Simulation and Virtualization

Riccardo Guaglio / Leonardo Cipollini

Traditional approach
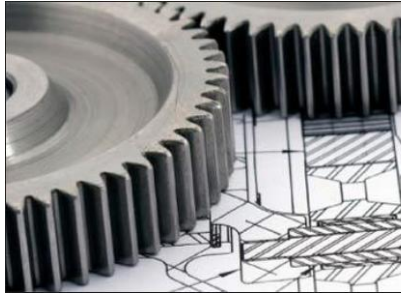
Mechanic

Create prototype

Electrica

hange

Result

Multilevel approach

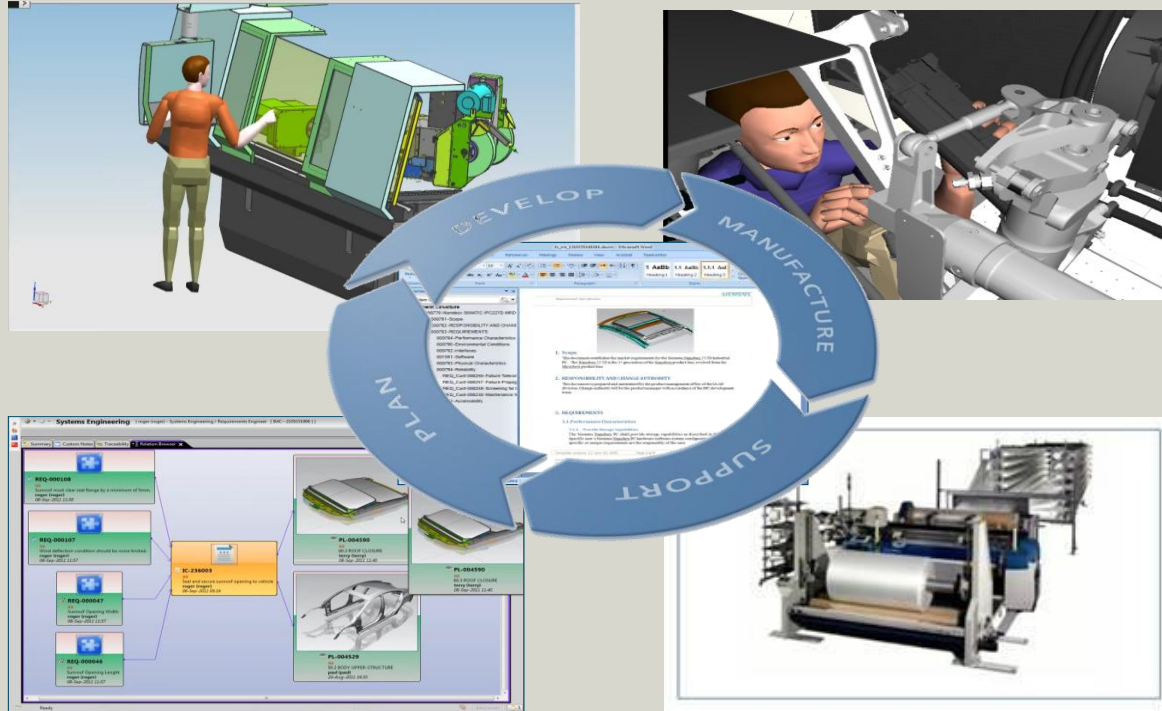Virtual model = Result

Mechatro— Test

3-4

A new machine can be tested and validate during simulation on virtual model without spend time and costs on real prototype

A virtual model reduce time and costs

Design requirement definition & management

*Easily **Define**, carefully **check**, and **maintain** all design requirements through the whole lifecycle.*

Efficiency Energy Analisys

EE Single Machine Analisys

Process:
• Virtual schema definition
• System Concept and control ring optimization
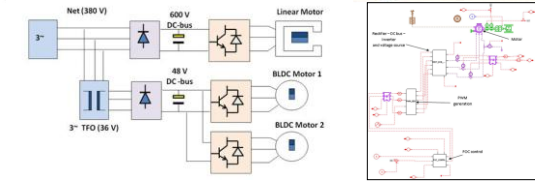• Prototype building (or retrofitting)

Benefits:
• Evaluate and Optimize machine concept configuration selecting components with better energy consumptions conditions/combinations

AMESim model of the badminton robot

Electrical drive configuration of the robot

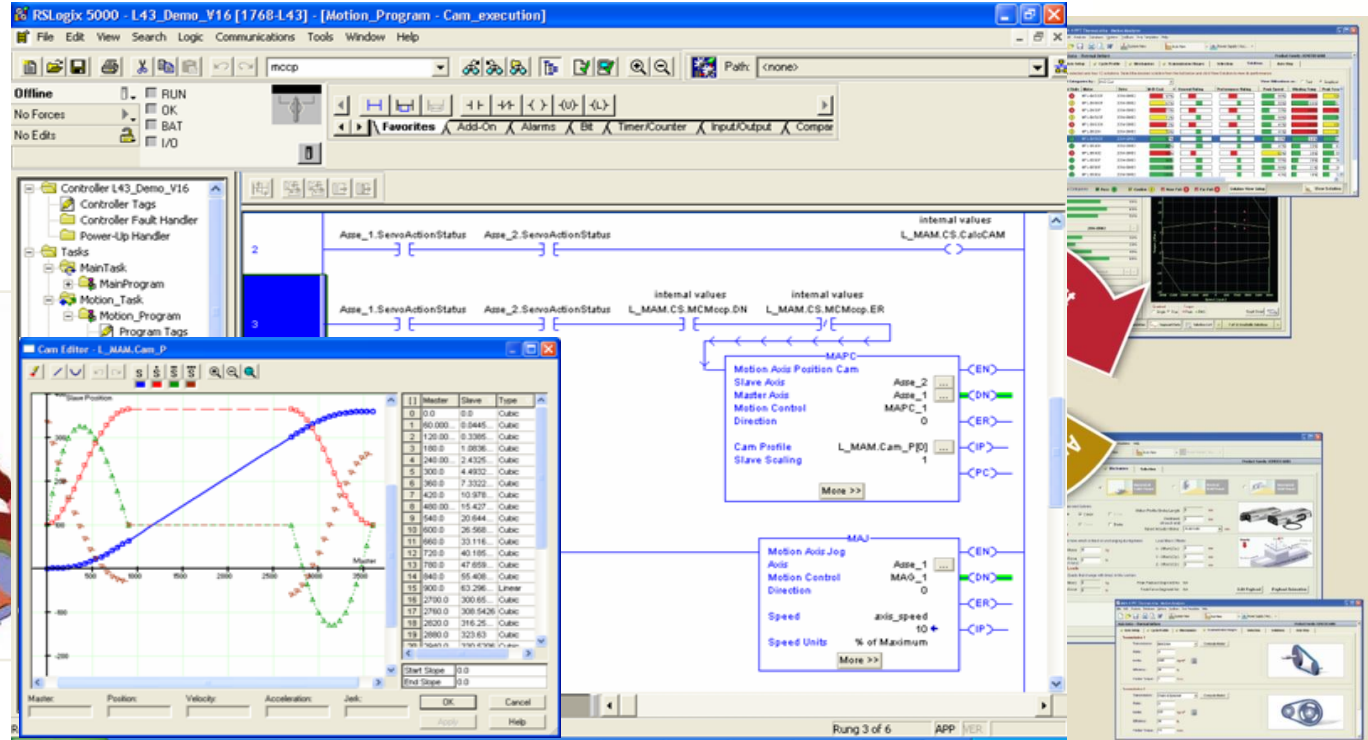## EE Multi-Machines Analisys -> Digital Factory

Scopes:
• Work Conditions Consumption levels, stand by etc. (line balancing)
• Consumptions Behavior Tracking

Benefit:
• Better definition of the energy commitment and the energy supply agreement (contract)
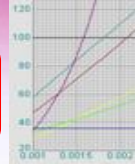
Design Optimization

- **The optimization reached with the collaboration venture between the component selection tool and the CAD project give you a final result that is the motion profile ready to use in your motion controller**
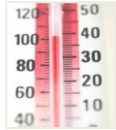
Virtual Design Tools

System Efficiency Analysis
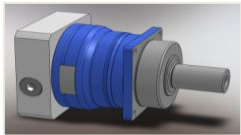Helps boosts machine performance and reduce energy consumption.

System Thermal Modeling
Especially useful for machine builders exporting to countries with hot weather.

Ratio Design Analysis
Guides designers to an optimized solution.

Supply Voltage Tolerance Analysis
Reduces chance of machine issues in the field that result in costly support.

System Tolerance Analysis
Provides an insight into a machine's ability to cope with change.

Emergency Stop Analysis
Maximize output without compromising safety

System Tuning Simulation
Helps reduce design error and can save time during machine commissioning.
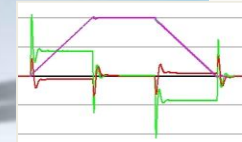
Lifetime Estimation
Size an integrated linear stages and automatically get a service life estimation.

3D CAD Integration
Download models of motion product and verify motion profiles at the mechanical design phase.

Development optimized
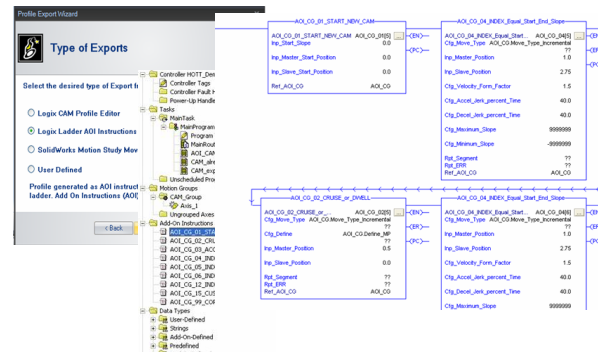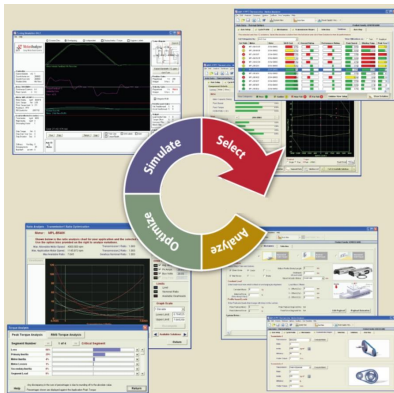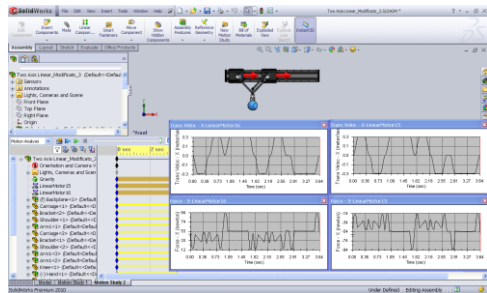
CAD

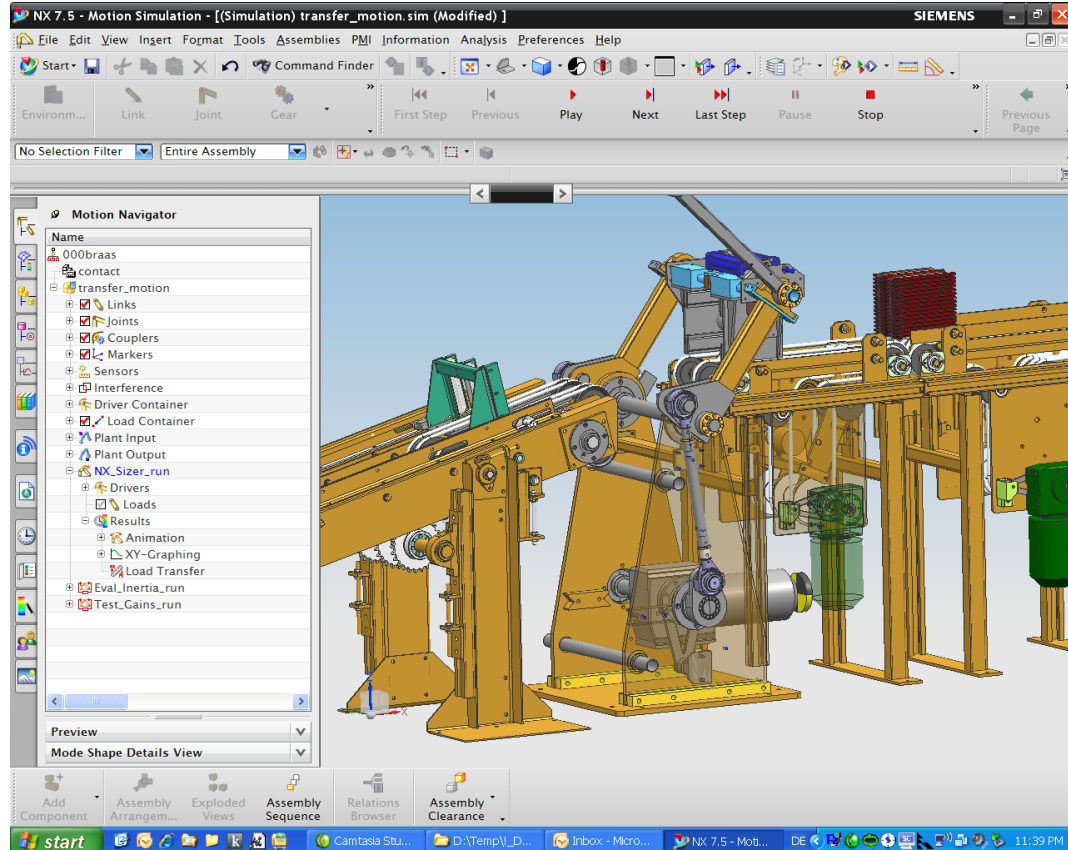- Project
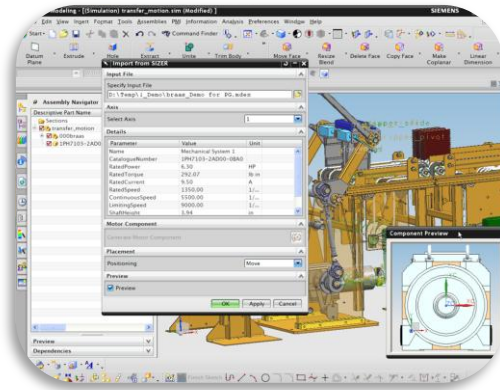- Motion Analisys
- Plot force diagrams

Simulation Tool

- Analize
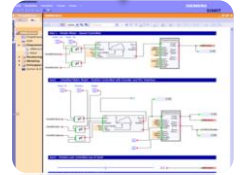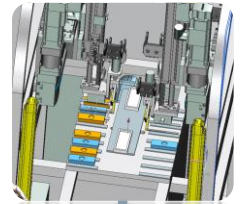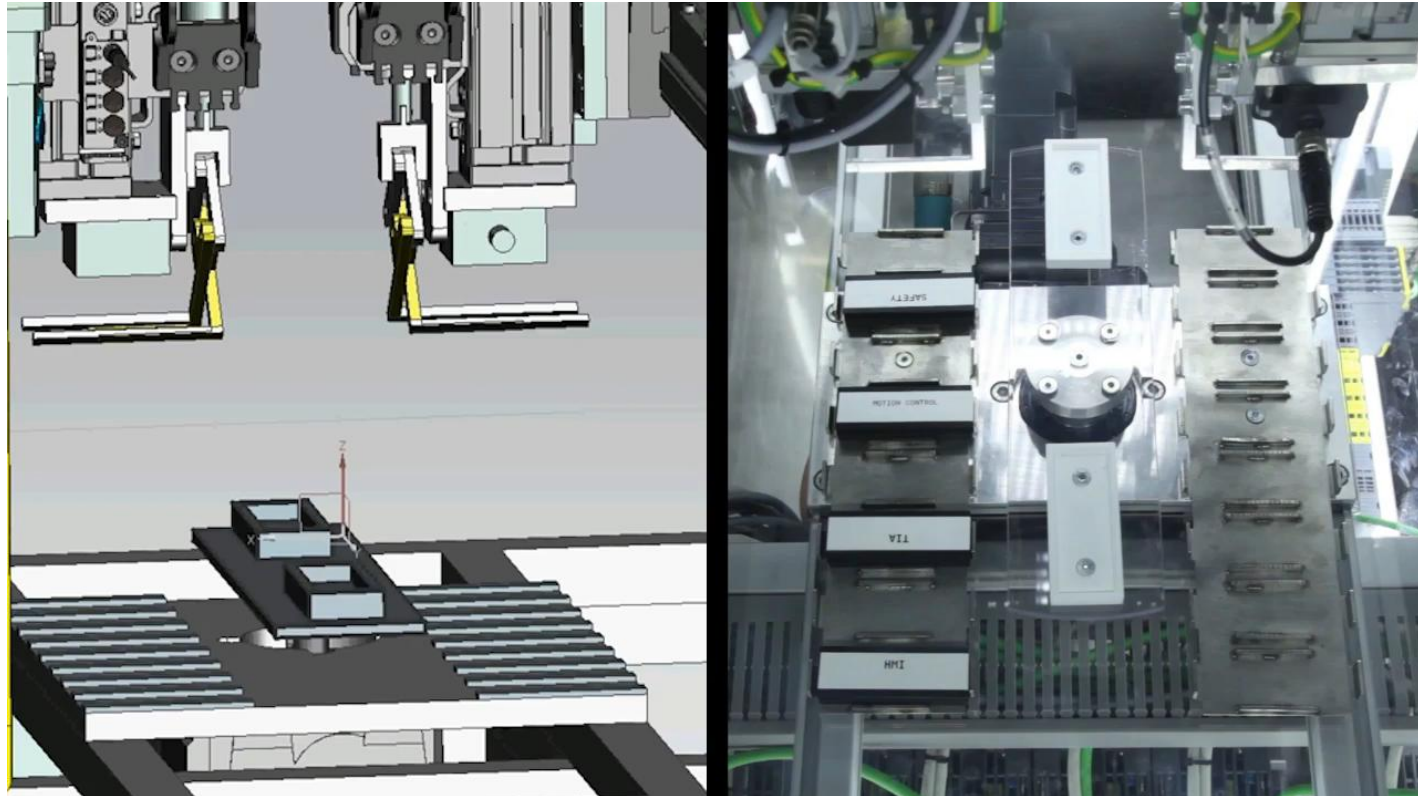- Simulate
- Optimization
- Selection

PLC

- Export / Import
- AOI instruction
- CAM Profile

The Final Digital Mockup

The Digital Twin Model

Benefits and advantages

- Reduced Time To Market
- Greater Innovation Agility (Test without Risk)
- Risk Mitigation (Simulation reduce risk by predicting)
- Commissioning time reduced (waste already predicted)
- Increased machine value (more throughput, no additional cost)

By take advantage of these technologies it's possible to reach a big step forward on the machine performance

MECHATRONICS: IT'S ABOUT TIME