

# THE VIBES METHODOLOGY FOR MODULAR NVH

1 Component models & source descriptions from test or CAE

2 Build up a modular transfer path

3 TPA synthesis, auralisation and optimization of subcomponents



## Source description

Use Blocked Forces in **SOURCE** to get test-bench independent data for transfer to new source/receivers



## Test-based FRF models

Virtual Point FRFs measured with **DIRAC**



## CAE-based FRF models

FRFs from simulation software (e.g. Nastran)

# COUPLE



## Assemble full-vehicle model

Bridge test & simulation by coupling models at the Virtual Points with Dynamic Substructuring, using **COUPLE**



## Simulation & Predictions

Use the source description of **SOURCE** with the full-vehicle FRF in **COUPLE** to predict e.g. sound pressure at the driver's ear



Optimize

# THE DESIGN PROCESS USING COUPLE



## ASSEMBLE

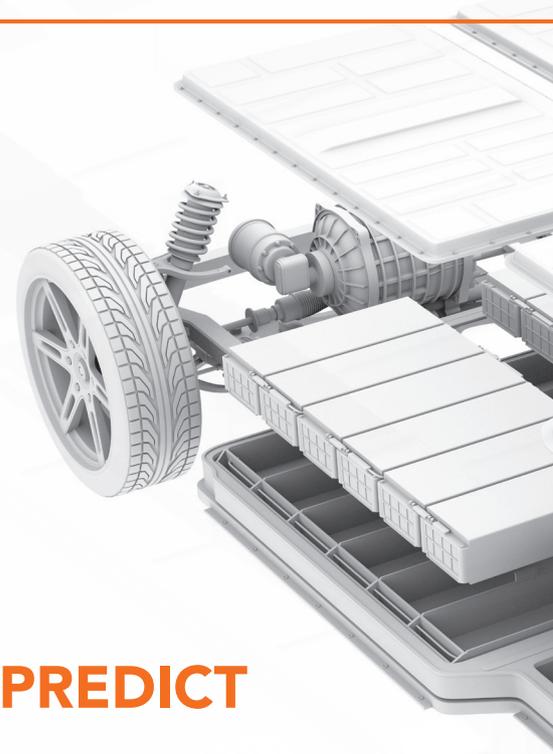
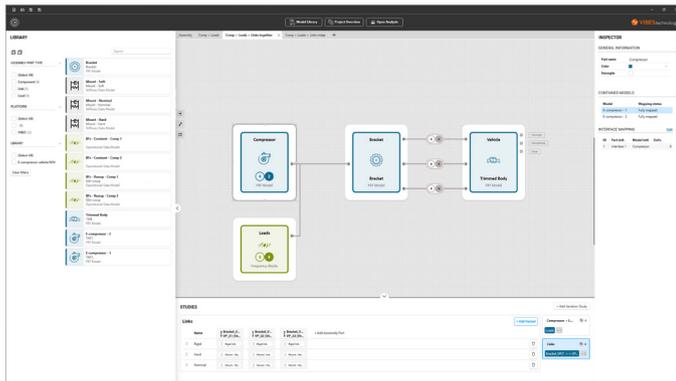
Combine **test-based component models** with **numerical simulations** to modularly connect your vehicle components at their interfaces using Dynamic Substructuring.

### Compatibility

**COUPLE** is compatible with data from all sorts of measurement hardware, like ATFX, UFF, MAT, XLS, and BDF & HB from CAE. Test-based models made in **DIRAC** fit perfectly with **COUPLE**, as well as numerical models from various simulation packages.

### Design area

With **COUPLE**, you plan and design your system using an intuitive 2D design area. This allows you to connect the interfaces of each component visually. The blueprint function acts as a placeholder for topologies that you might not yet have models for.



## PREDICT

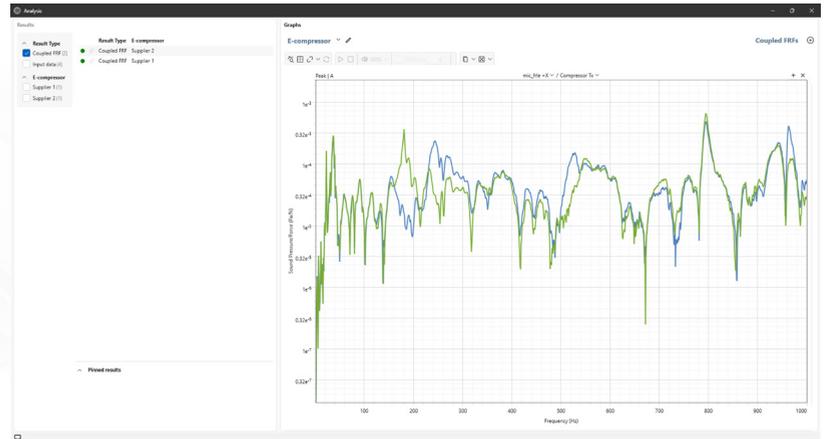
### Full-vehicle NVH predictions

Synthesize full-vehicle responses for various vehicle configurations and operational scenarios, such as engine loads and driving speeds.

### Project administration

**COUPLE** takes care of mundane administrative tasks, such as the matching of individual subsystem degrees of freedom or coordinate frame adjustments. This way, errors are avoided and you can focus on the NVH engineering of your vehicle.

Once your vehicle is virtually assembled, **predict noise and vibration levels** for specific load cases.



## OPTIMIZE

**Refine your design** and optimize specific subcomponents with respect to the full-vehicle.

### Analyze different design variants

Analyze and choose between different model variants quickly and intuitively, allowing you to optimize your vehicle design based on available models. This allows you to compare the effect of for instance adding an additional isolation stage or using a different vehicle component.

### Intra variant optimization

Optimize design settings and choices within each variant, such as rubber bushing stiffness, to get the most out of your components.

# COUPLE TEST-BASED MODELS WITH MODELS FROM SIMULATIONS

COUPLE allows you to assemble, predict and optimize your full-vehicle NVH design, in a complete modular workflow. This way, late-phase troubleshooting is avoided and fewer iterative design cycles are needed, saving time and resources. All in all, reliable full-vehicle models are available much earlier in your development process.

COUPLE is a modeling application to perform hybrid Dynamic Substructuring, in which you can easily combine test-based models with models from simulations. In COUPLE you can combine test-based models made in DIRAC, as well as simulated models from your favorite CAE software, to generate a full-vehicle model. Moreover, COUPLE works with source characterization data from SOURCE, allowing you to simulate and further optimize your NVH design.



COUPLE is perfect for assembling an entire vehicle model, taking away the complexity of Dynamic Substructuring, but still getting the results you expect.

– Arthur Hülsmann, Specialist Acoustics at BMW Group –



DO YOU STILL HAVE A **COUPLE** OF QUESTIONS?  
GET IN TOUCH FOR A **DEMO**



+31 (0) 85 822 5049

info@vibestechology.com

[www.vibestechology.com](http://www.vibestechology.com)



**VIBES.technology – Delft office (H.Q.)**

Burgwal 8a

2611GJ Delft, The Netherlands



**VIBES.technology – Munich office**

Löwengrube 12

80333 München, Germany



**VIBES**.technology  
engineering good vibrations

# COUPLE

Assemble, predict and optimize your NVH design, combining test-based models with models from simulations