UNIVERSITI TEKNOLOGI MARA

HEAVY METALS EXPOSURE FROM WELDING FUMES IN AUTOMOTIVE INDUSTRY AND HEALTH RISK ASSESSMENT

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Project submitted in fulfillment of the requirement for
the degree of
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DECLARATION BY STUDENT

I declare that the work in this project draft is my original work. I, hereby, acknowledged that I have complied with the Academic Rules and Regulations for Post Graduate Research, Universiti Teknologi Mara, Puncak Alam Campus, throughout conducting the conduct of my study and research.

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ABSTRACT

Heavy Metals Exposure from Welding Fumes in Automotive Industry and Health Risk Assessment

by

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Heavy metals (HMs) contained in welding fumes from Malaysia's North automotive industry were investigated. Fitting Line at Body Assembly Section is chosen for ambient air sampling for heavy metals detection in welding fumes. Majority of the welding process at Fitting Line is manually conducted by welding operators and is adjacent with other sections which are fully operated by robotic welding. Ambient air sampling by using GilAir3 personal air sampling pump were conducted during eight hours working shift to collect heavy metals Mn, Cr and Fe contained in the fumes. Metal fumes sample collected from the breathing zone of the welder were analysed by Atomic Absorption Spectroscopy Perkin-Elmer Model Analyst 900. All three elements were detected in the sample collected with the variation order Fe > Mn > Cr, and with the mean concentration value 0.1388 mg/m^3, 0.0163 mg/m^3 and 0.180 mg/m^3 respectively. However, results of this study prove none of the metals element was exceeding the local allowable guideline. The non-carcinogenic health risk of HMs was estimated by hazard quotient (HQ) and hazard index (HI). Whereas, the carcinogenic health risk of HMs was estimated by cancer risk (CR). Verdicts of Health Risk Assessment (HQ, HI and CR) for all the heavy metals concerned in this study were in safe limit. Carcinogenic metals Cr was detected as 6.443×10^{-2} which considered below the allowable range of 1.0×10^{-6} to of 1.0×10^{-4}, thus the carcinogenic health effects is unlikely exist and threat the welders if exposed to such concentration. Meanwhile CR value for Fe is currently unable to be calculated due to lack of information. Similar finding for non-carcinogenic metal, the HQ and HI value for Mn is 2.716×10^{-1}. The results showed that the HI value do not surpass the safe limit (HI>1), indicating non-carcinogenic health effects exist in present condition.

Keyword: Welding fumes, Heavy metals, Health risk assessment, ambient air sampling