

# LEI Lean Transformation Summit

March 9, 2011

## Building a Foundation for a Lean PD System

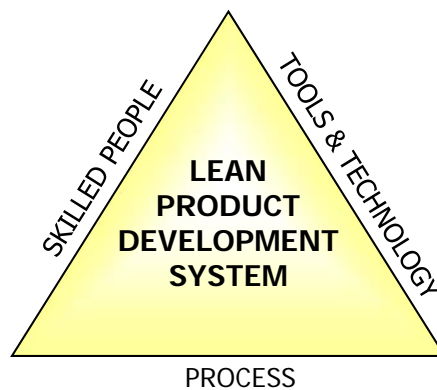
**Randy Frank**  
Manager, Global Front End and Underbody & CAE  
Ford Motor Company

**Jim Morgan**  
Director, Global Body Exterior and Stamping Engineering  
Ford Motor Company



SLIDE 1

## Building a Foundation for Lean PD System



SLIDE 2

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## Customer Defined Value

What do you want to talk about?

- People & Organization
- P.D. Process
- Tools & Technology

SLIDE 3

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ONE TEAM • ONE PLAN • ONE GOAL

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## Building a Foundation for Lean PD System

**SKILLED PEOPLE**

**TOOLS & TECHNOLOGY**

**LEAN PRODUCT DEVELOPMENT SYSTEM**

**PROCESS**


"The best people create the best products"

SLIDE 4

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## Skilled People



How do you transform  
A brand new college graduate  
into a Technically Mature, Highly  
Skilled and Efficient Employee?

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## Skilled People

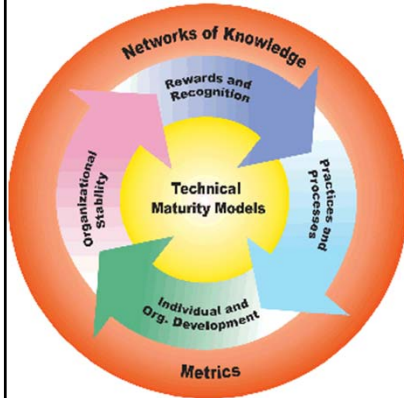
Level of Knowledge	How to Develop	Position
1) Novice	<ul style="list-style-type: none"> <li>- Rigorous Hiring process to Find Best               <ul style="list-style-type: none"> <li>- Technical Skills</li> <li>- Passion for your Business!</li> <li>- Diversity of Perspective</li> <li>- Organization Fit</li> </ul> </li> </ul>	New HIRE
2) User	<ul style="list-style-type: none"> <li>- Standardized Knowledge Base of the specialized knowledge to do your business must be available to teach new employees.</li> <li>- Technically Competent Leaders. Your Management team must be experts in their area to coach and mentor employees.</li> <li>- Track individual Employee Development of required Skills</li> </ul>	Capable Engineer
3) Expert	<ul style="list-style-type: none"> <li>- Reward Achievement of Technical Excellence               <ul style="list-style-type: none"> <li>- Awards and Public Recognition</li> <li>- Promotion/Compensation/Career Development</li> </ul> </li> <li>- Monitor total organizational Maturity with HR</li> <li>- Committees/Employee Development Plans</li> <li>- Monitor Employee Satisfaction</li> </ul>	Technically Mature Supervisor
4) Innovative Leaders	<ul style="list-style-type: none"> <li>- Accountable and Capable</li> <li>- Build from Foundation Knowledge</li> <li>- Give your Teams a Sandbox to explore and Innovate               <ul style="list-style-type: none"> <li>- Closures Lab/TDM Example</li> </ul> </li> <li>- Bridge Critical Teams with aligned objectives</li> <li>- Bold Leaders will <b>PUT THEIR JOB ON THE LINE</b> <ul style="list-style-type: none"> <li>- Provide room to challenge the status Quo</li> <li>- However do not create environment of "Loose Canons"</li> </ul> </li> </ul>	Manager Chief

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SLIDE 6

## Defining Technical Maturity

- Technical Maturity Models (TMM) around Critical Functions



-Skills required for Every Phase of PD mapped to the Function

-Mixture of Industry/Specialized Training/On-Job Experiences Defined to meet requirements of “Novice”, “User”, “Expert”

-System must teach Employees what they do not learn in school. “Body Structures 101”

## Skilled People – Delivery

- New Ford Hires have accelerated Rotations focus on Function (Ford College Graduate Program)
  - Synergistic Rotations to TMM (Stamping, CAE, Design, Test, Launch)
  - Gain 5 years skills/knowledge in roughly 2 years
  - Understand what it takes to deliver peer group functions
- Engineers
  - Self Assess skills annually with your supervisor against TMM/One Ford
  - Set Goals and Monitor development
- Experts
  - Achieve Functional Experts in 7-10 Years
  - Become the Leaders in the Function
- Personal Development Committees
  - Monitor organizational skill sets
  - Create Succession Plans for Critical Skill/positions

**Your Teams will VALUE their Technical Capability/Competency and Accomplishments more than the “Next Promotion”**

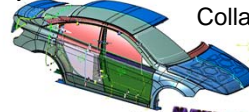
## Organize Around the Value Stream

“Best In World” Bodies Come from the Best Designs and  
the Best Manufacturing in Partnership.

### Body Engineering + Stamping Engineering

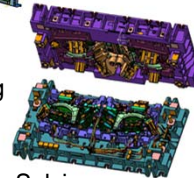


Aligned Objectives



Collaborative Designs

Precision in  
Manufacturing



Sharing Problem Solving

Achieve Common Goal



SLIDE 9

## Chief Engineers

### Functional and Nameplate Chiefs

- Chief Functional Engineer
  - Strong Technical Capability
  - Set the Knowledge Foundation for the Functional Team
  - Draw Innovation from the Team
  - Systems Integration
  - Accountable Start to Finish
- Chief Nameplate
  - Cross-Functional Integration of Vehicle
  - Overall Program Focus and Delivery
  - Focus on what is needed from each Functional Chief

SLIDE 10

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## Building a Foundation for Lean PD System

**SKILLED PEOPLE**

**TOOLS & TECHNOLOGY**

**LEAN PRODUCT DEVELOPMENT SYSTEM**

**PROCESS**

# Quick Q&A – Skilled People

SLIDE 11

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## Building a Foundation for Lean PD System

**SKILLED PEOPLE**

**TOOLS & TECHNOLOGY**

**LEAN PRODUCT DEVELOPMENT SYSTEM**

**PROCESS**

STANDARD PROCESS & ARCHITECTURE

SET BASED CONVERGENCE

SLIDE 12

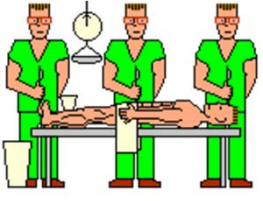

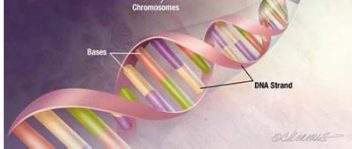
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## Medical Analogy - Std Architecture Strategy

**Medical Analogy**

Autopsy → Prevention → Genetic Engineering

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8-D/Lesson Learned → Engineering Disciplines  
 - FMEA  
 - Design Rules  
 - Specifications  
 - Compatible Geometry → Engineering Templates → Standard Architecture & Knowledge Base Engineering

- What could provide a step function improvement in Quality
- Standard Architecture

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SLID-13

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## Integrated Body Exterior Strategy



**Differentiate Vehicles**

**Common Platforms**

**Standard Sub-System & Component Architectures**

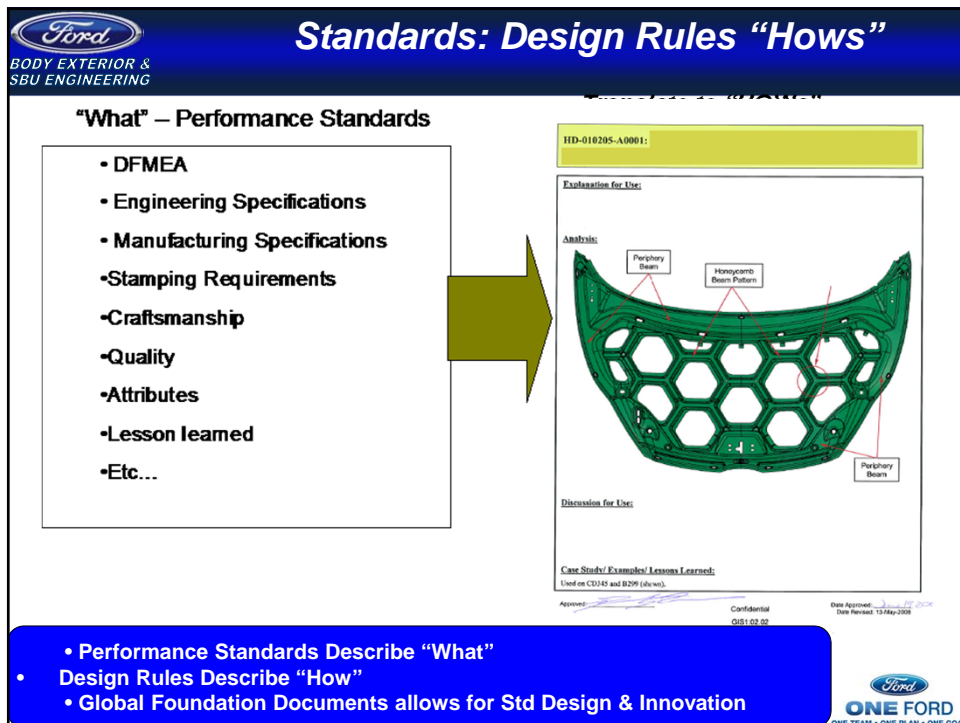
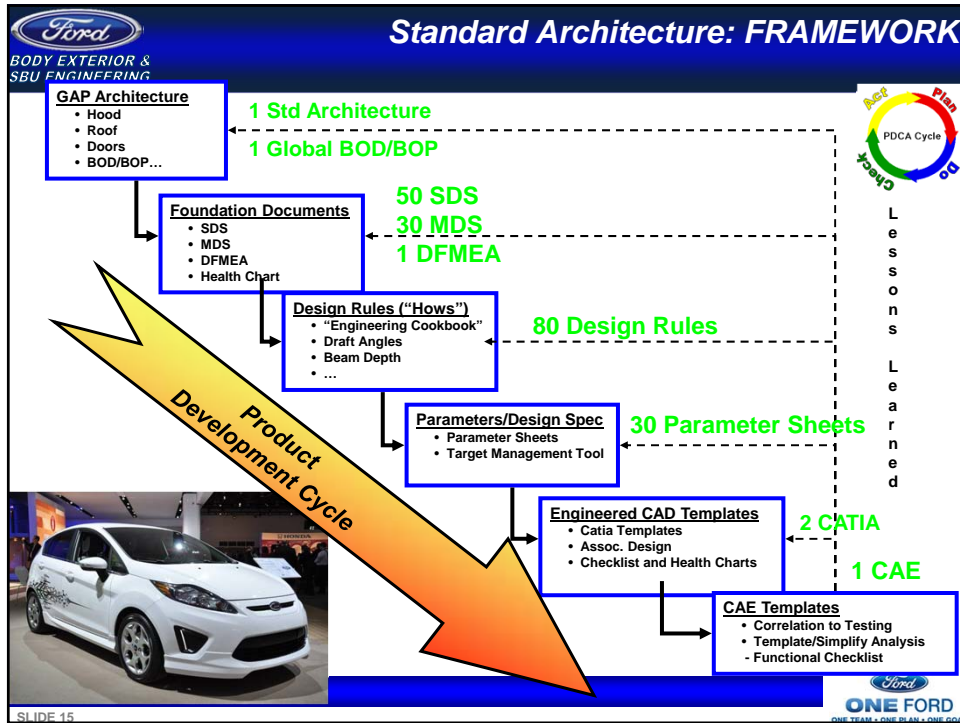
**Global Foundation of Engineering Disciplines**

- CBP
- Templates
- Eng. Check Lists
- PDP
- Design Rules
- Health Charts
- PDPD
- Mfg. B.O.P.
- Std. Mfg. Footprint
- Craftsmanship/ Perceived Quality

**Would it be nice to have a Cookbook?**

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SLID-14





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## Standards: Process Driven Product Design

### Process Driven Product Design (PDPD)

www.us.ford.com/pdpd

SEDPS Access Request | SEDPS Download

Product Requirement References

**Process Driven Product Design**

Body Side Panel (1.2 Des)	Body Side Panel (1.2 Des)	Body Side Panel (1.2 Des)	Body Side Panel (1.2 Des)
Body Side Panel (1.2 Des)	Body Side Panel (1.2 Des)	Body Side Panel (1.2 Des)	Body Side Panel (1.2 Des)
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Zone Description

- 1. Catalyst
- 2. Exhaust
- 3. Drive Shaft
- 4. Driveshaft Frame
- 5. Coat
- 6. Wheel
- 7. WheelHub Area
- 8. WheelCore

Zone 3, Catalyst

Stage 3 - Parameter Sheet

Parameter	Value	Unit	Comment
...	...	...	...

• Standard Process “Hows” enables to meet Efficient Mfg Process

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## Leverage Standards

### “One” Efficient Design

Best Practices  
Quality History  
Launch  
Lessons Learned

Quality

Current Margin 4.0 mm  
BIC Margin 3.0 mm

Cost

Benchmark CBP TVM

Trade-offs

Efficient Design Level

MFG

Function

CAE Hood Bending Results

Engineered Template

Program Specific Attributes  
PAL Strategy  
Benchmarking  
Best Practices

Global BOP/BOD  
PDPD  
MDS

SDS  
Attribute Performance  
ES  
DPA  
VVT

Material Utilization  
Extrusion Strategy  
SCT Strategy  
AEDL

MUD – Optimization

Common Assembly Equipment

Consistent Process & Design Yields  
Predictable Results

Stamping FE

Stamping FE

Best Practices  
Quality/Reliability  
Cost  
Benchmarking

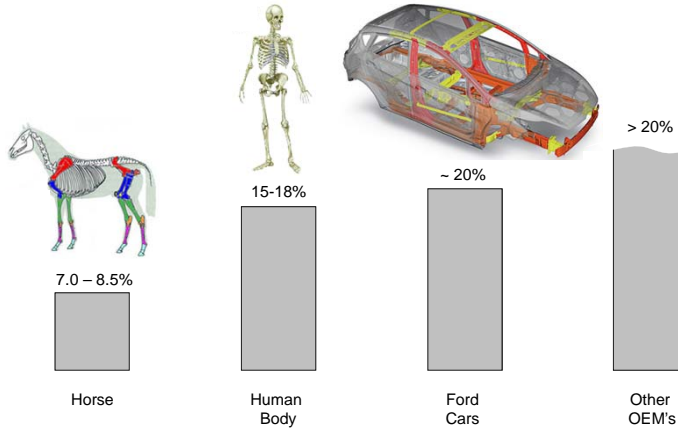
Hood Assembly – Standard BoD/BoP

Pedestrian Protection

New Failure Mode

## Measure Your Efficiencies - Benchmark

The Body Structure the supporting element similar to the skeleton of a mammal or the human body. Interesting is the percentage of the supporting structure versus the total weight.

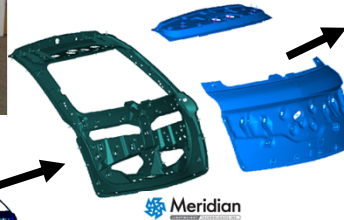


## Innovation From Standard Architecture Foundation



### Mg/AL Liftgate

- Weight
- Cost
- Package Efficiency
- Technical 1<sup>st</sup>



Meridian



- Innovation pulls from the Knowledge Base of Standards
- Allows for Technically Mature Organization to Delivery Incredible Things.

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## PD Value Stream Mapping

### VSM Workshops to Achieve GPDS Timing

**CURRENT STATE**

**FUTURE STATE**

- Develop countermeasure
- Create desired Future State
- Develop implementation plan

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## PD Value Stream – Continuous Improvement

### Lead Time Reduction Team – PD Value Stream Improvement

Current State GPDS 2.1x → Current Program GPDS 2x → Future Vision GPDS 3x Timing

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## Building a Foundation for Lean PD System

STANDARD PROCESS & ARCHITECTURE

SKILLED PEOPLE

TOOLS & TECHNOLOGY

LEAN PRODUCT DEVELOPMENT SYSTEM

SET BASED CONVERGENCE

PROCESS

# Quick Q&A – Process

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## Building a Foundation for Lean PD System

SKILLED PEOPLE

TOOLS & TECHNOLOGY

LEAN PRODUCT DEVELOPMENT SYSTEM

PROCESS

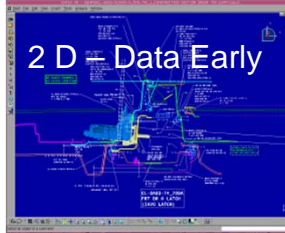
SLIDE 24

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## Front Loading PD: Parametric CAD Tools

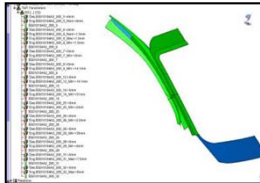
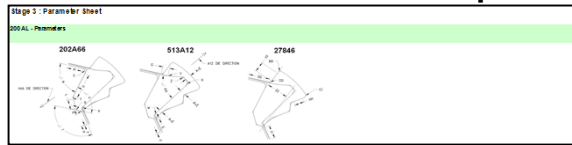
### Historical



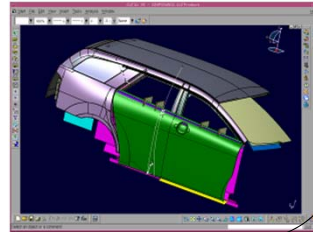
2 D - Data Early

- 2D Sections Establish 75% Feasibility
- 3D Explicit Design Late In Process
- Discrete, Non-sync. Work Streams
- Verbal Engineering Direction

### CATIA V5 – Parametric Templates

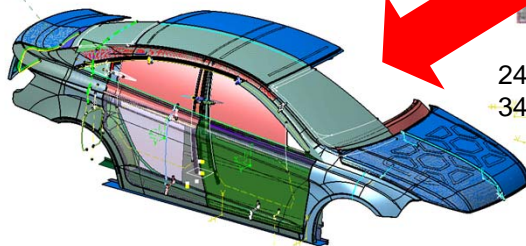
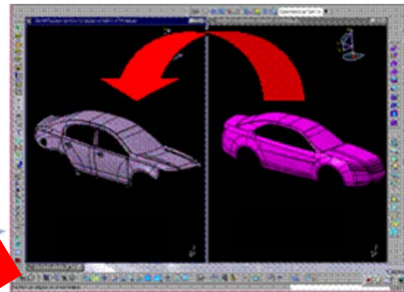
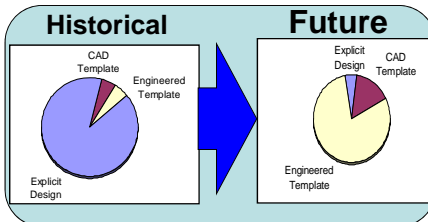


- Fully Engineered Standardized 3D Process
- Enhanced Integrated Team 3D Process
- Verbal & Parametric Design Engineering Direction



- Early 3-D CAD Enables Optimization during the Product Development Cycle
- Templates insure Standard construction and Holding Critical Parameters

## Tools can Front Loading PD



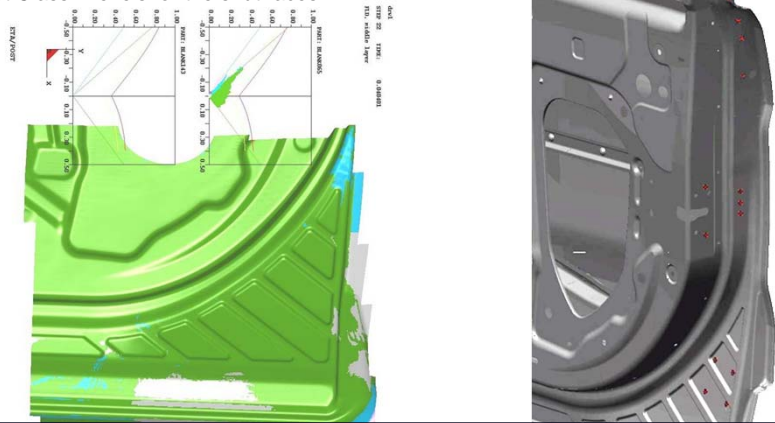
24 Re-usable CAD Templates  
34 Resultant Construction Sections

- Templates in CATIA (Lincoln MK S to Taurus)
- Early Full Vehicle 3-D Data Enables Efficient Product Development

## STAMPING FEA – Feasibility for Door Inner

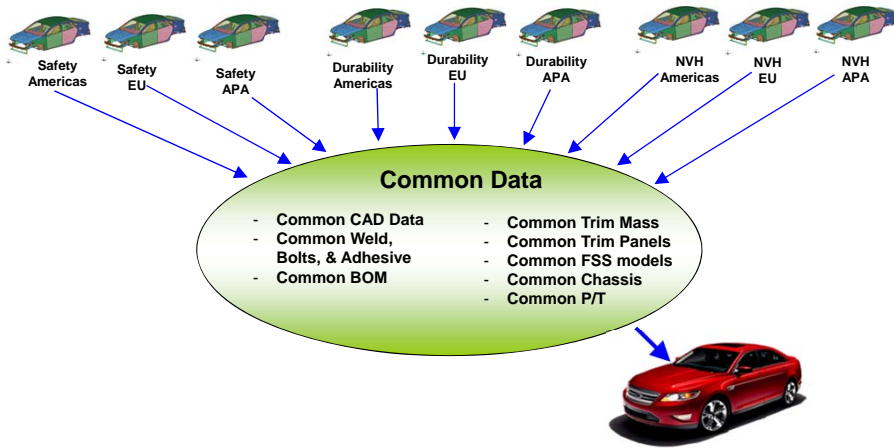
Process/Design Collaboration to optimize bead patterns

- Crafted appearance
- Target Class 1 levels for the shut-faces



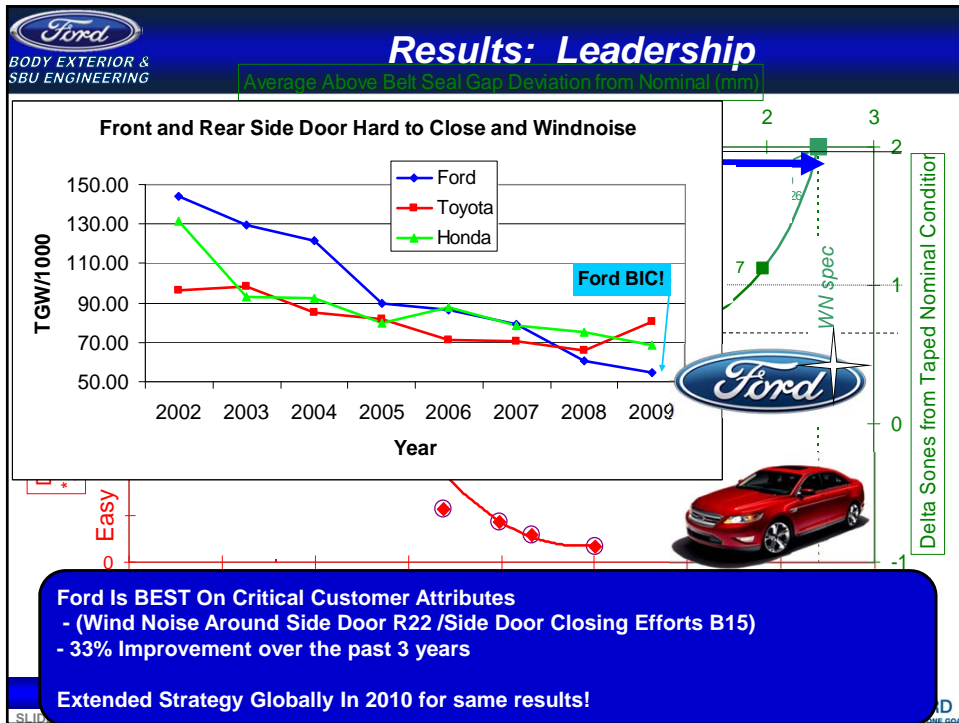
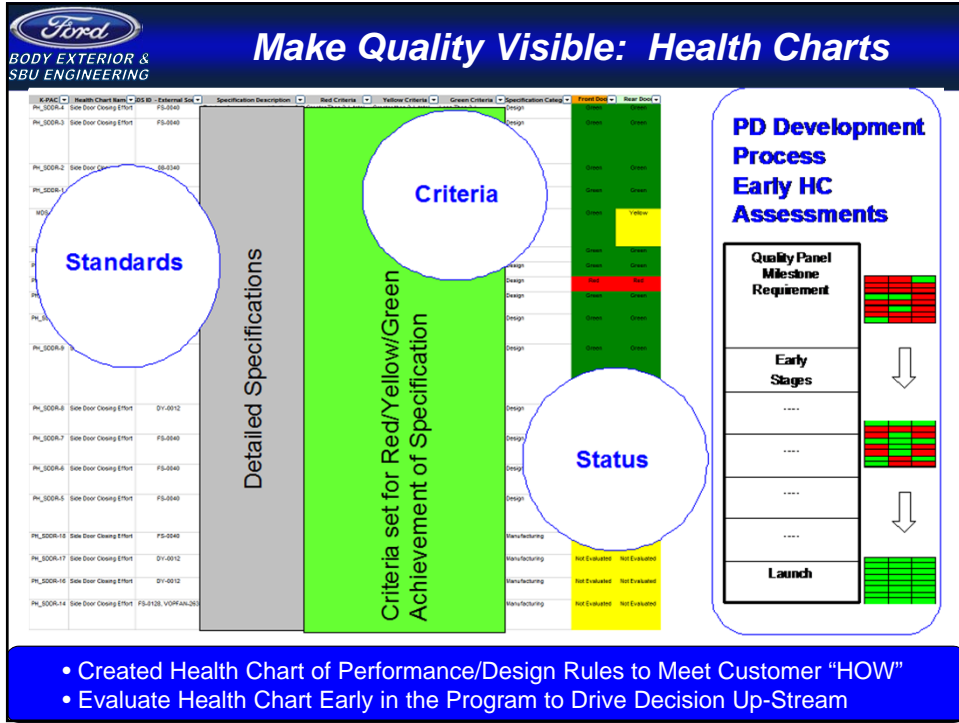
- Early Stamping FEA from Early 3D CAD
- Helps Drive Package/Formations to develop Crafted Secondary Surfaces

Many Attributes and Organization traditionally have Independent CAE Models



- Early 3D Data
- Early Analysis
- Common Models/Design Assumptions Required





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## Closed Loop Lessons Learned Process – Body Exterior “Building a Prevent Recurrence Culture”

Part Churn Lessons Learned (Notices/CR's), Common Cause (Launch AIMs), & On-Site Modification (OSM):  
<https://sam.sp.ford.com/sites/PartChurn/default.aspx>

**ECB – EARLY CLAIMS BINNING (Prevent Recurrence)**

**CUSTOMER CLINIC ISSUES BEST-IN-CLASS (BIC) INHIBITORS**

**5D**

**Prevent Recurrence:**  
Knowledge Base Engineering  
Foundation Document Updates

- DFMEA
- DVP
- Design Rules / SDS
- Engineering Template
- Perfect Drawing Plan (PDP)
- GPD S Attachment C
- ED&T Template, E SOW
- CBPs (Commodity Business Plan)
- Supplier and VO Process Checklist (PFMEA/Control Plan)
- EDL (Efficient Design Level)
- Boundary Diagram, P-Diagram, RCL, RDM Matrix, Interface Analysis

**Global Set of KBE Lessons Learned Scorecards - Managed by Each Region**

North America, Europe, South America, Asia Pacific

**BSAQ – BALANCED SINGLE AGENDA FOR QUALITY**

AWS – Top R/1000, CPU or Cost  
GQRS – TGWs

**Prevent Action Closure – PAC: FSA / Stop Ship**

**5D / 14D**

**GLOBAL SYSTEMIC ISSUES BUILT-TO-LAST Priorities**

**5D**

Note: 5D, 8D or 6-sigma (DMAIC) may be used

**5D**

Health Chart –  
Deployment Plan

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## Building a Foundation for Lean PD System

**SKILLED PEOPLE**

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**PROCESS**

**Quick Q&A**

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