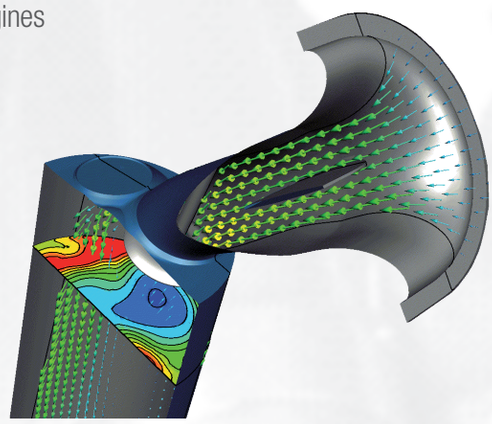
Engineering Services for Engine Performance Development

HERON TECHNIK

Graz/Austria

Activities

- **Support in engine development process**
  - 2- and 4-stroke engines
  - Diesel, Gasoline, Gas and DF engines
  - Alternative concepts
  - Specialist in engine efficiency optimisation of gas engines



- **Applied technology**
  - Sophisticated 1D engine simulation
  - 3D-CFD flow and combustion simulation
  - Valve train optimisation
  - Test bed data analysis
  - High- and low pressure data analysis
  - Detailed combustion data analysis

- **Additional services**
  - Costumer tailored software development
  - Thermodynamic training courses for engineers

- **Based on more than 30 years of experience in the field of engine development**

References:

aprilia, AVL, Cummins, STEYR MOTORS – INNOVATION WITH LIGHTNESS, KTM, PGES – Professional Gas Engine Solutions G.m.b.H, BRP, MWM – Energy. Efficiency. Environment., LIEBHERR, ISUZU, TRIUMPH

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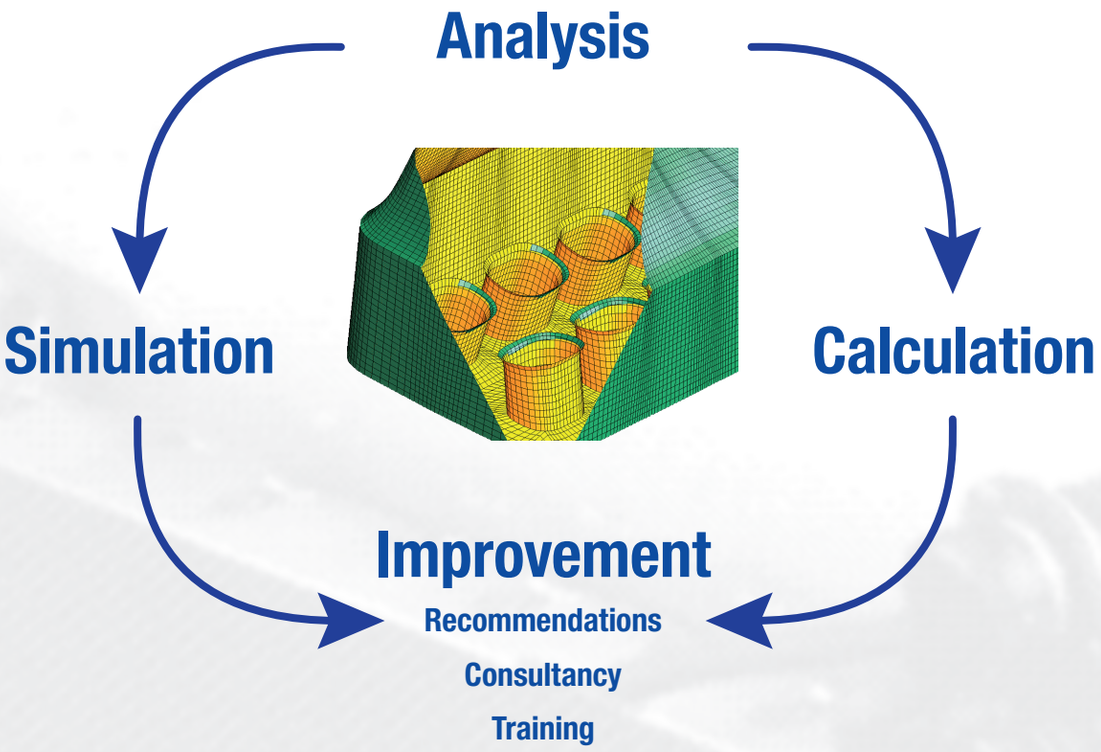
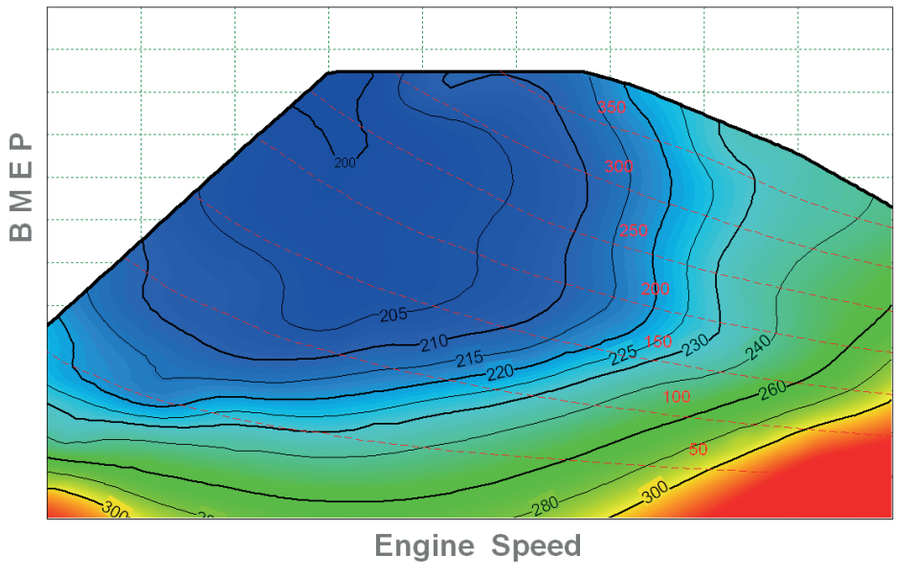


ADVANCED SIMULATION TECHNOLOGY

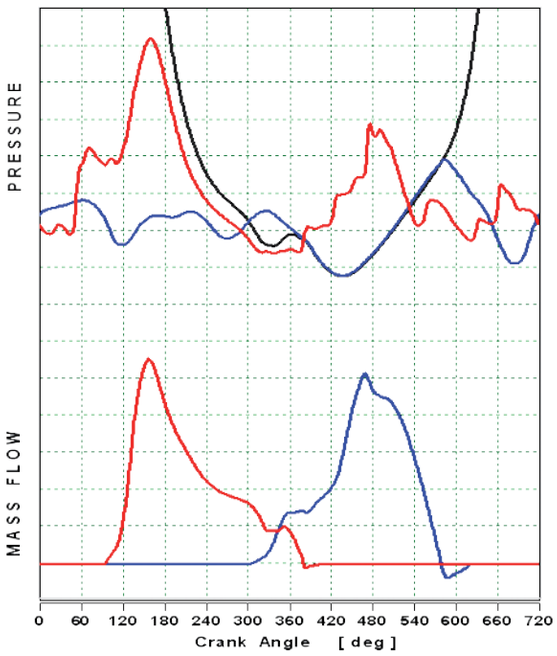
- High QUALITY standard
- SATISFIED costumers
- FLEXIBILITY and FAST RESPONSE are our POLICY and ADVANTAGE.

Simulation technology is our passion



1D Engine Simulation

Thermodynamic Engine Cycle and Gas Exchange Simulation



To analyse:

- Manifold dimensions
- Valve timings
- Gas exchange process
- Combustion data

Minimize Losses

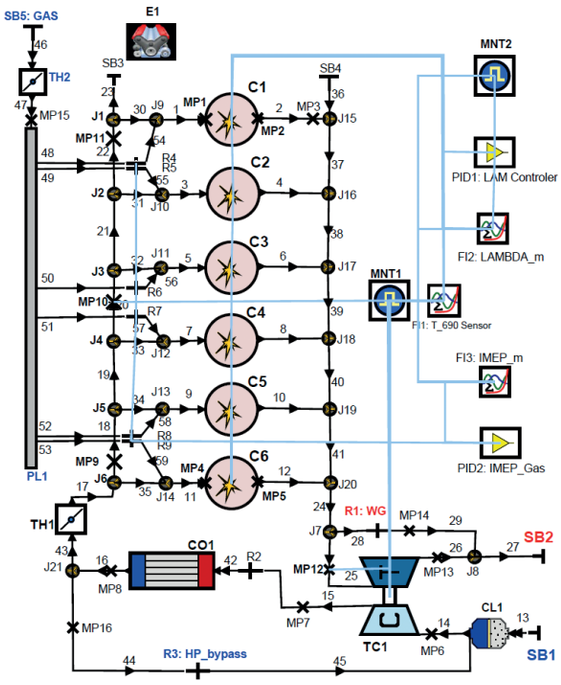
Optimise Efficiency

To predict:

- Power, torque and fuel consumption
- Peak in-cylinder pressure
- Pumping and pressure losses

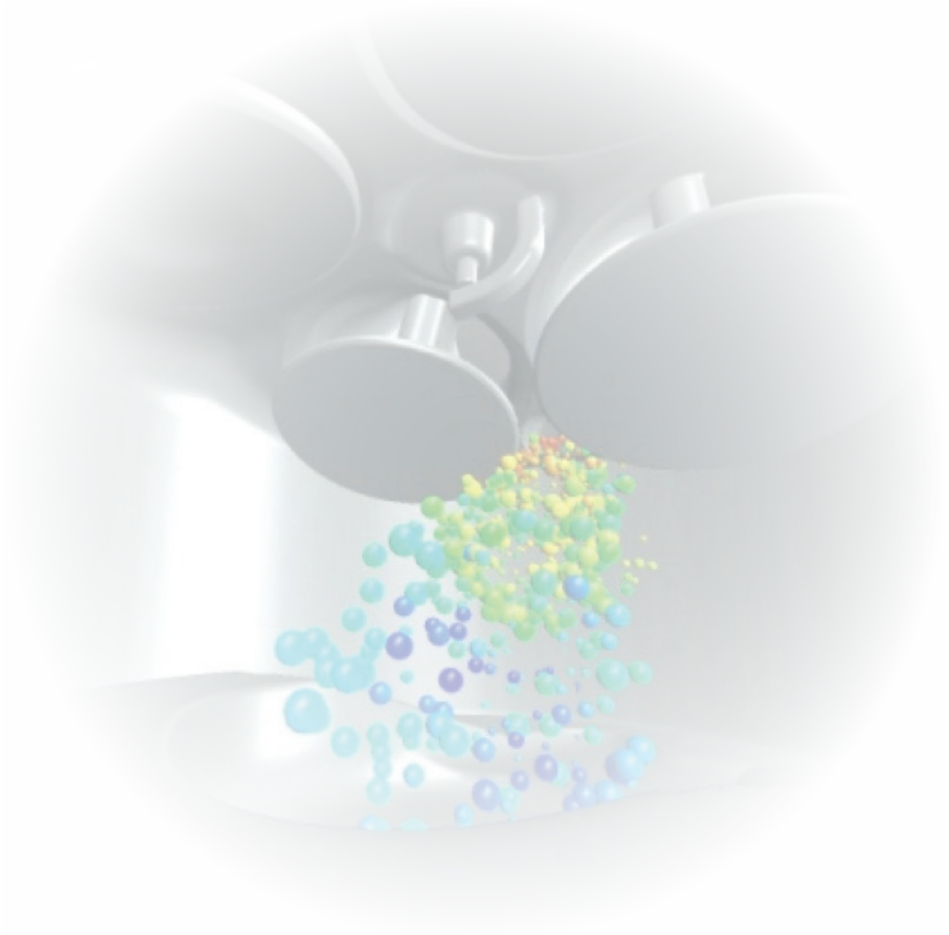
and to optimise:

- All main engine data
- Valve timing strategy
- Optimum manifold dimensions
- Turbo charger specification



Calculation Model: HD 6C TCI Engine Model

Simulation technology is our passion



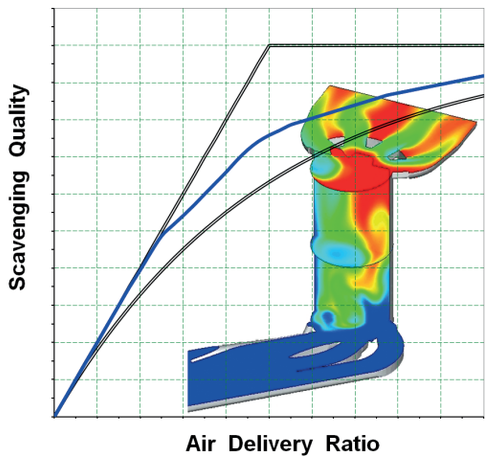
3D-CFD Simulation

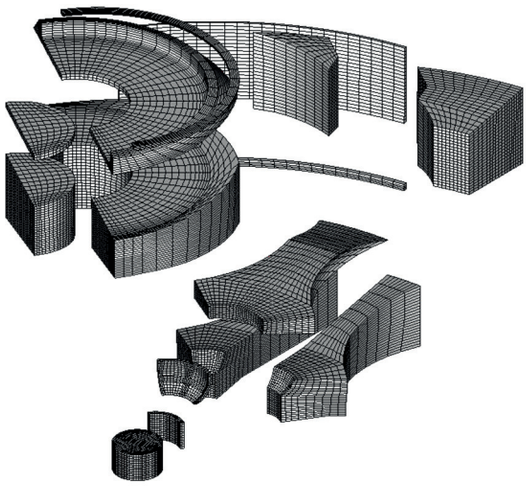
Flow, fuel injection and combustion simulation

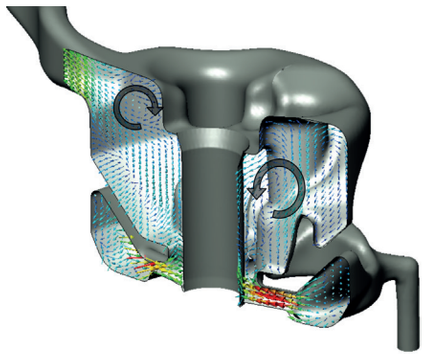
With moving valves and pistons for DIESEL, GASOLINE and GAS engines

Steady-state applications

- Port flow coefficients
- Swirl and tumble ratios
- Flow pattern and HTC distribution
- Scavenging quality
- Mean pressure losses

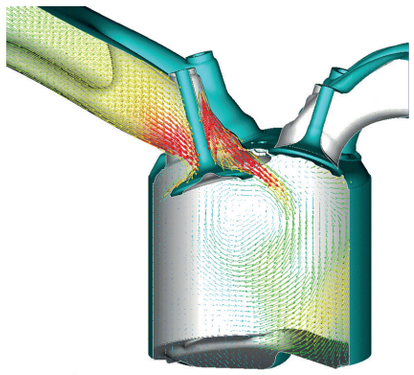






Transient applications

- Entire gas exchange process
- All in-cylinder conditions
- Mixture formation and fuel distribution
- Flame propagation and rate of heat release
- EGR distribution, TKE and dynamic flow fields
- and a lot more



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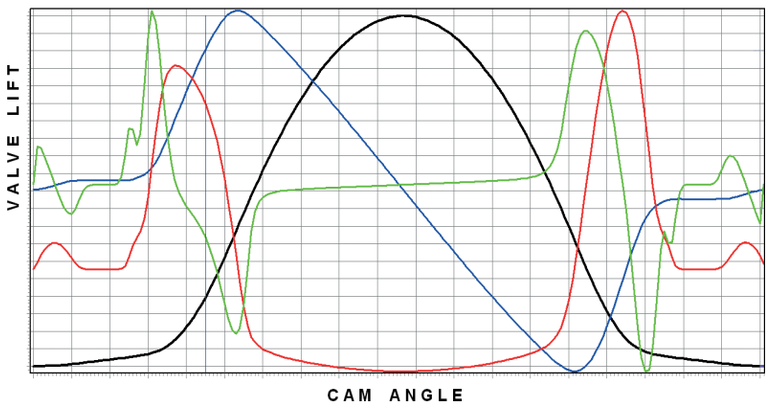
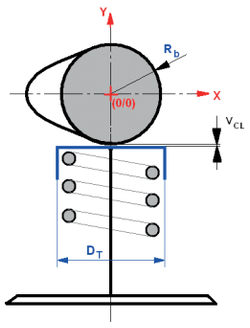
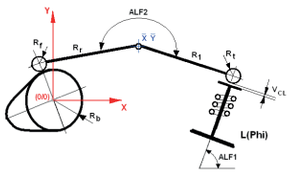
Valve Train Analysis and Optimisation

For Valve Springs or Pneumatic Systems

Dynamic simulation in cooperation with CDS, Dr. D. Zuck, Steinheim\Germany

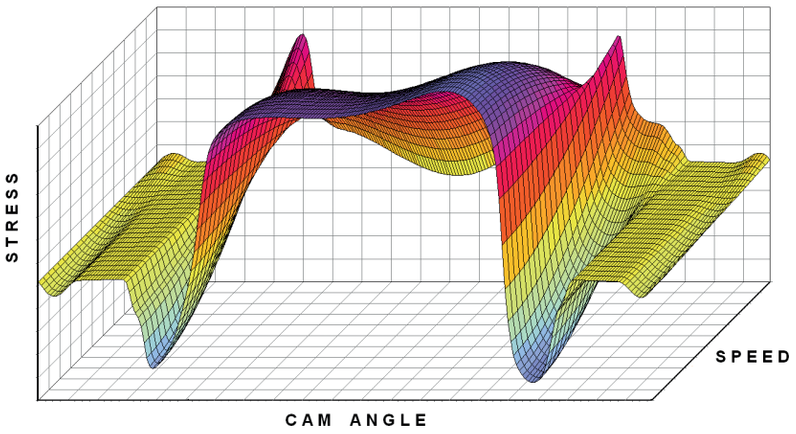


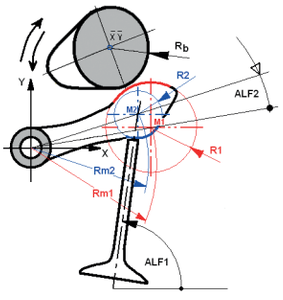




Service:

- Basic layout in combination with 1D engine simulations
- Stress, torque and stress calculation
- Modern algorithm for jerk-less valve acceleration characteristic
- High-accuracy grinding coordinates
- CAD interface based on DXF format
- Interface for quality control and dynamic body simulation





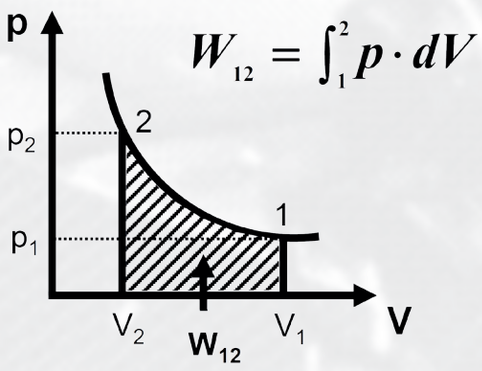
We like to share our experience

Thermodynamic Training Courses

- From the ideal to the real engine
- For designers, development and application engineers
- 2 – 3 day courses on site
- German and English language
- Including training materials and calculation examples

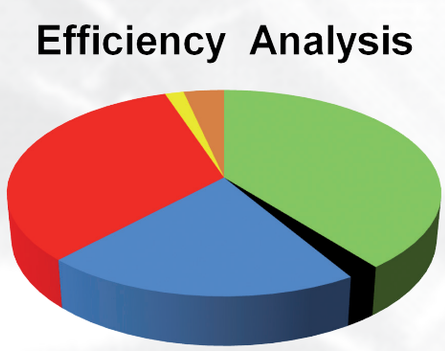
Main Chapters

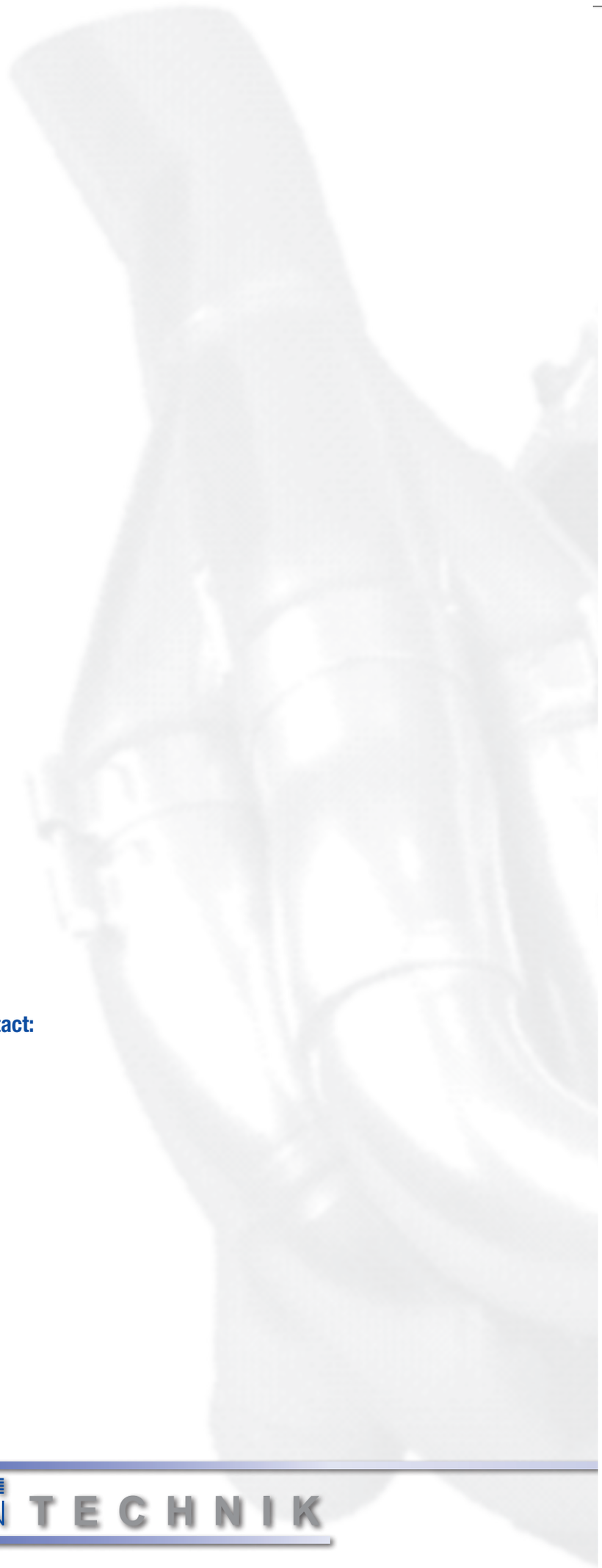
- **Basics**
  - Key engine data and equations
  - Fundamentals of thermodynamics
- **The ideal process**
  - Basic thermodynamic processes
  - Steady state and transient flow
- **The real engine process**
  - Heat transfer
  - Gas exchange process
  - Combustion analysis
  - Basic calculations and simulation techniques
- **High- and low pressure indication technology**
  - The hardware
  - The installation
  - Accuracy and errors



Additional Support

- AVL-BOOST & AVL-FIRE user support
- Low- and high pressure data analysis
- Advanced combustion data processing
- Alternative processes (CHP, ORC, WHRC,...)
- Customer tailored software tools, based on
  - FORTRAN, C++, VBA, Dotnet, EXCEL





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