

Elastic Bodies within Pro/ENGINEER

ProSIM, the bi-directional interface between Pro/ENGINEER and SIMPACK, has been in existence for over four years. It places SIMPACK functionality at the users disposal from within the Pro/ENGINEER graphical user interface. This means that a MBS model can be created and animated without leaving the CAD environment. A new feature has been added to the latest ProSIM version, allowing structural elastic components from FEA models to be used within Pro/Engineer.

The ProSIM Concept

ProSIM offers SIMPACK features within Pro/ENGINEER's CAD environment required for the initial kinematic and dynamic analysis of a model. To access all the advanced features within SIMPACK, a model or part of a model can be exported. The exported model can be modified and altered within SIMPACK and subsequently imported back into the CAD environment, where the newly added SIMPACK standalone features are fully functional.

Elastic Bodies in SIMPACK

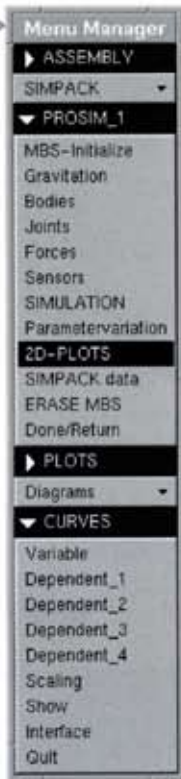
The default body in ProSIM is a rigid body, meaning that apart from density and geometry no further body properties are taken into account. However, in some instances it might be desirable to include the elastic properties of a body in a model. This requires an FEA-analysis of the body producing eigen modes, mass matrices, stiffness matrices, etc. These results can be converted by FEMBS so that they can be used by SIMPACK. FEMBS goes beyond the norm by taking into consideration second-order terms (for instance a flexible beam that shortens when it bends) and so-called geometri-

cal stiffening effects (a rotating rotor blade having a higher stiffness than a non-rotating one).

Elastic Bodies in Pro/Engineer

ProSIM can also use the results from an FEA-analysis. The use of earlier versions of ProSIM as an integral part of Pro/ENGINEER's graphical user interface offered many advantages compared with Pro/ENGINEER's own MBS-module. The latest version of ProSIM offering the ability to use elastic bodies within Pro/ENGINEER is highly advanced and unequalled by any competitor.

ProSIM automatically performs a large number of initiating steps for an FEA-analysis whenever a new elastic body is defined. Most importantly the load cases that reflect the location of the body within the MBS are determined. Pro/ENGINEER's built in mesher outputs a ANSYS FEA model, ready for use with the ANSYS solver. The results of the FE-analysis must be converted by FEMBS before ProSIM is used to perform calculations and animations which incorporate elastic deformations. ProSIM offers the user a powerful tool, providing animation closely resembling reality.



SIMPACK Features Integrated in Pro/ENGINEER's User Interface

The use of elastic bodies is a new ProSIM feature, implemented according to the basic concept of ProSIM. This means that the use of elastic bodies is fully accessible from within Pro/ENGINEER's graphical user interface. The routines that were used to implement this new feature are the same routines as the original FEMBS routines. This means that complete compatibility with SIMPACK is guaranteed. Also, any improvements and new features of future versions of FEMBS will also be incorporated in new versions of ProSIM.



Sun Roof with Elastically Modelled Spoiler in Pro/ENGINEER Using ProSIM

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SIMPACK Version 5,6,7,8,
FEMBS, LOADS,
ProSIM, CatSIM,
SIMAT, SIMAX
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REGISTERED TRADEMARKS

ABAQUS: Hibbit, Karlsson &
Sorensen, Inc.

ANSYS: Swanson Analysis Sys-
tems, Inc.

CATIA: Dassault Systems

NASTRAN: MacNeal-Schwendler
Corporation

MATLAB: The MathWorks, Inc.

MATRIX: Integrated Systems,
Inc.

MARC: MARC Analysis Research
Corporation

Pro/ENGINEER: Parametric Tech-
nology Corporation