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PHYSIOCHEMICAL TESTING OF EXISTING WORK WEAR OF CEMENT PORTERS

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ABSTRACT

Physiochemical testing was performed on existing cement porter's work wear i.e fabric weight, thickness of fabric, air permeability, abrasion resistance and chemical resistance. Results indicated that most cement porters were not having protective clothing and existing work wear cannot meet the actual requirements. Therefore, there is a need to develop dustproof, thermal and moisture comfort, appropriate weight and thickness and easy to maintain work wear for cement porters.

KEYWORDS Physiochemical, Testing

INTRODUCTION

Cement porters often work in dusty circumstances with high labour intend sites. Cement and cement-based products can harm the skin in a number of ways. Cement can cause dermatitis as it contains hexavalent chromium (chromate). Cement can cause ill health mainly by skin contact, inhalation of dust and manual handling. Exposure to cement may cause irritation of the eyes, nose and skin. It may cause chronic irritation of the eyes, nose ulcers, and skin rashes. Allergic skin rashes may also occur. Repeated exposure over a long period of time to cement dust has produced changes in the lungs and an increased amount of wheezing, shortness of breath, and cough with sputum. These risks can be minimized by use of personal protective equipments if properly selected and worn by workers. Personal Protective Equipments (PPEs) play a prominent role in ensuring the overall health and safety on construction sites.

METHODLOGY

Physiochemical testing was performed on existing cement porter's work wear i.e fabric weight, thickness of fabric, air permeability, abrasion resistance and chemical resistance.

RESULTS AND DISCUSSION

The first aim of the cement porter's protective clothing is to prevent cement dusts from contacting with human skin directly, therefore clothing should be dustproof to prevent dust from entering the clothing further to protect porters from any health issues. Workwear should have thermal and moisture equilibrium. It should have appropriate weight and thickness to avoid additional load. It should be easy to maintain and quick drying (Li et al., 2010). To study the presence of the above mentioned properties, physiochemical testing was performed on existing cement porter's work wear i.e fabric weight, thickness of fabric, air permeability, abrasion resistance and chemical resistance. Results indicated that fabric composition of existing work wear of cement porters was 100% polyester (Knitted).

Weight (GSM) and Thickness of Fabric

Fabric weight is the property of the fabric which is used to measure fabric density. On the basis of results, it was

found the weight of fabric was 109 g/m^2. Thickness of the fabric indicated 0.692 mm. It is reported that typical work wear should have heavy weight fabric with 310 gsm, lightweight fabric with 155 gsm and medium weight fabric with 190 gsm (workkitworkwear.com.au).

Air Permeability

Air permeability is defined as the volume of air in milliliters, which passes in one second through 100 mm2 of the fabric at a pressure difference of 10mm head of water. The air permeability of a fabric is a measure of how well it allows the passage of air through it. The air permeability of a fabric is affected by the fabric material such as fiber fineness, structural properties such as shape and the value of the pores of the fabric and the yarn and fabric thickness. Most of the previous studies investigated the relationship between the air permeability and structural characteristics of plain knitted fabrics (Bhattacharya et al., 2013). In the present study, air permeability test was performed on the existing work wear of cement porter. The rate of flow of air was 319.07cm^3/ cm^2/s. Results indicated that air permeability of the existing work wear was very high. This may lead to the penetration of cement dust, which may cause skin problems to the cement porters. Therefore, the first aim of the cement porter's protective is to prevent cement dusts from contacting with human skin directly, so that clothing should be dustproof (Li et al., 2010).

Abrasion Resistance

The resistance of textile materials to abrasion as measured on a testing machine in the laboratory is generally only one of several factors contributing to wear performance or durability as experienced in the actual use of the material. While "abrasion resistance" (often stated in terms of the number of cycles on a specified machine, using a specified technique to produce a specified degree or amount of abrasion) and "durability" (defined as the ability to withstand deterioration or wearing out in use, including the effects of abrasion) are frequently related, the relationship varies with different end uses, and different factors may be necessary in any calculation of predicted durability from specific abrasion data (ASTM D 4966). Özdil et al., (2012) reported that abrasion is the physical destruction of fibres, yarns, and fabrics, resulting from the rubbing of a textile surface over another surface. Textile materials can be unserviceable because of several different factors and one of the most important causes is abrasion. Abrasion occurs during wearing, using, cleaning or washing process and this may distort the fabric, cause fibers or yarns to be pulled out or remove fiber ends from the surface. Abrasion ultimately results in the loss of performance characteristics, such as strength, but it also affects the appearance of the fabric.

Abrasion test was performed on the existing work wear of cement porter. Number of cycles required to break yarn in 250 cycles with 250/load. It was observed that the yarn of fabric could not pass the test which shows that the fabric is less durable. It is very for work wear to resist the friction. Studies reported that construction labors rank high with work-related musculoskeletal injuries. 85.2% of workers regarded holding with both arms as most frequently action, and 66.7% of workers ranked arms as most painful position. Positions where fabrics were the most easily worn out are cuffs (60.6%), knees (18.2%) and elbows (15.2%). So materials should possess high levels of durability (Li et al., 2010).

Chemical Resistance

The chemical resistance test was performed using two different chemicals -$H_2SO_4$and NaOH**.** Two parameters were observed when the test was performed.

- Index of penetration
- Index of repellence

Results indicated that chemical ($H_2SO_{4)}$ was repelled by 19% and there was penetration of 27.6% into the fabric. If there is less repellency of chemical this may lead to skin problems. To increase the repellency there is a need to modify the fabric for cement porters so that they can protect themselves. While it was observed NaOHwas repelled by 79.8% and there was penetration of 30.1% into the fabric which was quite satisfactory as compared H_2SO_4 (Figure 1).

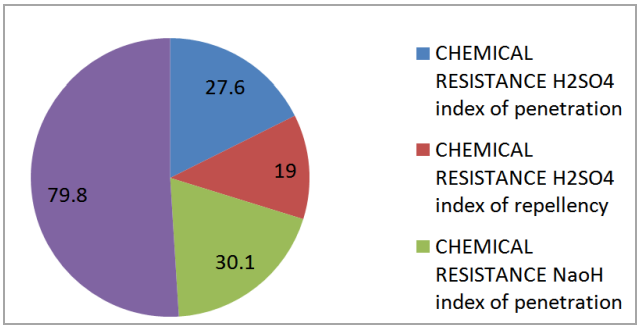

Figure 1: Results of Chemical Resistance Test

CONCLUSIONS

Above results indicated that most cement porters were not having protective clothing and existing work wear cannot meet the actual requirements. Therefore, there is a need to develop dustproof, thermal and moisture comfort, appropriate weight and thickness and easy to maintain work wear for cement porters.

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