Coatings and Process Development for Reduced Energy Automotive OEM Manufacturing

DE-EE0005777

PPG, Dürr Systems USA & North Dakota State University

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Overview

Timeline

- Start: 01/01/2015
- End: 06/30/2018
  - BP3 completed

Budget

	Federal Budget	Cost Share	Total Budget
BP 1	963,561	389,161	1,352,722
BP 2	1,120,670	455,734	1,576,404
BP 3	888,118	428,827	1,316,945
Total	2,972,349	1,273,722	4,246,071

Total Cost: $4,146,077

Barriers

- Technical Target
  - Low temperature coating system
  - Monobooth prototype
- Technical Barriers
  - Sustainable Manufacturing
  - Energy Reduction

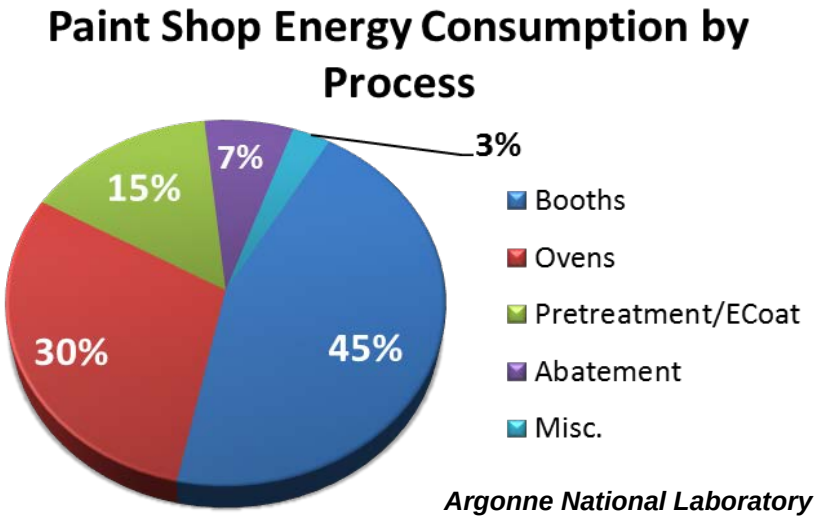
Partner

- North Dakota State University
- DÜRR Systems USA, Inc.

Project Objective

- Develop coatings, processes and facility design to reduce energy consumption in automotive OEM paint shops

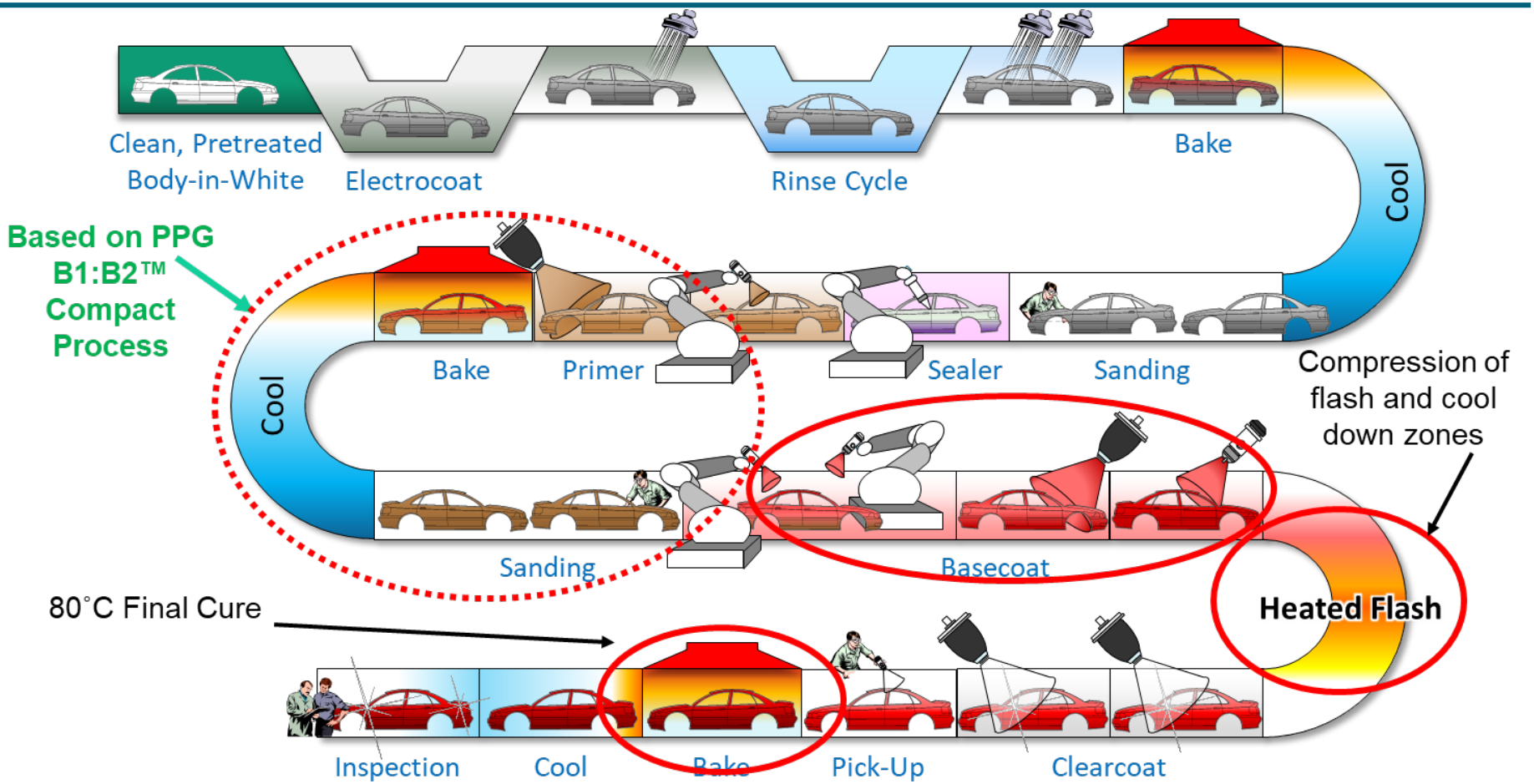
70% of the automotive assembly plant energy is consumed in the paint shop



Argonne National Laboratory

- Technical Barriers
  - Maintaining coating properties at lower temperature cure
  - Low temperature cross-link chemistries not commercial
  - Adoption of waterborne technologies and VOC restrictions
  - Process optimization compatibility with “Brownfield” conversion

Technical Innovation – Reduced Energy Process



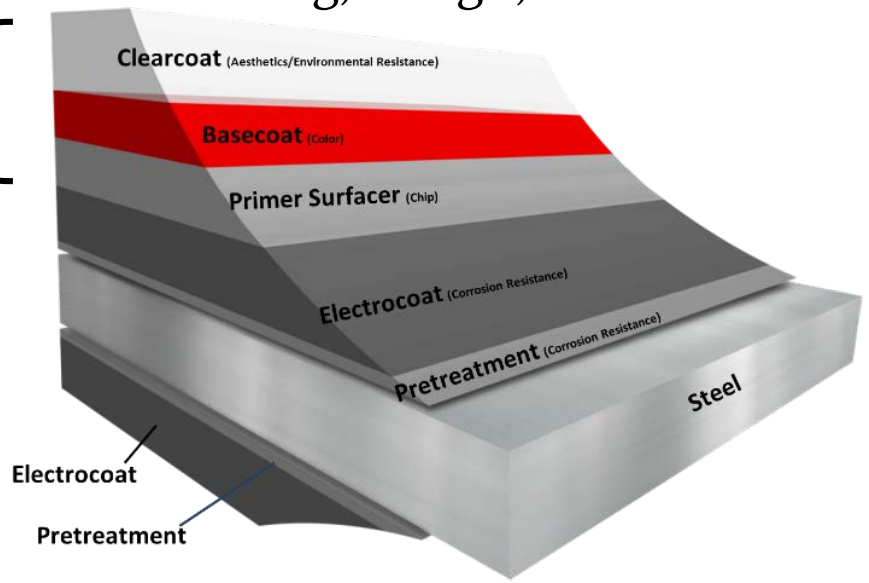
- Lower Oven Temperature
- Reduction in Waste Heat
- Faster Time Between Layer Applications
- Lowers Fresh Air Demand in Oven
- Reduced Temperature/Humidity Control Requirements
- Enable Lightweighting– Temperature Sensitive Substrates

Technical Approach – Low Temperature Cure

Low Temperature Cure Coating

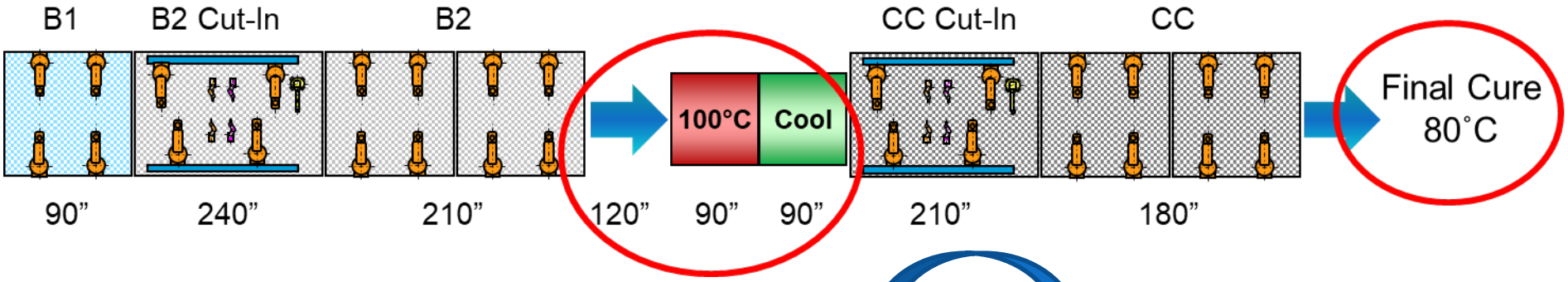
- Development of new low temperature cure polymers and formulas
  - Oven temperature reduction 140°C → ≤100°C
  - Dehydration redesign for smaller footprint, lower energy
- Target layers include: Primer, Basecoat and Clearcoat
- North Dakota State University: High-throughput material analysis
- DüRR Systems Inc.: Application system modeling, design, and fabrication

Project Focus



Technical Approach – Process Analysis

LEAPP™ Reference System Process



Compacts the process further

- Reduce Ambient Flash time from 5 min to 2 min
- Reduce Heated Flash time from 7 min to 90 sec
- Increase Heated Flash Temperature from 70°C to 100°C
- Reduce Cool down time from 2 min to 90 sec
- Reduce Final Bake Temperature from 145°C to 80°C
- Reduce oven time from 30-35 min to 25-28 min

36% Energy Reduction

(34,500 MWh)*

$820,000/yr Op. Cost Savings

*$4.1MM capital savings**

*For a two line plant, with 60 jobs per hour

Results and Accomplishments



- ✓ Coating system developed in 3 colors: silver, white, and black
- ✓ Lab scale simulations completed using monobooth concept
  - ✓ Robotic paint application of low temperature cure topcoat systems demonstrated on a door skin

Transition

- PPG has a long history of automotive OEM innovations
  - Cationic electrodeposition, B1:B2™ Compact Process
  - LEAPP™ continues this tradition

- PPG Public Announcement Press Release
  - http://www.ppgautocoatings.com/News/06-12-2018-PPG-to-introduce-low-energy-paint-pro

- PPG Presentation at Inaugural SURCAR NA Congress
  - http://northamerica.surcar-community.com/

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Questions?

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