CAD/PLM Integration and Data Exchange in Accordance with the Business Strategy

Dipl.-Ing. Dr. Rudolf Wedenig
Introduction
MAGNA International

Business Strategy

CAD/PLM Integration and Data Exchange
The Challenge
The Vision
The Solution
The Roadmap

MAGNA International Europe Prototype

Integration of further Systems

Outlook
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CAD/PLM Integration and Data Exchange

The Challenge

The Vision

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The Vision
Magna International Inc. which is the most diversified automotive supplier in the world designs, develops and manufactures automotive systems, assemblies, modules and components, and engineers and assembles complete vehicles, primarily for sale to Original Equipment Manufacturer (OEMs) of cars and light trucks in North America, South America, Mexico, Europe and Asia.

- Total Revenues 2005: 22.8 (US$ Billion)
- Ranking in Revenues: No. 3
- Total employees: over 82,000 (as of January 2006)
- 222 manufacturing divisions and 58 product and engineering centers
  - Stock listed
    - NYSE: MGA
    - TSX: MG.A, MG.B
In 6 Design & Engineering Centers in the U.S., Canada, Europe and Asia, Magna Powertrain employs nearly 850 engineers providing the know-how for innovation, concepts and design.

**Toronto, Canada:**
- Advanced Engineering and Design for Engine and Transmission components

**St. Valentin, Austria:**
- Engineering Services for Drivetrain, Engine, Chassis
- Commercial vehicles, Software

**Lannach, Austria:**
- Advanced Engineering and Design for Drivetrain, AWD / 4WD

**Troy, MI / USA:**
- Advanced Engineering for Drivetrain AWD / 4WD

**Syracuse, NY / USA:**
- Design for Drivetrain AWD / 4WD

**Shanghai, China:**
- Sales and Engineering Office

**Tokyo, Japan:**
- Sales and Engineering Office

**Asan, Korea:**
- Advanced Engineering and Design for Engine components

**Seoul, Korea:**
- Sales and Engineering Office
Engineering Center Steyr St. Valentin

- **St. Valentin:**
  - Engineering Center
  - Commercial Vehicle Engineering
  - Engine & Drivetrain Engineering
  - Technology Center
    - Simulation and Testing Services
    - FEA & Durability
    - Thermal Management
    - CAD/CAM
    - Software Development and Sales
  - Low Volume Production of Components
  - Headcount: 350 (Sep 2007)
Organization Engineering Center Steyr (ECS)

Management
F. Dorfer

Functional Range

- Human Resource
  E. Ebenhofer
- Project Management & Organisation
  W. Dantendorfer
- Engineering Administration & Project Controlling
  H. Antensteiner
- Logistics, Purchase & Facility Management
  E. Fürst
- Controlling & Accounting
  G. Papitsch
- Quality, Environment, Health & Safety
  W. Diesenreither
- Information Technology
  R. Fasching

Business Units

- Vehicle Engineering
  W. Weller
- Engine Engineering
  H. Waras
- Engine Components Engineering
  R. Marzy
- Drivetrain Engineering
  J. Leitner
- Technologie Zentrum Steyr
  B. Unger
- Production Vehicle Components
  M. Muckenhuber

Stand: 1. Apr. 2007
TZS - Technology and Software for the Vehicle Development Process

- Dynamics - MBS
- FEA & fatigue
- Concept, design DMU, load data (ALSIM, KABI, VANC)
- Vehicle thermal management (FEMFAT, KULI)
- Verified prototype
- Comfort & acoustics
- Fatigue laboratory
- First prototype
- Staff 110
MAGNA - ECS Software Products

- **FEMFAT** Fatigue Life Prediction based on FEA
  - multi-axial fatigue
  - welded structures and spot joints / rivets
  - thermomechanical fatigue
  - load data management and engine dynamics / acoustics

- **KULI/FASI** Vehicle Thermal Management Optimization
  - fluid and air flow netwerk simulation
  - design and optimization of cooling system concepts
  - transient simulation

- **KABI** Integration CAD- and Manufacturing System for Vehicle Electric
  - electric engineering for the vehicle industrie (cars, trucks, busses, ...)
  - reduced process time from design to manufacturing
  - 3D-design manager with interfaces to CATIA V4/V5
  - cable harness manufacturing

- **VANC** CAM System for Turning, Drilling and Milling
  - 3D-Integration
  - Tool Resource Planing
  - „Navigator“
  - ...

- **ALSIM** CAD based dynamic Leak Simulation – Dip Painting
  - early definition and optimization of process fluid drainage
  - avoids modifications
  - suitable for complex surface and volume models
Business Strategy

• ECS is a world wide competence center for
  – overall commercial vehicle development
  – engine development
  – drivetrain development
  – software development and sales
  – …

• ECS drives the technology, growth and profitability of global Engineering Services & Systems Integration (ES&SI).

• …

System Integration (SI)
means ...
  – integration of modules on a higher level (system), considering interaction between these modules and/or other modules/systems of a vehicle e.g. powershift interaction with engine regarding shifting strategy
  – integration of one module with influence on other systems

Drive shaft-induced dynamic phenomena

Input from customer
  • engine excitation

Drive Train bending
  • Torsional vibration

Final Optimization
  on complete vehicle
  • Vibration Comfort
  • Homologation

Car Body dynamics

Transfer Path Analysis
• Modal Contribution Analysis
Conclusions for the CAD/PLM Systems

• Since the system integration will be one of the most important foci of MAGNA Powertrain on the engineering side => also the CAD/PLM system integration on the IT side will get tremendous attention in the future

• A continuously IT-system supported process is one of the keystones of a successful system integrating engineering process

• ECS (has to) drive(s) the technology in CAD/PLM System integration
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System Requirements

- **System Requirements**
  - Optimal support of the engineering processes for the
    - Concept phase
    - Advanced (technology) development
    - Development for the volume production (serial development)
  - Functions to be supported
    - Import
    - Export
    - DMU
    - ...
  - High flexibility in projects and CAD releases

⇒ Deep integration of the PLM and CAD systems necessary
⇒ Development of a flexible and neutral data exchange platform
The Challenge

• The integration of the geometry creating system (e.g. Catia/SmarTeam, UG/Teamcenter, Pro/E/Intralink) including the PLM Systems

• The challenge is to integrate all systems and customers/supplier requirements in only one integration platform incl.
  – data exchange throughout the platform
  – Mapping and renumbering of the structures
The Vision

Data Exchange Platform „Engineering Integration Base (EIB)“

- OEM 1: CAD, BoM, ERP
- OEM 2: CAD, BoM, ERP
- OEM 3: CAD, BoM, ERP

Virtual production planning
Virtual prototyping
DMU

Supplier
PLM/ERP-systems
CAD

Magna Powertrain
The Solution
The Roadmap

Engineering Integration Base

In productive use
In work
Planned

Caption
Systemarchitecture + Data Exchange ECS – Overview
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- MAGNA International Europe Prototype
  - Catia V5-SmarTeam-SAP
  - UG-Teamcenter-SAP
  - Teamcenter-SmarTeam
Integration of further Systems

- System Plan
  - Topological Concept
  - Wiring

- Functional Design
  - CAPEMaster

- EIB (Engineering Integration Base)

- 3D Design Manager
  - CATIA

- Topology Manager incl. DB

- Topological Plan
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Outlook

- First modules of the integration platform in productive use
- Several modules schedules until the end of the year
- Data exchange is pushed
- Strong co-operation between the different MAGNA sites
- Concept is multisite proven
Thank you for your Attention

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