturing Innovation Center (SMIC)**
  • Focus is based on industry vertical (i.e., steel, automotive, chemical processing, discrete manufacturing, etc.) or a technology horizontal (i.e. artificial intelligence, 5G, etc.).
  • Center of Excellence + Membership Services
  • Each SMIC will have an instance of the SM Innovation Platform, integrated with real manufacturing assets
  • Members are free to chose which SMIC(s) to engage with; may change over time as their SM journey progresses

• *In April, transitioned to monthly, national membership call format*
Current State and Offerings of CESMII
SM Innovation Centers
Smart Manufacturing Innovation Center Overview

Lighthouse/beacon for SM Industry Engagement

• **Core Requirements**
  • Deep relationships with industry
  • Vertical industry focus or horizontal technology focus
  • Strategic focus on Smart Manufacturing – both research and practical industry engagement
  • Access to functioning manufacturing assets
  • Understand federal government process and funding
  • Potential for hosting Application projects and EWD programs
  • Partner with a local System Integrator with similar strategic alignment & focus
  • Lead Affinity Group(s) for relevant industry or technology focus areas

• **Create simple operations framework and funding to startup new SMICs**
  • Ensure our SM Platform & Applications have industry-relevant content/demos
  • Build better relationships with local members
  • Ensure robust distribution network for demonstrating SM technologies and delivering segmented EWD training

Leverage SMICs for existing strengths & build on them; CESMII takes responsibility for other necessary capabilities
Value of the SMIC Network-of-Networks

- SMICs are interlinked throughout the U.S. to perform daily activities of the Institute for local and national opportunities and challenges.

- Provide access to small, medium and large businesses by leveraging local relationships and directly engaging with the manufacturing community in each region.

- Leverage the diversity and breadth of resources, expertise and capabilities within and across regions to create a powerful force of “on the ground” innovation, technology transfer, SM industry awareness, and workforce development.
Current SMIC Network Highlights

- North Carolina State Univ. (NCSU)
- Western SMIC
- Rensselaer Polytechnic Institute (RPI)
- Texas A&M Univ (TAMU)
NCSU-SMIC: Building the Smart Manufacturing Community
Powerful Educational Platforms to Promote Active and Immersive Learning for Workforce Development

SMIC-Nonwovens: Polymeric Materials
SMIC-BTEC: Biopharmaceuticals
SMIC-Paper: Pulp & Paper
SMIC-AM: Advanced Mfg

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NCSU-SMIC: Powerful Educational Platforms to Promote Active and Immersive Learning for Workforce Development

Simulated cGMP Labs

Hands-on Automation Training

Training for Chromatography Skids

Visual learning on process control & monitoring
Additional Information: NCSU SM Innovation Center and SM Innovation Platform

NCSU SM Innovation Center Announcement
https://www.cesmii.org/cesmii-nc-state-smic-announcement/

A Vision for the SM Innovation Platform (SMIP)
https://www.youtube.com/watch?v=GDMLm1TmBjk&t=

The SMIP in Action – A Technical Overview
https://www.youtube.com/watch?v=j8fymUL55xk
Western SMIC – Satellite Network

**Atollogy, Inc**
Silicon Valley CA

- Smart manufacturing Platform Demo Center
- Machine Vision based Digital Twinning
- Sensor based asset tracking
- Real-Time Visual Analytics
- Scalable cloud solution that includes a cellular connection that fits small to large operations
- CESMII Roadmap Projects:
  - Smart Connected Workers in Advanced Manufacturing

**Oregon State University**
Corvallis OR

- Advanced Technology and Manufacturing Institute (ATAMI): capabilities in conventional & laser machining, additive manufacturing, industrial robotics, precision machining, and mechatronics.
- DOE Industrial Assessment Center (IAC): have visited over 500 Northwest manufacturers in identify opportunities to improve energy productivity.
- Center for Applied Systems and Software (CASS) and the Open Source Lab (OSL): provides software development, testing and cloud hosting solutions.

**El Camino Community College**
Torrance CA

- Business Training Center WFD: customized training in all areas of manufacturing
- Network CA Community Colleges: 115 colleges, 2.1M students, 72 centers, $13.4B facilities
- CESMII Roadmap Projects:
  - Smart Mfg Workforce Dev. Model
Rensselaer Polytechnic Institute – SMIC

**Rensselaer Highlights**
- No. 6 ranked Engineering School in U.S.
- Extensive Research Enterprise, >$100M
- Signature Research Thrust: Energy, Environment and Smart Systems
- 32 Research Centers, 161 Ph.D.’s awarded, 1213 Grad students
- Key faculty expertise:
  - Supercomputing, AI, ML, Analytics
  - Process Modeling, Simulation
  - Model Predictive Control
  - Supply Chain / Supply Chain Resiliency
  - Automation, Robotics
- Current Industry verticals:
  - Discrete
  - Chemical Process

**CESMII Roadmap Projects**
- RPI/IBM: Bayesian Deep Learning Decision-Making
- Texas A&M/Linde: Air Separation Unit Operation Analytics/Modeling
- ArcelorMittal: Steel Caster Analytics/Modeling

**Key Partner Centers**
- Manufacturing Innovation Center (formerly CATS) – advanced manufacturing, automation, robotics and control
- Center for Computational Innovations (CCI) – AIMOS 8 PetaFlop IBM Supercomputer
- Scientific Computation Research Center (SCOREC) – advanced simulation modeling
- Lighting Enabled Systems & Application (LESA) – intelligent connected systems
- Institute for Data Exploration and Applications (IDEA) – cognitive computing, analytics, AI

**External Resource Partners**
- Regional MEP Network – NY, CT, MA, OH, PA, NJ, RI, IA
- New York Workforce Development Institute
- SUNY Community Colleges, Connecticut Community Colleges

**Manufacturing @ The MILL**
- Manufacturing Innovation Learning Lab (The MILL) – educating next-gen manufacturing innovators
- >10,000 ft² Test Factory Platform and Highbay
- Dedicated Digital Manufacturing Center
- Graduate-level Manufacturing Certificate offered
- Perennial award-winning manufacturing student design teams
All MILL Assets to be Integrated with CESMII SM Innovation Platform

**MILL Equipment**
- Haas VF 1 – CNC Milling Machine
- Haas OM-2 CNC Milling Machine
- Moore Nanotechnology Systems 350 UPL Lathe
- Hurricane Laser Cutter Category 4 Charley 80W
- Adept Cobra 800 SCARA Robot
- SONY Conveyor System
- Staubli RX 90 Robot
- Fanuc LR Mate, with Vision, Educational Training System
- Stratasys Dimension FDM Machine
- Stratasys UPrint FDM Machine
- Z-Corporation Z310 3D Printer
- B-9 Creator Stereolitography Printer
- Phenix Direct Metal Selective Laser Sintering 3D Printer
- Brown and Sharpe Gage 2000 CMM
- Faro Platinum Inspection Arm
- Arburg Allrounder 270c Injection Molder
- Arburg Allrounder 221k Injection Molder
- Battenfeld Injection Molder
- Formech 660 Vacuum Former
- Flow Mach2 Abrasive Water-Jet Cutter
- Sonitek S840 Ultrasonic Welder
- Sonitek TS500 Thermal Press
- Branson Ultrasonic Welder 2000 D
- Branson Ultrasonic Welder 2000 DT
- General Machining Equipment

**MILL Sponsors**

[Images of sponsors logos]
SMIC Overview of TEES at Texas A&M

**General & Expertise**
- Hosted by Texas A&M’s Energy Institute and the Texas A&M Engineering Experiment Station (TEES)
- SMIC located on College Station campus outside of Houston TX
- Texas A&M system represents 11 colleges, 8 agencies, 153K students, and $4.7B budget
- TEES represents $168M research, 1281 research projects and 167 industrial sponsors

**Expertise**
- CESMII Roadmap Projects:
  - Linde Air Separation Unit
- Current Industry verticals:
  - O&G processing and refining
  - Chemical processing

**Assets & Capabilities**
- Process modeling, simulation & optimization.
- Additive mfg processing
SMIC Value
Creation for
Membership

- Membership engagement and retention
- Workforce development and training
- Industry-focused SMIP and SM Marketplace innovation and adoption
- Industry-focused Roadmap and Project success & growth
- Consulting or Domain Expertise Services
- Affinity Groups centered around industry or technology
Plans to Improve and Make our Affinity Groups More Effective

CESMII Affinity Groups 2.0
Affinity Groups (AFGs)

- A group of CESMII members with an interest in a particular manufacturing sector vertical or a technology horizontal
- National in scope
- Examines the sector or industry challenge strategically
- Members bring their abilities, capabilities and interests to engage CESMII Resources & Strategies as needed to address the sector or problem
- An official venue to provide collective inputs to CESMII strategy & capabilities
- CESMII Members can participate in any AFG within the Institute
- Currently active AFG’s
  - Aerospace
  - Food Safety and Traceability
  - Small Medium Manufacturers (SMM’s)
Advantages of the Affinity Group Approach

- Provides clear view into how the SM Portfolio is (or should be) structured on an industry-by-industry basis vs. a project-by-project basis

- Allows CESMII to better align efforts to the Institute Roadmap and to track how the portfolio is evolving to meet member needs

- Encourages multi-regional participation to optimize development efforts; provides forum for collaboration of skills and expertise in a sector from the CESMII member network

- Maximizes opportunity to solve real SM problems for members within that industry sector
AFG 2.0 Proposed Improvements

• Improve ROI to members that contribute their time to AFG’s
• Improve the Affinity Group impact on CESMII’s value proposition across industry verticals
• More structured AFG formation and operation to ensure mutual ROI
  • New AFG formation to be approved by CESMII Business Standing Committee
  • AFG to have a written Purpose Statement that drives their agendas and activities
  • AFG to define Success Metrics
  • AFG leadership team to ensure sufficient industry engagement and CESMII admin support
  • Establish consistent cadence of monthly meetings
  • AFG meeting agendas, meeting minutes, and actions
  • Quarterly reviews with Business Standing Committee
Key questions to answered by the AFG Purpose Statement in the Context of Addressing Industry Challenges

• What are the most pressing SM-related business challenges that your industry faces?
• What new capabilities should be evaluated to address these challenges?
• Which operations (plant, enterprise, supply chain) are the most critical to monitor to ensure profitability, energy productivity and growth?
• What is the ‘current state’ of smart manufacturing in your industry? What is the desired ‘future state’ of smart manufacturing in your industry?
• What are the barriers to adoption of Smart Manufacturing?
• How can data be more effectively used as an asset?
• What are your workforce objectives related to smart manufacturing?
AFG 2.0 New Roles and Responsibilities

• **Leader and Co-Leader** – Collectively provide insights and focus on the needs and strategic importance of topics to be addressed; provides a starting point for team engagement
  - Prefer industry manufacturing leader and an industry thought leader/subject-matter expert
• **Members** – Bring insights from their respective industry; drive the AFG’s impact on CESMII’s strategy development, roadmap, and service offerings (SMIP, technology, EWD)
• **CESMII Facilitator** – Ensure alignment with CESMII focus, capabilities and updates; bi-directional input / VOC for industry requirements, roadmap development, etc.
• **CESMII Admin Support** – Facilitate meeting scheduling, logistics, maintaining meeting minutes and action items, and develop performance reports
AFG Measures of Success

• **Member Engagement**
  • # of active members involved in AFG
  • Results of annual AFG member satisfaction survey

• **Impacting CESMII Capabilities & Strategy**
  • Recommendations provided for potential future Roadmap / Application projects
  • Recommendations provided for potential future EWD projects
  • Recommendations provided for CESMII Roadmap
  • Recommendations provided for SM Innovation Platform / SM Profiles / SM Marketplace
  • Contributions to white papers, content pieces, or presentations generated by group

• **Industry Impact**
  • Quantify impact on addressing sector problem as per Purpose Statement
Affinity Group 2.0 – Next Steps

• Implement AFG 2.0 process with currently active groups
  • Aerospace
  • Food Safety and Traceability
  • Small Medium Manufacturers (SMM’s)

• Please send us your input/proposals for additional Affinity Groups

• Looking for volunteers for Business Standing Committee
Plans for Adding new Smart Manufacturing Innovation Centers
National Presence Through Smart Manufacturing Innovation Centers

Engage Manufacturing & Supply Chains where they are - local presence, test beds, training...

- Aligned around Industry Segments or Technology Verticals
- A World-Class Network of Manufacturing Assets Connected to our SM Innovation Platform
- Academia or Industry Partners

HQ & SM Innovation Center
SM Innovation Centers
SMIC Satellites
Other SMICs or Satellites (directional)

SMIC Industry/Technology Focus Areas
- NCSU – Pulp/Paper, Nonwoven, Bio Mfg
- TAMU – O&G / Chem processing
- UCLA - Aerospace
- RPI - Discrete, Pharma
- Metals
- Robotics
- CNC/Machine Tools
- SMM
- Auto
- Chemical
- AI/ML
- 5G
Developing SMIC RFP Process

Pre-defined SOW’s and Funding

SM Platform Showcase to Drive SM Journey Discussions

Outreach Events

SM Platform Demonstrators/Testbeds

EWDC Infrastructure

EWDC Content

Consulting, Benchmarking and Assessments

SM Project Funding
- Min: $25K federal / $25K recipient cost share
- Max: $100K federal / $100K recipient cost share
Streamlined SMIC Selection Process - Modeled After Innovation Projects (pending DOE agreement)

1. **RFP**
   - Based on pre-defined SOW’s and Funding

2. **CESMII SMIC Review**
   - Due diligence and Recommend to DOE for concurrence

3. **SOPO & Budget Packages**
   - For final selection Submission to DOE

4. **DOE Review & approval**
   - For each individual SMIC selection

5. **UCLA Sub-Recipient Agreements**
   - For each selected SMIC

**Targeting 8 – 10 weeks from Proposal Submission to Contracting**
Value - What’s in it for the SMIC and for Industry

• Drive deeper engagement with Industry, focused on Smart Manufacturing technologies, knowledge & innovation

• CESMII funded Operating budget and provides operating kit
  • Operations & Business Processes
  • Facilities and Capability
  • Membership
  • EWD training
  • Outreach event artifacts
  • SM Platform demonstration

• Exposure to the broader manufacturing ecosystem

• Opportunities for Roadmap and Application projects

• Opportunities for publications, promotion, market visibility, etc.

• Education/Workforce Development and consulting opportunities

• National and global visibility as a SM Innovation Center

• Potential to host a CESMII Affinity group as part of their industry engagement
Thank you for investing in CESMII!

Smart Manufacturing Innovation

System Integrator
Manufacturer
SW App Vendor
Academia, Labs
Machine Builder

$140M Funding Innovation in Technology AND Education AND Cultural Transformation

Free Access to the SM Innovation Platform & many highly Innovative SM Solutions

Funding for your SM Innovation Ideas
Access to some of the most innovative SM leaders in the world
Contribute to the Future of Smart Manufacturing

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