

CADfix Makes Load More Bearable at Glacier Vandervell

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-David Merritt
Senior Engineer at
Glacier Vandervell

CADfix

CADfix removes barriers preventing the reuse of solid models. By providing an extensive set of geometry manipulation tools for importing, repairing and exporting data, CADfix maximizes the reuse of CAD data in downstream applications.



Glacier Vandervell Bearings

Glacier Vandervell is a major international supplier of engine bearings for the world's automotive industry to original equipment (OE) and aftermarket customers. The company supplies a wide range of applications from small petrol engines to Formula 1 and large diesel engines. Glacier Vandervell is part of the Dana Corporation, a \$10.3 billion multinational automotive components supplier.

Glacier Vandervell's global technology center is home to the Advanced Bearing Technology team. Their main focus is on developing techniques for the analysis and design of engine bearing systems. The techniques use commercial software to perform finite element analysis (FEA) of engine-bearing structures, coupled with in-house-developed computer programs for performing elasto-hydrodynamic lubrication (EHL) analysis of the bearing system.

David Merritt is a senior engineer in the Advanced Bearing Technology department working on the finite element modeling of customer components. "We develop software tools for analyzing bearings under engine operating conditions," explains Merritt. "It's essentially a free service to customers who are using our bearings or developing engines with our bearings in them."

Get Your Bearings

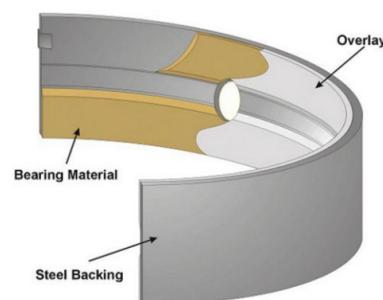
A bearing is a steel shell coated in a specialized material, typically about 2mm thick and 15mm wide. It transmits a load through two elements of an engine moving relative to each other. The structure is fairly simple, but the interactions between the bearing and the rest of the engine can be complicated. Much of the research at Glacier Vandervell goes into developing bearing materials that give better performance in terms of wear and resistance to seizure and fatigue.

If there is a problem with a bearing system in an engine or if a customer wants to look at different bearing designs or engine structures, the Advanced Bearing Technology team performs analyses to highlight the problems and how they can be solved. This could involve changing the shape of the bearing, adding different features to it, changing the bearing material or actually changing the structure of the engine.

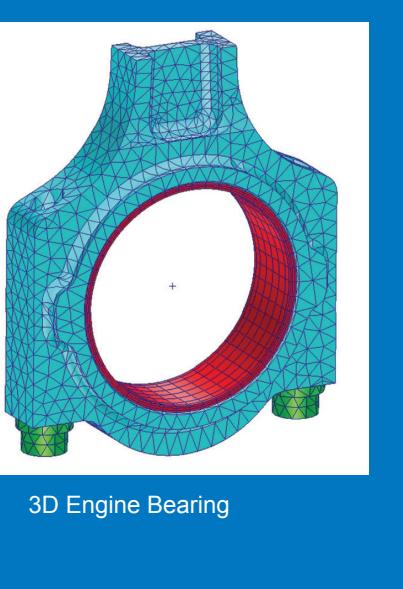
"We analyze the bearings in the engine using a piece of software that we've developed, called Sabre-EHL. This performs an elasto-hydrodynamic analysis of the engine bearing, which couples the pressures generated in the oil film with the flexibility of the engine structure," says Merritt. "The process of setting up the analysis involves receiving CAD models from our customers, usually the connecting rod or engine block plus the crankshaft. The first task is to translate these into the software we use for the pre-processing."

The Matrix Reloaded

The engineering team uses MSC.Patran for mesh generation and analysis set-up. The model is then analyzed in Abaqus to obtain a stiffness matrix for the bearing surface and also the deformed bearing profile due to the interference-fit of the bearing relative to the housing during the bolt-up procedure. The data is fed into Sabre-EHL, which performs the calculations.



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3D Engine Bearing

About ITI

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www.iti-global.com
info@iti-global.com
1-800-783-9199 US
+44-1954-234-300 UK

European Headquarters:
4 Carisbrooke Court, Anderson Road
Buckinway Business Park, Swavesey
Cambridge, CB24 4UQ, England

World Headquarters:
5303 DuPont Circle
Milford, OH 45150 USA



International TechneGroup

Productivity gains

The benefits Glacier Vandervell has experienced through adopting CADfix are typical and illustrate the importance of addressing the challenge of engineering data interoperability. "We use CADfix as a tool to get data into a form we can use as quickly as possible. The real benefit to us is time saved," says Merritt. ITI's own research suggests that up to 80 percent of a typical engineering design project is wasted on reworking data.

More manufacturers are turning to CADfix because they employ qualified engineers to engineer things, not to spend time remodeling CAD files from scratch. Merritt concludes: "We are saving between a half and four man days per project, depending on the complexity of the model. In percentage terms, the amount of model re-working has been reduced by around 90 percent and the total model setup time reduced by around 50 percent."

Usually, the OEM specifies the application and dimensions and Glacier Vandervell recommends the type of bearing that would best suit the job, based on inspection after certain test procedures. "We take all the dimensions of the structure, the stiffness and the loads that are applied and use this information to perform a lubrication analysis taking into account the oil film," says Merritt.

At a basic level the bearing only survives because there is a very thin oil film separating it from the crankshaft. The crank is riding on a film of oil that may be no more than 0.1 of a micron thick in some places. The success of that oil film determines how well the bearing performs.

Solid Solution

Because the engineers at Glacier Vandervell are dealing with CAD models from customers, the ability to translate data reliably and accurately is a major issue. In the past, the process of getting a customer's model into a form that could be meshed was time consuming.

"We have Pro/Engineer here so we're able to take Pro/E files from customers. We use MSC.Patran for pre-processing and are able to import Pro/E files via a direct link. This is fairly successful but not 100 percent reliable. In the past for all other CAD software we had to rely on an IGES file. It was the amount of time that that process was taking that led us to think that it would be good to look at CADfix," says Merritt.

CADfix is a suite of translation and repair tools for engineering product data that facilitates true interoperability between a comprehensive selection of CAD, CAM and CAE systems. The software removes significant barriers that can hamper the reuse of solid models.