Design and Development of the Dassault Future Falcon Electrical Test Rig

BEng (HONS) Mechanical Engineering - Final Year Project

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Project Background

- Eaton Aerospace have successfully won the Dassault Future Falcon programme. This programme requires Eaton to design, qualify and manufacture a new type of fuel pump to be used on the Future Falcon aircraft, a luxury business jet.
- As a part of this package of work, Dassault requested the supply of an Electrical Test Rig, this is to be delivered to Dassault's Electrical Distribution System Supplier General Electric (GE).

Project Aim

- To research design, develop, analyse and evaluate the Electrical Test Rig design for the Dassault Falcon Future Programme

Project Objectives

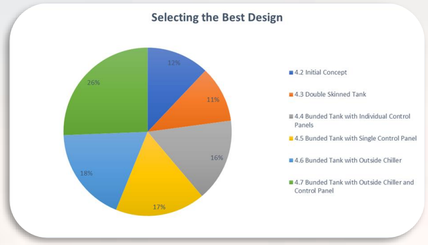
- To determine the requirements of the Electrical Test Rig
- To develop/transform the requirements into a detailed Product Design Specifications (PDS) and communicate this to the customer
- To conceptually design the Electrical Test Rig
- To detail design and develop the Electrical Test Rig's structure
- To analyse and evaluate the Electrical Test Rig's structure and keep Factor of Safety above 3

Project Highlights

- Customer requirement change mid-way through the project, resulting in substantial re-design
- Successful demonstration of using FEA in design development

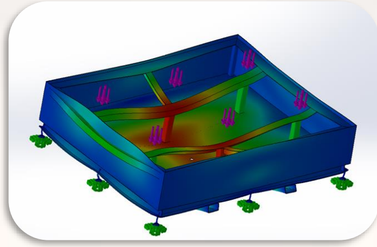
Project Achievements

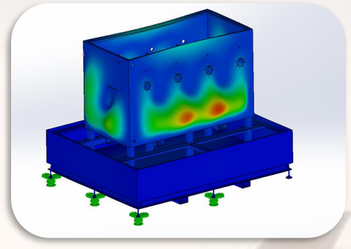
- A detailed thesis submitted that documents the project thoroughly and provides evidence that the project aims and objectives have been met
- A thorough specification created which was used as a means of testing component compliance in a Compliance Matrix
- Project completed on-time as per the project Gantt Chart



Design Selection

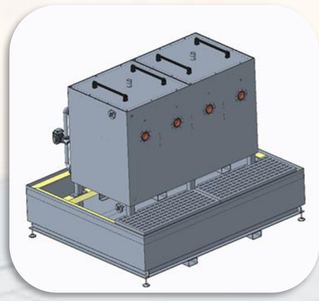
The Analytical Hierarchy Process (AHP) was used as a tool for selecting the best design. Design criteria was given a weightage and candidate solutions were compared.

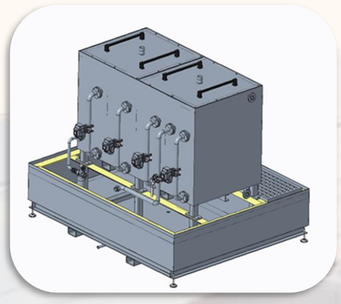




FEA

- FEA Conducted at assembly and sub-assembly level
- Result of FEA had impact on final design (structural member added)
- FEA proved that Factor of Safety greater than 3 has been achieved





Electrical Test Bench Main Features

- Designed to provide the customer with fuel booster pump electrical characteristics for on-the-ground testing in order to qualify the Aircraft EDS (Electrical Distribution System)
- Ability to run 4 pumps simultaneously
- Provides enough cooling capacity to keep test fluid at ambient conditions (15° - 30°C)
- Structure is safe to a minimum factor of safety 3 (as per Solid works analysis)
- Bund Tank provided to "catch" oil in case of catastrophic failure
- Provision for filtration, liquid level gauge and instrumentation
- Welded fork lift pockets to allow for easy transportation
- Aircraft representative inlet and outlet pipework