Process Simulate Virtual Commissioning

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Shop-floor challenges

- Sensor positioning
- Tool change procedure
- Throughput reaction
- Conveyor optimization
- Electrical device signals
- Handling variants
- HMI synch with tools
- Safety procedures
- Conveyor optimization
Virtual Commissioning

Environment for testing, simulation and debug of PLC programs, HMI code, and automation scheme with a virtual model of a factory

- **Faster**
  - Shorter time to production
  - Quicker change cycle

- **Better**
  - High quality PLC code
  - Optimized performance

- **Less Expensive**
  - Cost of production stop
  - Cost of prototype parts
From: OEM-XYZ Design Department
To: Supplier 123 - Head of Engineering
Cc:
Subject: Variant with reinforced side beam

Sirs,
Based on Crash tests we have decided to add during the week end a different variant with reinforced side beam for the vehicle. This beam has to be built with different material and therefore additional welding is needed.

1. Calculations have shown that only a pedestal Gun can avoid transformer over-heating.
2. Given the short time window, week-end, it has be decided to validate all the needed elements virtually.
3. An additional Clamp had to be inserted to guarantee correct functioning.

As initial supplier of the line we'd prefer to handle the work to you.

Best Regards

OEM-XYZ
Design Department
Supplier Analyze: What is required?

**Tooling**
- Clamps and Pose sensors address new variant

**Robotics**
- OEM Standard program considers pedestal gun and new variant

**Control**
- HMI test for clamps, safety procedures and E-Stop pass
EBZ Case Study

Primary Line Builder Challenge

Validate OEM changes faster and more accurately
Tooling Tasks

Adaptation of Process, based on existing design
- Define **clamp functionality** and specific behaviour
- Mapping to **PLC Signals** and dynamic testing

Change the existing Process to multi variant
- Correct **Material Flow**
- **Variant** Detection
- Mapping to **PLC Signals** and dynamic testing
Tool design Example

1st style #2 - only 2 sensors active
Sirs,
We’d like inform you that based on your offering for a fast delivery and short commissioning time we attach hereby the path data and expect in return the full robot programs with synchronization to the PLC within 4 days.

Please be sure that all the programming is according to our robot programming standards (RPS-2010).

Best regards
OEM-XYZ
Purchase Department
The Use Case: Requirements

- Safety
- Synchronization
- OEM Standards
- Variants
- Native Language
- Maintenance
- Peripheral Resources

Traditional Work cell Simulation
Robotic engineers tasks

Manage changes after receiving a new path:
- Variant Branching
- Synchronize robots to PLC
- OEM Standard Robot Code
- Download programs and test
Robotic Simulation
Event-Based Simulation

- Realistic cycle time
- Conveyor control (physical, logics)
- Material handling between stations
- Load, steady state, variants and shutdown scenarios

![Diagram of Event-Based Simulation]
Supplier Analyze: What is required?

Tooling

Clamps and Pose sensors address new variant

Robotics

OEM Standard program considers pedestal gun and new variant
Control – virtual commissioning

Evaluate Mechanical and Automation System behavior

- Kinematics
- Robot Programs
- Mechanical Sequences
- Layout
- Clearances
- Cycle Time

- Inputs / Outputs
- Logic
- Interlocks
- HMI
- Diagnostics
- Safety
Virtual Commissioning

- Easily create a realistic shadow of a production environment
- Test & Debug PLC code
  - **Long before** the real system is build
  - **Minimize impact** on existing environment
- Use real PLC H/W or emulated S/W

Start of Production

Test earlier

Don't disturb production
VC Environment

Process Knowledge

Digital Process Design

Automation Validation

Simulation

OPC (Client & Server)

Controls

PLC

PLC Code

HMI

Real Time Signal Exchange

Signal Mapping
Virtual Commissioning Demo
Life Cycle Processes  
(Current State)

Estimating  Planning  Design  Construction

- Process Planning & Documentation
- Controls Design
- Workcell Simulation
- Equipment Design

- Installation
- Program Robots
- Debug
- Try-Out

Cost and Time
AMT Testimonial

https://sales.industrysoftware.automation.siemens.com/accesscount/24847/Virtual-Commissioning-Video-AMT-Testimonials-R7T4N3
Benefits

- **Earlier start** of production
- **Lower cost** on changes

- **Major Risk reduction:**
  - Mature processes
  - Right the first time
  - **Standardization** of processes and components

- **Collaborative** and Efficient Engineering
  - Validation reduces risks on site
Process Simulate Take Aways

- Highly functional & easy to use
- Widely deployed by OEMs and LB
- Natural upgrade of Robcad
- Connected to TC backbone
- Proven value and customer benefits
THANK YOU!