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Design and Experimental Analysis of a Portable Motorcycle Lifting Device for Maintenance Operations

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Abstract: *Motorcycle servicing in small-scale workshops is commonly carried out at ground level, which forces mechanics to work in awkward postures for long durations. This practice not only reduces work efficiency but also leads to physical fatigue and long- term musculoskeletal problems. Although hydraulic lifting systems are available in authorized service centers, their high cost, large size, and dependency on external power sources restrict their use in small garages. To address these limitations, this paper presents the design and experimental analysis of a portable motorcycle lifting device intended specifically for maintenance operations in space-limited and low-budget workshops. The proposed lifting system is manually operated, compact in size, and easy to transport, making it suitable for diverse working environments. The structural design is developed using computer-aided design techniques, followed by finite element analysis to evaluate stress distribution and deformation under static loading conditions. A prototype is fabricated and experimentally tested to verify its load-carrying capability, stability, and operational safety. The experimental outcomes show good agreement with analytical results, confirming the reliability of the design. The developed lifting device effectively improves working posture, reduces physical strain on mechanics, and enhances overall maintenance productivity, offering a practical and economical alternative to conventional motorcycle lifting systems.*

Keywords: Motorcycle lifter, Portable lifting device, Maintenance operations, Ergonomic design, Finite element analysis, Experimental validation

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