Collaborative Initiatives for Sustainable Products Manufacturing

NIST Workshop on Sustainable Manufacturing

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National Center for Manufacturing Sciences

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Outline

- About NCMS
- Sustainable Product Initiative
- LCA Projects
- Illustrative Example in LCA

What NCMS Does …

***L** eads in Precompetitive r&D*

***E** valuates* **New Technologies** ***A** ccelerates* **Applications**

***D** evelops* **<u>Cross-industry</u> Collaborations**

Improves Global Competitiveness of Our

Core Competencies

- Technology Needs Identification
- Project Creation & Organization
- Knowledge Management
- Customer/End User Connect
- Neutral Facilitation

Cross-Industry Impact (since 1986)

- Aerospace
- Automotive
- Communications
- Controls
- Electronics
- Energy
- Health Care
- Heavy Equipment
- Machine Tools
- Sensors
- Software

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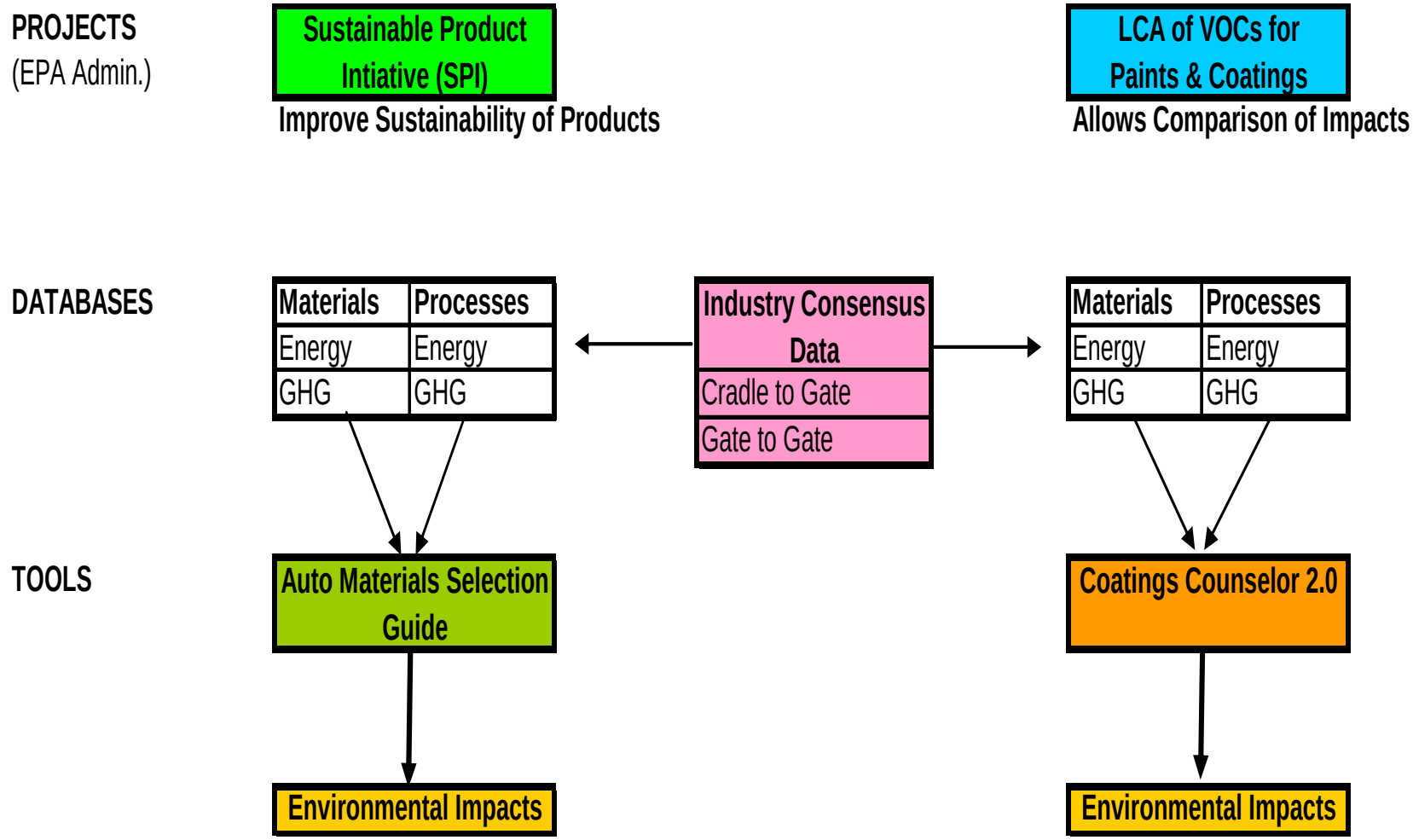
Sustainability Program - Mission

1. Add Value for NCMS Members and Sponsors/Partners by Providing Data-Driven Decision Support Tools to Assist and Accelerate Transformation Programs
2. Provide Direction to Guide Industry Strategy Changes in Keeping with Globalization Trends
3. Apply and Leverage NCMS' Generic Framework for LCA and Sustainability Assessments to Facilitate Product/Sector-Specific Sustainability Change Initiatives for NCMS Members/Partners via Clearly Differentiated Custom Tools and Services
4. Migrate Tools to Address Emerging Manufacturing Sector Needs (e.g., Battery, Wind Power, etc.)

Common Elements of NCMS Projects

- **Collaborative** involving manufacturers at all phases of the supply chain with input from regulatory agencies, and when applicable from public interest groups.
- **Evaluate potential environmental merits** of proposed product modifications on a life-cycle basis to the extent permitted by available information.
- **Evaluate potential commercial viability** of product modifications on the basis of probable market acceptance, independent of any regulatory framework while on the market.

Program Relationships



Sustainable Product Initiative (SPI)

- Six Year EPA-Sponsored Program (2004-2010)
- Develop 'best practices', design criteria, analytical tools, manufacturing capabilities and/or recovery techniques for future products, resulting in an enhanced level of environmental acceptability and sustainability than products currently available.
- Demonstrations Target Early Adopter Sectors:
  - Automotive Sector
  - Office Furniture Sector
  - Textile Sector

SPI Key Elements

1. *Automotive Materials Selection Guide*
2. *Sustainable Furniture Standard (BIFMA)*
3. *Sustainability Standards Guide (EPA)**
4. *Design for Remanufacturing Tool (RIT)*
5. *Cradle to Gate Tool*
6. *Gate to Gate Tool*
7. *Sustainability Implications of Power Train Design*

- ** = included in today's presentation*

SPI – Sustainable Product Standards Guide

- Sustainable Product Standards Guide – a collaboratively developed "How-to" Document addressing multi-attribute standards development processes and pitfalls
- NCMS has engaged leading organizations pursuing standards-related activities to confirm relevance & differentiation of NCMS-led effort
- Plan is to release an advanced 'draft' Guide by March 2010, hold Educational event at NeoCon 2010 in June
  - Establish a protected Wiki to solicit broader input

Draft Sustainability Standards Guide - Document Organization/Contents http://spi.ncms.org/standards

<u>Introduction</u>

1. What is a Sustainable Product Standard?

2. Trends Driving Development of Sustainable Product Standards

3. How to Start the Process

4. How to Manage the Process

5. Content of a Sustainable Product Standard

6. Implementing the Standards

7. Lessons Learned

8. Directions/Opportunities for the Future?

SPI-Stds Guide Beta-Timeline

October 7 - December 30, 2009:

- Identify Publication Opportunity for Guide and submit abstract/bid
  - E.g., NeoCon 2010 and Green Build 2010
- Coordinate Offline edits by Consultant team and sponsors
- Solicit additional Case Studies if relevant (e.g., EPEAT, ASHRAE, Plumbing/Mechanicals, etc)
- Review Protected Wiki Format for SPI Website with Experts

January – March, 2010:

- Prepare for Launch of Guide via Workshop Materials
- Assign Presentation/Advocacy Duties to Contributors

June 2010:

- Present Educational Workshop on How-To Guide

July – September 2010:

Solicit Comments/Inputs from Standards Organizations

Life Cycle Assessment (LCA) Projects at NCMS

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L E V E R A G I N G E X C E L L E N C E

Life Cycle Assessment

- LCA is a powerful tool for analyzing sustainability of manufacturing systems, using multiple commensurable (i.e., measurable in similar units) aspects of quantifiable systems, based on systems thinking.
- LCA parameters analyzed by NCMS Teams are:
  - energy, resources, impact and outputs
  - e.g., waste, emissions, electricity, total energy, etc
- Social implications of products are generally lacking in LCAs, as they are difficult to quantify, and are often based on values and perceptions of the stakeholders
- **NCMS' Innovation is in establishing 'consensus' Min-Max Ranges vs. Single Point Data**

Collaborative Projects on LCA

1. LCA for VOCs in Paint & Coatings Applications (EPA)

2. LCA for Sustainable Light Emitting Diode Fluorescent Lamps (DOE)

3. Sustainable Product Initiative (EPA)
   - Cradle-to-Gate Tools
   - Gate-to-Gate Tools

LCA-VOC Project Background

- **Duration:** September, 2006 - August, 2011
- General industry participation began with launch meeting in March, 2007
- **Primary objective:** to develop a consensus framework for carrying out life cycle assessments of paints and coatings
- Framework to be embodied in an online calculation tool known as "Coatings Counselor"
- NCMS approach is to develop General tool and Customize calculators for selected individual manufacturing industry sectors (of 16 identified)

LCA-VOC Project Background-2

- 40+ Participants include chemical suppliers, paint manufacturers, industrial users (e.g., 3 automaker reps), equipment manufacturers, and others
- First series of LCA tasks involved selecting impact categories, identifying data sources, and selecting a typical industrial coating process to serve as a model
- Collaboration with NPCA (www.paint.org) is an opportunity to develop and validate consensus tools that challenge the industry to improve footprint, reduce impact

Project Background

- Selected impact categories:
  - energy use
    - electrical
    - total
  - greenhouse gas emissions
  - solid waste generated
  - regulated emissions
    - VOCs
    - HAPs

LCA-VOC Calculation Tool

- Current version, “CC 2.0” is in spreadsheet format
- Some key features of the NCMS approach:
  - Users specify coating type and process sector
  - Tool automatically fills in default data appropriate for those choices, and provides ranges (minimum to maximum) for the impacts
- As users provide more specific data, the results become sharper

NCMS
Life Cycle Analysis of VOC's in Paints & Coatings

Coatings Counselor 2.0
LCA Tool
Disclaimer: Illustrative Example Only!

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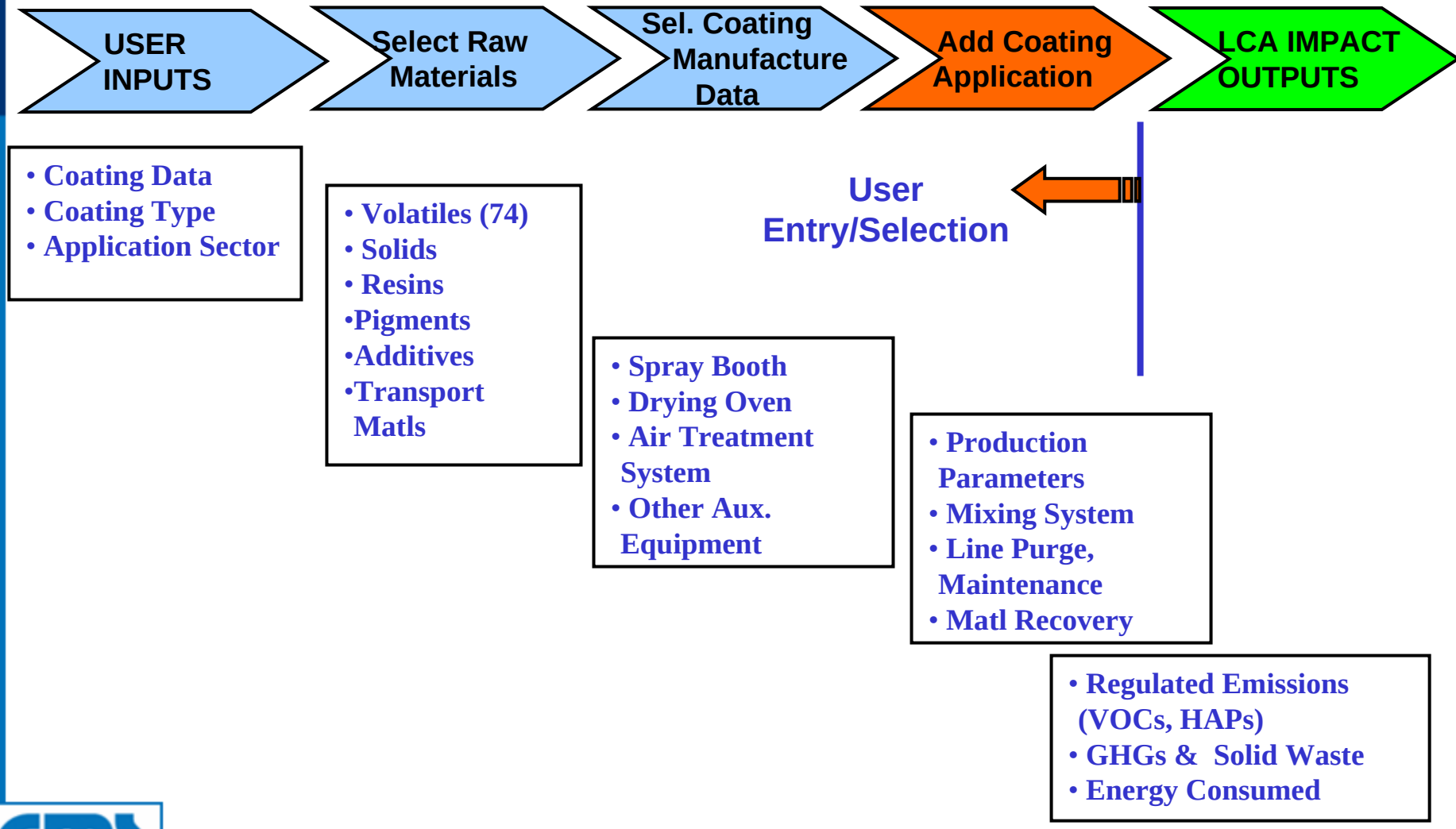
L E V E R A G I N G E X C E L L E N C E

CC 2.0 Calculation Process Flow



SAMPLE Coatings Counselor 2.0 User Screen

Coating Data – Select Inputs

Coating name:	*High Solids Silver Basecoat #B-16*

Select coating type:	*Solvent-based*

Select sector:	*Automotive*

SAMPLE Coatings Counselor 2.0 User Screen

Coating Manufacture- Inputs

Parameter category	Description	Unit	Input values		
			min	"actual"	max
Coating formulation	Coating density	lb/gal	8.00		8.00
	Blending	kW			
	Extruding	kW			
	Grinding	kW			
	Mixing	kW			
	Filling, Packaging, Storage	kW			
Thermal oxidizer	Select heat source				
	Electric power (other than heat)	kW			

					Subtotals: impacts from coating manufacture

Transport to coating user	Container and packaging weight per lb coating	lb/lb			
	Select transport mode	miles			
	Select transport mode	miles			

Coatings Counselor 2.0

OUTPUTS = Total Life-Cycle Impacts

Regulated Emissions				Greenhouse Gases Emitted		Solid Waste Generated		Energy Consumed			
VOCs (g per 1000 Coated Square Feet)		HAPs (g per 1000 Coated Square Feet)		(g CO2 eq per 1000 Coated Square Feet)		(lb per 1000 Coated Square Feet)		Electrical (kWh per 1000 Coated Square Feet)		Total (MJ per 1000 Coated Square Feet)	
min	max	min	max	min	max	min	max	min	max	min	max
5,918	7,379	5,470	6,869	298,322	338,401	2.79	4.42	2.43	20.28	5,598	6,721

Thank You!
For more information….

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