

## Renault

### An Innovative Approach to Lighter and More Efficient Powertrains

Carmakers the world over are investing heavily in the development of lighter vehicles and more economical engines that can go further on less fuel. Renault's powertrain division wanted to further decrease the weight and increase the performance of existing and in-development engines by redesigning key components to use a minimum amount of material. As an existing user of Altair's simulation solutions, Renault approached Altair ProductDesign to assist in the development of the required optimization design methods and processes for use at component and sub-system levels.



### solution

The project included two main areas of focus, namely the noise, vibration and harshness (NVH) performance of the global powertrain assembly and the fatigue performance of the engine's bearings. The first step in the process was to parameterize the model in the CAD environment, identifying design spaces and parametric design variables such as wall thickness and rib height that could later be used as design considerations for the optimization process. In order to find the best trade-off between NVH and durability performance, weight targets and manufacturability criteria, design of experiments (DOE) processes were conducted.

To further enhance the NVH performance of the structure, topology optimization techniques were employed in parallel on the external rib network for the global powertrain assembly. By identifying the design space areas within the model and applying the known loads and constraints, the process suggested the ideal material layout for the rib network, removing any material that was not required to meet the NVH targets.

### result

The final design of the new powertrain achieved an 8% reduction in weight while improving in-house NVH and fatigue cumulated performance indicators by 30%. When compared against the other powertrains in the market, this improvement made the performance of the new Renault engine the best in its class.

***"Altair helped us to greatly increase the impact of optimization by applying it in the early development phase, with an ambitious scope, yet coping with real industrial time and resource constraints."***

Dr. Anthony Hähnel, Powertrain NVH CAE Team Leader, Renault