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NANOPARTICLES EXPOSURE MITIGATION IN PLASMA SPRAYING

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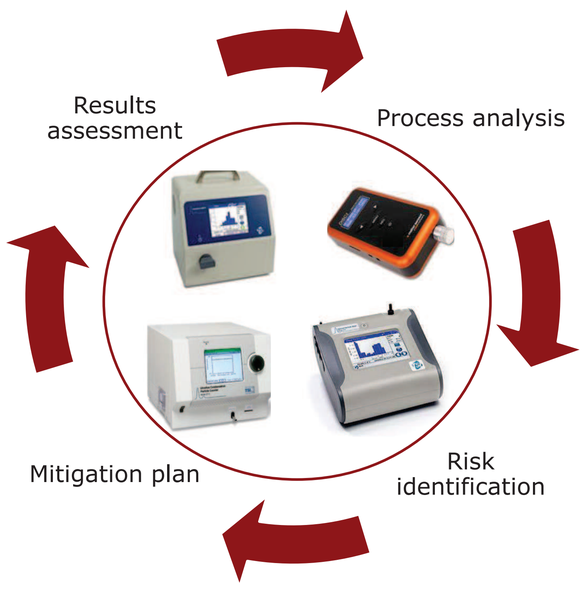
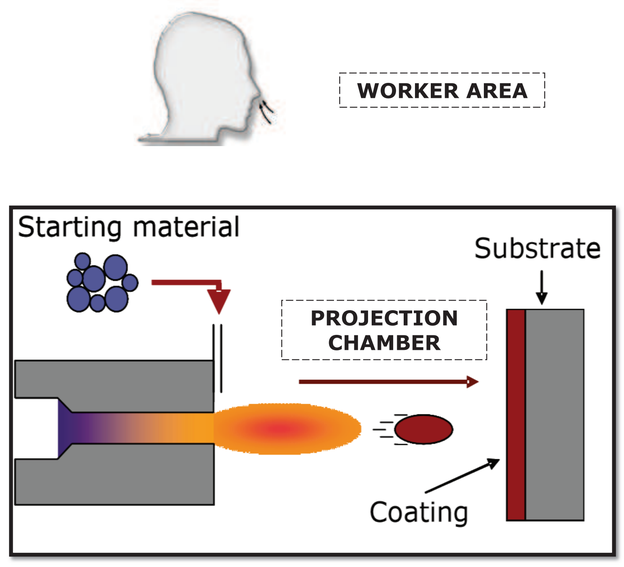
INTRODUCTION

The surveyed literature establishes that workplaces, where high temperature processes take place (such as plasma spraying or ceramic and glass kilns), are potentially affected by worker exposure to harmful airborne micro-sized particles. However, much less is known about the occupational exposure to ultrafine particles (< 100 nm in diameter). The present work aims to identify and quantify particle emissions from atmospheric plasma spraying process (APS).

PREVENTION PROTOCOL

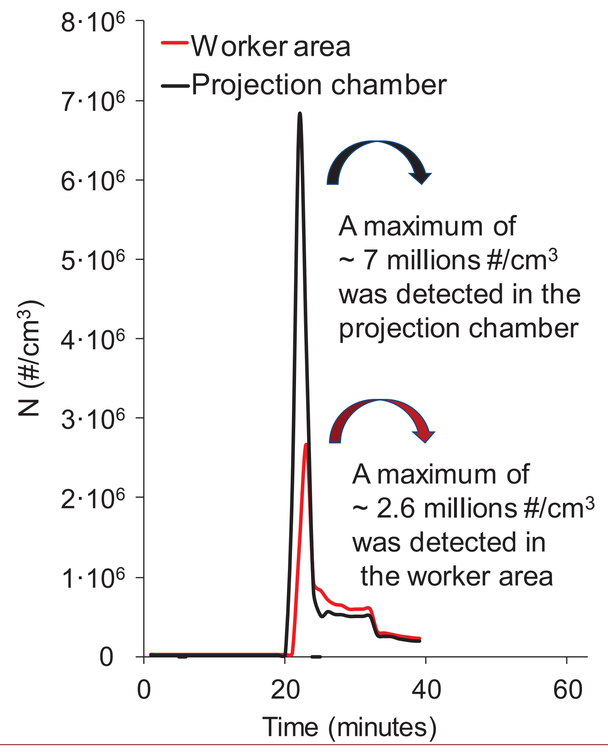


PROCESS ANALYSIS



Stage 0: The APS system working using the manufacturer set up. Plasma spraying took place inside a cabin (projection chamber); the ventilation air in the cabin was entered through a single point from the worker area.

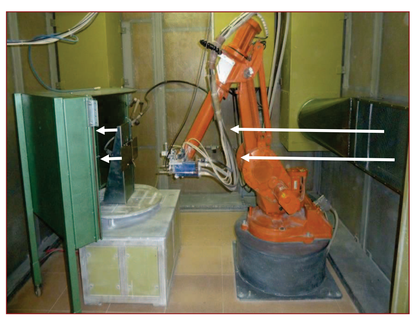
RISK IDENTIFICATION



MITIGATION PLAN

Stage 1: Corrective measures in the emission zone (projection chamber): 1) Extraction system surrounding the plasma plume, 2) Air entrance by a multipoint system from outside, 3) Implementation of door opening protocol

AIR OUT

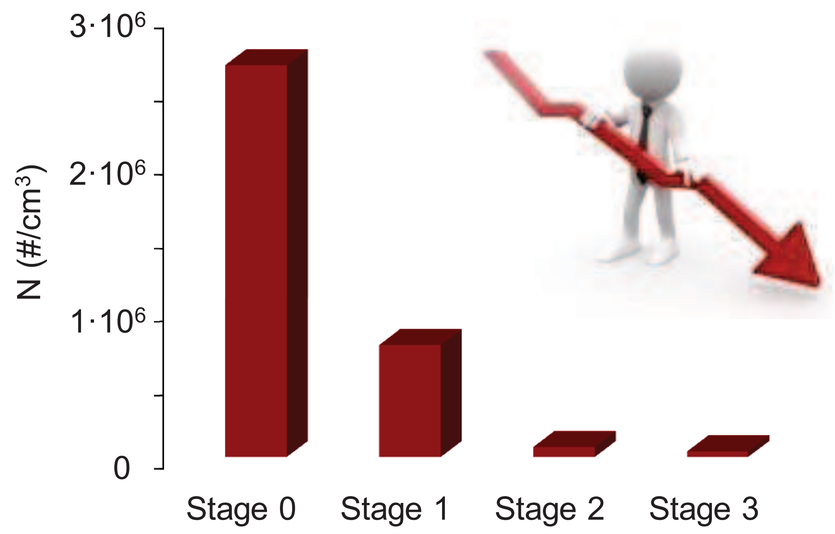


AIR IN

Stage 2: Measures focused on isolating the worker area from plasma emissions: duct sealing improvement

Stage 3: Measures in the worker area: Improved ventilation in the worker area from <2 to 14 air changes per hour

RESULTS ASSESSMENT



CONCLUSIONS

These findings evidence the **potential risk of occupational exposure to ultrafine and nanoparticles during APS**

The implementation of the prevention protocol has allowed a significant **reduction (>95%) in the worker area:**

from >2.5·10⁶ to 0.05·10⁶ #/cm³

This study shows that **the investigation of high energy processes may lead to implement economic and effective measures to protect the workers from nanoparticle exposure**

ACKNOWLEDGEMENTS

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