AN INVESTIGATION ON LIGHTING LEVELS TO SUIT FABRIC TYPES AND COLOURS DURING SEWING OPERATION IN GARMENT FACTORIES

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Degree of Master of Engineering in Energy Technology

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DECLARATION

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ABSTRACT

The illuminance, colour and the fabric type in workplaces of garment industry are directly linked to energy saving and safety hazards of the work place. The garment industry worldwide makes the use of different illuminance and different kinds of lighting systems with which any factory can face issues. Employees face these issues with lighting systems due to the use of different materials in different lighting conditions where materials vary according to the fabric type and their colours. Improvements in lighting do not necessarily mean that workplaces need more lights. Also we can ensure that less electrical energy is consumed in case of ensuring that lights are positioned correctly for each task to make better use of existing lights and guarantee that all lights are clean and in good condition. Moreover, from the workers' point of view, poor lighting at workplace can lead to eye-strain, fatigue, headache, stress and finally accidents.

Findings of this research suggest that long-duration exposure to different illuminance levels together with wavelength give rise to eye fatigue, and illuminance can be changed in industry according to different fabric materials and colours in order to reduce eye fatigue. If the illuminance is reduced from the maximum of the lighting standard for sewing operations to the minimum, for a 1m ×1m floor area, the calculated energy saving is 42Wh per hour. Therefore, under different required conditions the lighting levels can be changed (i.e. according to fabric type and colour) with the aim of reducing lighting energy consumption and eye fatigue. In this research carried out in the sewing sections in the garment industry, the illuminance preferred for different fabric types and colours were determined with a view to reduce eye fatigue. Taking 800 lx as the prevalent illuminance in sewing sections, the energy saving potential when illuminance is changed to reduce eye fatigue for different fabric types and colours were then calculated. Results show that the energy saving potential is 640 Wh, 480Wh,320Wh, and 160Whper hour per 1 m x 1 m floor area for the fabric colours blue,green, yellow, and red respectively, resulting the minimum energy saving potential by the red colour. However, the energy consumption is changed depending on the fabric density as well as the colour. For an example for red colour, energy consumption varies as280 Wh, 224 Wh,144 Wh and 96Whper hour per 1 m x 1 m floor area for fabric densities 1.02 kg/m, 0.85kg/m, 0.51 kg/m and 0.34 kg/m respectively.

Key words: Lighting energy consumption, eye fatigue, fabric type, illuminance, colour.

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LIST OF ABBREVIATIONS

Abbreviation	Description
IES	Illuminating Engineering Society
IEED	Leadership in Energy &EnvironmentalDesign
LED	Light Emitting Diodes
CFL	Compact Fluorescent Lamp
IES	Illuminating Engineering Society of North America
LOR	Light Output Ratio
IT	Information Technology
HPS	High-Pressure Sodium lamps
OLED	Organic Light Emitting Diodes
CRI	Colour Rendering Index
SPD	Spectral Power Distribution