Precision Tooling Assembly Cost Reduction

Sponsor: Mate Precision Tooling
Sponsor's General Business Statement: Mate Precision Tooling is dedicated to developing unique punch press tooling using new materials and new applications with a focus on proving the viability of value added products while reducing time needed to bring these products to market.
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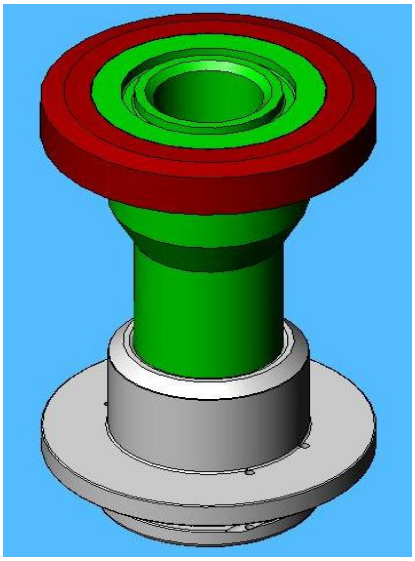
Team Member Names: Nathan T. Brown (ME), Jeffrey N. Grant (ME), Conor D. Gray (ME), Hezbon M. Moze (ME)
Senior Design Clinic I-II (ENGR 480-481) 2005-2006 Project Mission Statement: Redesign the B station canister assembly in order to reduce cost by 30% while maintaining the defined form and functionality.

Major Design Requirements:

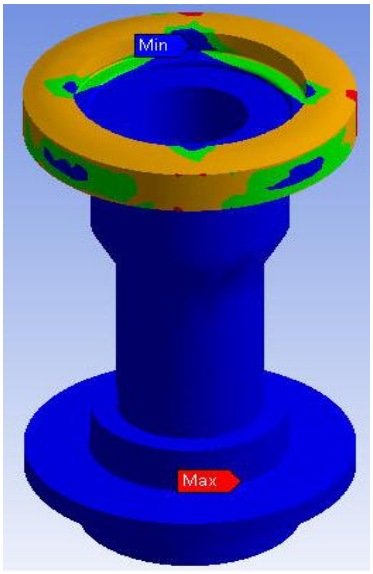
1. The estimated cost of the purchased parts, manufactured parts, and assembly must be equal to or less than $58.23.
2. The list of critical dimensions must be met.
3. FEA must show an equivalent factor of safety to the current model.
4. FEA must show a life equivalent or longer than the current model.
5. The prototype must survive one million compressions at Mate in cycle testing.
6. The prototype must interface with Mate punch designs and survive punch testing in a Finn Power turret press.

Senior Design Project Summary: The scope of this project was centered on the mechanical redesign of Mate's B station canister in order to reduce total cost by 30%. In order to achieve this goal, the members of Team Mate began by researching turret press tooling manufactured both by Mate and by their various competitors. Next, potential designs were three dimensionally modeled using SolidWorks and tested for stress resistance using ANSYS finite element analysis. At this point there were two feasible options remaining, and a design review between the students and engineers at Mate eliminated one design due to concerns with manufacturability and assembly. The remaining candidate was then run through an estimated cost analysis by Mate engineering using their Oracle business system, and was found to meet the financial goal. The design was modified slightly through design for manufacturability and the final estimated cost was set at $50.68, actually below the original target. Six prototype units were assembled and run through various physical tests at Mate including one million compressions in a cycle tester, static loading on the external retaining ring, impact testing, simulated strip-miss conditions, and press production testing. Each evaluation yielded a passing result, and the final design was determined to be acceptable.



SolidWorks drawing of the final design canister assembly.

Photo of the Team Mate canister prototype shown in cycle testing.



Finite element analysis of the assembly as modeled in ANSYS.