The Value of Virtual Simulation Across the Design/Build/Operate Lifecycle

Dick Slansky
Senior Analyst
ARC Advisory Group
dslansky@arcweb.com
Virtual Simulation Validates Across All Domains of the Product Lifecycle

• Manufacturing Processes, Automation, & Maintenance have become “Virtualized” across the Product Lifecycle Enabling Virtually Simulated Environments for all Domains

• PLM Scope has expanded: Design/Build has become Design/Simulate/Validate/Build/Support/Maintain

• Digital Manufacturing Simulation Tools Enable Users to Create Virtual Production Processes to Validate and Test Factory Floor Operations, Maintenance, and Operator Training

• Validation of the Physical World Through Simulation of the Virtual World
The Value Proposition for Virtual Simulation

• Virtual Environments can be Created to Simulate Entire Production Systems, Machine Tools, Field Operations & Maintenance

• Replaces Building Expensive Physical Prototypes with Virtual Prototypes for Testing

• Already the excepted standard for realistic product testing (CAE)

• Can significantly shorten the production system ramp-up time leading to faster product launches.

• Virtual commissioning for production systems reduces time to launch and physical commissioning costs

• Real-Time Virtual Simulation for Training, Operations, and Support can be used for all Industries
Virtual Product Design: Concept, Design, Knowledge Capture, Realistic Simulation

Virtual 3D Design

Innovation/Concept
- Ideation
- Knowledge Capture
- Styling

Product Design
- Mechanical
- Electrical
- Systems Engineering

Product Test
- Realistic Simulation
- Product Reliability
Virtual Build: Simulating Manufacturing

Virtual Design

- Mfg Process Design
  - Detail Planning
  - Assembly & Installation Planding
  - Work Instruction Generation
  - Tooling & Assembly Process

Production Process Simulation

- Virtual Workcell Design
- Robotic Simulation
- Virtual Commissioning

Physical Implementation

- Automation
  - Automation Platform
  - Control Code Generation
Virtual Production: Validating the Build

Virtual Design

Production Process & Work Instructions
- Work Flow
- Operations Methods
- Work Instruction Distribution

Production Systems Simulation
- Production Line Throughput Simulation
- Work Flow Simulation

Shop Floor Systems & Execution
- Operations & Inspections Records
- Work Instruction Execution
- As-Built to As-Designed Validation

Physical Implementation
For certain manufacturing segments (especially discrete and hybrid), introducing new products or improving the manufacturing process usually requires *creating and optimizing production systems*.

Many production system problems are not discovered until late in the design/implementation process, which introduces delays and cost.

**Reducing the Time & Cost of Product Launch Remains One of the Biggest Challenges for Manufacturers**
Virtual Production & Support: Design/Simulate/Automate/Build/Operate

• PLM technology now offers Next-Generation 3D Simulation Tools that Enable Manufacturers to Create a Fully Immersive Virtual Reality Simulation

• Engineers can now Virtually and Accurately Simulate not merely a Machine tool, Robot, or Work cell, but the entire Factory and all of the Production Systems within it.

• The concept of the Virtual Factory involves an Integration of the Entire Process from Product Design, to Manufacturing processes, Mechanical and Electrical design for Production Systems, and the Controls Design for Automation.

• Engineering a Virtual Factory brings together Multiple Disciplines including Virtual Commissioning, Integration of Mechanical and Electrical design (mechatronics), and Systems Engineering
Virtual Simulation for Power, Process, Energy, & AEC

- PLM technology offers 3D simulation tools that enable the Process, Energy, and AEC industries to create a fully Immersive Virtual Environment.

- Complete Virtual Environments can be created for Plants, Refineries, Drilling Platforms, Nuclear Reactors, Power Generation Facilities, and Large Scale Construction Sites.
Engineering Disciplines for Automation Design & Virtual Production
Systems Engr View for Virtual Production Systems: Design, Simulate, Validate, Build

Virtual Production System

- Systems Design & Subsystem Breakdown
- System Validation & Commissioning
- Integrated Product & Process Definition

Engineering Discipline Domains

- Mechanical Design
- Electrical Design
- Controls Design

Systems Engineering

Product Design

- As-Designed
- As-Simulated
- As-Built
Future Trends & Directions for Virtual Simulation

• Continued 3D Virtualization of all domains of the Product/Production/Operations Lifecycle
• Digital Manufacturing and Virtual Production Simulation Technology adoption by Process, Power, and AEC Industries
• Virtualization of Production Processes will Enable the Implementation of Smart Assembly and Ergonomic Improvement
• Building 3D Virtual Environments will Drive Optimization of Manufacturing and Production Processes back to Product Design

The Physical World will be Validated by the Virtual World
Thank You.

For more information, contact the author at dslansky@arcweb.com or visit our web pages at www.arcweb.com