## ABSTRACT

Human performances at work get influenced by various factors related to individual, job, environment and organization. An emerging concept called work compatibility (WC) has been derived based on previous human performance theories and has several uses such as (i) an integrated work design criterion, (ii) a measure of sustainable growth, and (iii) a multi dimensional diagnostic tool for measuring human performance. However, there are issues related to its measurement and need to explore its relationship with human performance measures, especially with safety performance. The thesis addresses three specific objectives as: (i) to develop a methodology to assess WC at group level, (ii) to model job risk perception to examine its relationships with work injury, and employees' demographic factors, and (iii) to model the relationship between WC and employee safety performance in terms of job risk perception. In fulfilling the research objectives, the thesis has made several contributions as: (i) proposed a new approach to assess WC at group level based on Taguchi's signal-to-noise (S/N) ratio, (ii) proposed a methodology to examine the relationships of job risk perception with work injury and demographic factors of employees using multinomial logistic regression and multivariate linear regression, and (iii) developed a structural equation modeling based methodology to examine the relationships between the dimensions of WC and job-risk perception. The methodologies developed in this thesis are applied in a steel melting shop of a steel plant in India and the results useful to the steel plant are obtained.

For the plant studied, the results of the S/N ratio based models revealed that (i) the supervisor and worker groups perceive poor compatibility for 'physical environment', 'mental task content' and 'individual growth' factors, (ii) the young and less experienced employees perceive poor compatibility for 'individual growth' and 'perceived risk/benefit'. The multinomial logistic regression results revealed that 'general-risk' is associated with both reportable and non-reportable injury occurrences. The multivariate linear regression results revealed that 'location of the workers' is significantly associated with 'general-risk' factor. The structural equation modeling results revealed that total WC has a significant negative relationship with job risk perception. Accordingly, specific recommendations made to case study plant are: (i) major improvement strategies need to devise for physical environment and job related factors, and (ii) priority should give to consider location related factors in designing safety programs.

*Keywords:* Human performance modelling, Work energizers, Job risk perception, Signal-to-Noise ratio, Multinomial logistic regression, Structural equation modeling.