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## Environmental Toxicology and Health Safety

### Validation of MEASE tool under REACH: Comparison of MEASE tool estimates with real exposure measurements In a high risk industry

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In the welding process, hazardous pollutants such as fumes and gases threaten workers health. The most important pollutants are fume and gases emitted during welding operations. The semi-quantitative risk assessment (SQRCA) and identification is an effective tool for determining the risk of exposure to individuals in the workplace. Exposure estimation models are widely employed to estimate exposure to respiratory and dermatological agents in occupational settings. The guidebook for the European Chemical Material Agency has introduced the MEASE Assessment and Measurement Model (MEASE) as an appropriate tool for estimating occupational exposure. The aim of the present thesis is to validate the MEASE model and compare its results with those of the SQRCA method to estimate welders' occupational exposure to various welding processes in a steel industry. The present study, conducted in Steel Complex. Seven types of welding (SMAW-E7018, SMAW-Carbid Chrom, GTAW, MIG, MAG, PAC and SAW ) were investigated. Sampling of metal fumes was done using the NIOSH 7300 method and the sampling of pollutant gases by Direct-reading devices (DRDs). The semi-quantitative risk assessment of welders was conducted via the SQRCA method, and to estimate respiratory exposure, the MEASE method was employed. The results of the working environment air sampling indicated that the maximum and minimum mean concentration of metals were associated to iron ( $1987.28 \pm 1624.98$  g/m<sup>3</sup> $\mu$ ) and aluminum ( $45.71 \pm 65.81$  g/m<sup>3</sup> $\mu$ ). The highest concentrations of gases in gas stations were related to NO<sub>2</sub> ( $4.87 \pm 1.07$  ppm) and O<sub>3</sub> ( $0.335 \pm 0.14$  ppm). Among the welding gases, the highest and lowest risk ratings are related to O<sub>3</sub> and CO<sub>2</sub> respectively. The results of the MEASE method showed that the highest and lowest welders' respiratory exposure was related to iron ( $59.59 \pm 32.71$  g/m<sup>3</sup> $\mu$ ) and aluminum ( $4.79 \pm 3.78$  g/m<sup>3</sup> $\mu$ ) respectively. Spearman correlation coefficient showed a strong and statistically significant correlation (the rang from 0.118 to 0.859) between the sampling values of the working environment and the estimated values of the MEASE model (p value<0.05). According to the total correlation coefficient and based on the total observation, there was a direct and statistically significant correlation between weekly concentration degree and the MEASE (r = 0.522). The present thesis indicated that the values of most fumes and gases in the study processes are significantly higher. according to the assessment observations, due to the significance of the relationship between some of the variables of the SQRCA method in case of respiratory exposure via the MEASE model, the results of the present study can confirm the effects of the variables of the SQRCA method on the prediction of individuals' respiratory exposure level using the MEASE model in the workplace. It seems that employing the MEASE model can serve as a complementary tool in addition to the SQRCA method to play an effective role in determining individuals' occupational exposure level.

### Biography

Younes Mehrifar was born in 1989 in Delfan. He continued his education until high school in the city of Harsin and was accepted in the national entrance exam at the undergraduate level of Shiraz University. Mehrifar, after receiving his bachelor's degree from Shiraz University, was accepted in the master's degree of the University of Isfahan. Currently, He spends PhD in occupational health and safety at work from Shahid Beheshti University of Medical Sciences, Iran. Mehrifar has several books and international articles.

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