Green Vehicles 2015
GV-6 and GV-8

Prepared for:

Information Days of the Research
PPPs on Green Vehicles

Brussel 21 October 2014
Dr. İsmail Bayezit, BEE-S/Software Development

Affiliation: Istanbul Technical University

- Turkey's Leading Engineering Institute
- Experienced in engineering since 1773
- Strong commitment to carry both Applicable and Value-added research
- Producing a new generation of technology and innovation
- University aims at expanding relations with the selected institutions abroad

Affiliation: Istanbul Technical University

1773
Mühendishane-i
Bahr-i Hümayun

1909
Mühendis ve Mimarlar
Mekteb-i Alisi

1944
Engineering Building

1988
Marine Faculty

1795
Mühendishane-i
Berr-i Hümayun

1914
First Engineering
Graduates

1970
main location
at Ayazağa

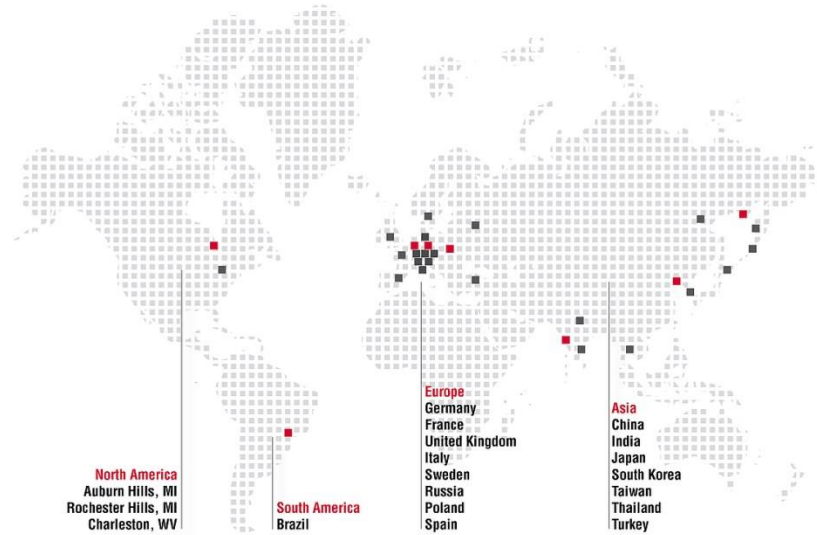
1974
Switching to two level
Undergrad. And Grad.
Education

In 2014
Since 241. years

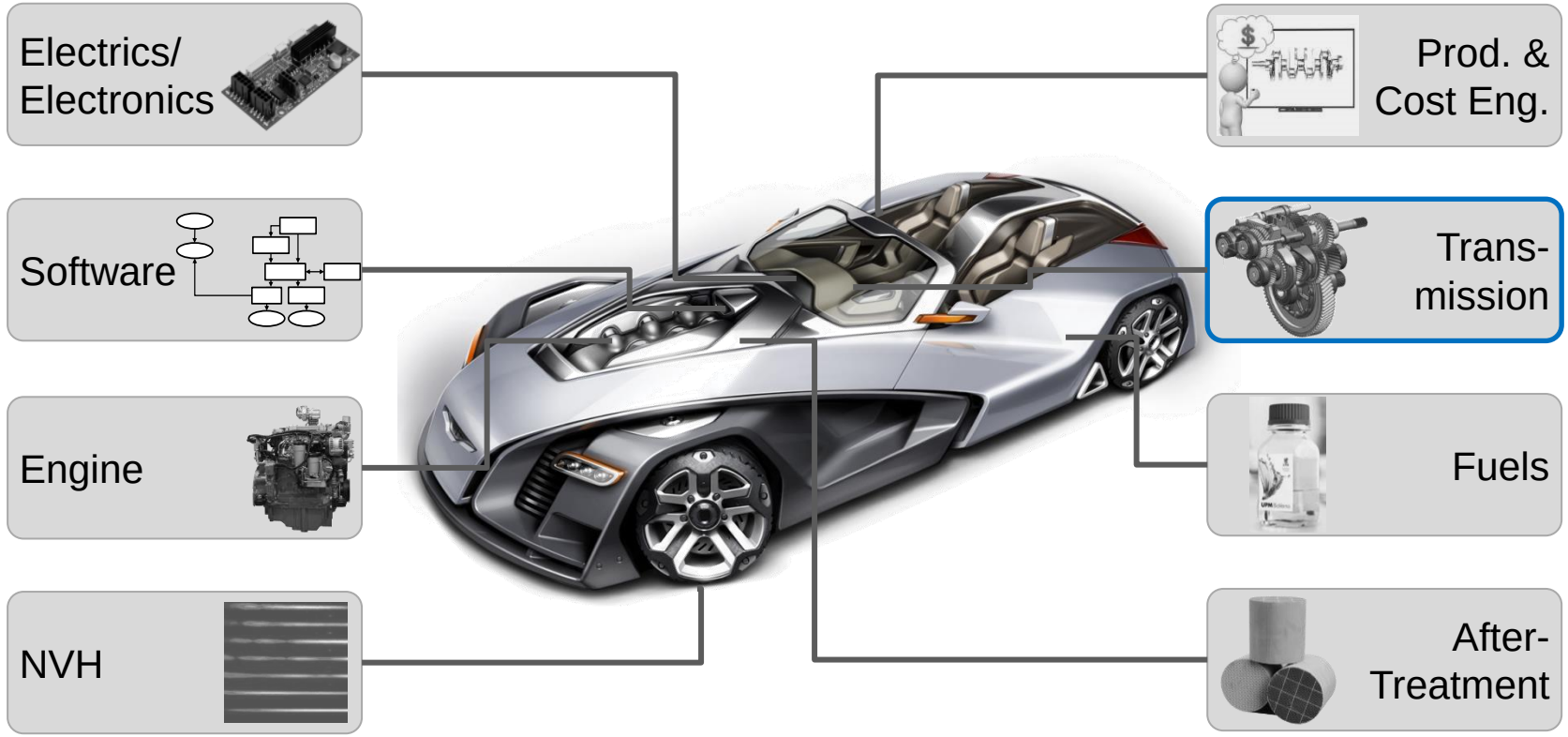
FEV worldwide
… Turning innovative ideas into reality

Founded in 1978

- working for major car and engine manufacturers worldwide
- > 3,000 employees
- > 150 engine/powertrain test cells
- ~ 30 R&D employes work for FEV Turkey

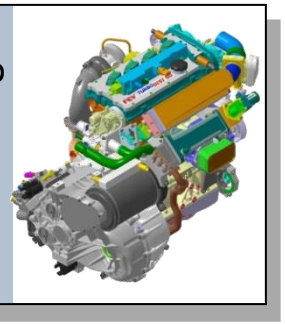


Turn key project capabilities

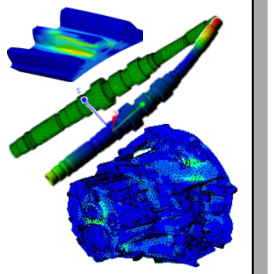


FEV Transmission Development
One-Source for complete Powertrain Development

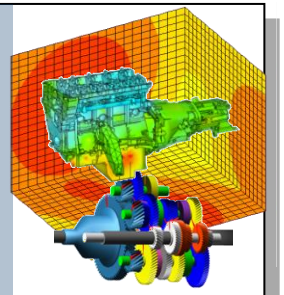
HW Design



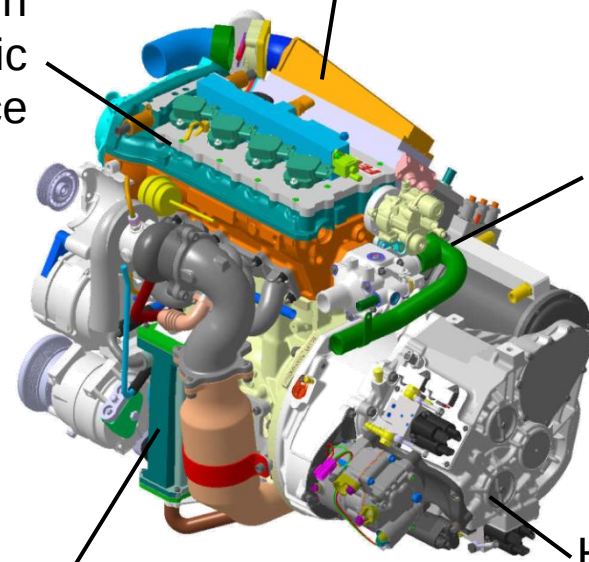
CAE



NVH



Transmission Development

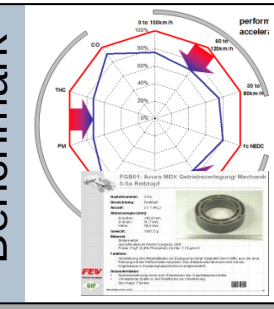


Engine Development

Calibration

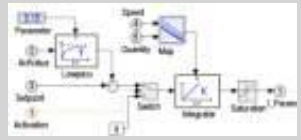
HW Testing

Benchmark



Complete Power Train Solution from One-Source

FEV Transmission Meeting
Overview of Engineering Services for Software & Calibration

Product / Service	Content	Customer Benefit
Testing 	■ 15 transmission test benches ■ up to 385 kW ■ max. input torque = 900 Nm ■ max. output torque = 2 x 5.000 Nm	■ Up to 15.000 rpm input speed possible (20.000 rpm soon) ■ Entire testing catalog available
Software development 	■ TCU software development ■ Software devevelopment for series production using dSPACE TargetLink ■ Rapid prototyping software for demonstrator vehicles	■ AUTOSAR compliant implementation ■ Support of all common tool chains
Calibration 	■ Experience in series calibration ■ Shift quality calibration & evaluation using FEV toolchain TraCE / FEVos ■ Shift strategy calibration with TraCE / ShiftAnalyzer	■ Fast and reliable tool chain ■ Experienced processes proven by European clients

Reference Project 1
Air Management Software

Heavy Duty Application

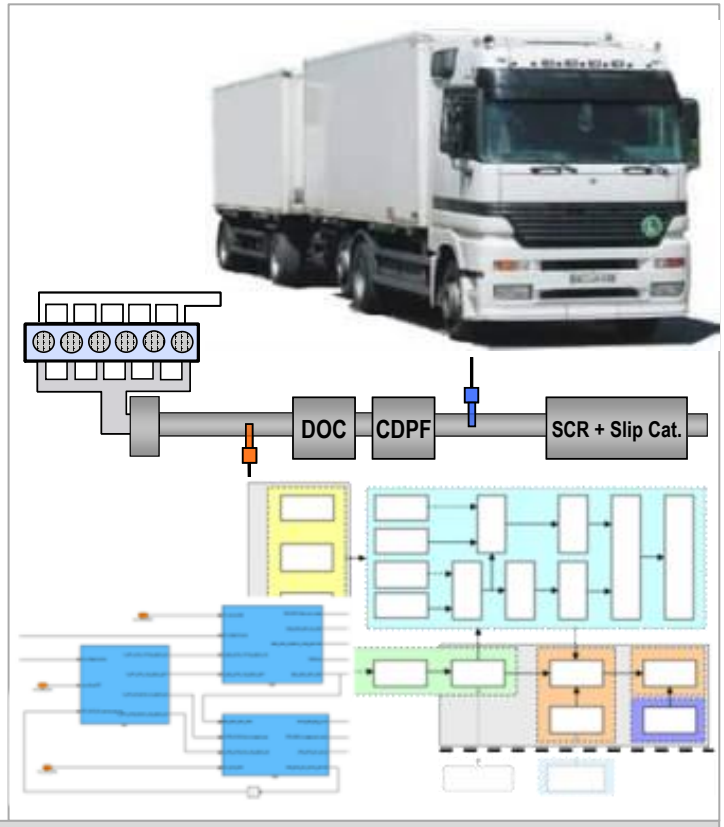
- Air management
- Exhaust after treatment
- Engine coordination

Responsibility

- Concept development and function specification
- Production software function development
  - Floating- and fixed point model implementation in Simulink and Ascet
  - ECUs from two different Tier-1, auto- and manual coding
- Production calibration

Achievements

- SOP 2010 (US2010) successful
- EU6 & US2013 SW upgrade



This work comprises complete development from concept to SOP

Reference Project 2
Particulate Filter Control

Development of Particulate Filter Control Software for European OEM

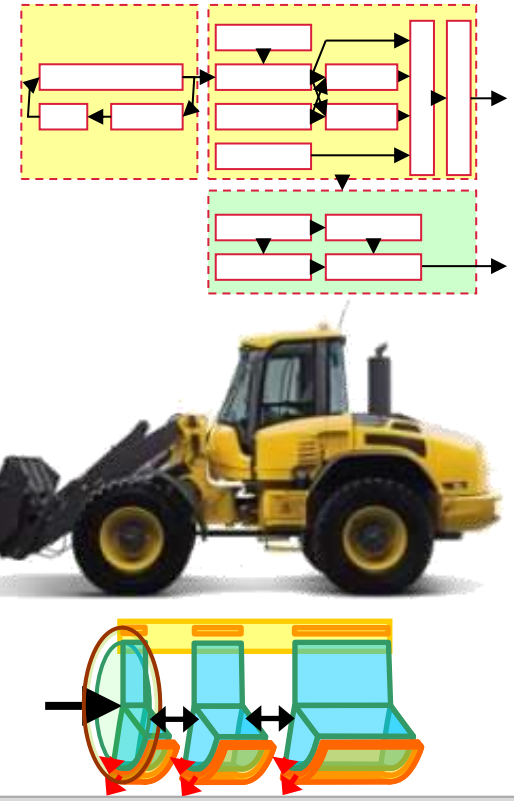
- Emission standards On Road (Euro 5/6) & Non Road (Stage IIIb/IV, Tier4 I/final)
- Regeneration Management, with and without Burner
- Air mass and Temperature Control, Delta-Pressure Model
- Advanced Soot, NOx Raw Emission and CRT Models
- Ascet and Simulink/TargetLink
- Embedded on ECU or separate standalone control unit

FEV responsibility

- Function development (Specification, RCP, Series implementation, Validation)

Achievements

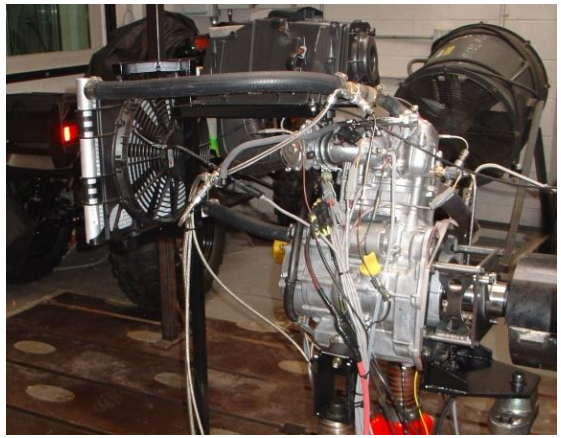
- SOP 2008 / Upgrade SOP 2011

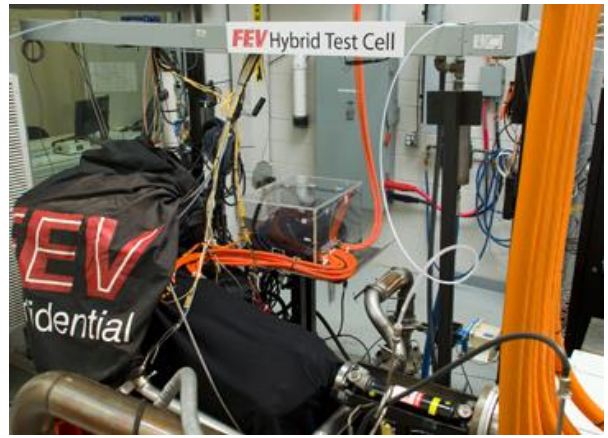


FEV develops sustainable advanced aftertreatment functions

FEV Development Examples
Diverse Testing Experience

FEV is Well-Versed in the Setup of Unique Applications

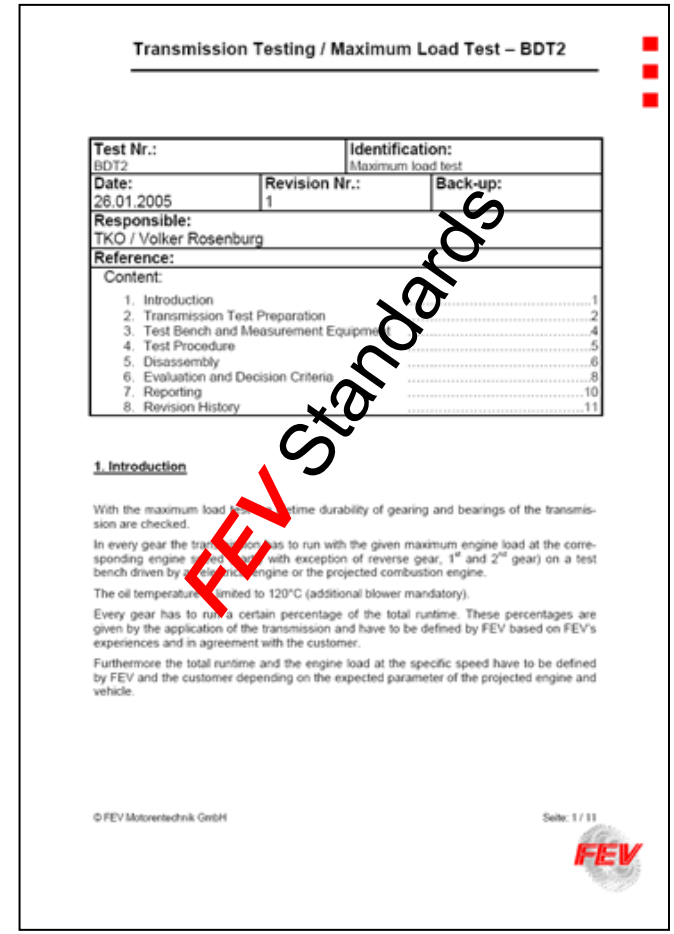




…. From transmission to vehicle, from 6 to 600 kW

Transmission Development
Tools & Methods

- Design
- CAE
- Calibration
- SW Development
- Project Management



Transmission Testing / Maximum Load Test – BDT2

Test Nr.: BDT2		**Identification:** Maximum load test
Date: 26.01.2005	**Revision Nr.:** 1	**Back-up:**
Responsible: TKO / Volker Rosenburg		
Reference:		

Content:

1. Introduction

With the maximum load test the lifetime durability of gearing and bearings of the transmission are checked.

In every gear the transmission has to run with the given maximum engine load at the corresponding engine speed (all gears with exception of reverse gear, 1st and 2nd gear) on a test bench driven by an electric engine or the projected combustion engine.

The oil temperature is limited to 120°C (additional blower mandatory).

Every gear has to run for a certain percentage of the total runtime. These percentages are given by the application of the transmission and have to be defined by FEV based on FEV's experiences and in agreement with the customer.

Furthermore the total runtime and the engine load at the specific speed have to be defined by FEV and the customer depending on the expected parameter of the projected engine and vehicle.

FEV Standards

Transmission Development
Tools & Methods

CATIA

Pro|ENGINEER WILDFIRE 3.0

UNIGRAPHICS

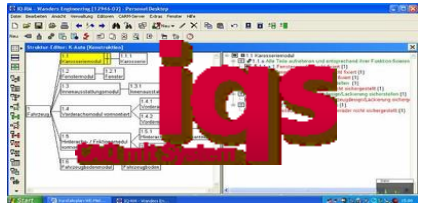
Windchill

KISSsoft
Calculation programs for machine design

Virtual Vengine

I·DEAS enterprise

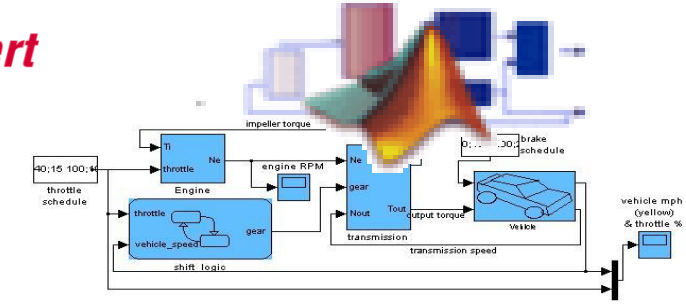
ABAQUS



vector

CANape
eASEE
CANalyser

TOPexpert



Microsoft SharePoint 2010

Microsoft Project 2010

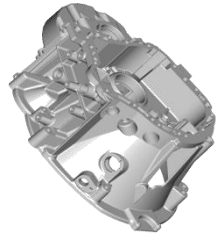
CALIBRATION methods

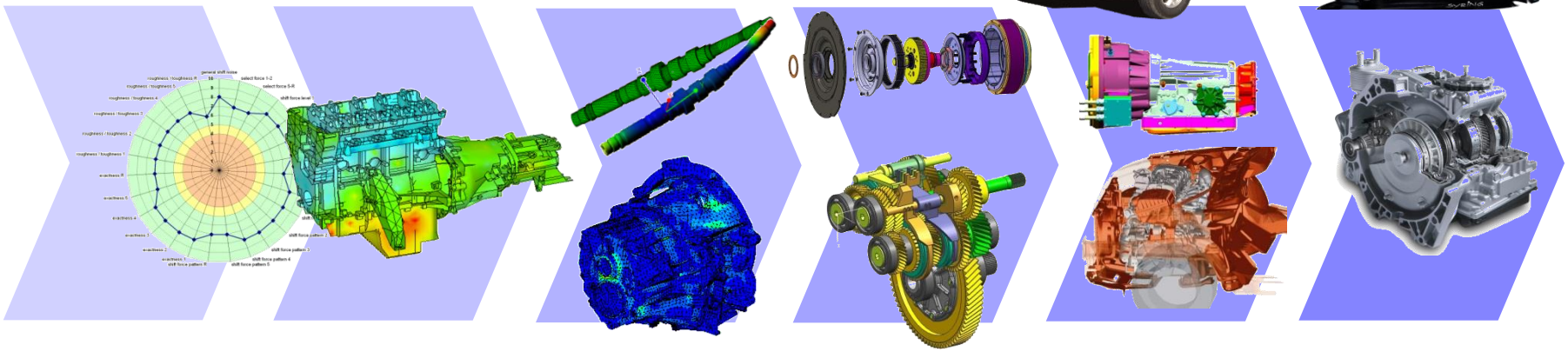
İTÜ

FEV

FEV Transmission Development
Summary

Complete Transmission Development From Concept to beyond SOP





Benchmark	Application, SW Development & Acoustics	Component Design & CAE	Detail Design, CAE & Testing	Prototypes & Vehicle Integration	Series Development & Calibration

..... or any step in between

Workpages or Responsibilities

- Able to take part as a project partner in GV-6 call
  - Developing the Transmission Unit targets emission reduction
  - Software Development for the TCU unit
  - Better shift schedules with energy saving and optimized emission
  - Calibration of the Engine unit for emissions
- Potential roles for GV-8 call
  - Developing BMS algorithms both for Hybrid/Electrical vehicles
  - Range Extended Electric Vehicles
- Fuel economy and cleanliness
  - Alternative fuels (LPG, CNG, LNG)
- Vehicle Functionality and Durability Testing
  - Different Drive Cycles
  - Test-benches (HIL/MIL , Dyno, Noise/Vibration)

Thank you for your attendence and attention

Contact details

Dr. İsmail Bayezit

Software Development

Phone +49 (241) 5689 6160
Mobile +90 (535) 799 32 87
Email bayezit@itu.edu.tr
bayezit@fev.com