Simulation and Virtualization

Giuseppe Testa / Leonardo Cipollini
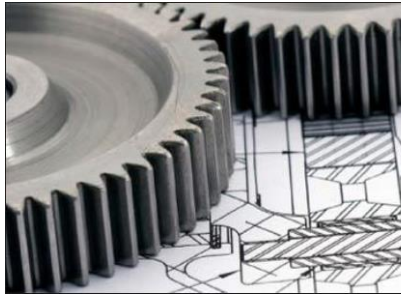
Traditional approach

Mechanic

Create prototype

Electrical

change

Result

Multilevel approach

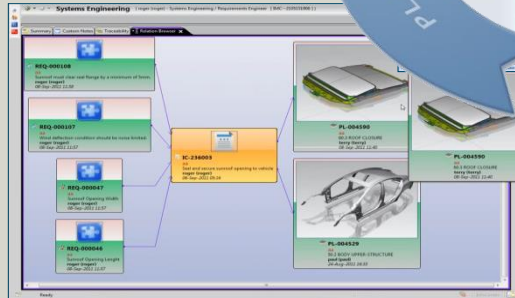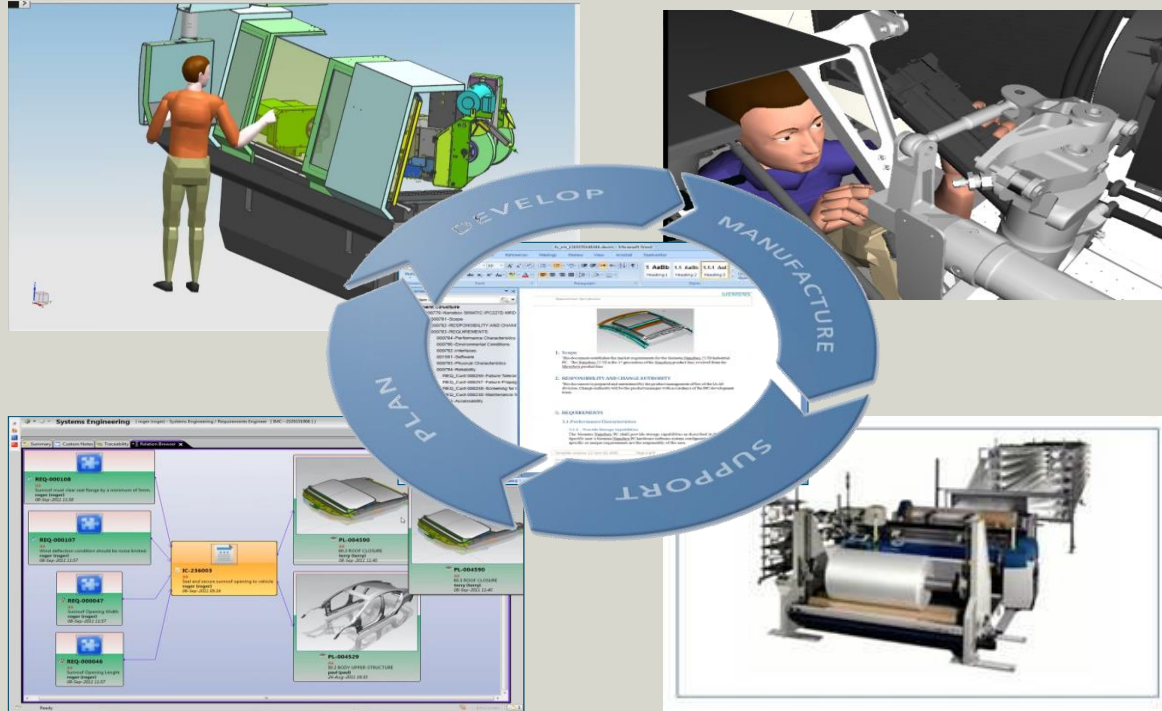Virtual model = Result

Mechatro... – Test
... de

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
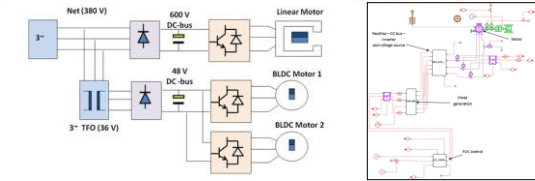- Prototype building (or retrofitting)

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

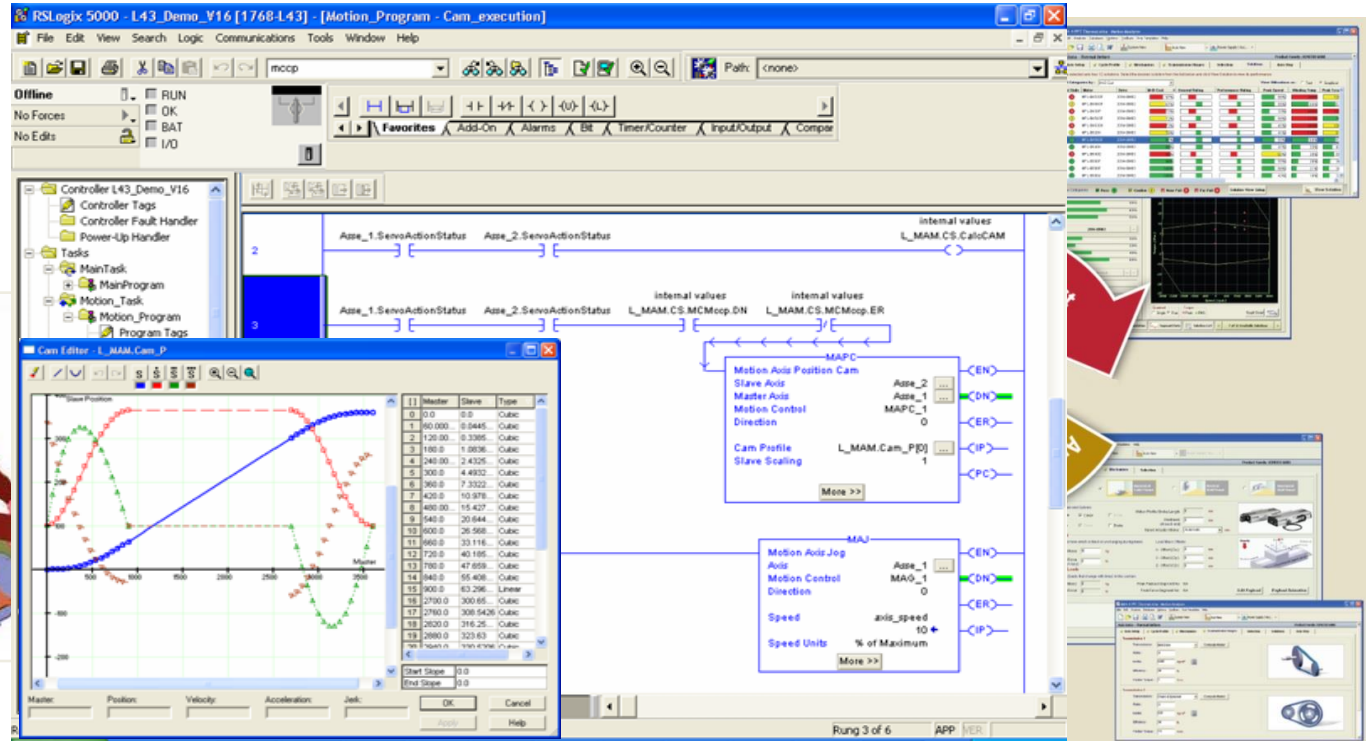## EE Multi-Machines Analisys -> Digital Factory

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)
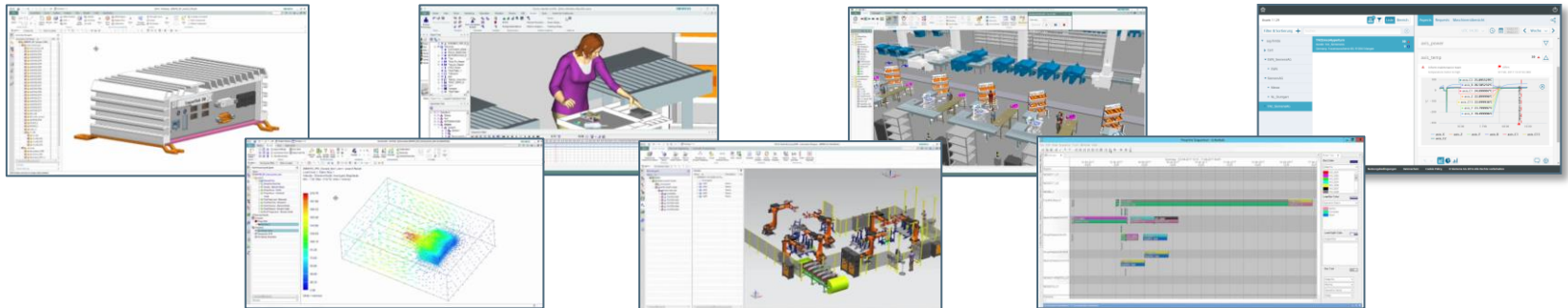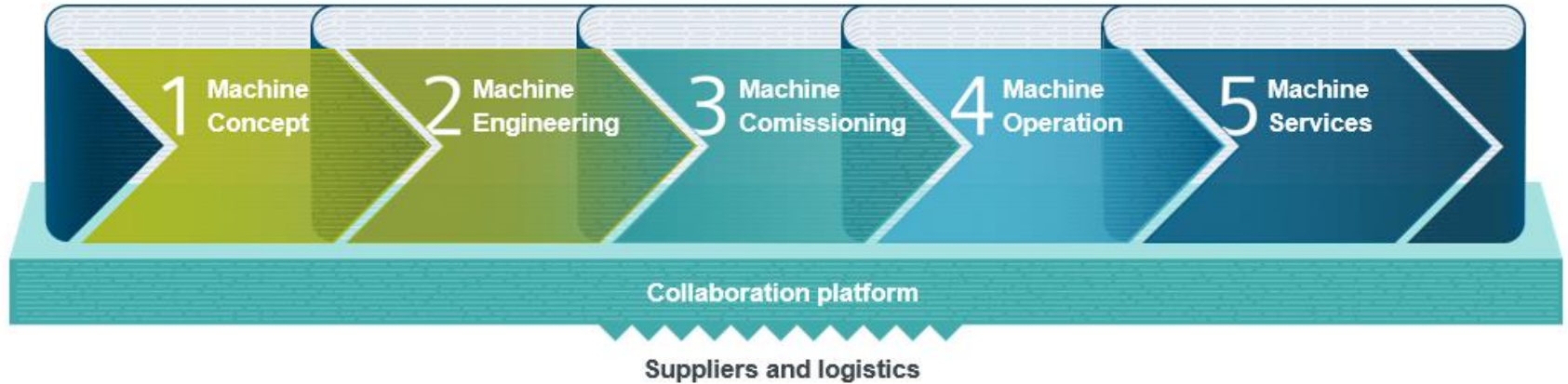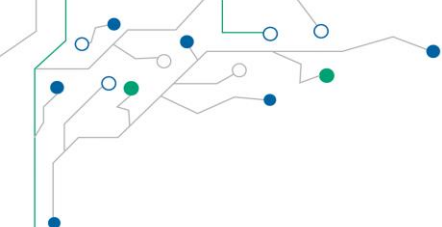
Design Optimization

- **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**

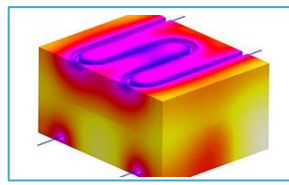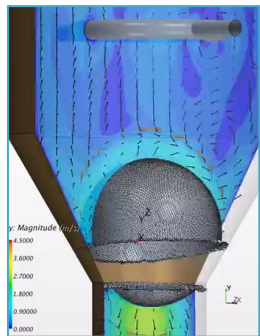# Digital Twin of the product & process at all the lifecycle stages
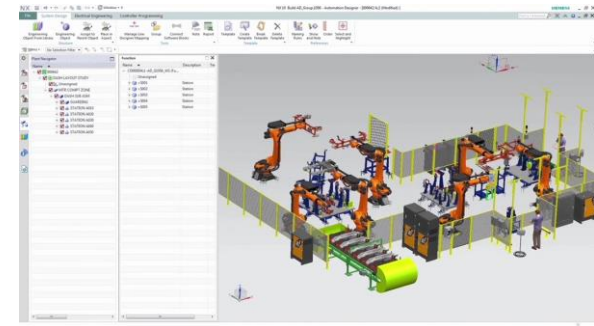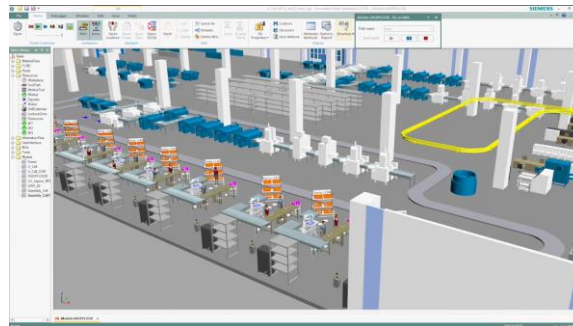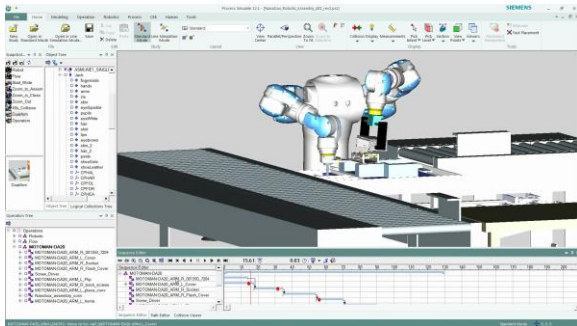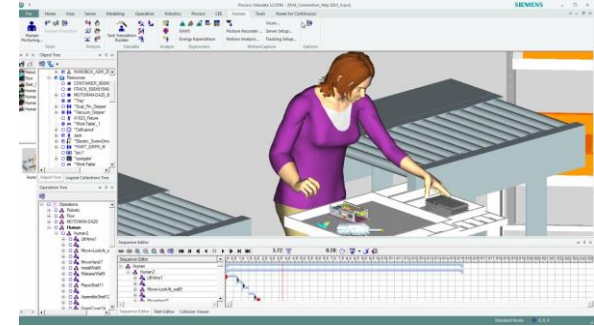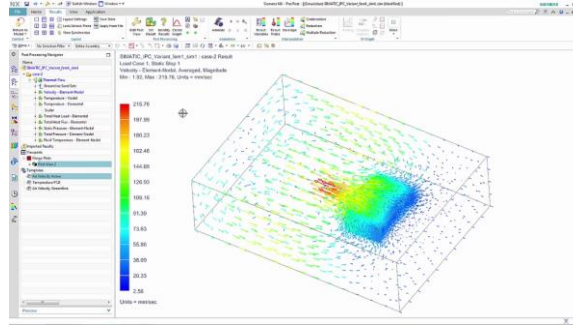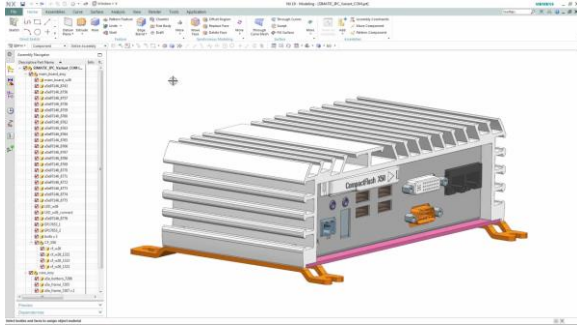
Digitalization along the value chain

Mechatronics design

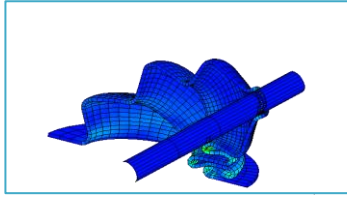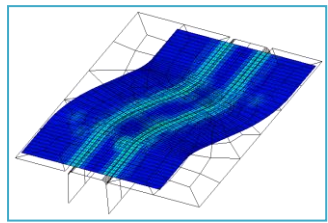Integrated mechatronic design and concept validation

Multi-physics Simulation
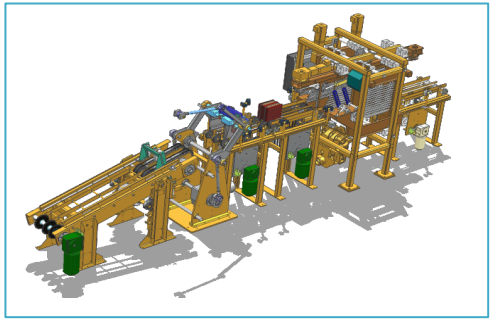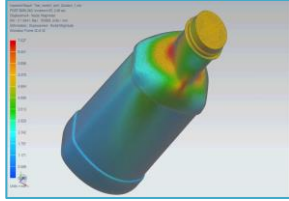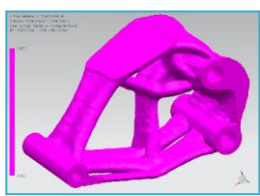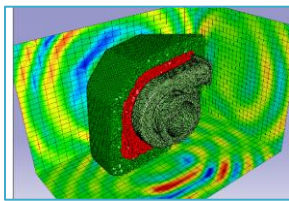
Digital security through diversity of the simulation disciplines
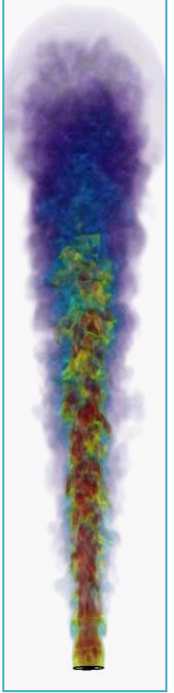
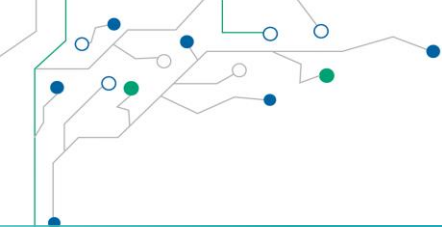**Thermal Stress Vibrations Structures**

Thermal Non Linear

Flow Thermal Durability Optimization
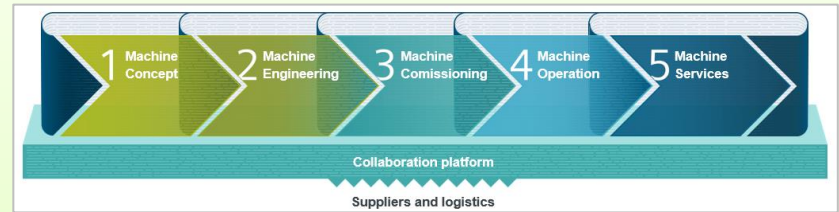
MKS FEM BEM FSI

CFD

Virtual commissioning

Seamless connection of the digital model to the real world

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
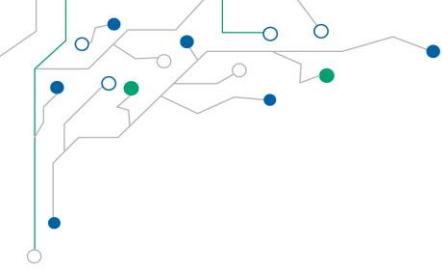
Mechatronics:
a "common" language between the mechanical, electrical and software design disciplines

Thank You!