

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

Company contact Person: Henry Waring
Engineering Manager
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Tel 260-927-3462

Composite Material Mechanical Engineering Proposal

Luke Henderson



Composite Material Mechanical Engineering Proposal:

Trends and Applications in Mechanical Engineering, Composite Materials and Smart Manufacturing Padhi, Surya Narayan, 2024-08-14 The fields of Mechanical Engineering Composite Materials and Smart Manufacturing find themselves at the heart of a pivotal predicament As these industries grapple with the demands for efficiency sustainability and innovation a need arises for a unified exploration of the transformative solutions within these domains At this crucial moment researchers academics and practitioners worldwide need to focus on understanding and solving the complex issues that are hindering progress Trends and Applications in Mechanical Engineering Composite Materials and Smart Manufacturing delves into solutions that propel industries economies and societies into a future defined by progress and resilience At its core this book strives to examine the disciplines of mechanical engineering composite materials and smart manufacturing With the collaborative efforts of diverse experts it attempts to create a comprehensive resource that not only identifies emerging trends but also unveils their impact on the real world By acting as a driving force for advancing current research bridging knowledge gaps and presenting innovative solutions the publication contributes significantly to the collective understanding of these disciplines The goal is to empower scholars educators and professionals with the knowledge and insights required to sculpt the future of these increasingly complex industries

Advanced Functional and Composite Materials Neeraj Kumar Bhoi, Harpreet Singh, Himansu Sekhar Nanda, 2025-09-30 This book provides an in depth understanding of the properties characterization and applications of advanced functional and composite materials for energy electronics biomedicine and aerospace fields Divided into four sections it covers sustainable smart and composite materials intelligent techniques for optimization of material properties their characterization and processing case studies based on modernization in processes and systems sustainability based approaches and novel strategies and sustainability and Industry 4 0 based contents Key Highlights Provides smart materials and sustainability novel product design and materials implementation Reviews molecular dynamics simulation techniques Includes Industry 4 0 and sustainability interventions in functional composites Discusses life cycle engineering and analysis in composite processing Covers microwave assisted processing of composites This book is aimed at graduate students and researchers in materials sciences and metallurgy mechanical and manufacturing engineering

Advanced Research in Aerospace, Robotics, Manufacturing Systems, Mechanical Engineering and Bioengineering Adrian Olaru, 2015-07-08 Selected peer reviewed papers from the OPTIROB 2015 International Conference on Cyber Systems in the Fields of Aerospace Robotics Manufacturing Systems Mechanical Engineering June 27 30 2015 Jupiter Romania

Carbon Fibers and Their Composite Materials Luke Henderson, 2019-07-16 Carbon fiber is an oft referenced material that serves as a means to remove mass from large transport infrastructure Carbon fiber composites typically plastics reinforced with the carbon fibers are key materials in the 21st century and have already had a significant impact on reducing CO2 emissions Though as with any composite material the interface where each

component meets in this case the fiber and plastic is critical to the overall performance This text summarizes recent efforts to manipulate and optimize the interfacial interaction between these dissimilar materials to improve overall performance

Challenges and Opportunities in Industrial and Mechanical Engineering: A Progressive Research Outlook S M Pandey,Ambrish Maurya,Chetan Kumar Hirwani,Om Ji Shukla,2024-06-24 Present time Industry 4 0 is the need of all industries because it connects industries to AI high productivity safety and flexibility ensures the 100% utilization of resources across diverse manufacturing systems and could accelerate normal manufacturing systems to advanced manufacturing systems by using robotics additive manufacturing and many more In this book the collection of selected papers is constituted from the International Conference on Progressive Research in Industrial Mechanical Engineering PRIME 2021 which was at the National Institute of Technology NIT Patna India from August 5 to 7 2021 This conference brings together all academic people industry experts and researchers from India as well as abroad for involving thoughts on the needs challenges new technology opportunities threats in the current transformational field of aspire This book deliberates on several elements and their relevance to hard core areas of industrial and mechanical engineering including design engineering production engineering industrial engineering automobile engineering thermal and fluid engineering mechatronics control robotics interdisciplinary and many new emerging topics that keep potential in several areas of applications This book focuses on providing versatile knowledge of cutting edge practices to all readers helping to develop a clear vision toward Industry 4 0 robotics automation and additive manufacturing in this demanding and evolving time The book will be a treasured reference for students researchers and professionals interested in mechanical engineering and allied fields

Dynamic Response and Failure of Composite Materials Valentina Lopresto,Ilaria Papa,Antonio Langella,2023-04-24 This book gathers the latest advances and innovations in the field of dynamic loads and testing of composite materials and sandwich structures as presented by international researchers and engineers at the International Symposium on Dynamic Response and Failure of Composite Materials DRAF held in Ischia Italy on June 21 24 2022 Contributions include a wide range of topics such as low and high velocity impacts smart composites hull slamming shock and blast hail and bird impact damage resistance and tolerance failure mechanisms composite structures delamination and fractures progressive damage modeling micromechanics ballistic impacts ceramic and CMC auxetic materials and structures additive manufacturing crashworthiness green composites and structural health monitoring

Index of LRL Berkeley Mechanical Engineering Department Engineering Notes and Specifications James O. Turner,1963

Mechanics of Composite Materials F. W. Wendt,H. Liebowitz,N. Perrone,2013-10-22 Mechanics of Composite Materials contains the proceedings of the Fifth Symposium on Naval Structural Mechanics held in Philadelphia Pennsylvania on May 8 10 1967 The papers explore the mechanics of composite materials for naval applications The structural requirements of a system and the fundamental mechanical properties of composite materials as well as the behavior of such materials under various

environmental conditions are discussed This book is comprised of 40 chapters and begins with an analysis of missile and aircraft systems constraints and operational requirements along with ship systems constraints and operational requirements for composite materials The following chapters focus on structural uses of composites particularly in naval ships aircraft re entry vehicles and space vehicle structures and the micromechanics structural mechanics and failure mechanics of composite materials Problems in the design of joints and attachments are considered along with the stability of pre strained laminated media environmental factors in the design of composite materials and the effect of water on glass reinforced plastics This monograph will be a useful resource for scientists and engineers who are particularly concerned with the mechanics of composite materials

Scientific and Technical Aerospace Reports ,1995 Management: A Bibliography for NASA Managers ,1989

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