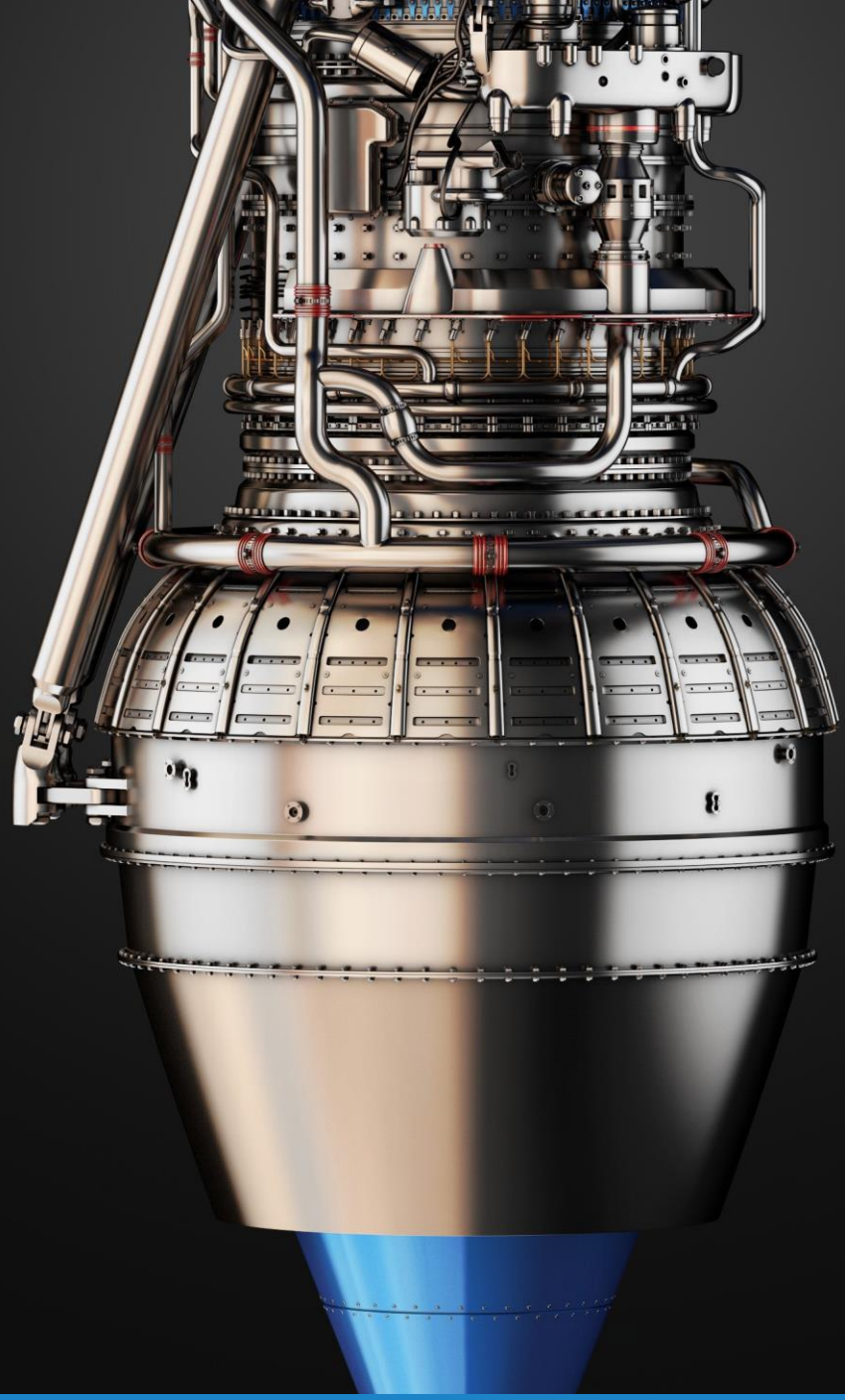
dipolo

We engineer the future



Corporate presentation


dipolo
Engineering Services

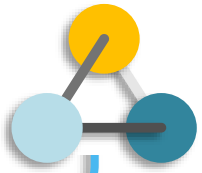
Dipolo

1 + 1 = 3

BSIM engineering

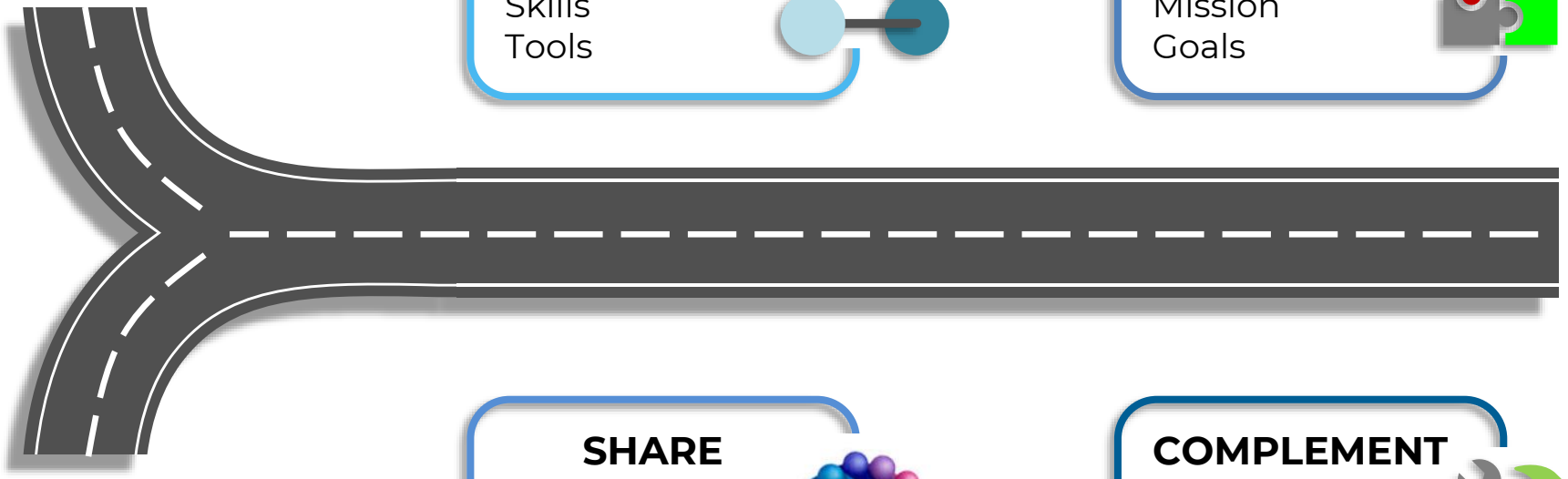
COMBINE

Resources
Skills
Tools



SYNERGIZE

Strategies
Mission
Goals



dipolo

DACH power in motion

SHARE

Professionalism
Values
Passion

COMPLEMENT

Expertise
Experience
Talent

Dipolo

Added value

Dipolo arises from a joint venture between the Italian companies BSim and DACA-I and operates as a Siemens Digital Industry Solution Partner for the sale of simulation and test systems.

In addition, Dipolo offers a comprehensive portfolio of engineering services and supports customers across a wide range of industries in all phases of product development - from concept design to validation.

Dipolo's experience in design and development is impressive, as proven by the successful completion of complex projects. The use of technical synergies, strategically smart sales techniques, and a tailored business model are the pillars that set Dipolo apart from the competition and make it an attractive partner for customers.

Dipolo

We engineer the future

We support our customers through design, simulation, testing, optimization and validation, helping them to get better, more reliable products to the market, faster.

Siemens Solution Partner

Dipolo is a trusted Siemens Digital Industries Software product distributor for: Simcenter™ Amesim simulation software and Simcenter™ Testing Solutions.

Engineering Service Excellence

Providing our clients with an array of design, simulation and testing services, to support their development process.

Corporate‘s structure

BSim Engineering

A team of **skilled engineers** with a **problem-solving mentality** and **strong experience** in the field of advanced engineering tools and solutions

>20 Years of experience

>130 Completed projects

>100 Customers

4 EU offices

Siemens Smart Expert Partner

Corporate‘s structure

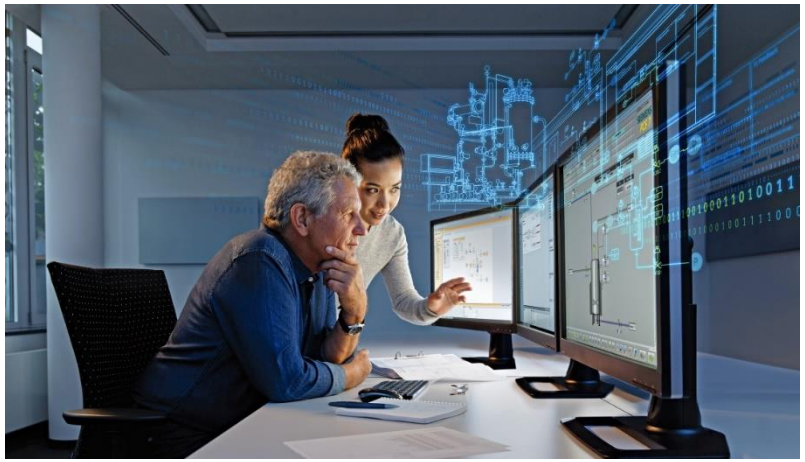
BSim Engineering: Core activities

Engineering Service Provider

Our engineering know-how at your service. Simulation and testing–powered consulting for new product development or troubleshooting activities.

Simulation Software Distribution

Proud reseller of top-class Siemens simulation software, supporting companies select the right tools, learn how to use them, and fully implement them in the organization.



Testing Solutions Distribution

Providing companies with an unrivaled suite of testing solutions for durability, noise, and vibration engineering.

Corporate's structure

DACA-I Powertrain Engineering

Years of experience

23

Employees

60

EU offices

3

Battery testing facilities

R&D Department

We work alongside customers, partners and universities to **develop innovative projects**, especially in the **electrification and renewable energies sectors**.

Corporate‘s structure

DACA-I Powertrain Engineering: Core activities

Engineering Service Provider

In over twenty years of consolidated experience, DACA-I has become a solid reference in the Italian engineering scene by offering integrated services in various industrial sectors.

Power in Motion

We like to approach each new project with competence and resourcefulness. They represent the doors to new worlds that we love to explore.

Testing Solutions

DACA-I offers a very wide range of testing solutions in the fields of NVH, End of Line for vibroacoustic performance and Electronic Control Systems (Controls).

Siemens DISW

A prestigious partnership

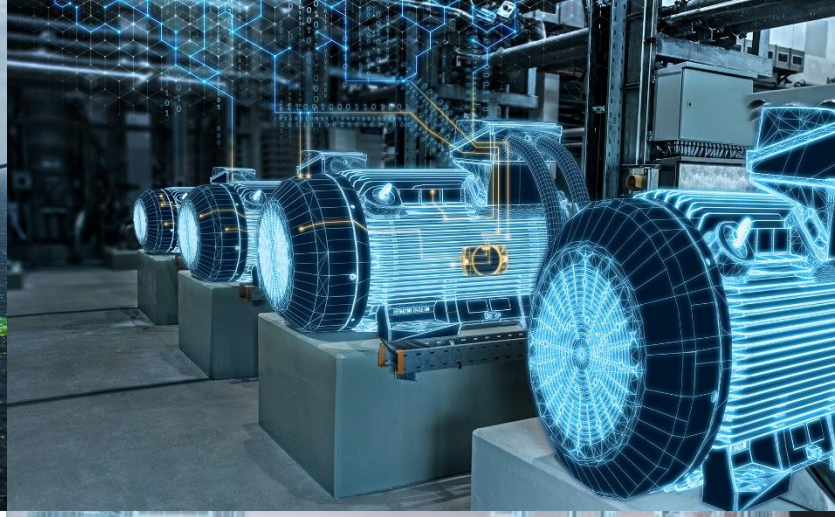
Siemens partners are selected through a thorough recruitment process and an extensive evaluation of their well-founded knowledge and experience in various sectors of the industry.

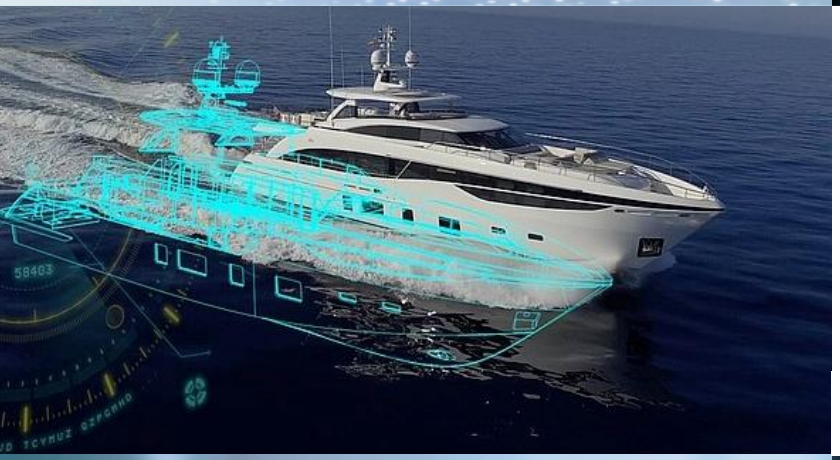
Thanks to its effective business model, Dipolo is proud to be a Solution Partner in the fields of system simulations (0D/1D) with Simcenter™ Amesim and vibroacoustic (NVH) Simcenter™ Testing Solutions.

Partner

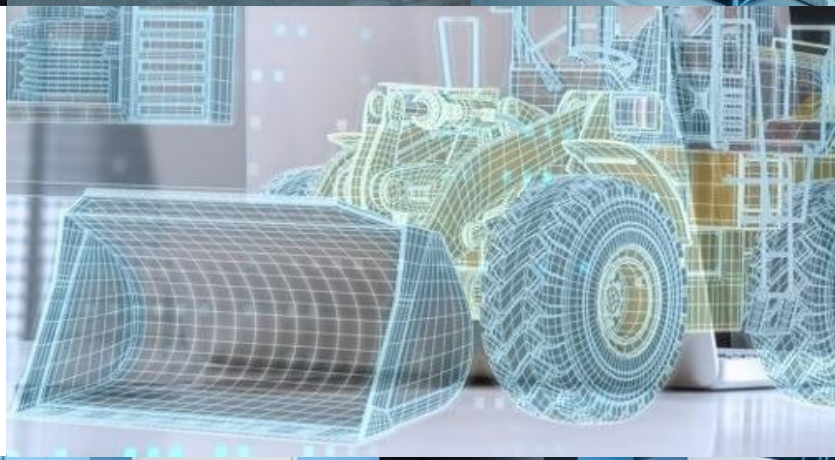
Digital Industries Software

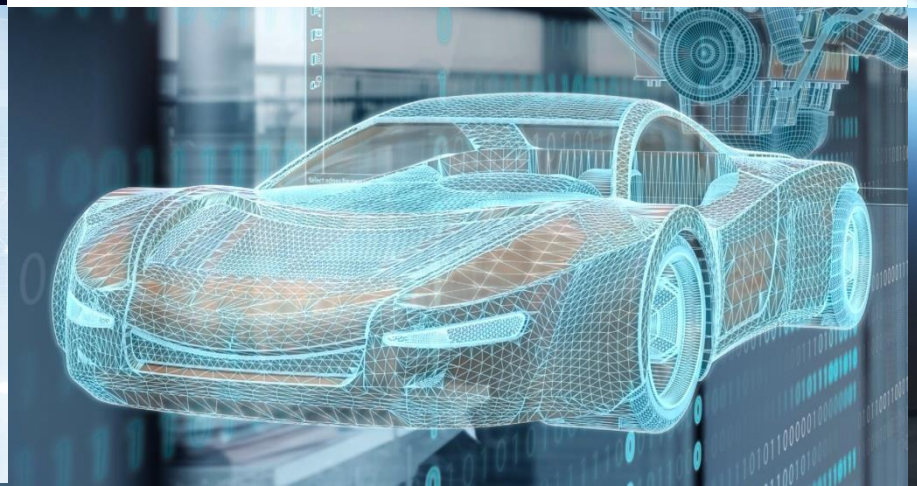
SIEMENS





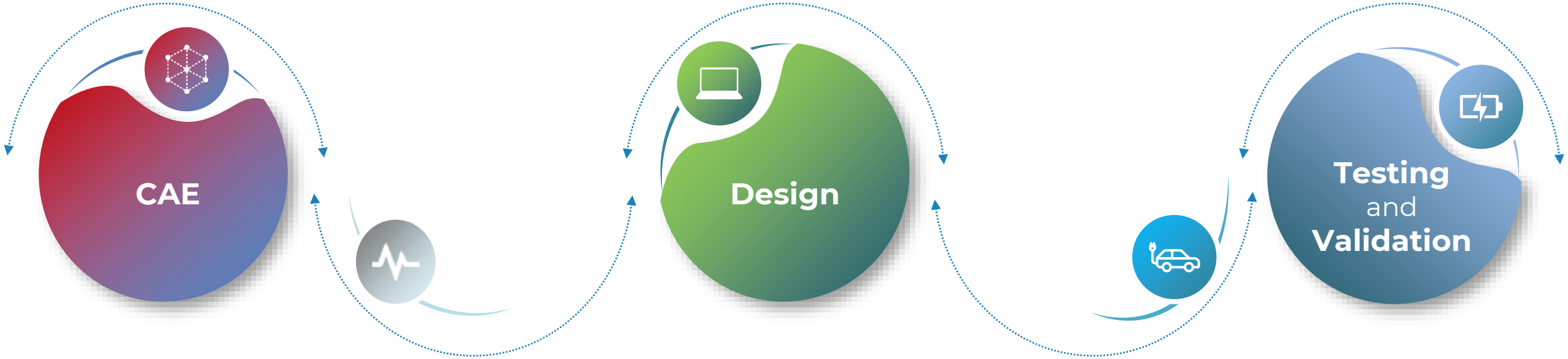
dipolo





Engineering Services

Technical expertise

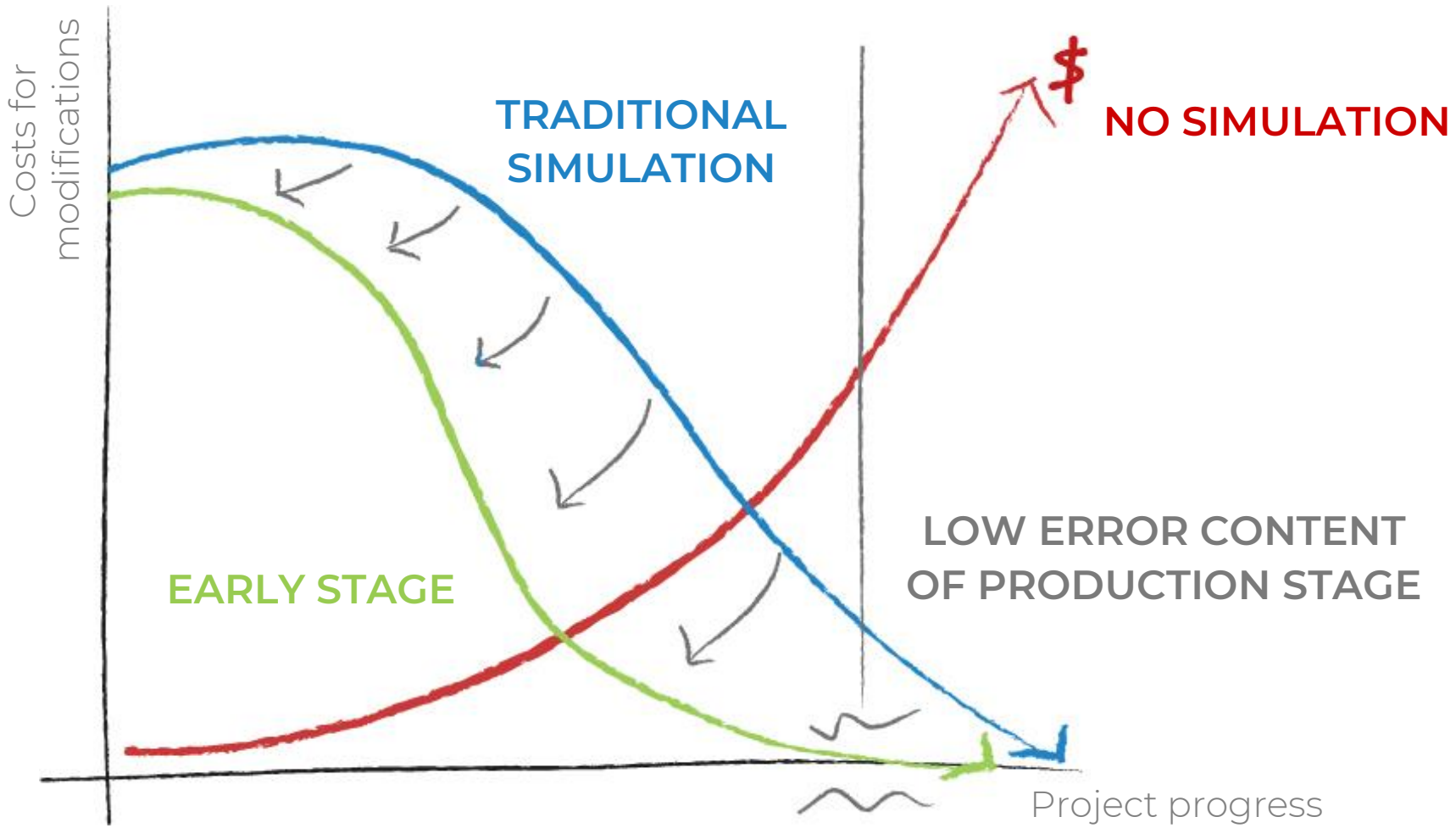


Dipolo is the partner to rely upon during every phase of product and process development

The assets available to us, are the deep knowledge and skills of our professionals, high flexibility to match customer requirements and constant attention to technology evolution

Thanks to the know-how and experience gained and consolidated over the years, we offer customized technical solutions both insourcing and outsourcing

Computer Aided Engineering (CAE)



CAE

What can we do?

Our mission is to help clients to find new efficient product designs or improve existing ones.

For our engineering services, we employ advanced simulation to quickly simulate different product configurations, test multi-attribute performance, structural integrity, vibroacoustic performance and deliver timely, reliable results aimed at improving quality and reducing product development costs.

Count on us to ensure feasibility and desired performance levels of new designs and technologies early in the development cycle, or to find powerful improvement solutions for existing designs.

Pre-Design

Define new designs through predictive simulation by using **0D/1D simulation** tools. Evaluate the technological trade-offs between different design proposals and obtain accurate data on the project's performance levels.

Design Simulation

Fine-tune the product design using **dynamic performance simulations** in the time or frequency domain, using **CFD, FEM and BEM** analyses, or using **multi-objective parametric** and **topological optimizations**.

Virtual Validation and Troubleshooting

When a product does not respond properly to certain applications or operating conditions, these can be digitally replicated to perform a **root cause analysis using Design of Experiments (DoE) and sensitivity analysis** to investigate these technical issues and make **alternative suggestions** using virtual validated simulation **without compromising its performance**.

CAE

Pre-Design

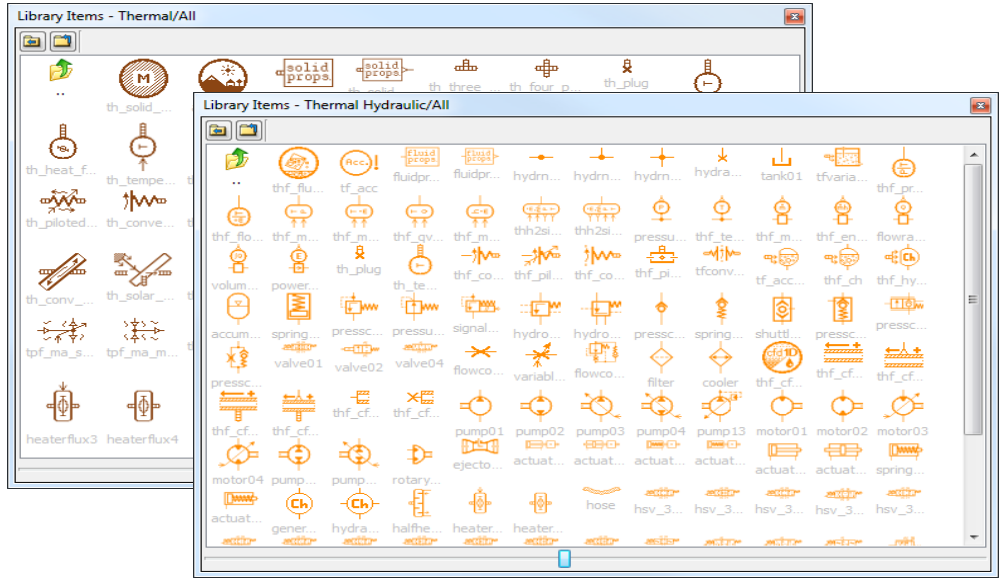
I 0D/1D System Simulation

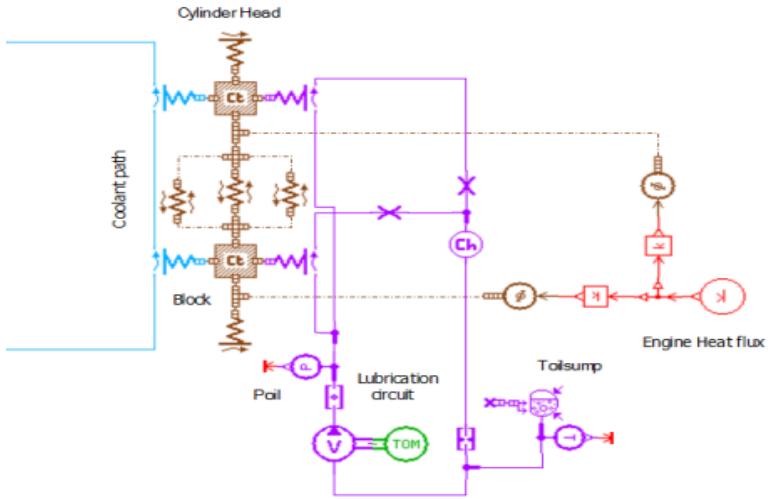
With a lumped parameter modelling approach, it is possible to create a **digital predictive model of any component or system** and **simulate its dynamic performance**.

Even before a CAD model is available, we can use 0D/1D simulations to:

- **determine** the best sizing of new components and systems;
- **simulate** the dynamic performance of the new design;
- **predict** the behavioral data for various working conditions;
- **analyze** the design feasibility very early in the product development cycle.

We can **predict** and **verify** the **evolution of various parameters** like flow-rate, pressure, current, voltage, relative humidity, efficiency, acceleration or speed for various critical working conditions.





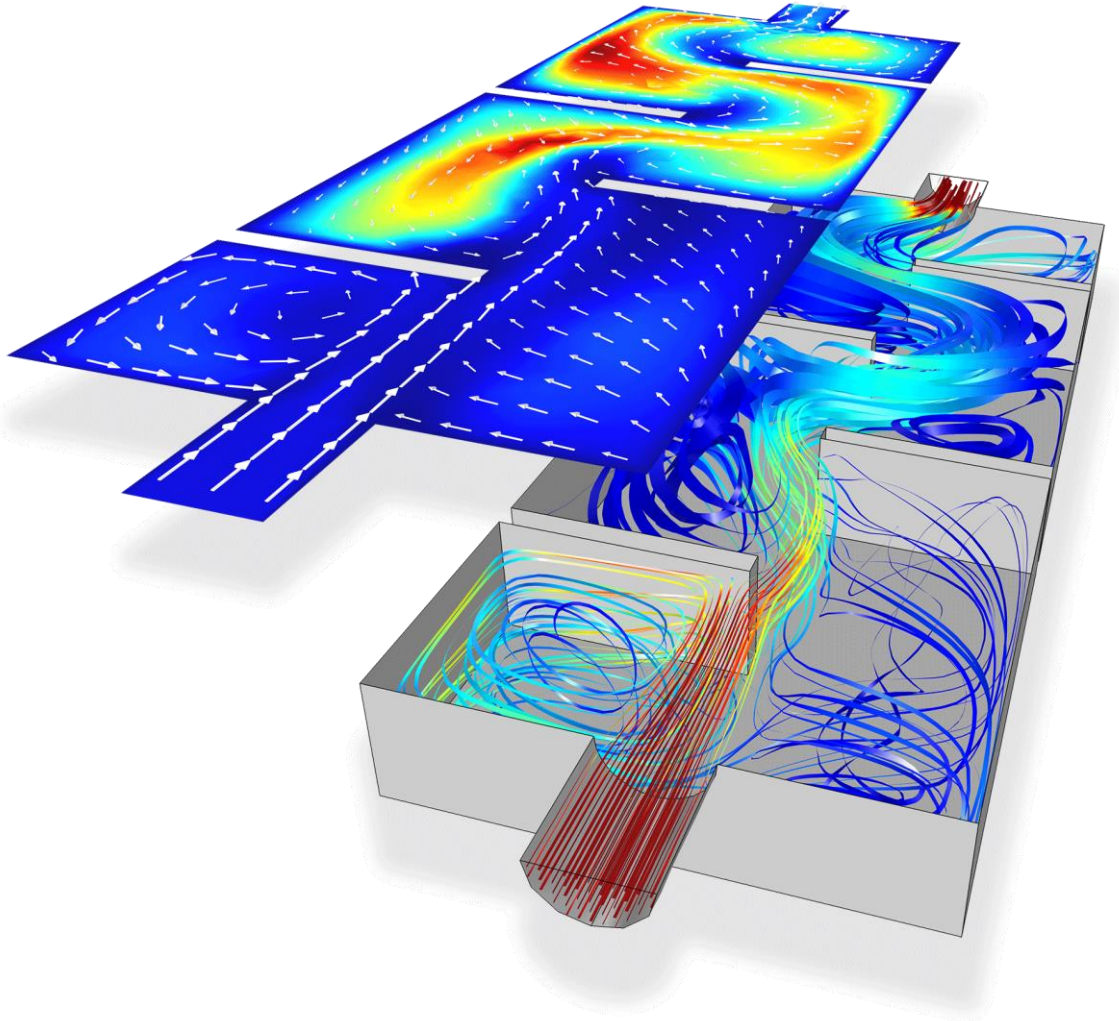
CAE

Design simulation

I Computational fluid dynamics (CFD)

We use CFD simulations to **understand, analyze and solve various complex problems** that involve fluid flow.

The various parameters (like pressure, temperature, velocity, volume fraction, etc.) can be calculated to **assess** the **performance characteristics** (like mixing efficiency, particle transport, recirculation zones, etc.) of different product designs. This can easily be visualized through **plotting options** such as contours, streamlines, section slices, particle flows and iso-surfaces to quickly provide useful insights and move forward with **design optimization proposals**.

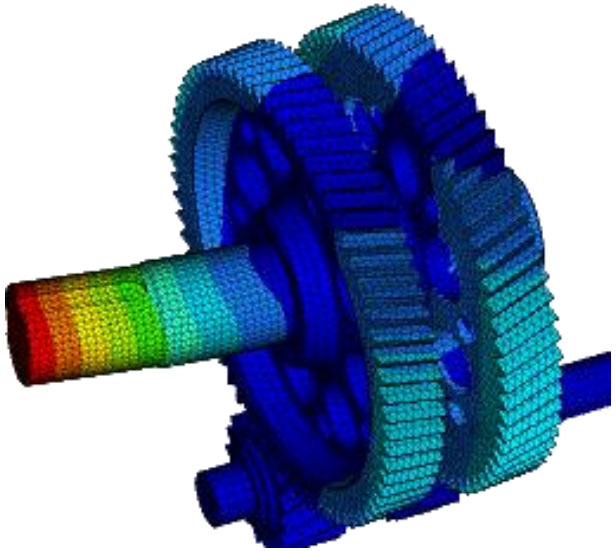


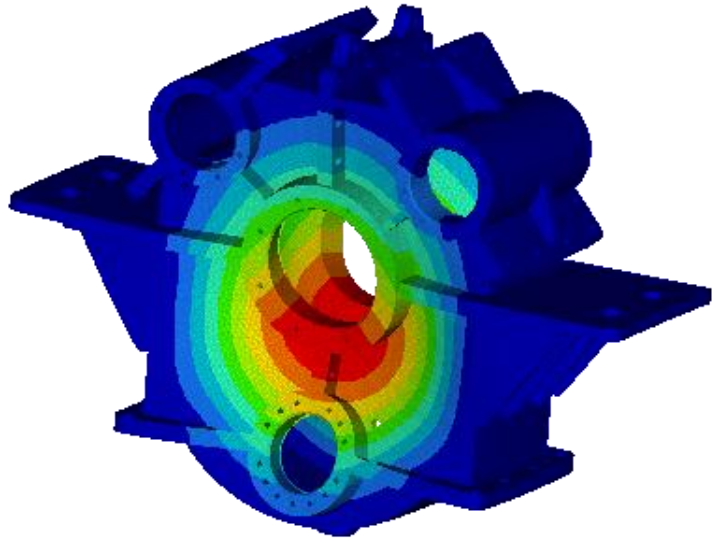
CAE

Design simulation

I Finite element method (FEM)

We carry out FEM calculations to evaluate the structural **performance** of a product and **perform complex analyses** on advanced materials like Carbon Fiber Reinforced Plastics (CFRP), Metal Matrix Composites (MMC), to understand various complex phenomenon such as post-buckling, thermal stress, bonding failure, durability, crack propagation, and more.





A structural analysis allows to:

- **simulate** the behavior of **complex physical systems** by means of specific calculation codes (pre- and post-processing, thermal analyses, optimizations);
- **predict** the lifetime for evaluating the **reliability** of various components using structural simulations;
- **understand** how a material **conducts** or **insulates heat**, how a solid **reacts** to a **thermal load**, or how increasing of **pressure load** causes temperature changes in a solid using **thermomechanical** simulation;
- **foresee** resonances and vibroacoustic behavior **during operation.**

CAE

Design simulation

I Boundary element method (BEM)

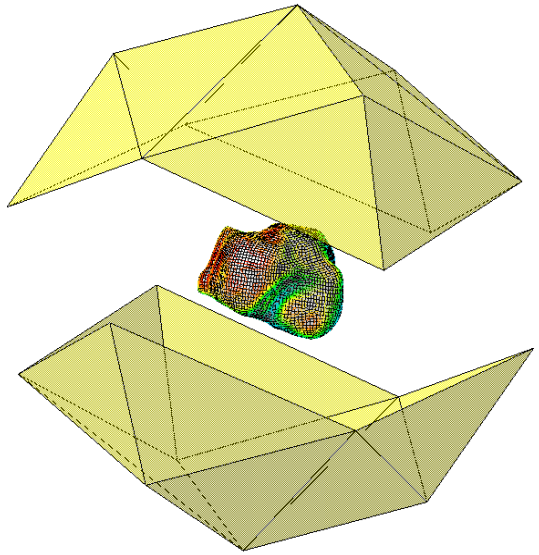
In engineering, numerical modeling and simulation are widely used for solving complex problems.

The BEM approach is very interesting in this way, as it **allows to solve** numerous **problems**, especially those, that require the use of **differential equations**.

The method is based on the **discretization of the solution domain only at the boundaries**, **reducing** the size of the problem and thus **simplifying** the required input data.

It is based on the resolution of an integral equation defined on the boundary instead of on the direct resolution of partial differential equations as is the case of FEM.

In BEM, the starting equation is reformulated with an integral equation defined on the boundary of the domain (BIE - Boundary Integral Equation), and an integral that correlates the solution on the boundary with the solution in the internal points.



BEM can be widely applied to solve:

- **electromagnetic** problems associated with electrical machines;
- problems of **airborne acoustic emission, fracture mechanics, potential flow** around an airfoil;
- problems related to **natural frequencies** of liquid sloshing in tanks;
- problems related to **contact issues**, especially in association with the simulation of adhesive contacts;
- all those problems in which it is possible to define an **integral equation.**

CAE

Design simulation

I FEM/BEM – Differences and advantages

- **Advantages of BEM:**

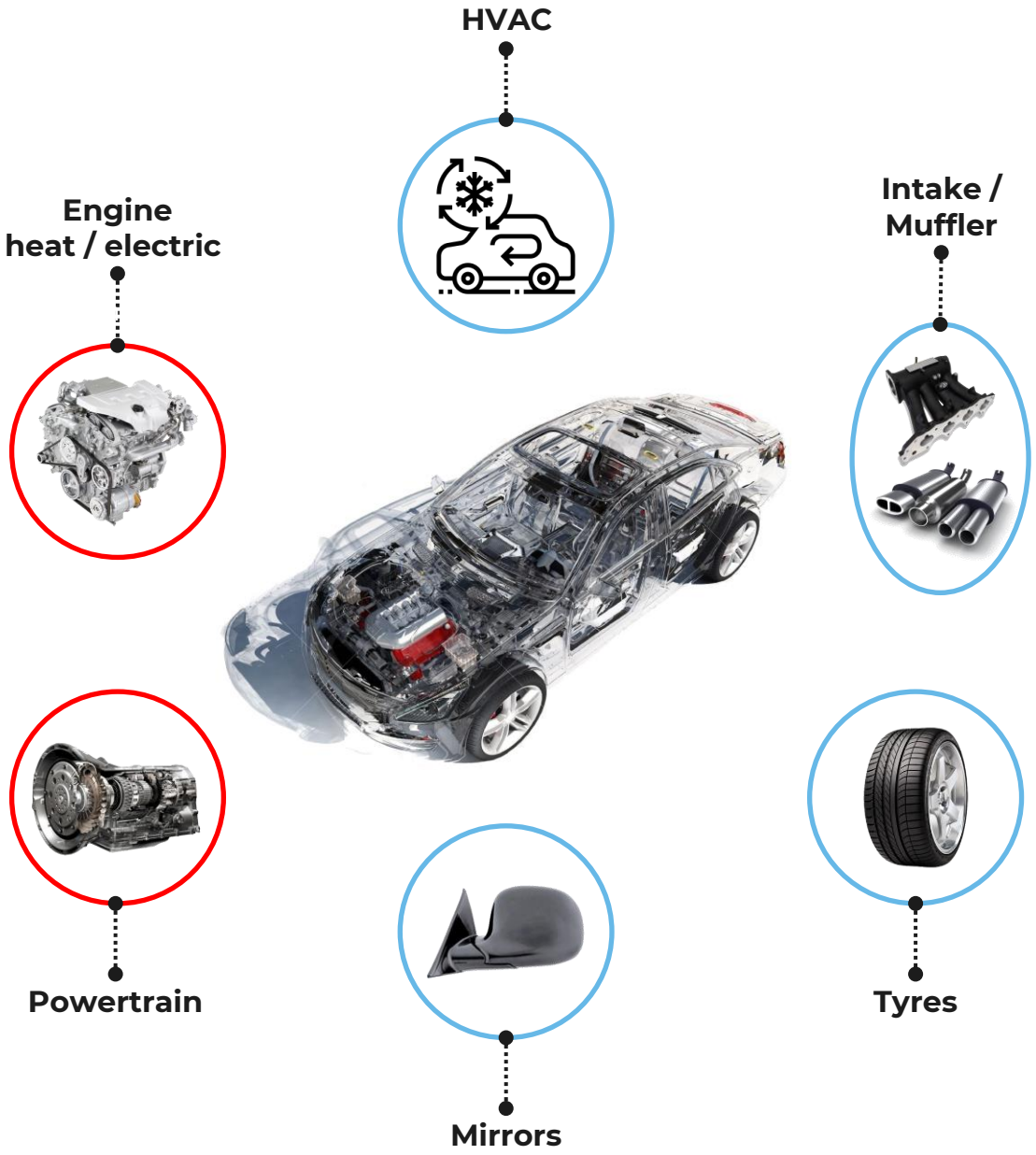
The main **advantages** of this method can be identified with the simplicity of building a 3D model having **to discretize only the surface of the body**, the high precision for calculations in which the results on the border have preponderant importance compared to those inside and with the adaptability to problems with open or mobile boundaries.

- **Advantages of FEM:**

Typical **advantages of FEM** are found in the simplicity of solving non-linear problems and in the versatility of being extended to transient problems.

- **Advantages of both, BEM and FEM:**

It's beneficial to verify results by **comparing** both different methods.



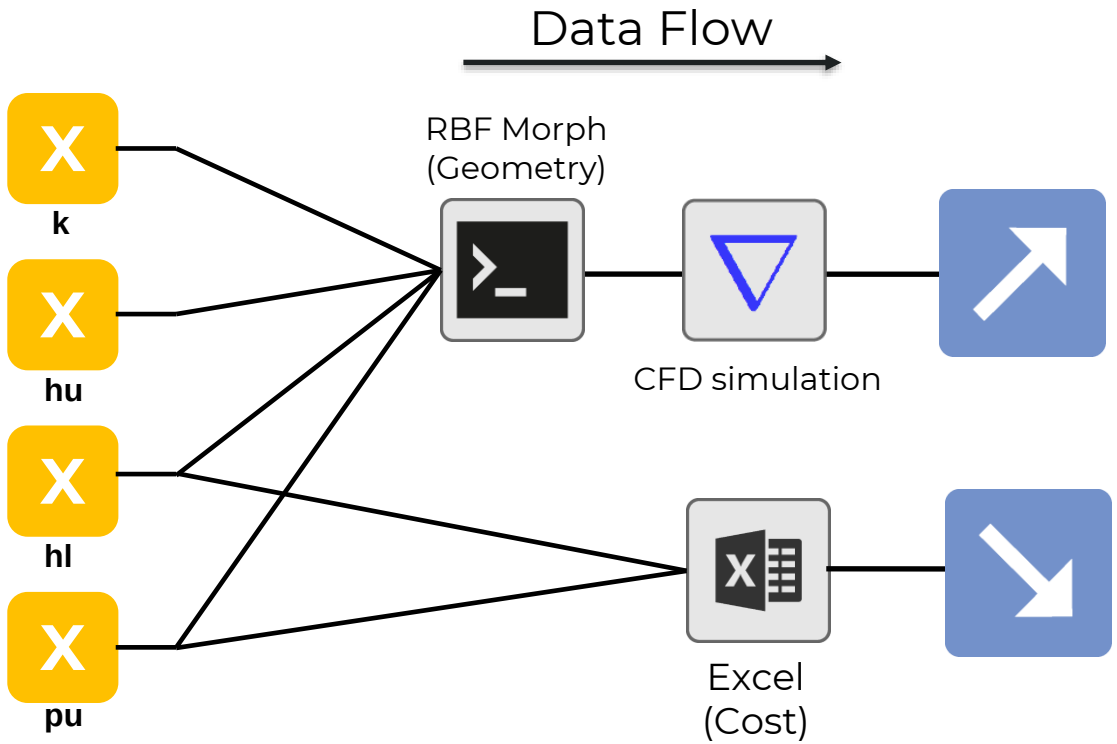
CAE

Design simulation

I Multi-objective parametric optimization

Advanced optimization algorithms allow us to explore **design alternatives** by searching a defined design framework to select a combination of design parameters that allows products to be optimized **without compromising performance**.

We use **multi-objective optimization** software to identify the best combination of design parameters required to **achieve** the intended or required product **performance** and simultaneously adhere to imposed or required constraints.



CAE

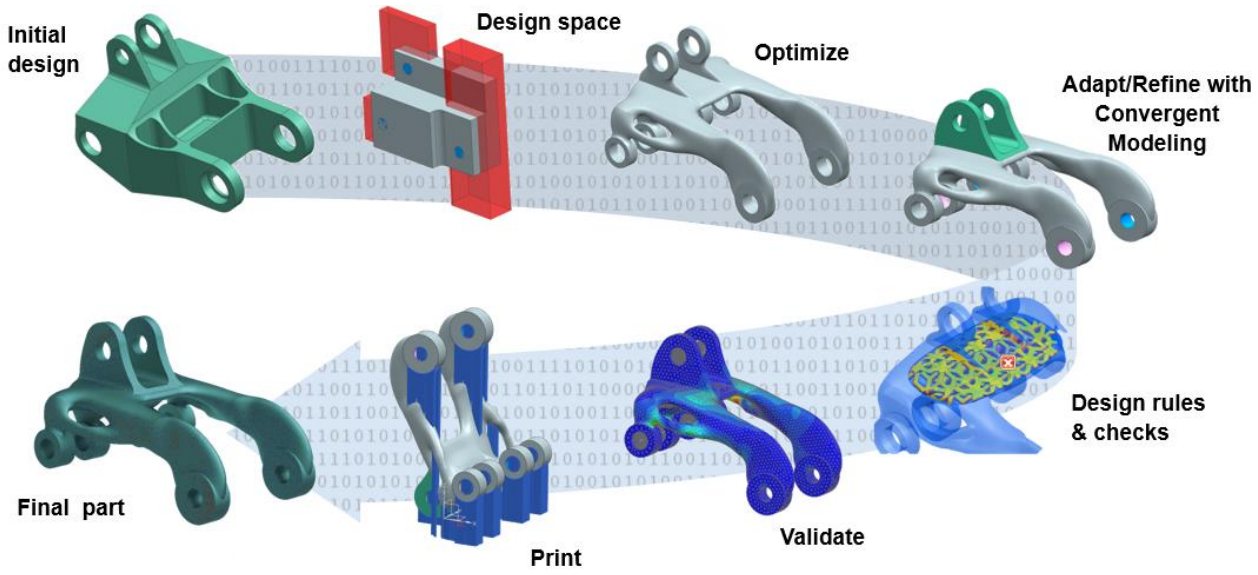
Design simulation

I Topological optimization

Traditional structural simulations allow engineers to verify whether a design will support the required loads.

Through topological optimization, it is possible to **improve** this process by using loads and constraints as input to **generate** a new, **lighter** layout in an already defined volume and define **structurally efficient** and **lightweight** concepts in both the design and redesign phases.

Thanks to this mathematical method it is possible to **reduce weights**, **times** and **production costs** in respect of the functional and mechanical requirements.



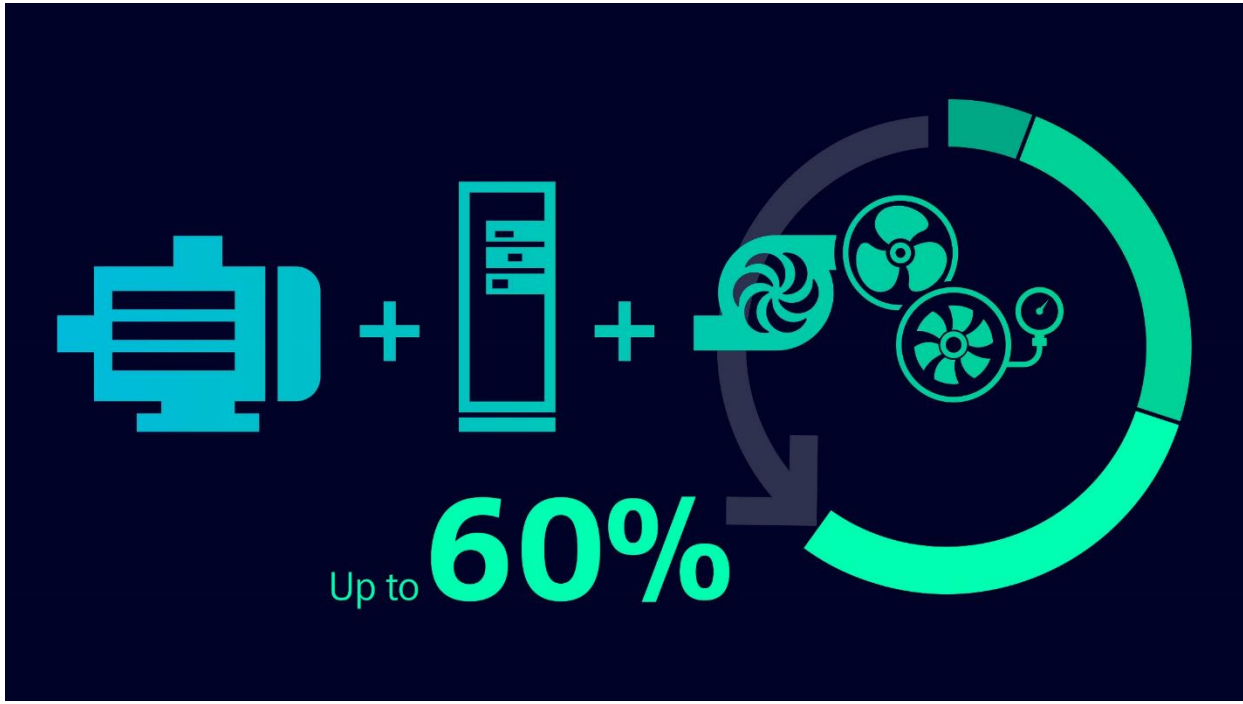
CAE

Virtual validation and troubleshooting

I Energy efficiency

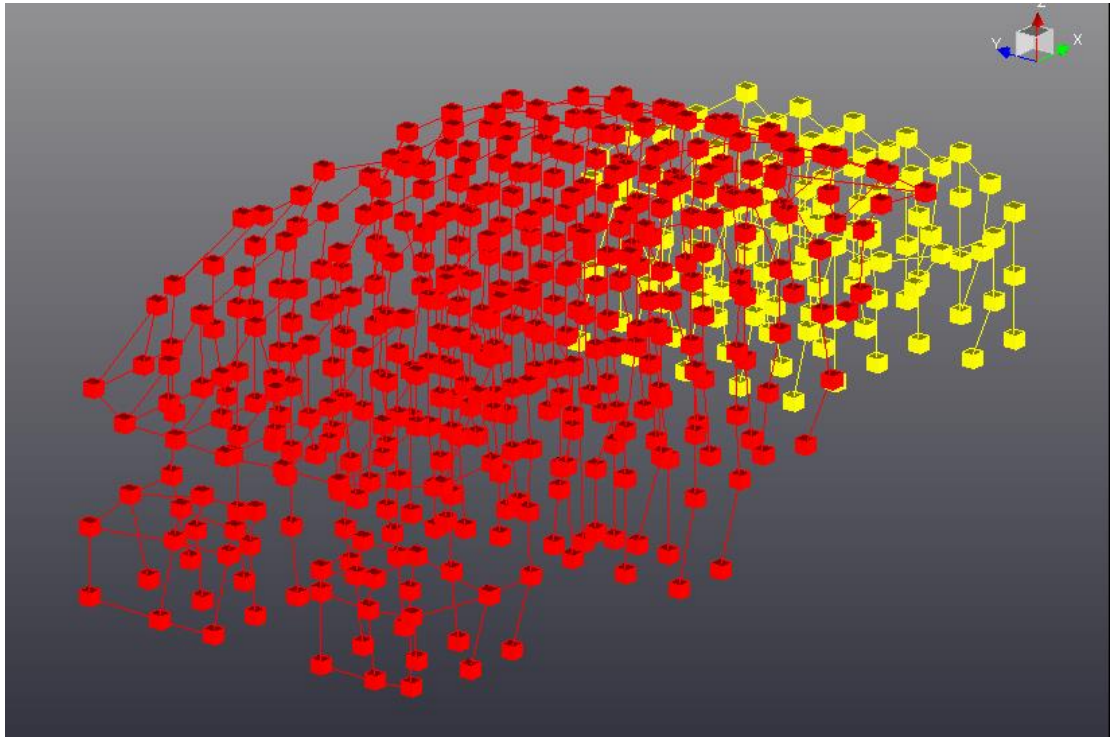
Using a **digital predictive model**, we can simulate and analyze the **energy efficiency** of a component, product or system by applying tools based on **bond graph theory**.

We are then able to **calculate** the energy consumption of different components or specific subsystems, and also **identify** the power losses and inefficiencies during critical duty cycles, which allows us to suggest **energy-optimized efficient design alternatives**.



CAE

Virtual validation and troubleshooting



I Noise and vibration analysis

In noise and vibration analysis, we employ linear analysis to study the natural frequencies of a system to **determine the causes of undesired high-frequency vibrations, fluid-, structure- and air-borne noise or noise transmitted due to modal couplings**.

Noise and vibration analysis can be used to:

- suggest various methods to reduce **the excitation from the source;**
- find resonances in the system and tune it so as **not to excite** said resonances;
- evaluate the influence, behavior, and contribution of mounts, couplings, isolators, etc. that are employed **to reduce the transmission of noise or vibrations;**
- understand the **dissipation** of the **noise** or **vibration energy;**
- optimize the **properties of acoustic materials** such as cabin interior linings, etc.;
- get insights into the loads and deformation of parts and components **to prevent fatigue cracking** and increase durability.

Design

Design

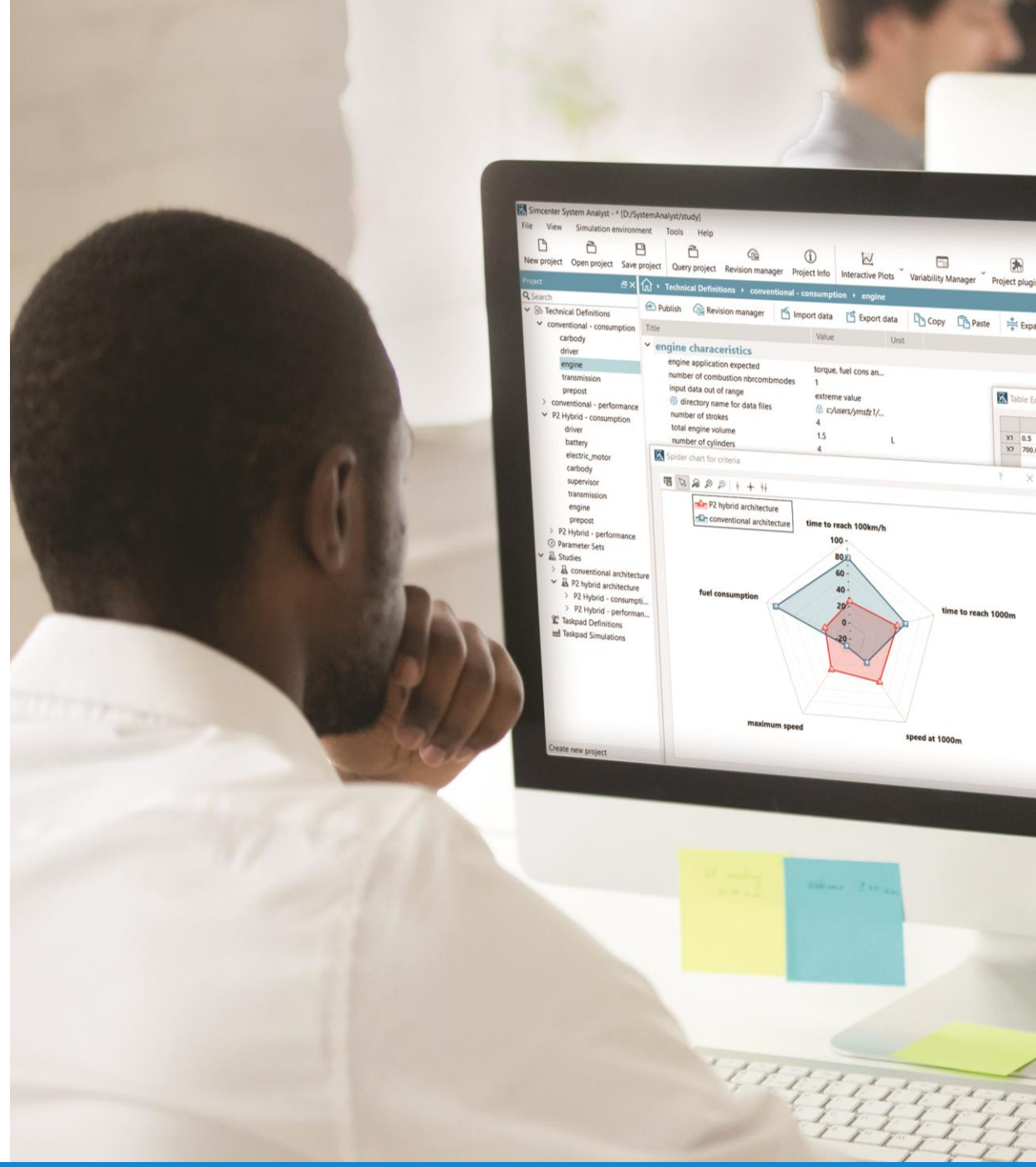
What can we do?

Quality and **reliability** are the main values with which we aim to provide a **complete range** of services to accompany our customers step by step even in every phase of the design.

Computer assistance in the design stages is essential for the development of new products.

Thanks to the **variety** and **complexity** of the projects carried out so far and the **consolidated experience** gained in various fields, we apply the know-how, expertise, and methodologies acquired with confidence, competence, and awareness of materials and in production processes.

With our offer, we are able to satisfy the **development of engineering activities** by covering the process, from the initial concept to the production start-up according to given requirements and specifications at our facilities or at the customer's site.



Basic design

Determination of the objectives
Concept setup
Feasibility study

Advanced design

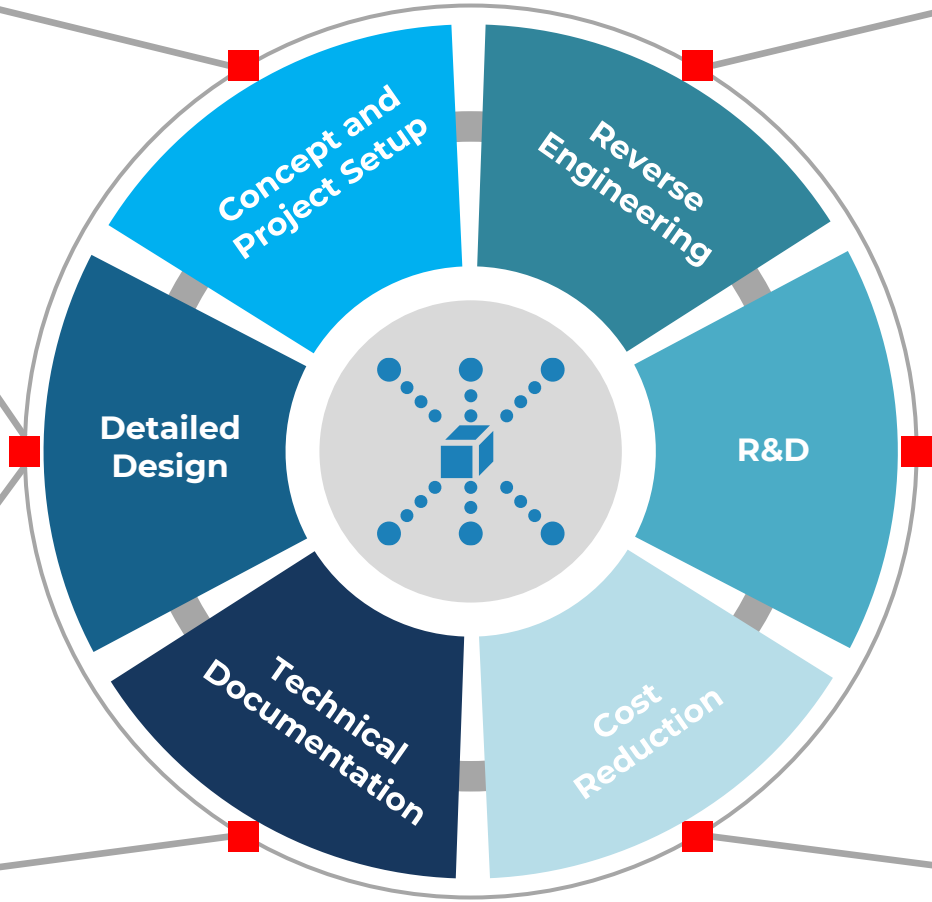
3D Modelling
Digital and visual mock-up
Constructive technology analysis
Drawing of parts and assemblies (2D)
Stack-up analyses

Data management

Product lifecycle management (PLM)
Product manufacturing information (PMI)

Technical documentation

Assembly plans
Bills Of Material
Failure Mode and Effect Analysis



Reverse engineering

Data converting (e.g. source 2D)
3D data acquisition
3D CAD re-processing
Direct analysis / Test comparison

R&D

New materials
Electrification (EV and HEV)
New production processes
(Additive manufacturing)

Cost reduction

Product analysis
Manufacturing technology analysis
Material analysis
Suppliers analysis
Cost-reduction-oriented re-design

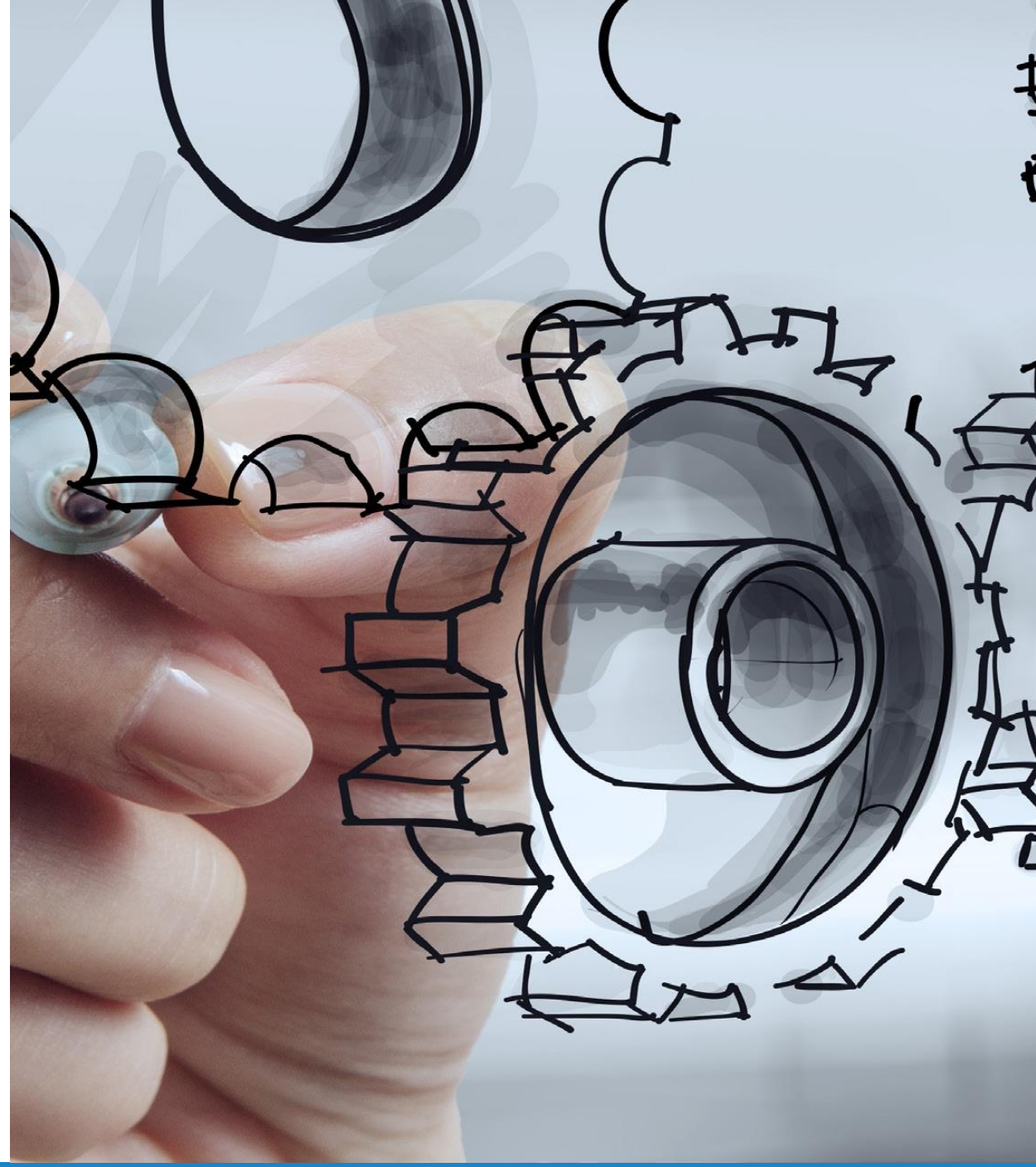
Design

Concept and project setup

In the preliminary stages of the project, we support the customers in **defining the objectives**.

Before starting the feasibility studies, concept requirements and the necessary data for the set-up of the project are collected and analyzed along with the choice of technologies and materials. The client's standards and specific working methods are also taken into consideration.

A constant exchange of information with the customer is of course the basis for all processes.



Design

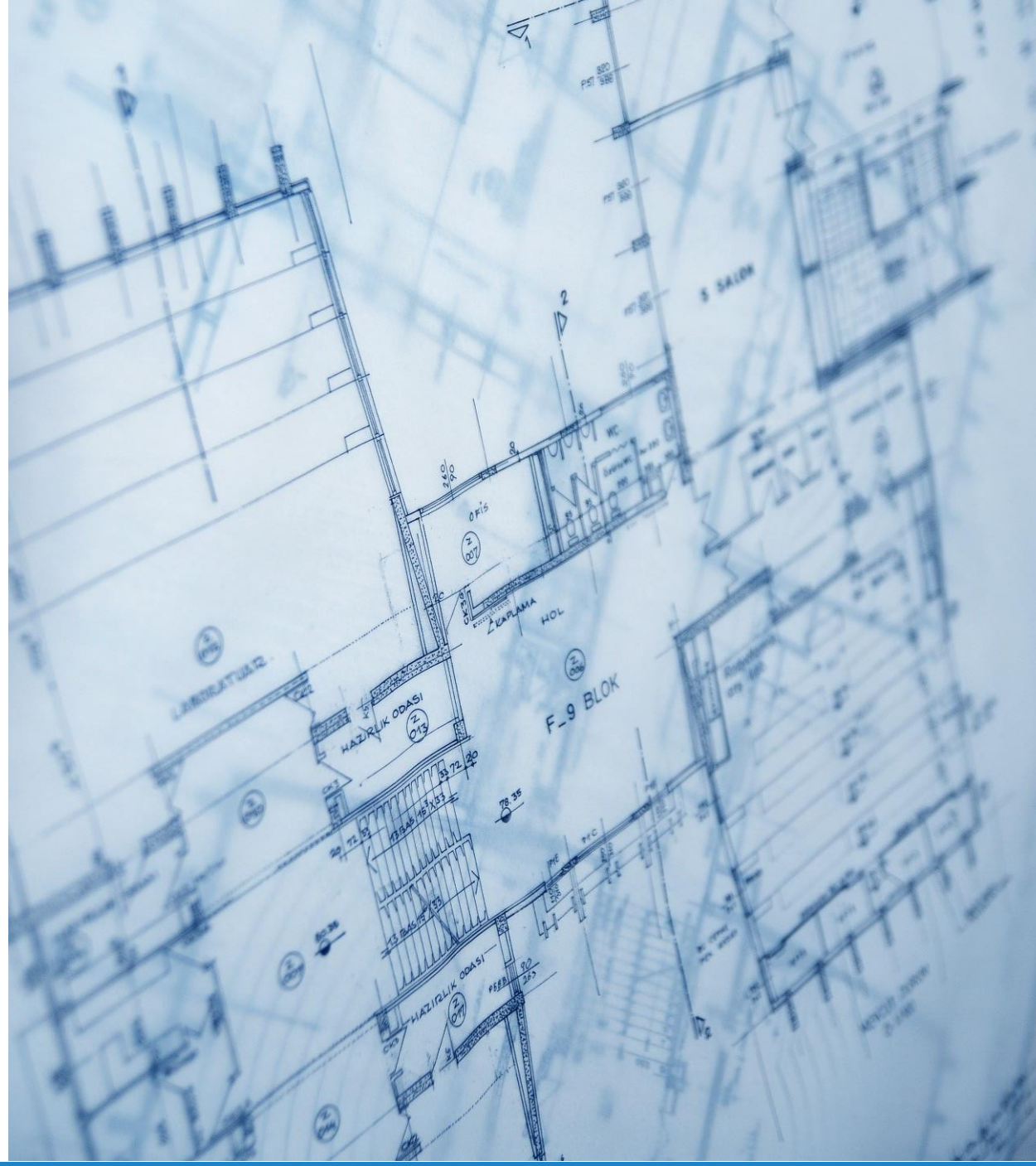
Detailed design

When the project begins to take shape, **the viable solutions are analyzed** from a technical/construction point of view.

Once the **most convenient solution** has been identified, detailed 3D modeling is carried out.

The technical drawings/assemblies and technical documentation are prepared to support the project by **providing** the necessary information for **prototyping** and **manufacturing**.

Other design activities such as **digital mock-up, packaging analysis, stack-up analysis etc.** can be performed to complete the project details.

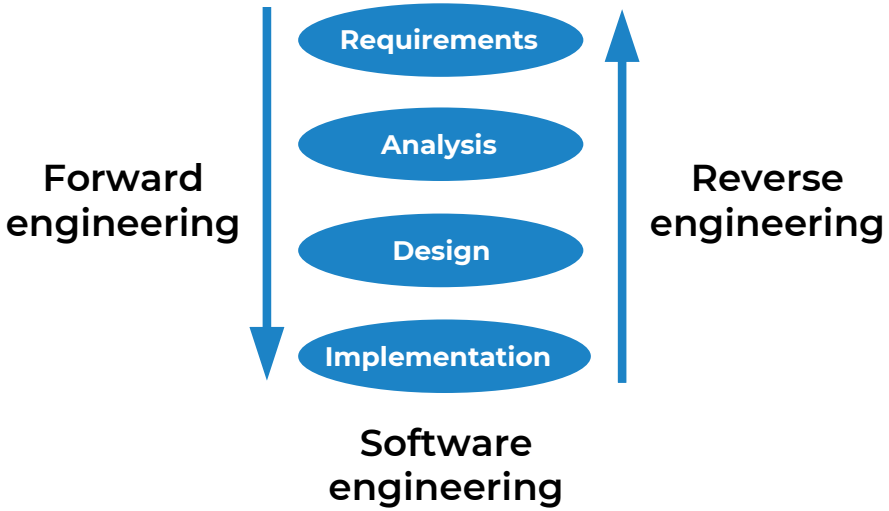


Design

Reverse engineering

Using a **3D scanner** it is possible to digitize points on the surface of an object and **convert** them into a three-dimensional mathematical model (CAD).

The opportunity to make a **1:1 copy of an object** can valuably open up to a wide range of valuable applications as for example the possibility of the further development, redesign, assessment, analysis or testing.



Scanned data from original part

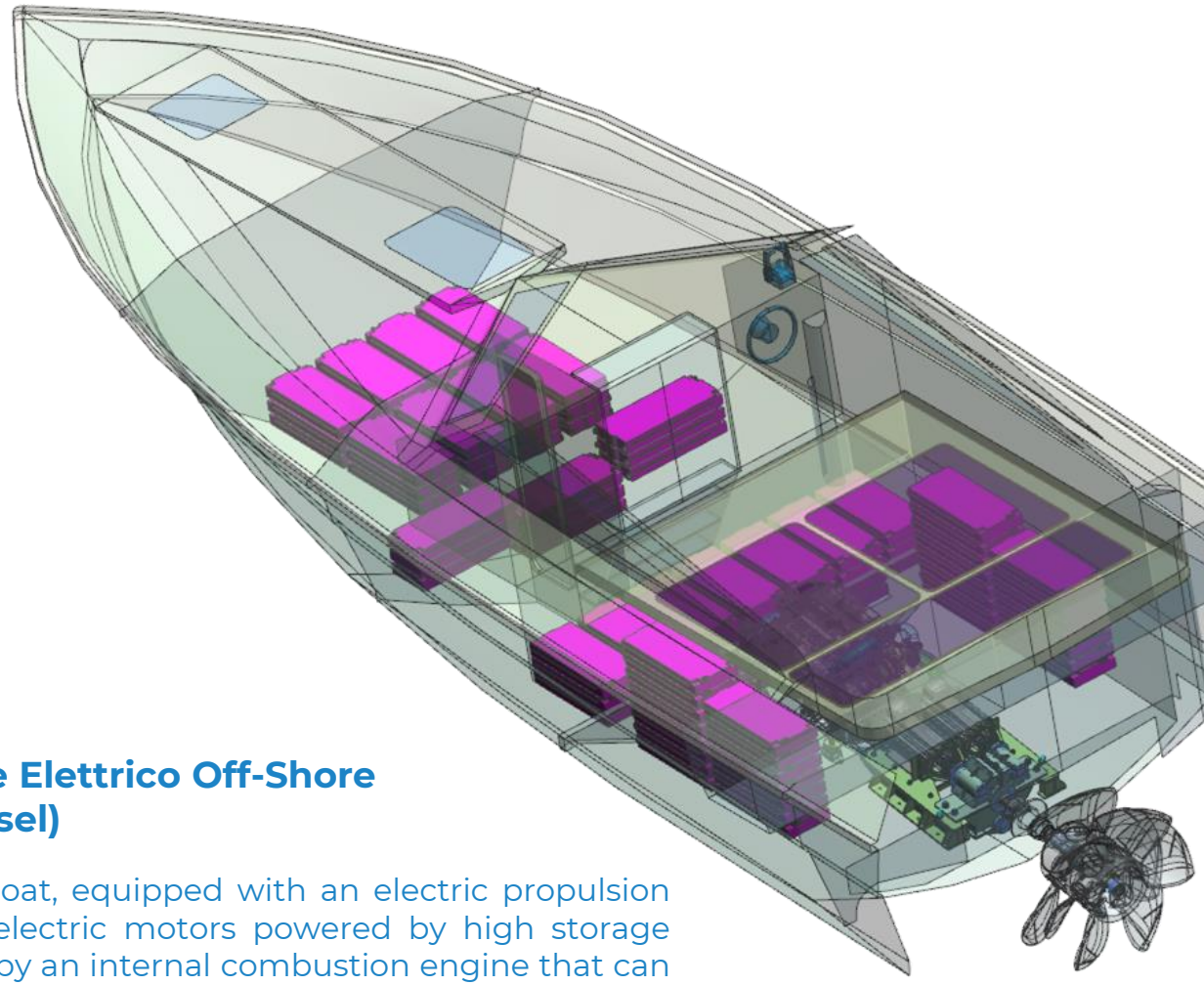
Completed 3D CAD data from the scanned original part

Prototype of 3D CAD data for analysis and redesign/modification

Design

Research and development

Endowed with a **flexible mindset**, our company group is very active in the field of technological innovation and a member of consortia and cooperations that have developed, with own investments, very important and ambitious projects mainly in the sectors of **mobile electrification** and **innovative materials**.



Project NEOS - Natante Elettrico Off-Shore (Off-Shore Electric Vessel)

It's a prototype of hybrid boat, equipped with an electric propulsion system consisting of two electric motors powered by high storage capacity batteries, assisted by an internal combustion engine that can act as a range extender.

Design

Cost reduction

In order to **reduce** production **costs**, component or system redesign can be carried out through:

- **intelligent use of materials and technologies;**
- **topological optimization;**
- **optimization of the efficiency of systems and processes;**
- **application of system simulations;**
- **…**

Testing and validation

Testing and validation

What can we do?

With the awareness that even in our **digital era**, testing, validation and optimization **remain crucial** factors to **improve** product designs before releasing them to the market, we offer a wide variety of **test-based services** including:

- **Battery testing**
- **Calibration and validation of control units**
- **Vibro-acoustics (NVH)**

Our **engineering services** cover a broad range of industrial applications thanks to the experience gained over the last twenty years.

For a detailed overview of the **applications** and the **solutions** we offer, please take a look at the section related to the **products** in our portfolio.

Testing and validation

Battery testing

Among the various **energy storage systems**, electrochemical batteries are preponderantly used in most industrial sectors such as automotive, aerospace, naval, and photovoltaic to name a few.

With our battery test **facilities**, we aim to **test** and **validate** the vast majority of **electrochemical batteries** intended for various uses and applications, preeminently lithium-ion batteries.

Our extensive range of tests can be run on single battery cells, modules, and large packs **ensuring voltage and power levels in full compatibility**.

We also can perform **charge/discharge tests** with **configurable current** and **temperature** profiles according to standards or customer specifications up to **hazard levels 5** in compliance with EUCAR classification.

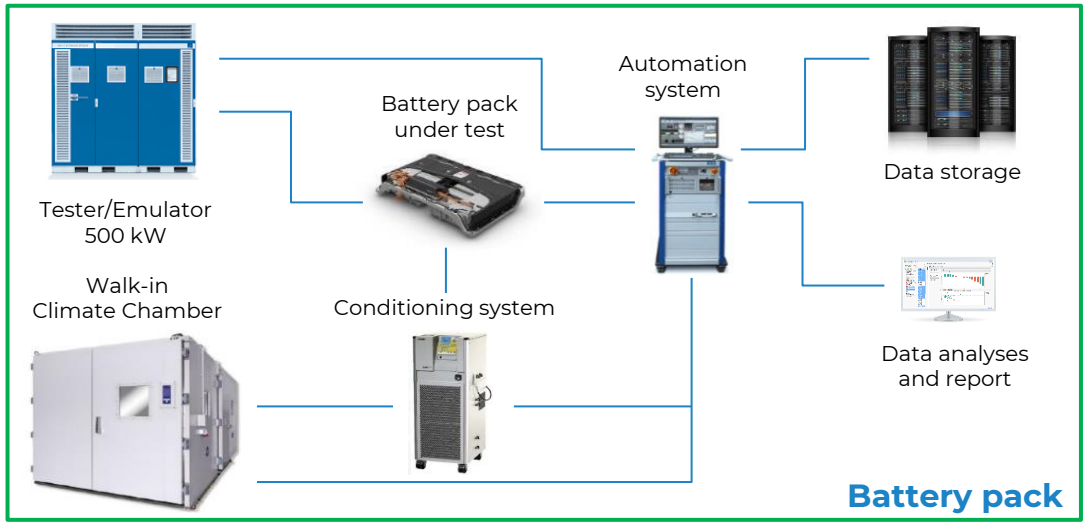
A powerful air conditioning system allows us to carry out **thermal management** studies and assessments as well.

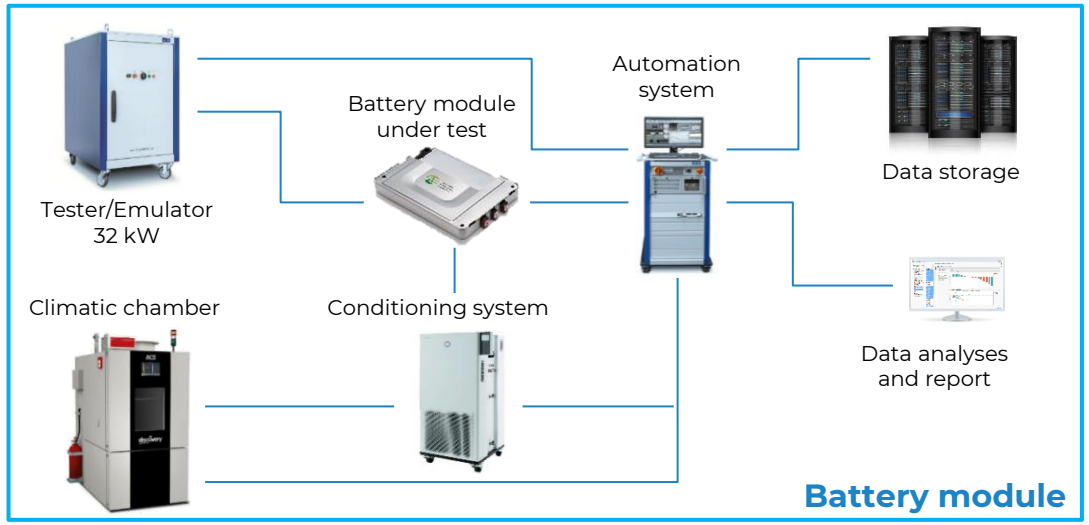
Following, are some examples of battery tests:

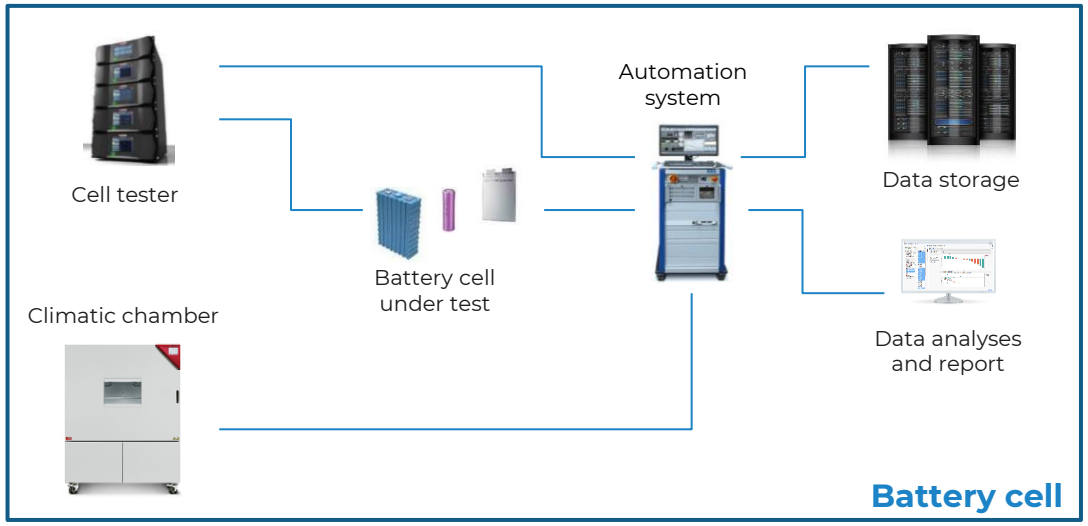
- Static capacity
- Capacity fade
- Hybrid power pulse characterization (HPPC)
- Self-discharge
- Cold-cranking
- Thermal performance
- Energy efficiency
- Cycle life
- Calendar life

Testing and validation

Battery testing systems







Main features

- Tests on battery packs up to 1200 V, 500 kW
- Tests on battery modules up to 60 V, 32 kW
- Tests on battery cells up to 6 V, 3,6 kW (per channel)
- Tests in climatic chamber
- Tests with temperature control units

Testing and validation

Battery testing - Abuse tests

Test	Regulation	Test Specifications	Data Logged
Altitude	UN 38.3	P = 11.6 kPa	Chamber Pressure, Cell Voltage and Temperature
Thermal Shock	UN 38.3	T_{cold}= -40 °C ; T_{hot}= 72 °C ; dT~ 3.8 °C/min	Chamber Temperature, Cell Voltage and Temperature
Vibration	UN 38.3	Max acceleration = 8g Max frequency = 200 Hz	Acceleration, Force
Mechanical Shock	UN 38.3	Max acceleration = 150g	Acceleration, Force
External short circuit	UN 38.3 – GB 38031	Resistance = 0.1 Ω	Temperature
Crush	UN 38.3	Force= 13 kN	Voltage, Force, Temperature, Deformation
Overcharge	UN 38.3 – GB 38031	Maximum Current according to cell specs.	Current, Voltage
Forced discharge	UN 38.3 – GB 38031	Maximum Current according to cell specs.	Current, Voltage
Heating	GB 38031	T_{hot}= 130 °C ; dT= 5 °C/min	Temperature
Temperature cycle	GB 38031	T_{hot}= 85 °C ; T_{cold}= -40 °C	Temperature

Testing and validation

Electronic Control System

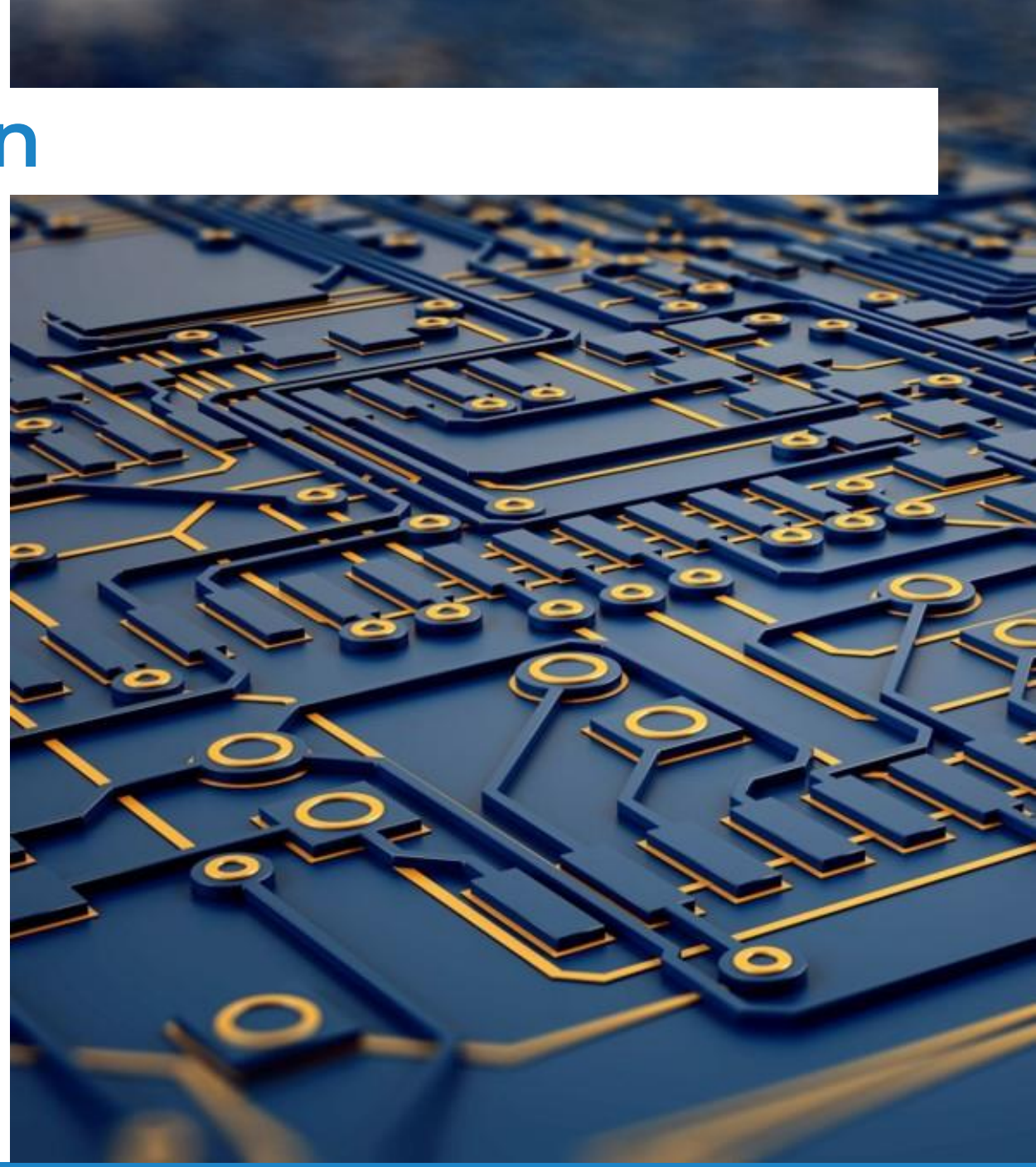
I Calibration and validation of control units

In modern vehicles, there are many complex operational systems, often managed electronically by a control unit.

Our engineers are involved in the **development** and **validation of hardware/software for electronic control applications** for engines (ECU), transmissions (TCU) and whole powertrain modules (PCM).

The purposes of software development and validation are:

- **Unit testing**
  - **Tests** for new software release for ECUs.
  - **Anomalies** and **solutions** analyses.
- **MIL + HIL**
  - **Calibration of engine software** run on vehicle and by a simulator in order to find the optimal solutions for drive comfort.
  - **Calibration of control units** for mechanic and automatic transmissions (dual clutch application).

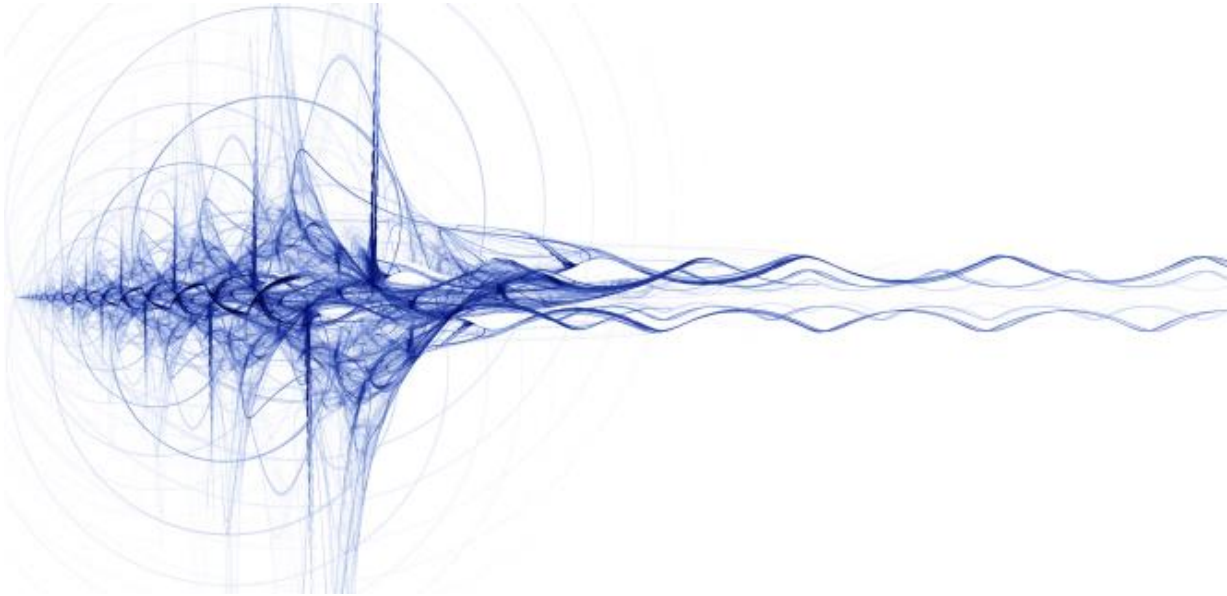


Testing and validation

Noise, Vibration and Harshness (NVH)

Acoustic emissions and vibrations **strongly influence the value and quality** of a product.

The containment of noise is essential to comply with increasingly stringent regulations. Vibrations, in addition to reducing comfort, induce fatigue and contribute to generate structural critical issues.



We employ various hardware and software solutions for the **acquisition** and **analyses** of vibro-acoustics phenomena mostly in the following fields:

- **Acoustic testing**
- **Durability testing**
- **Environmental testing**
- **Model-based system testing**
- **NVH-based End of line testing**
- **Rotating machinery testing**
- **Sound design & Sound quality**
- **Structural dynamics testing**
  - **Experimental analysis**
  - **Operational modal analysis**
- **Transfer path analysis**

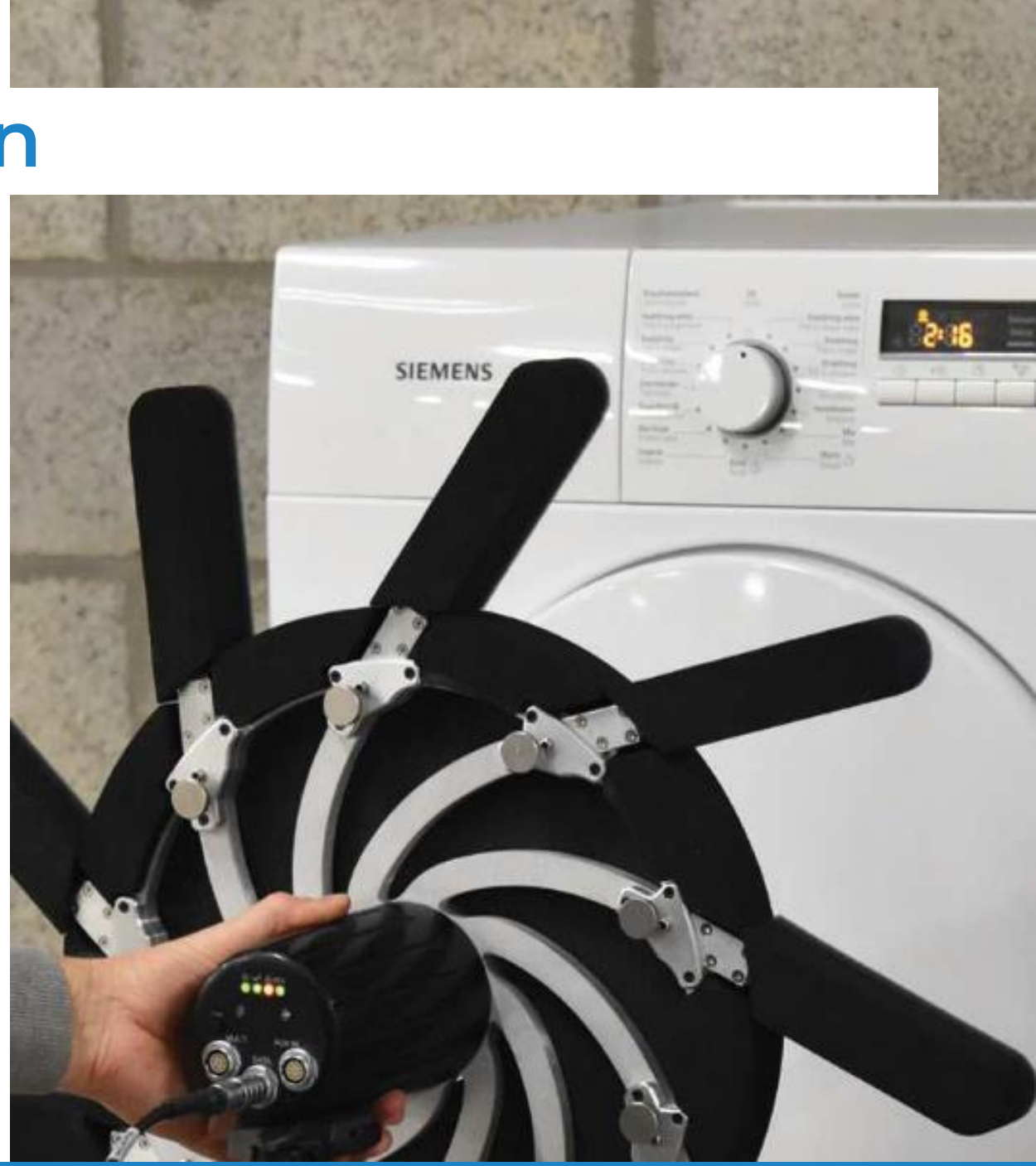
Testing and validation

NVH

I Acoustic testing

During the operation of a machine, it may be necessary **to monitor the noise emission levels** both to ensure its correct functioning and **evaluate the acoustic comfort** of the surrounding environment.

We are able to measure and assess the **acoustic performance**, **sound pressure** and **sound power** levels of a machine or a product and support the customer by developing improvements and optimized solutions.



Testing and validation

NVH

Durability testing

With our durability test techniques, we are able to determine the characteristics of a system subjected to **variable loads** over time or to **various load conditions**. These loads determine whether a system is infinitely durable or may only serve for a certain amount of time or number of duty cycles.

In the automotive application, we **acquire** and **analyze** the **loads** and **fatigue** of a vehicle and the road load elements.

Testing and validation

NVH

Environmental testing

We are able to perform tests in **different climatic** and **environmental conditions** by reproducing temperatures, shocks, particular stresses, and extreme vibrations to safeguard proper system behavior in all situations.

Testing and validation

NVH

I NVH–based End of line testing

End of Line vibroacoustic tests are intended to **verify** and **ensure** that a product **complies** with **technical specifications**, as well as with **vibroacoustic performance** and **quality requirements**.

Through these fully automated and very fast tests, the components that do not fall within **predefined thresholds** can be collected and reviewed for new validation. The product vibroacoustic quality standards are usually provided by manufacturers or collected via feedback from customers or end users.

We support manufacturers from the **early definition** of the **admissibility thresholds**, carrying out tests and measurements, reading the output data, and validating each product taking into account their peculiar acoustic response.

Provided a positive outcome of the validation, **only the items that meet the specifications will be reintroduced into the manufacturing cycle and delivered** to be assembled.

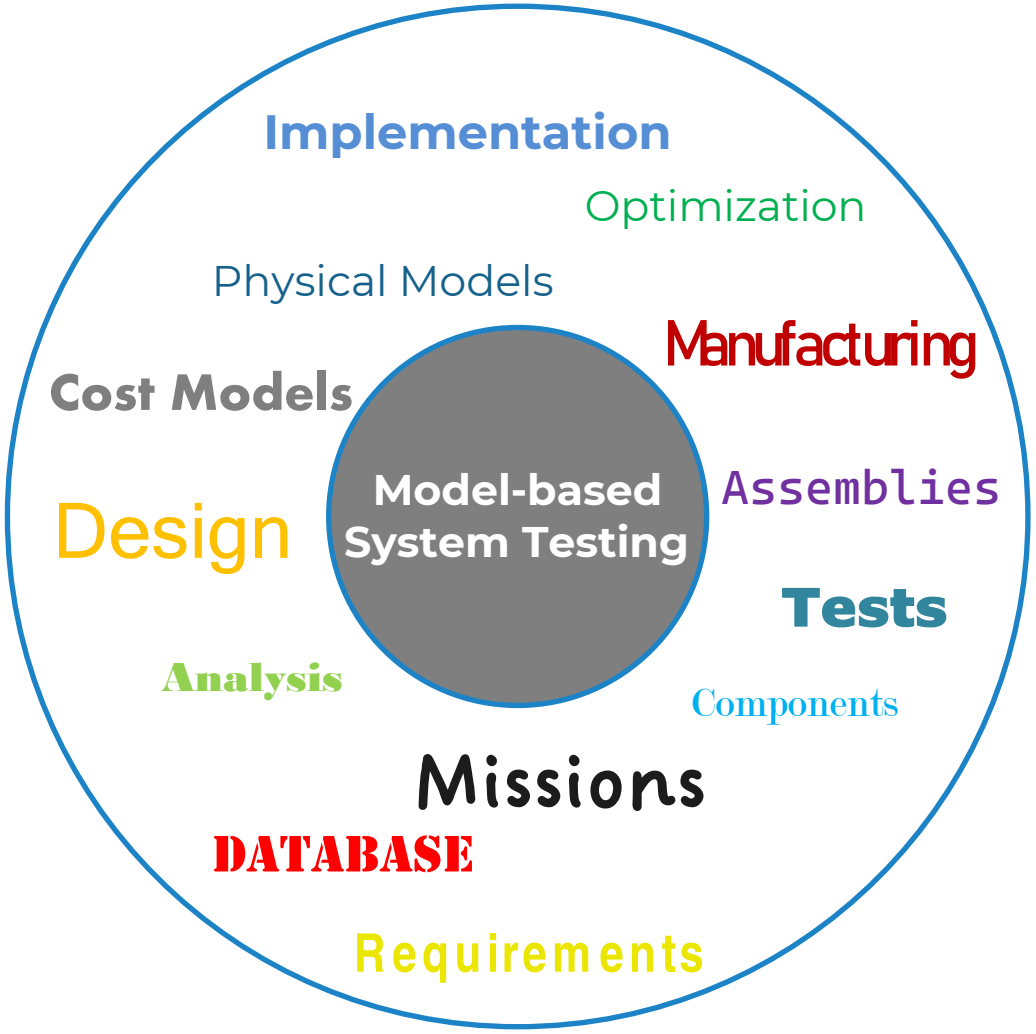
Testing and validation

NVH

Model-based system testing

We are able **to implement and correlate tests and simulations in a single environment** to provide a complete and specific assessment based on both **virtual models** and **physical tests**. This interdisciplinary combination reduces time, cost, and errors in all phases of product development and validation.

Simulation frontloads the development cycle and **reduces the necessary physical testing** while the subsequent test data is fed back into the models to improve their accuracy.



Testing and validation

NVH

Rotating machinery testing

We are able to perform NVH tests to **monitor** and **control parameters** such as speed, torque, torsional vibrations, etc. in order to **optimize** and **maximize the efficiency and the quality of rotating machines and the environment** in which they operate.

Testing and validation

NVH

I Sound design & Sound quality

Apart from a specific brand sound, the noise from any system has another subjective quality. Recent studies show an important **correlation between sound and perceived sound quality**, which is why sound design and acoustic tests have become an integral and important part in the development process of many products currently on the market.

Testing and validation

NVH

Structural dynamics testing

With our structural dynamics test methods, **components can be evaluated at every stage of design**, even in **high-stress** and **high-performance** environments.

We support our clients to create and develop comprehensive test programs and campaigns to **ensure the reliability** and **safety** of a product throughout its life cycle.

Modal Testing

We manage acquisitions and analysis, to the frequency responses functions (FRFs), natural frequencies and modal shapes of the system.

- **Experimental Modal Analysis**
  To describe, assess, and model the dynamic behavior of a structure, including its natural frequencies and mode shapes. (performed in lab conditions).
- **Operational Modal Analysis**
  To identify the modal properties of a structure during operating conditions and collect vibrational data. (performed during normal operation).

Vibration Troubleshooting

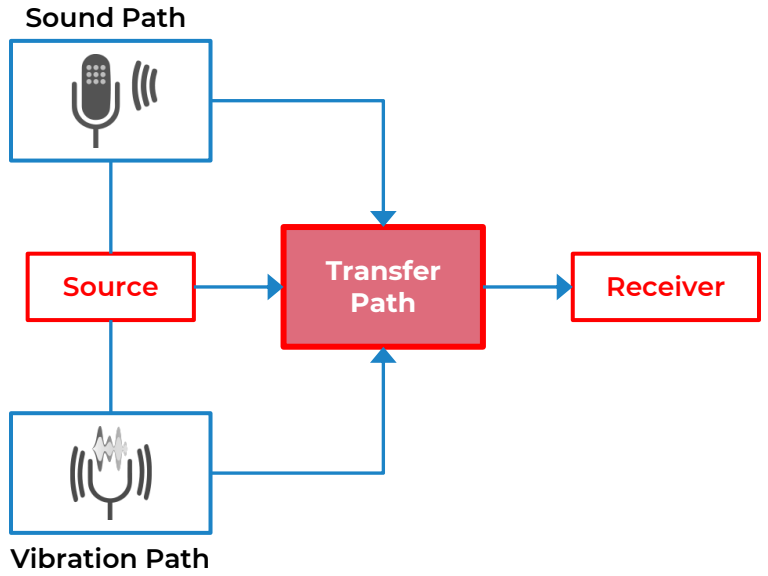
Root cause analysis to identify the cause of abnormal vibrations/frequencies and possible solutions.

Testing and validation

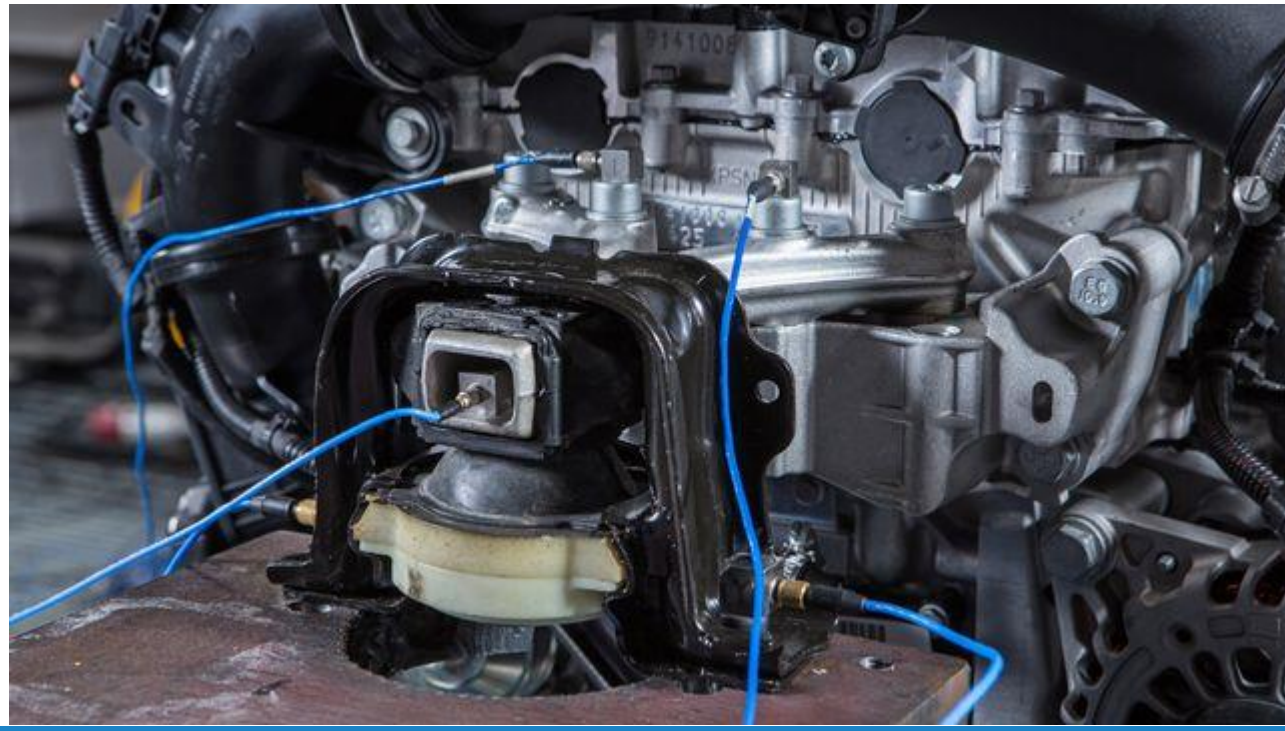
NVH

Transfer path analysis

Modern machines increasingly use different innovative materials and different assembly techniques that can **modify the normal propagation of vibrations and noises**.



With the use of a Transfer Path Analysis (TPA) we are able **to identify loads, forcing and source emissions, transfer and response functions in key positions to optimize products** at every design level.



Training

Training

What can we do?

We gladly provide our **expertise** in the use and application of tools for design, simulation, testing, etc. with solutions that serve **to improve** engineering skills and methods.

Our training and **commitment methodology** towards customers is to propose a targeted and concrete work plan, which assists users with much broader purposes than those typical of design and production processes.

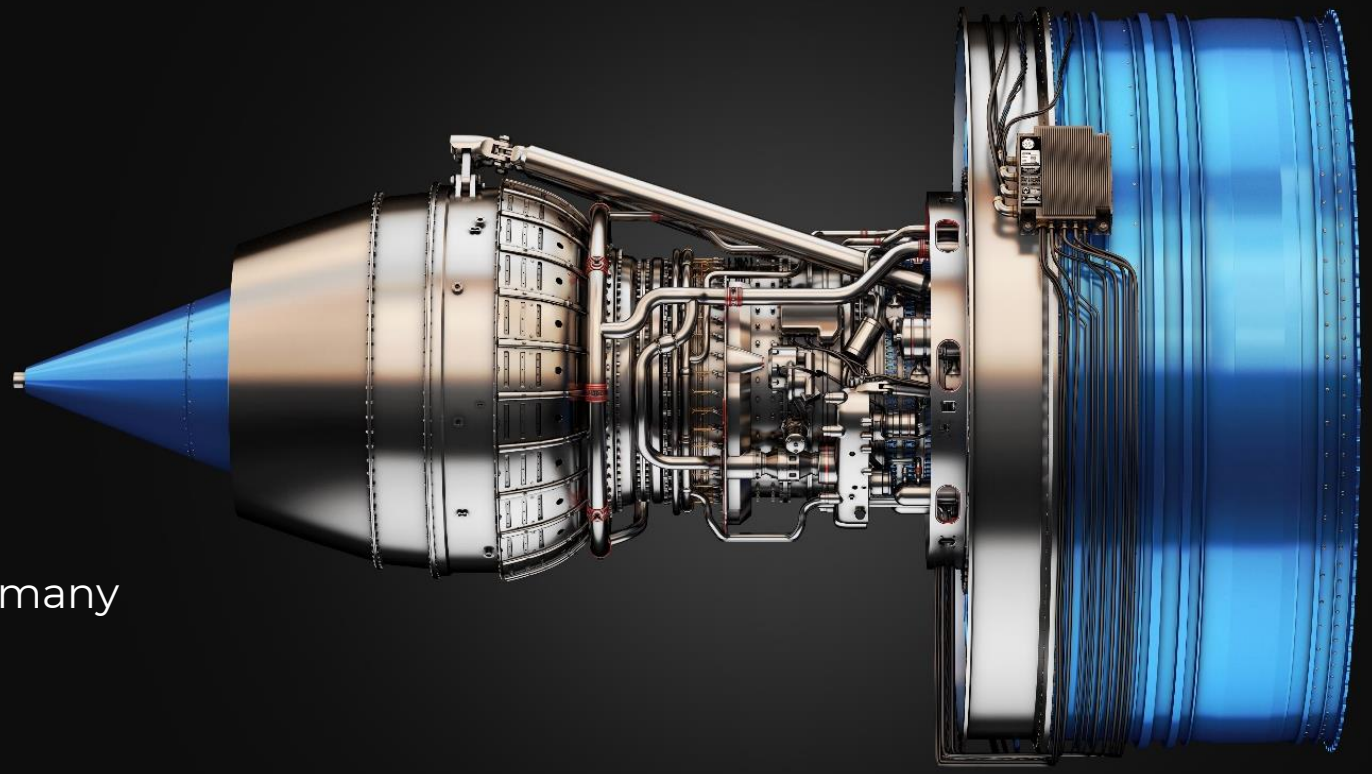
Trust us to train your technical staff

Contact us to find the best fitting training solution for your needs.

We will be glad to offer you a **virtual chair** for comfortable remote sessions.

dipolo

Get in touch



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