UNIVERSITI TEKNOLOGI MARA

DESIGN AND FABRICATION OF A MANUAL RAMMING MACHINE FOR THE MOLDING PROCESS

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ABSTRACT

The production of sand molds for casting is a critical process in modern manufacturing, particularly in industries such as automotive, construction, and machinery. However, existing ramming tools and machines face several inefficiencies, including uneven compaction, high costs, and ergonomic concerns. This study focused on the design and fabrication of a manual ramming machine tailored for small-scale workshops and educational purposes, offering a low-cost and user-friendly solution for efficient mold-making. The proposed manual ramming machine is designed using SolidWorks and incorporates a 2-ton hydraulic jack to ensure uniform sand compaction. Fabrication methods included cutting, welding, and mechanical assembly using durable and recyclable materials. The final prototype is compact, portable, and manually operated, reducing energy consumption and promoting sustainability. Testing confirmed the machine's capability to achieve uniform compression with minimal operator effort, producing high-quality molds in under one minute. The design prioritizes safety and simplicity, making it ideal for students and small-scale manufacturers. Furthermore, the incorporation of recyclable materials and manual operation underscores its environmental benefits. This research highlights the potential of the manual ramming machine to address inefficiencies in current tools, improve accessibility, and enhance the learning experience in casting workshops. Recommendations for future improvements include modular components for easier maintenance ad potential automation to reduce manual effort further.

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CHAPTER ONE
INTRODUCTION

1.1 Background of Study

Ramming machines and tools are widely used in sand casting. Ramming machines, including pneumatic and hydraulic types, compact sand in mold efficiently. Uniform density is ensured with hand tampers and strike-off bars, among other ramming equipment. These tools are necessary for various industrial applications to achieve accurate castings, prevent errors, and create precise mold. The primary objective of using a ramming machine in casting is to ensure that the sand is tightly compacted around the pattern to produce a solid uniform mold or core and to achieve accurate and precise casting dimensions, surface finish, and a solid structure in the final casting product.

The increase in the production of casting and its use in recent years has proven in significant of modern industry and the world economy [1]. Castings are mainly used in automobiles, power generation, construction, railways, the cement industry, textile machinery, pumps, compressors and valves, diesel engines, and many other specialized applications. In order to create a product form during the molding process, the manufacturer must ram a sand casting until the density of the sand is solid. The widespread use in the industry showed that ramming machines are important in casting during the molding process. The use of ramming machines is important to ensure regular and consistent sand compaction, which saves time and reduces the need for manual labor, especially for small workshops [2].

Therefore, there is a need to develop and design a manual ramming machine for the small-scale casting workshop and workshop for students to make a small casing product. This machine is designed with low-cost, high-quality parts without sacrificing quality in order to provide efficient sand compaction. It also easy for students in the workshop to conduct and protect users from potential hazards while in use.