



**INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS**

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Programme of Study	: Ph.D.
Thesis Title	: Ergonomic design interventions for improvement of shop-floor working conditions in the Indian small and medium scale injection-molded plastic furniture manufacturing industries
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Thesis Submitted to the Department/ Center	: Design
Date of completion of Thesis Viva-Voce Exam	: 27 th February 2016.
Key words for description of Thesis Work	: ergonomics, workstation, product design, CAD and DHM, occupational health; industrially developing countries; manufacturing; MSMEs, MSDs

SHORT ABSTRACT

Manual labour and locally designed workplace fixtures are prevalent in Indian plastic processing industry which is highly fragmented, comprising of Micro Small and Medium Enterprises (MSMEs). In Indian scenario, investigations pertaining to workstation design and layout from a broad perspective of ergonomics, occupational health and indoor work environment have not been performed till date in the shop-floor of small and medium scale injection-molded plastic furniture manufacturing industries.

The present research aimed to investigate and propose design interventions for improving shop-floor working conditions from an applied ergonomics view point. To accomplish the stated aim, combination of research methods featuring literature survey, questionnaire study, postural assessment tools, direct observation, statistical analysis, work study technique, virtual human modeling and simulation has been used.

Existing shop-floor workstations and work accessories were designed without considering ergonomics principles and thus led to the occurrence of risky work postures. Moreover, indoor work environmental conditions were not in accordance with recommendations. Ergonomics and indoor environmental factors were not considered while designing shop-floor layouts. Statistical model derived from present research established that occurrence of symptoms of musculoskeletal ailments due to awkward working postures and bad workstation design; is exacerbated if work shift duration is longer. Significant ($p < 0.05$) reduction in hand grip strength before and after work indicated the likelihood of shop-floor workers developing upper limb musculoskeletal disorders in due course of time.

Virtual evaluations, work study techniques, psychosocial and subjective work load assessments deployed in the present research were helpful for designing concept workstations and work-accessories. Redesign of workstation and work methods in accordance with recommended guidelines enabled downgrading the risk perception of work postures. Context specific suggestions were also proposed for improving indoor work environment. A conceptual shop-floor layout was developed incorporating guidelines proposed in published literatures.

Business houses interested in expanding or establishing new injection-molded plastic furniture manufacturing factories in the small and medium sector will find the results of the current research endeavor highly beneficial. Research methodology and design interventions as demonstrated in current study may be easily adopted by engineers / managers / supervisors in MSMEs of industrially developing countries towards implementing validated context specific human centric production systems.