Enables Seamless Integration of TURBOdesign Suite in Existing CAE Design Systems

Main Features of TURBOdesign cad

TURBOdesign cad is a program developed to seamlessly integrate TURBOdesign Suite within an existing CAE environment. It provides the functionality to convert years of direct design know-how in a format which is compatible with TURBOdesign Suite, but also storable as general design guidelines based on aero/hydrodynamic principles, which are easier to transfer to new designers.

The code features three main functionalities:

1. A CAD conversion module: This module allows design engineers to bring their existing designs in IGES surface data into a point data format which is native for TURBOdesign Suite environment. This module allows automatic generation of all the required TURBOdesign data files, such as .mri, .th and .geo files, from an existing surface IGES file of the blade. The IGES blade definition needs to include the hub and shroud surfaces, which should be extended to upstream and downstream of the blade (see Fig 1). The blade surface definition can either be in terms of just 2 surfaces, the pressure and suction surface, or in terms of multi surfaces. The user then selects the surfaces that represent the hub, shroud and blade. It is then possible to start optimising the blade with TURBOdesign1 and setup CFD analysis with TURBOdesign cfd in a few minutes.

2. A Quasi-3D analysis Module: By using this code the blade loading for a given blade geometry can be computed with ease. This will then allow the designer to relate better the features of the optimum blade geometry to the hydrodynamics of the flow and derive more general design know-how from the existing database. Also this blade loading can then be brought into TURBOdesign1 and modified to improve the hydrodynamic design. The quasi-3d code currently assumes inviscid, ideal gas behaviour and is in SI units.

3. A Direct Design Module: Some manufacturing constraints may impose small modifications to the blades designed with TURBOdesign1 or TURBOdesign2. The direct design capabilities of TURBOdesign cad allows design engineers to modify with ease the blade angle, wrap angle and blade thickness at different streamwise locations. Such modifications can be done in a matter of minutes, without exiting from the TURBOdesign Suite environment and maintaining the possibility to work on a file format which is native to TURBOdesign cfd for immediate evaluation of the designs.

The schematic diagram in Fig. 2 shows how TURBOdesign cad can be implemented within an existing design environment in order to optimize existing designs with TURBOdesign Suite.
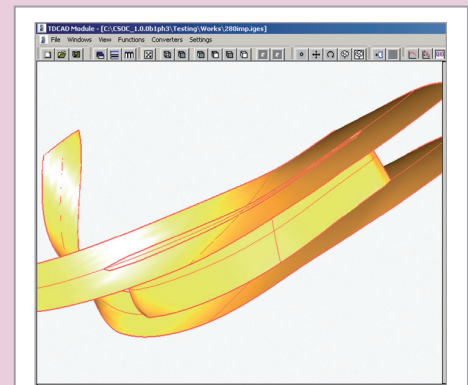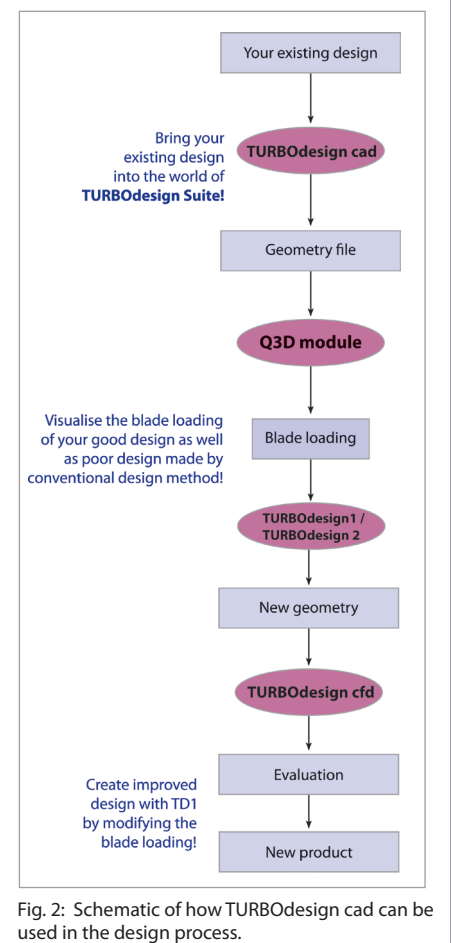

Fig. 1: Example of Surface IGES file.

Fig. 2: Schematic of how TURBOdesign cad can be used in the design process.

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