Consuming 3D-MBD in Quality Inspection
We provide seating and electrical content on every vehicle segment from compact cars to full-size sport utility vehicles.
• Leading provider of universal 3D metrology software solutions.

• The world’s largest industrial manufacturing organizations trust InnovMetric’s **PolyWorks**® software solutions.

• **PolyWorks|Inspector™**: the industry-standard 3D metrology toolbox.
Hexagon is founded on brand names that you have trusted for decades.
• What is MBD?
What is Model Based Definition (MBD)?

• Defined:
  – The National Institute of Standards & Technology (NIST) defines MBD two ways:
    
    (1). The Model Based Enterprise (MBE) is made up of many related processes. At its core is the product definition which we refer to as the Model Based Definition (MBD).

    (2). An annotated CAD model that contains all of the information needed to define a product. This annotated model replaces the traditional drawing. Thus, a drawing is created by exception not as a standard process.

SASIG defines 3D-MBD and MBE as follows:

- **3D Model Based Definition (3D-MBD)** - is the practice of using 3D models (such as solid models, 3D PMI and associated metadata) within 3D CAD software to define (provide specifications for) individual components and product assemblies. The types of information included are geometric dimensioning and tolerancing (GD&T), component level materials, assembly level bills of materials, engineering configurations, design intent, etc.

- **Model Based Enterprise (MBE)** - MBE is a fully integrated and collaborative environment founded on 3D product definition (3D-MBD) detailed and shared across the Enterprise; to enable rapid, seamless, and affordable contextual consumption of engineering data.

*See SASIG Whitepaper entitled “Model Based Enterprise” for additional 3D-MBD & MBE information*
Moving away from

• Heavy reliance on 2D drawings
  – Drawings as the authoritative source of the information.
  – The perceived need to print
  – Disconnected Enterprise

Moving forward toward

• Placing greater emphasis on 3D
  – Connecting the Enterprise
  – Increased efficiencies
  – Improved overall quality

Technology is in place to move forward!
Maturing toward 3D-MBD / MBE:

The leap to Model Authority easier than you think!
What is MBD? Understanding PMI

Part Manufacturing Information (PMI)

Answer: **Non Geometric info that defines a part or assembly**
What is 3D-MBD? Putting it together

Answer: **Geometric & non geometric** info that fully defines a part or assembly.
Does your Organization **need** hard copy drawings?

Or can the same information be consumed in a better way?

**MBD supports hardcopy drawing elimination**
What is 3D-MBD?

Traditional 2D Information  →  3D Embedded Information

3D-MBD provides exactly the same information
• Simultaneous review of child / parent datum points & quality controls

“What? No drawing?”

“Where is the same datum on the detail, sub-asm & up-level dwg”?

“Viewing information is so much easier like this!”

Review all information from a single source!
What is MBE? – Connecting the Enterprise!

Answer: **Model Based Enterprise** = Managing 3D-MBD for reuse throughout the extended Enterprise & value chain

*Insight. Expertise. Results.*
• Verify CAD quality & validate replicated derivatives for reuse.
• At Lear, PLM ensures the MBD CAD, derivative format files & related information are shared for consumption and reuse.

Everyone has access to the same data!
What is 3D-MBD / MBE?

• Simply stated:
  – 2D drawing information is embedded in a 3D CAD model. Drawing is produced as exception, not as standard process.
  – 3D-MBD is considered the authoritative source of the product definition.
  – Communicated via CAD, lightweight & neutral formats
  – 3D-MBD / MBE is an improved method to create, revise, deliver & consume information that defines a part.

**Consuming 2D drawings vs. 3D-MBD**

**Is similar to....**

**Paper Mail vs. Email**
MBD related to 3D Quality Inspection
3D Inspection – Lear’s internal look

• **Re-examined Inspection process**
  – Not a new idea
  – Recognized additional opportunities for 3D Inspection
    • Metals, foam, plastics, Final Contour / STO

• **Revised processes**
  – Review TGW/TGR is process
  – Streamline to capture efficiencies
  – Improve overall quality

• **Increased 3D Inspection commitment**
  – Purchase hardware / software
  – Provide training
Addressing typical concerns with 3D Inspection

- **Fixture expense / maintenance**
  - Replace “check fixtures” with simple “holding” fixtures when possible

- **Lack of info / Incomplete dwgs**
  - Move toward 3D-MBD environment
  - Geometry & GD&T mature together
  - Provide tolerance info directly from 3D-MBD CAD

- **Reliability & Repeatability**
  - Provide inspection guidance
  - Provide templated reporting
Inspection Projects:

• **Provide Repeatable Inspection**
  - Guides inspector through pre-defined steps for successful inspection
  - Process repeatable by multiple users @ various locations
  - Only minimal training required

• ** Templated Result Reporting**
  - Predefined report template
  - Easily updated & consumed
  - Instant recall of historical data
  - Customizable

**Reliable & Repeatable Inspection process**
Example of an Inspection Project & Result Reports

Multi page reports include:

- Color Map Chart
- Pass / Fail (Red / Green)
- Specific Feature Criteria
- Statistical Process Control (SPC Data)
- Trend data

Can be:
- Viewed with PolyWorks free viewer
- Shareable & Printable

Understand specific features, overall parts or trends
Using MBD – Dimensional Throughput

**Predictive Analysis**
- VSA/FEA
  - Understand objectives
  - Define GD&T Strategies to meet objectives

**Quality**
- Consume Inspection Report
- Validate Strategies meet objectives

**Dimensional Management**
- Communicate GD&T Strategies
- Create Inspection Project

**Design**
- Create MBD in CAD

**Manufacturing**
- Consume Polyworks Project
- Repeat Inspection
- Update Report

**PLM**
- Share MBD & related documents for reuse

**PLM**
- Manage MBD CAD & Inspection Project

**Insight. Expertise. Results.**
3D Inspection: Lessons learned

• **Good** = Scan physical part & overlay to CAD.
  • Provided general idea of consistency
  • Dimensional tolerances not considered

• **Better** = Scan physical part, overlay to CAD & manually input GD&T controls from 2D source for comparison.
  • Dimensional tolerances considered in evaluation
  • Time consuming / susceptible to manual errors

• **Best** = Create Project using 3D-MBD CAD, & scan part.
  • Import 3D-MBD from validated lightweights or neutrals if needed
  • Scan results updated automatically in project report

**Overall quality of Inspection improved using 3D-MBD**
Creating Inspection Projects: Lessons learned

• Importing MBD directly into Inspection Projects:
  – Significantly reduces time to create Inspection Project
  – Eliminates manual errors & misinterpretations of data

• Create Inspection project early
  – Use simulated prior to actual scan data
  – Project is updatable if CAD is revised

**Gained efficiencies using 3D-MBD in Inspection**
MBD related to Quality inspection

**Dimensional Mgt**
- Creates Inspection Project
- Stores Project info in PLM

**PolyWorks®**
The Universal 3D Metrology Software Platform™

**Manufacturing Facility**
- Access Project w/ free viewer
- Follows Project direction
- Updates Reports

Facility A, Facility B, Facility C
Creating Inspection Project

- Importing 3D-MBD features & controls from CAD
- Extracting surface for simulated data
- Using simulated data early creation of report template
- Capture project views for report
• Inspection with guidance
  – Access Report
  – Inspection Guidance
  – Repeating the Inspection
Video 1
1. Create Inspection Project & Report template
2. Manage Project in PLM for inspector access.
3. Access Project & repeat inspection.
4. Update Inspection Report via template provided
5. Share updated results report in PLM for stakeholder access.
Key Point Summary

- **3D-MBD / MBE is a cultural change**
  - 3D-MBD considered authoritative source of the product definition.
  - Contains same info as traditional 2D drawing
  - Can be consumed in CAD, lightweight & neutral formats

- **Consuming 3D-MBD in your Inspection process leads to:**
  - Increased efficiencies
  - Improved Inspection process – Ensures Reliable & Repeatable method

- **Move toward a 3D-MBD / MBE environment**
  - Technology & tools are in place
  - Solutions & processes exist – Take advantage of them!

*You can be successful in a 3D-MBD environment!*