

Work-related Postural Risk Assessment of welding operators using Digital Human Modeling in CATIA

Adnan Qadeer Shaik

Student, Industrial and Production Engineering Department
P.D.A.College of Engineering, Kalaburagi, India
adnan.q.shaik9@gmail.com

Qutubuddin S.M.

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

Deepak, Basavaraj, Shoaib

Students, Industrial and Production Engineering Department
P.D.A.College of Engineering, Kalaburagi, India
deepaknatikar890@gmail.com, bassuallur57@gmail.com,shoaibabdulkhadeer@gmail.com

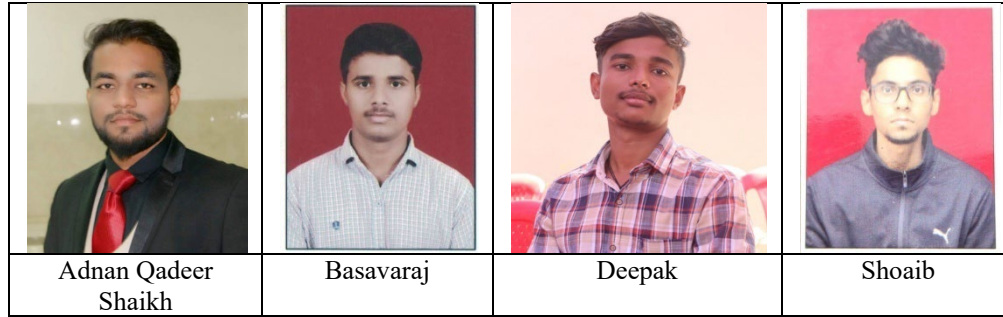
Abstract

The basic process in metal fabrication industry is welding which poses several risks and hazards to the workers. Welding process contributes to work related problems and is the most common method of metal joining and a part of metal fabrication work. The general process in metal fabrication is cutting, welding, drilling, grinding hammering and painting. The welding methods include horizontal welding, vertical welding and overhead welding. Welding operators report high musculoskeletal complaints, back, neck and shoulder discomfort and pain in knees and ankles. Manual welding and heavy lifting, awkward postures like bending, twisting, kneeling, stretching and working overhead are the reasons for discomfort and pain. About five welding units are elected for study where different works like general fabrication, furniture making and heavy welded structures are fabricated. In the study the discomfort and postural assessment of welding operators is carried out. A total of 66 welding operators are identified and a modified discomfort survey was administered to know the discomfort faced during work at different awkward postures. The average age of operators is 33.5 ± 9.62 year and experience 12.63 ± 9.40 year. Ergonomic assessment tools Rapid Upper Limb Assessment, Rapid Entire Body Assessment (RULA and REBA) and Quick Exposure Checklist (QEC) was used to determine the risk levels. Results of RULA indicate 64% postures in high risk in vertical and overhead welding. REBA results indicate 57% postures in high risk and 7% in very high risk. QEC results indicate 62% in high risk, which are near equal to RULA scores. Few selected postures at different workstations are modeled in CATIA and assessed in RULA. The actual workstation with human manikin is also modeled and suitable ergonomic interventions in CATIA are demonstrated. The level of risk is considerable reduced (from 7 to 4 in RULA) by implementing the suggested changes in workstation and postures. The study also indicates that the safety measures and awareness can be further strengthened and interventions carried out to increase workers awareness in areas like safety training, usage of PPEs and enforcing appropriate safety regulations.

Keywords

Welding, QEC, RULA, REBA and musculoskeletal disorders.

Biographies



Adnan Qadeer Shaikh, Basavaraj, Deepak Natikar and Shoaib are students in Industrial & Production Engineering Department, P.D.A.College of Engineering, Kalaburagi. They are student members of IEOM Student Chapter in at PDACE 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, and at 12th Annual IEOM Conference at Istanbul, Turkey March 2022.

Dr.Qutubuddin S.M., working as Associate Professor, Industrial and Production Engineering Department, P.D.A.College of Engineering, Kalaburagi. He has more than 30 years experience in teaching and research and has published more than 40 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 was actively involved in getting NBA accreditation for the department. He is a life member of ISTE, IIPE, IAENG and IEOM Society USA. He is the Faculty Advisor of IEOM Student Chapter at PDACEK. The chapter was awarded the best student chapter three times in various IEOM Annual Conferences at Bangkok 2019, Dubai 2020, and Istanbul 2022. He is serving regularly in various capacities as a Reviewer, Track Chair, Session Chair and Technical Committee member in IEOM International conferences since 2015. He is assigned as Director of IEOM Operations in India. He has been awarded with Best Faculty Advisor Award, Teaching Excellence Award and Distinguished Service Award at IEOM Conferences.