

Senior Design Project Proposal

— Reverse Engineering and Redesign of a Riveting Machine

Sponsor: Cooper Standard Automotive

Advisor: Zhuming Bi

Problem description and Objective: Cooper Standard is a leading global automotive supplier, offering solutions in the body sealing, fuel, brake and emissions, thermal management and anti-vibration segments of the industry. Cooper Standard has a set of machines to assemble parts together by crush riveting. Machines were customer built years ago by vendors, where the design details are not available to the Cooper Standard Automotive. These machines show unsatisfactory performances at several aspects including (1) the short and unpredictable lifetime of pivot pins, (2) lack of the flexibility in adjusting power to fulfill the tasks, (3) the failure of riveting operations on certain parts. These problems cause the economic loss and uncertainties of the company. The objective of this SD proposal is to solve these problems, so that the machines can operate at a satisfactory level of system performances in terms of the lifetime of moving parts, flexibility of operation, and reliability of machines.

Main Tasks: Riveting machines are typical mechanical systems, whose designs require thorough and intensive modeling, simulation, and analysis. Main tasks of this project include (1) reverse engineer the design of an existing machine, (2) analyze its mechanical system, decompose the system into machine elements, and evaluate and identify critical factors to cause the specified problems, (3) redesign the mechanism and its machine elements to ensure the better system performance, (4) prototype, assembly, and test the redesigned machine to verify the performance.

Budget and Resource: The estimated budget of rebuilding a machine is \$7,000, and Cooper Standard will be responsible for acquiring and manufacturing all of the hardware components for the project. Students in this project are allowed to access machine tools, equipment, and other resources at Cooper Standard. One engineer staff will be available to oversee the project at company side.

Required Students: 3 or 4 students in Mechanical Engineering

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