



Model Based Engineering at Sandia National Laboratories

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Rick N. Harris, Senior Manager

rnharri@sandia.gov

Tony D. Hernandez, Technical Manager

tdherna@sandia.gov

CAD Engineering Design Analysis & CM



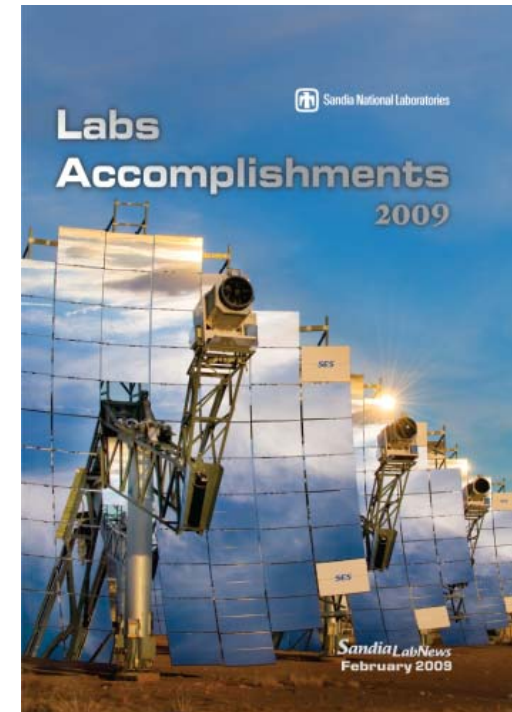
Definitions

- **Product Definition** – Is the information required to build weapon product (e.g. design definition set, EBOM, MBOM, specification, work instructions, engineering authorizations, quality documentation)
- **Design Definition Set** – Is the mechanical computer aided design (MCAD) files (i.e. Pro/E model, Pro/E drawing file, and 2D image file). This set is managed in PDMLink and is the information PRIDE (Product Realization Integrated Digital Enterprise) is committed to provide a common NSE approach.



NSE Transformation History

- Ten years of Pro/E as a drafting tool with minor engineering use
- Five years of Model Based Engineering development
- Five years of Pro/NC learning and use
- Five years of PDM usage (Matrix, Intralink, CMS, Pro/PDM, Metaphase, Sherpa)
- Heavy model usage in LEP's
- Usage of models as product definition has been recognized





Product Definition Today

- **Authoritative Source** is an image file in the Sandia National Laboratory Image Management System (IMS)
- **Product Definition** rules are written around mechanical drawings and people
- **Systems** are in place to move text and images in human readable format
- **Redundancy** is created at many steps in the process because product definition must be re-entered from text and images to computer definition to continue NC programming, inspection programming, analysis, tooling design, and quality documentation.
- **Optimization** exists for disconnected processes, not the entire product lifecycle process



Sandia is a Design Agency within NSE Enterprise Future – NSE- wide approach

- **The M&O contractors must define and manage mechanical product definition set using a common NSE approach that meets one of the following criteria selected by the PRT (Product Realization Team):**
 1. **3D mechanical models only**
 2. **3D mechanical models with supporting 2D mechanical drawings**
 3. **2D mechanical drawings with supporting 3D mechanical models**
 4. **2D mechanical drawings without supporting mechanical models**
- **The M&O contractors must produce and manage a 2D mechanical drawing set using a common NSE approach prior to FPU, official product production.**



DATA MANAGEMENT OF MCAD

- **Product data management (PDM) and product lifecycle management (PLM) capability are required for options 1 and 2**
- **Option 3 (drawings and supporting mechanical models) has two variations;**
 - a. **Is with verified supporting models, which requires PLM**
 - b. **Is without verification and does not require PLM**
- **PLM is an integral part of mechanical product definition advancement**

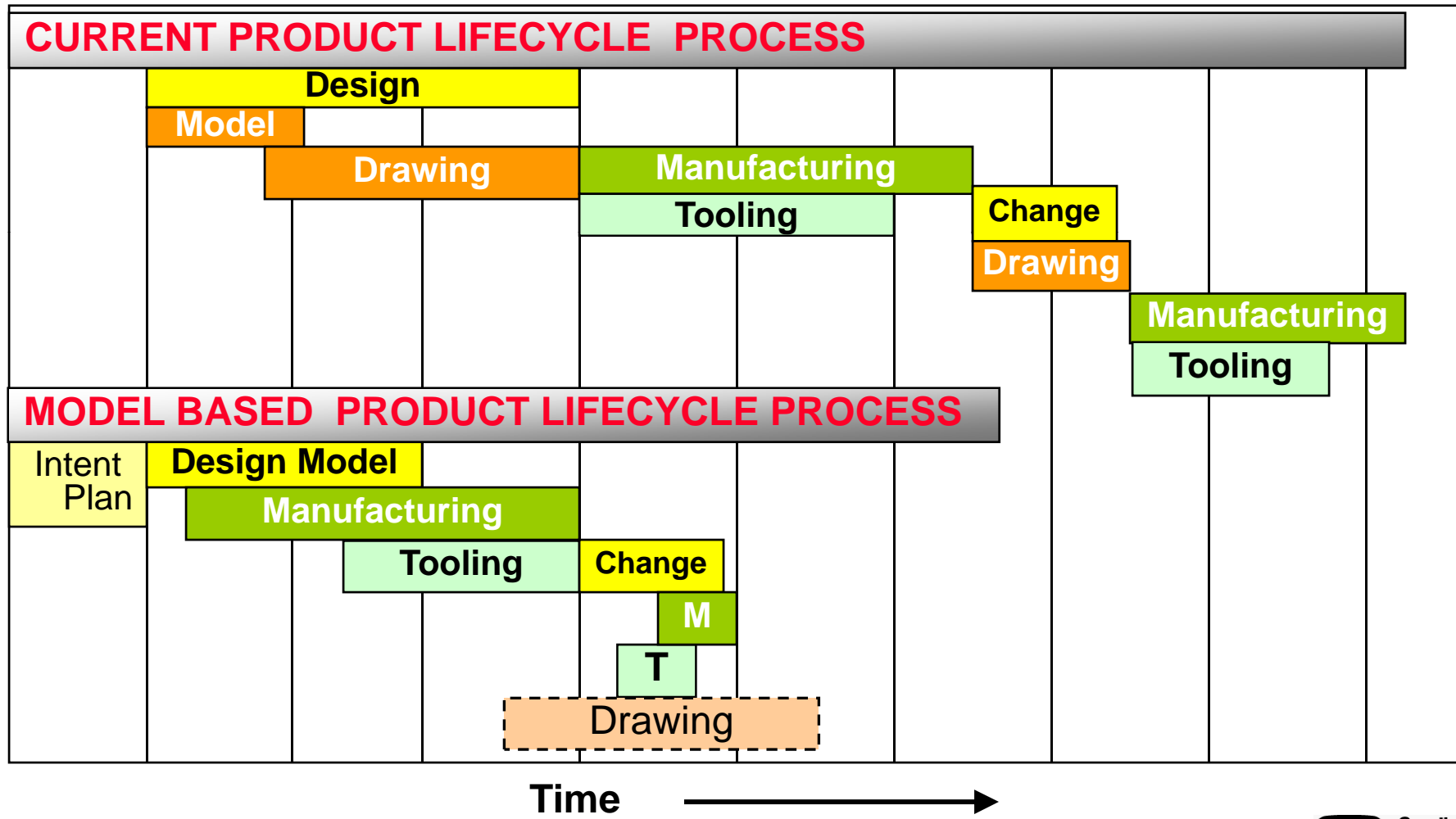


Production MCAD System Requirements

- **Manages the complexity of Pro/E models and assemblies (PDM)**
- **Manages the parametric structure for Manufacturing (PLM)**
 - Tool design
 - Process planning
 - Fabrication
 - Inspection
 - Assembly
 - Quality documentation
 - Engineering Authorization
 - Administrative Documentation



Model Based Product Lifecycle Process





Conclusion

PRIDE solutions are ready to support transformation

- **PRIDE piloted NSE-wide solution “3D mechanical models with supporting 2D mechanical drawings”**
- **PRIDE has production infrastructure at all sites across NSE in place.**
- **Business rules nearing completion to allow for PRT selected approach**
 - **3D mechanical models only**
 - **3D mechanical models with supporting 2D mechanical drawings**
 - **2D mechanical drawings with supporting 3D mechanical models**
 - **2D mechanical drawings without supporting mechanical models**