FSU-FAMU College of Engineering

TECT POWER
68K Blade Process Handling

Needs Assessment

Group 14:
Patrick Filan, Clint Kainec, John Kemp

Project Advisors:
Dr. Kamal Amin
Department of Mechanical Engineering

Dr. Patrick Hollis
Department of Mechanical Engineering

Client Sponsor:
Mr. Ashtok Patel
Industrial Engineer and EHS Manager at TECT Power

TABLE OF CONTENTS

NEEDS ASSESSMENT

TECT Power currently manufactures and adjusts hundreds of parts every day. Among them is the 68K turbine blade part used by TECT Power's clients for turbine assemblies and engines. TECT's current process for transporting their 68K blade from shipping container to the milling fixture involves manual labor which endangers their workers. They desire to reduce risk and reduce on-site injuries from this process.

PROJECT SCOPE

PROBLEM STATEMENT

Currently, TECT Power employs staff to manually transport their 68K turbine blades from their received shipping containers to the milling fixtures. This put their employees at risk of injury and also slows down what should be a quick process. Last year, a team devised a plan to adjust this process to make it more ergonomic and efficient. Their project was not complete and the design of their apparatus to transport blades still requires more analysis and component selection. This project will examine the previous group's project, adjust errors and inaccuracies, improve upon the design, and fabricate the new assembly for TECT Power's 68K blade transportation need.

JUSTIFICATION AND BACKGROUND

TECT Power is a manufacturing company specializing in the manufacturing of turbine assembly parts intended for use in power generation and jet engines. They are based out of Thomasville, GA; approximately 40 miles from the FSU-FAMU College of Engineering where this project will be designed. The supervisor from TECT Power is Mr. Ashtok Patel, Industrial Engineer and EHS Manager at TECT Power. Mr. Patel oversaw the project from last year as well, and can prove to be an asset in the redesign process with his input on how last year's project met or failed to meet TECT Power's expectations.

Last year, an Industrial Engineering-led project consisting of one mechanical and three industrial engineering students devised a design for a cart that would carry the blades from the shipping container to the milling fixture; however, the design was very rough and lacking in configurability, functionality, and overall usefulness. Some flaws that with the design include: the lack of ability of the cart to retrieve the blades from the shipping container – this can be remedied by making modifications to the internal layout of the shipping container or how the blades are stored in the container, as suggested by Mr. Patel – the cart's inability to carry copious amounts of blades, the cart's apparent inability to safely load and unload the blades, and other flaws that will be examined as the project progresses. Luckily, an outline of previous work and one of the previous students who worked on the project will be resources for the redesign of the project.

OBJECTIVE

By this project's competition next semester, a definite redesigned model will be constructed. Analyses on the model will be produced for material and part selection using typical part selection equations and finite element analysis on key elements of the design. The cart will then be constructed, possibly from parts of the previous design, using the new modeled design and a 1-1 scale prototype will

be fabricated to completion. If possible, with the budget and time constraints, adjustments to procedure and shipping will be outlined and a design of new shipping apparatuses may be designed and constructed if needed by the design of the transportation apparatus. The total design will fit the requirements of the project, minimizing or eliminating human interaction with the blades and removing manual lifting in the transportation and loading and unloading of the blades.

METHODOLOGY

First, a tour of the TECT Power facility will take place where the project can properly be assessed by seeing the actual requirements of the design in their entirety. This will also allow for face-to-face conferencing with Mr. Patel. Then, an assessment of last year's project in its entirety will be done to check for feasibility, reliability, functionality, and efficiency. After the primary analysis of the previous design, and after speaking with Dr. Patel and previous group members who have worked on the project, an outline of adjustments will be constructed. The outline will therein be developed into a scheduled timeline of milestone points and project deadlines so as to keep the project on-task throughout its development.

The aforementioned schedule will include tasks such as: concept design/alteration, finite element analysis, material selection, part analysis, part selection, component ordering, simulation, construction, testing, adjustments, and any other task that is found to be needed. If a part is unavailable or too expensive, it is a possibility that it can be machined or salvaged from raw material or from the preexisting design or other parts.

CONSTRAINTS

The major budgets in this project are time and budget. However, client prescribed constraints do exist as stated in the initial address of the problem and declaration of needs.

TIME

The project must be completed by April 18th (tentative) for final presentations to the College of Engineering and to be presented to TECT Power. Also, there is a large break between the two semesters from mid-December to January. With this in mind, parts should be ordered before December 14th, when the first semester ends, to ensure that they arrive on-time and that work won't be pushed aside and group contact lost when the break begins.

BUDGET

Though, an initial budget was set at $2000, a document sent from Mr. Ashtok Patel insists that the budget is $4000, this will be clarified later. This budget is a major constraint and cannot be surpassed without prior approval from TECT Power.

CLIENT PRESCRIBED CONSTRAINTS

Because the cart is intended to remove manual lifting of the turbine blades, the final design(s) must have zero "manual" labor involved in any process that is part of the series from the shipping container's opening to the blades being fitted to be milled. A prototype, either small scale or full-size, must be constructed by the completion of this project.

EXPECTED RESULTS

When this project is completed, a refined design of the transportation apparatus and any other apparatuses will be completed. A working prototype, preferably full-sized, of the transportation apparatus will be completed as well. If possible or needed, a process for transporting and loading and unloading the 68k blades in their respective spots will be outlined and condensed into a manual.