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INDOOR AIR QUALITY INVESTIGATION AND HEALTH RISK ANALYSIS IN INDIAN TEXTILE-SIZING MILLS

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Abstract

The study aimed to evaluate indoor air quality (IAQ) in textile sizing mills in Tamil Nadu, India, focusing on pollutants such as $PM_{2.5}$, PM_{10}, total volatile organic compounds (TVOCs), carbon dioxide (CO_2), and carbon monoxide (CO). These pollutants were monitored using the Oizom Polludrone, a real-time air quality monitoring system equipped with optical particle counters, photoionization detectors, and non-dispersive infrared sensors designed to monitor key indoor air pollutants, including particulate matter ($PM_{2.5}$, PM_{10}), total volatile organic compounds (TVOCs), carbon dioxide (CO_2), and carbon monoxide (CO), as well as temperature and relative humidity. Measurements were taken over 10 days at a height of 1.5–2 meters to capture worker breathing zone concentrations. Key findings revealed that $PM_{2.5}$ and PM_{10} levels were highest in the wrapping section due to cotton dust, while TVOC levels peaked in the sizing section, attributed to the use of adhesives, binders, and chemicals. Night-time concentrations exceeded daytime levels, primarily due to reduced ventilation, and pollutant levels frequently surpassed OSHA and NAAQS standards. Health risks were quantified using hazard quotient (HQ) and hazard index (HI), showing significant risks in the sizing section. The results confirmed interdependencies between pollutants, showing that changes in one pollutant were often linked to changes in others. Recommendations include advanced ventilation systems, low-emission sizing agents, PPE usage, and regular air quality monitoring to safeguard worker health and ensure compliance with safety standards.

Key words: air quality, hazard quotient, Oizom Polludrone, textile sizing mill, TVOC

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