

Ergonomic Risk Assessment of Manual Material Handling (MMH) Tasks at Select Unorganized Small Scale Units in North Karnataka

Abhishek S. Humpli

Student, Department of Industrial & Production Engineering, P.D.A.College of Engineering,
Kalaburagi, India
abhishekhumplicollege@gmail.com

Qutubuddin S.M

Associate Professor, Department of Industrial & Production Engineering, P.D.A.College of
Engineering, Kalaburagi, India
syedqutub16@gmail.com

Arbaaz Sohail, Prashnat T. and Mohd. Azhar Ahmed

Students, Department of Industrial & Production Engineering, P.D.A.College of Engineering,
Kalaburagi, India
sohailarbaaz1996@gmail.com ,
tauseef44anwar@gmail.com, prashant.talwar100@gmail.com, ahmedazhar78695@gmail.com

Abstract

Manual material handling (MMH) is one of the most physically challenging works where workers are vulnerable to awkward postures, repetitive movements, forceful exertions and contact stresses. MMH tasks include lifting, lowering, holding, pulling, pushing, carrying and moving a load. These tasks, if repeatedly performed lead to fatigue and musculoskeletal disorders (MSDs) of lower back, shoulders and lower extremities. While performing MMH tasks, the operator's posture is at an unacceptable position, exposing them to MSD risks and low back problem (LBP). A field study of small scale industries in informal sector such as stone cutting & polishing units, saw mills, bottling plant and warehouses is undertaken. The methodology for present study is Body discomfort questionnaire, Rapid Entire Body Assessment (RULA), Rapid Entire Body Assessment tool (REBA) and NIOSH lifting equation. The primary data is collected through observations, interviews and discussions and RULA, REBA and NIOSH. RULA and REBA analyses the working postures of workers and determines the ergonomic risk factors. NIOSH determines the recommended weight limit (RWL) and calculates lifting index (LI), which analyses whether a lift is safe or hazardous. The ergonomic studies revealed that in almost all industries the workers complain of discomfort & pain in shoulder, low back and lower extremities due to unscientific methods of handling and awkward postures. The postural analysis according to RULA and REBA tools revealed most of the postures are in medium to high risks (40% to 55%). In one particular case, ergonomic interventions by Digital Human Modeling and Simulation (DHMS) are done using CATIA V5 software. By implementing suitable ergonomic interventions, the lifting index value was reduced from 1.64 to 1.2, and 1.79 to 0.98. The postural risks are also reduced considerable. Several ergonomic interventions and redesign of workplace and training of workers were recommended. The findings indicate an immediate need to implement ergonomic principles and interventions throughout different industries to reduce the risks due to MMH tasks. After implementation of proper lifting techniques and redesign of work systems, showed that the workers yielded lower lifting index, reduced physical exertion and MSDs and improved productivity.

Keywords

MMH, NIOSH, MSDs, RULA, REBA.

Bibliographies

Abhishek S Humpli, Arbaaz Sohail, Prashant T., and Mohd.Azhar Ahmed are final year undergraduate students in Industrial & Production Engineering Department, P.D.A.College of Engineering, Kalaburagi. Apart from academics they are a part of the research group in Human Factors and Ergonomics Laboratory. They are also actively involved in organizing various events and local industrial visits under IEOM student chapter, and have competed in Best Student Chapter competition at 11th Annual IEOM International Conference at Singapore. 7-11 March 2021. Arbaaz had presented a paper in The First Central American and Carribean Conference on Industrial Engineering and Operations Management, Port-au-Prince, Haiti, June 15-16 2021, and won the First Place in Undergraduate Student Paper Competition. He has also presented a paper at 18th International Conference on Humanizing Work and Work Environment (HWWE2020) 10th -12th Dec 2020.

Dr. Qutubuddin S.M., is working as Associate Professor, Industrial and Production Engineering Department, P.D.A.College of Engineering, Kalaburagi. He has more than 29 years experience in teaching and research and has published more than 35 papers in International and National journals and Conferences. Under his supervision 01 research scholar has completed PhD and 02 are undergoing. His research interest include Human Factors and Ergonomics, Occupational Health and Safety; Production/Operations Management. He has introduced the course Human Factors and Ergonomics in the curriculum in under graduate engineering and has developed laboratories such as Industrial Engineering Laboratory, Human Factors & Ergonomics Laboratory and Quality Control Laboratory. He was actively involved in getting NBA accreditation for the department. He is a life member of ISTE, IIPE, IAENG and IEOM Society USA. He has started a student chapter of Industrial Engineering and Operations Management Society (IEOM) Michigan, USA in the institute. The chapter was awarded the best student chapter in the year 2019 at IEOM International conference in Bangkok, and in 2020 at IEOM International conference held at DUBAI. He is serving regularly in various capacities as a Reviewer, Track Chair, Session Chair and Technical Committee member in IEOM International conferences since 2015. Under his guidance UG students have participated and presented papers in International Conferences in India and abroad.