

Speakers:

- 1. Adam Green, ATA Engineering Inc.
- 2. Layne Clemen, ATA Engineering Inc.



Simcenter Amesim



Who Are ATA Engineering?

We are an **employee-owned** small business with a **full-time staff of around 180**, more than 130 of whom are degreed engineers





ENGINEERING INC

Registered Professional Engineers 15 Average years of experience

Our Industries:

ATA Engineering's **high-value engineering services** help solve the most challenging product design challenges





Our Services

We provide our customers with complete, integrated solutions



Design

From initial concept development to detailed structural design



Analysis

Comprehensive structural, fluid, acoustic, and thermal analysis services





Test

Industry-leading structural test services for extreme loading environments

ATA Engineering is also a Siemens Platinum Level Value Added Reseller.



What is Simcenter Amesim?



SIEMENS Ingenuity for life

Digital transformation is key to mastering today's challenges and unleashing innovation

Digital is the main reason just over half of the companies on the Fortune 500 have disappeared since the year 2000.

Pierre Nanterme, CEO Accenture

Digital transformation with a comprehensive Digital Twin





Closing the loop with the comprehensive Digital Twin





Digital transformation with a comprehensive Digital Twin



Comprehensive Digital Twin



Performance engineering for the Digital Twin





Simcenter overview Engineer innovation





System Simulation Simcenter Amesim, Simcenter Flomaster Simcenter System Architect, Simcenter System Analyst Simcenter Prescan,

CAE Simulation

Simcenter 3D, Simcenter STAR-CCM+, Simcenter Flotherm, Simcenter Nastran, Simcenter Femap, Simcenter FLOEFD, Simcenter MAGNET, Simcenter Madymo, Simcenter Tyre, Simcenter Motorsolve, Simcenter Speed, ...

Physical Testing

Simcenter Testlab, Simcenter SCADAS, Simcenter Testxpress, Simcenter Anovis, Simcenter T3STER, Simcenter POWERTESTER, ... Exploration

& Analytics

HEEDS

Data

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Process Management

Teamcenter



Introducing Simcenter Amesim, the world-class system simulation platform for all industries



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Manager \succ . Where today meets tomorrow.

Engineering Decisions intrinsically involve Systems knowledge Design – Configuration – Physical behaviors – Electronics, Controls & SW





"...how can I front load decisions pre CAD to avoid late issues..."



"...how can I make the right engineering decision when I can't predict the outcome..."



"...how do we make sure that we meet the requirements set for the vehicle...and build what the customer really wants..."

"...we are spending more and more on prototypes, but we cant keep up with all the testing we need...







"...how can I design and virtually verify a complete system, not just components..."

System level innovation V-Model - Innovation is happening at the system level







System level innovation Innovation is happening more and more at the system level



SIEMENS Ingenuity for life

Increase in electronics, software within subsystems Quality Issues

Implications

Need for cross-domain simulation & Validation

System information exchange between OEMs & suppliers



What is a mechatronic system



What is a mechatronic system?

A combination of <u>multi-physics systems</u> interacting together and being <u>actively controlled</u> Mechanics + elecrtronic



What is mechatronic system simulation?



Classical design issues :

- Is the electric motor powerful enough?
- What is the time response of the system?
- What maximum pressure can be reached?
- Is there any risk of vibration?
- How to optimize the control design?

Key words :

- Multiphysics with power exchange
- Dynamic system (function of time)
- Physical system model = plant model

Control

Electric





Simcenter Amesim









CAD import



And more...

Physical modelling with Simcenter Amesim Simulation models based on physical connections



Electrical system simulation



Fluid system simulation



SIEMENS

 imulation
 System integration



Mechanical system simulation

Thermal system simulation



Modeling of mechatronics systems Any type of physics combined



Libraries

- Signal and controls
- Mechanics
- Hydraulics,
 Pneumatics
- Electrics and Electro-mechanics
- Energy storage, Battery
- Thermal and Thermodynamics
- IC Engine, Exhaust
- Aerospace and Defense







Design complex mechanical systems right from the first time





FEW LIBRARIES

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BZZ

2000

- Linear and rotary mechanics
- Planar mechanical
- 3D mechanical
- Powertrain
- Cam and followers, ...



Example of transmission solutions Modeling interactions between all transmission subsystems





Where this capability can help: Simulate a thermal runaway scenario in a battery module





> Simulate the thermal runaway propagation inside the module and evaluate design variants



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Streamlining the Design Exploration Process Application Example: Electric Vehicle Sizing



Objective:

- Minimize acceleration time (0 -100 km/h)
- Maximize range

Design variables (5):

- Torque Curve Coefficient
- Gear Ratio
- Downshift Speed
- Shifting Hysteresis
- Rim Diameter

Results:

500 design concepts were evaluated in five hours of simulation clock-time (5 cores used on Windows laptop)

Discovered tradeoff relationship between goals, with improvement over starting design ranging from 27% gain in acceleration to 33% longer range







Over to you Layne...



Contact Us





13290 Evening Creek Drive San Diego, CA 92128

(858) 480-2000

sales@ata-e.com

www.ata-e.com www.ata-plmsoftware.com

@ATAEngineering

ata-engineering

