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Design of Wind Turbine

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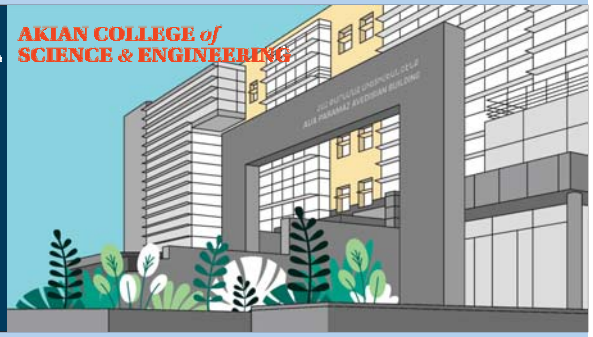

Introduction

KEUKA Wind, LLC and the Florida State University jointly implemented a wind turbine project. They produced prototype models and tested them in their wind farm. AUA was invited to take part in this project. Our task was to reverse engineer (prepare 3D models and engineering documentation) the existing prototype turbine. This task was successfully implemented during the Advanced CAD/CAM Applications course by the team of IESM 2nd year students and their instructor.

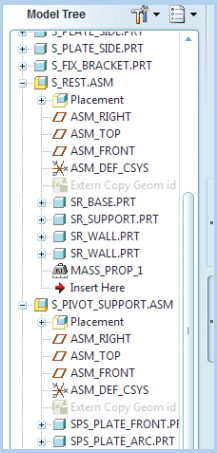

Fig. 1 Assembly structure

Top-Down Design

In a top-down approach an overview of the system is first formulated, specifying but not detailing any first-level subsystems. Each subsystem is then refined in yet greater detail, sometimes in many additional subsystem levels, until the entire specification is reduced to base elements.

In our case, the design process started with the document called layout. It is an electronic notebook containing the global parameters of the future product, relations between them, important sketches with the dimensions, and other information necessary to start the design. The layout controls the model because the components of the product can be declared to it using the parameters and relations created there. Hence, the name of the approach - Top-Down Design. The next step in this powerful design process is to create the assembly structure and fill in the component tree of the empty Pro/ENGINEER assembly window (Fig. 1). The skeleton (Fig. 2) is another important element of the Top-Down Design process. As its name suggests, the skeleton represents the links of the future model that can be copied and published in the appropriate components of the assembly structure. This way we achieve proper interfaces of the components and their intended functioning.

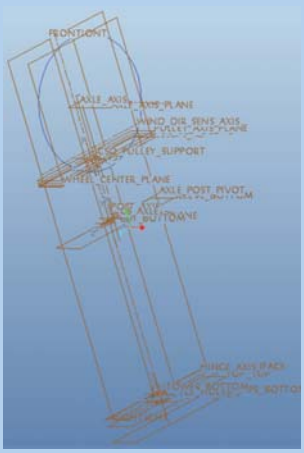

Fig. 2 Skeleton

Fig. 3 The 3D model of the turbine

Modeling and Drawings

The skeleton is the basic structure, on which the components of the turbine are built. There are 30 subassemblies and more than 200 parts in the turbine, all modeled and documented as engineering drawings by the team to provide to the collaborators in Florida. The three main parts of the turbine are the Reinforcement, the Tower system, and the Wheel. Figures 3 and 4 depict the 3D model of the turbine and its engineering drawing with the Bill of Materials table. Only top-level subassemblies are shown in the table.

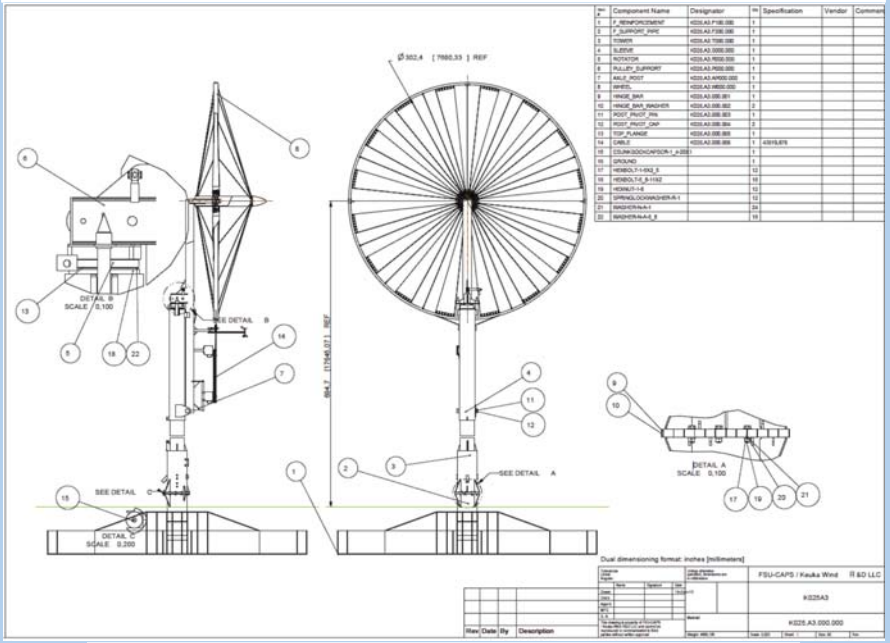

Fig. 4 The engineering drawing of the turbine with the BOM.