Clean Energy Smart Manufacturing Innovation Institute (CESMII)

Jim Davis, Vice Provost, Information Technology & Chief Academic Technology Officer, UCLA; Co-Founder, SMLC

Dale Turner, Director, CESMII California Regional Manufacturing Center

Moderator: Emily Tjaden Sylvester, AMP SoCal

AMP SoCal Webinar Series: Episode 4
July 13, 2017 10:00 a.m. – 10:30 a.m.
About AMP SoCal

• The Advanced Manufacturing Partnership for Southern California (AMP SoCal) is a collaboration of more than 135 different organizations.

• Its goal is to strengthen the industrial ecosystem for aerospace and defense manufacturers.

• AMP SoCal is led by the University of Southern California (USC) Sol Price School of Public Policy - USC Center for Economic Development.

• AMP SoCal supports the aerospace and defense manufacturing industry within the 10-county Southern California region.
Logistics

- All audio will stream through your computer speakers.
- Please submit your questions anytime throughout the presentation in the chat box, located on the bottom of your screen.
- Webinar recording and slides are posted within one week of the event.

ampsocal.usc.edu/webinars
Today’s Speakers

Jim Davis,
Vice Provost Information Technology & Chief Academic Technology Officer, University of California, Los Angeles (UCLA)
Co-Founder, Smart Manufacturing Leadership Coalition (SMLC)

Dale Turner,
Director,
CESMII California Regional Manufacturing Center (RMC)
CESMII Overview

Jim Davis
Vice Provost IT & Chief Academic Technology Officer
Co PI CESMII
July 13th, 2017
Integrating Operations/Information Technology (OT/IT) Systems and Enabling the Practice of Smart Manufacturing
Our Institute will:

• Provide Breakthrough Capability to Drive Energy Reduction by $195 B
• Be Industry Led and Driven
• Service all Manufacturing Segments
• Develop the Workforce and Job Creation
• Be Open to All Size of enterprises
• Achieve Financial Independence in 5 Years or less
Manufacturing USA Today

- Lightweight Metals, Detroit, MI
- Additive Manufacturing, Youngstown, OH
- Advanced Fiber-Reinforced Polymer Composites, Knoxville, TN
- Advanced Robotics, Pittsburgh, PA
- AIM Photonics, Rochester, NY
- Reducing Embodied Energy and Emissions, Rochester, NY
- Advanced Tissue Biofabrication, Manchester, NH
- AFFOA - Fibers and Textiles, Cambridge MA
- Modular Chemical Process Intensification, New York, NY
- Bio-pharmaceutical Manufacturing, Newark, DE
- Advanced Tissue Biofabrication, Manchester, NH
- Wide Bandgap Semiconductors, Raleigh, NC
- Smart Manufacturing, Los Angeles, CA
- Flexible Hybrid Electronics, San Jose, CA

Shaded states have major participants in Manufacturing USA Institutes.
Smart Manufacturing - Simply Stated

The Operational Business and Technology Practice of radically increasing the application of real-time data throughout the manufacturing enterprise while changing the facilities focused operational structure.

The right data in the right form, the right people with the right knowledge, the right technology and the right operations, whenever and wherever needed throughout the manufacturing ‘enterprise’.
Smart Manufacturing - A Term of Practice

Enterprise integration to realize untapped market, productivity and performance opportunities

Real-time Data and Modeling to qualify materials, parts, properties, assemblies and drive real-time precision

Operational Practices (A Vocabulary of Practices: intensification, virtualization, modularization, qualification and optimization) to achieve value in an increasingly customized product space with accelerated demand dynamics
Smart Manufacturing builds on IoT and IIC

Manufacturing Vertical
- Static physical facilities
- Legacy operations
- Always operating
- Need to qualify moving product
- IP in product & operations
- Highly compartmentalized
- Highly Heterogeneous
- High risk profile
What is CESMII?
Sponsored by DOE
Regional Centers

Each regional center is operated according to three key elements:

- R&D Testbeds
- Workforce Development
- Testbed Infrastructure
Power of a National Network of Manufacturing Centers

- Test Bed Pipeline
- Drive Membership
- Develop Technology
- Implement SM Projects
- Members of Advisory Committees
- Participate in CESMII Long Range Plan
- Regional Workforce Development and Training
CARMC Team Operational Structure

CESMII CARMC
Director Dale Turner

Technology Manager
Xiaochun Li / UCLA

Membership / Outreach Recruitment IPT

Workforce Development & Training IPT

Smart Mfg. Technology & Architecture Lead, Xiaochun Li lead

IP, NDA's & Contracts IPT

CARMC Concept-Project & Roadmap-Proposal Review Process IPT

Smart Manufacturing Implementation IPT Team

UCB
CMTC
UCI
UCLA

Northern California Research & Technology Demonstration Center
NCA-RTC Coordinator: Tarek Zohdi

UCB
UCI
UCLA
CSUN
Missouri
Michigan
CACT
CCC

Smart Manufacturing Research and Technologies Capabilities

Southern California Research & Technology Demonstration Center
SOA-RTC Coordinator: G.P. Li

UCI
UCLA
USC
CSUN
Missouri

Workforce Development, Training and Delivery Services for CARMC

UCI
CSUN
UCLA
Missouri
USC
Enterprise Thinking and Practice

Let’s consider some examples
What do we want to enable?
Connect across Boundaries

General Mills “Field to Fork”
OEM - Collaborative & Network-Based, Smart Manufacturing

Connected Supply Chain
- Agile
- Demand Driven
- Raw Material to Finished Product

Energy Efficient
- Lower emissions
- Less energy used
- Green manufacturing

Safe Production
- Improved safety
- Fewer incidents
- More user friendly

Sustainable Production
- Higher value products
- Data for decision making
- Product Lifecycle Management

Optimization
- Asset Utility/Zero Downtime
- Quality/Zero Defects
- Reliable results
Supply Side Management Chain of Custody

Elevator – Weekly Study

South Annex

North Annex

Steel Annex

Product
- No Sample
- Unknown Dirty Oats
- Known Dirty Oats
- Unknown Pre-Clean
- Known Pre-Clean
- Unknown GF Oats
- Known GF Oats
- Risk Analysis Req.
- Non-Usable Oats
- By-Product
- Pre-Sized Oats
- MT/Out of Service
Enabling Smart Manufacturing Practice
What got us here won’t get us there?
(OT) End-to-End Data Flow Systems
Advanced Sensing Controls Platforms & Modeling (ASCPM)
Predictable Systems Engineering, Predictable Acceleration and Predictable Cost

Value Creation

Core Functions

Business Applications

Core Systems

Data Input

Demand Driven Supply Chain

Green Light to Convert

Green Light to Ship

Optimized Inventory

Raw Mat'l Inventory

Finished Product Inventory

Plant Floor Inventory

Inventory Direct Consumption

WorkFlow

Demand Plan

Production Order

Line Schedule

Lot Tracking

Optimization Engine

Raw Mat'l Inventory

Directed Work

Directed Work

Supplier Managed Inv

Line Supply

Bin Mgmt

Overusage

Trace/Recall

BOM Validation

Yard Mgmt

Directed Work

Master Data

(BOM, Specs, Vendor, Ingredients, FP)

MQIS

MES

SAP ERP

SAP MRP

SAP APO

SAP PLM

Red Prairie

General Mills Eco System of

STUFF

© 2014 General Mills
(IT) Data, systems and security are complicated with current approaches.
Systems Infrastructure for Smart Manufacturing Practice
Collaboration & Business Processes

Application: Analytics, Optimization, Control

Data Infrastructure: Abstraction, Storage, Processing

System Network: Shop floor – Supply Chain, Integration

Physical System: “Things” of IoT – Machines, Sensors, Actuators, Devices

Inoperability Standards and Protocols

Security, Cybersecurity, Safety, Resiliency

Human-System Interface Services

Data and Data Services

Reference Architecture & Practice Thinking

Sudarsan Rachuri
Build OT/IT Integration as Cloud WfaaS
Reusable Configurations, Core Deployment Services & Trusted Data Services

WfaaS - OT/IT Construct

Marketplace as a Service
- Buyer/Seller Dashboard
- Composable apps & libraries
  Data tools, viewers, metrics, models
- Toolkits, App data services

Development Deployment Performance Reuse as a Service
- Workflow as a Service
- Validated/licensed software environments
- Data configuration models
- Secure historian & private virtual computation
- Secure data connectors

Cloud Integration Services
- Security; Machine & Human Interfaces;
- Virtual Compartments;
- Interoperability; Standards

Industry Marketplace
Reusable Configurations
What if we had a way to Unpack Data Curation

Operation 1

Operation 2
How can I span heterogeneous environments?
On-premise – Off Premise – On Premise
How can I understand state of execution?
How can I “Granularize” data management?

SM Platform
Data Structure

Contextualized Data Steps
- Data Assets
- Data Model
- Data Config
- Modeling Provider Product 1
- Data Config
- Analytics Provider Product 2

Modeling & Analytics Steps

Enterprise Workflow

Discretize and reuse
Security at business granularity

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Can I think about cyber system design and building differently?

- Certified app ‘configurations’
- Search Engine
- Compose and reuse
- V & V of a system of composed data & app configurations
- IoS for manufacturing
- DevOps for manufacturing
- End-to-end State Services
A Comprehensive Approach to Manufacturing

At the Intersection

• Workforce Productivity
• Business & Product Agility
• Supply Chain Agility & Optimization
• Asset Management and Risk
• Product Lifecycle
• Energy & Material Productivity
• Environment, Sustainability & Safety

Next Generation IT for Next Generation Manufacturing

• Make Data a Key Asset
• Advanced Real-Time Sensing, Controls, Platform and Modeling
Become a Member
Strength of CESMII’s Collaboration Network

- Investment in key industry-driven priorities
- Accelerate technology adoption
- Realize business results, energy sustainability and innovation
- Shared participation, non-proprietary results, IP

- Form relevant partnerships
- Solve collective challenges, catalyze RD&D Investment
- Develop a strong workforce via education/training
- Improve economic development, increase jobs
We Meet you Where you are

“Smart Manufacturing will unlock the true potential of our people, processes and technology.”

CESMII is tackling barriers that no one entity can address alone through Smart.

### Bringing together the Ecosystem

- Large Companies (500+ employees/members)
- Medium Companies (>100 and <500 employees/members)
- Small Companies (<100 employees/members)
- Community Colleges, K-12 Educational
- Academics, Govt. Labs, and Non-profits

### Advanced Technology
- Sensors
- Controls
- Platforms
- Models

### Workforce
- Curriculum Development
- Certifications
- Training
- Nationwide strategy

### Impact
- Energy
- Productivity
- Optimization
- Performance
- Accelerated technology adoption
- New business models

### Economic Development
- Improved jobs
- Energy sustainability
- Competitiveness
- Innovation
- Revitalized communities and access
California RMC Capabilities Summary

Sensors, Controls & Algorithms, Platforms, HPC

Energy Sustainability, Economic Development, Workforce Development, etc.
THANK YOU & QUESTIONS

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https://twitter.com/SMCoalition
Facebook.com/SMLeadershipCoalition
http://www.linkedin.com/groups/Smart-Manufacturing-Leadership-Coalition
NEXT WEBINAR:
Export Trade for Small and Medium Manufacturers

Speaker: Leah Goold-Haws, Center for International Trade Development, Long Beach City College

AMP SoCal Webinar Series: Episode 5
August 17, 2017  10:00 a.m. – 10:30 a.m.

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