

Ergonomics Study on the Handle Orientation of Shovel



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Abstract The paper intends ergonomic modification of the existing shovel for manual material handling tasks. A preliminary assessment of subjective discomfort and posture was conducted at the brick construction site in Rampur (UP), India. The survey conducted on 16 workers (age: mean = 35.8 years; SD = 3.1 years) revealed a REBA score of 17. With the help of computer-aided ergonomics, four different orientations of the shovel handles, namely H75, H80, H85, and H90 (measured relative to the base of the shovel), were tested. It was revealed that the orientation of the shovel handle had a significant effect on the right shoulder, left wrist, left shoulder, and C0-C1 vertebral joint. Minimum joint torques were obtained for shovel with H80 handle.

Keywords Manual material handling • Shovel • Computer-aided ergonomics

1 Introduction

Nearly every sector and industries involves manual material handling (MMH) tasks. These tasks generally involve holding, lifting, lowering, turning, push-pull, and carrying of weights through a distance [1]. MMH tasks are susceptible to forceful exertions, awkward posture, and repetitive motions, which if kept unnoticed may lead to work-related musculoskeletal disorders in workers and loss of work days [2, 3].

Shovelling is one important MMH task that is being exhaustively performed in construction and agriculture sector, involving plowing, digging, and conveying of loose material. The physical work load associated with manual shovelling is exceptionally high. Shovelling task is physically intensive and requires excessive trunk flexion/extension, trunk rotation, and shoulder rotation. Literatures have reported

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