

## 薄膜電晶體液晶顯示器製造廠室內環境品質與員工滿意度評估

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高科技產業之生產特性常使勞工須長時間於室內密閉空間作業，因此廠房室內環境品質 (IEQ) 對勞工之健康與生產力影響至鉅。本研究目的在瞭解光電業無塵室內作業員對 IEQ 之滿意度，以作為無塵室空調系統調節之參考依據。本研究於 2013 及 2014 年在中部某薄膜電晶體液晶顯示器製造廠進行；調查範圍包括同步進行之作業環境測定及 IEQ 滿意度評估。廠區依其生產與環境特徵分為 7 作業區塊。各區塊內之作業環境測定標的包括乾球與黑球溫度、濕度、風速、噪音、照度、及有機溶劑蒸氣濃度；IEQ 滿意度評估則利用以美國冷凍空調學會第 55 標準為基礎之問卷進行，記錄作業人員對美學、噪音、照明、熱、通風與整體 IEQ 之滿意度。本研究共包含 2 次問卷調查，每次受訪對象為 120 人。研究結果顯示：1) 多數人員對整體室 IEQ 感到不滿，且透過趨勢分析發現主要不滿來源為室內環境之噪音與通風；2) 整體 IEQ 與美學、噪音、熱、通風之滿意度在負面感知出現時呈線性相關；3) 調查對象對通風環境不滿意之高比例與作業現場之異味與粉塵量具關聯性，且有機溶劑蒸氣濃度在黃光作業區較高。若欲針對該光電廠擬定 IEQ 改善措施，可考慮由噪音控制與增加現場換氣量著手。

**關鍵字：**薄膜電晶體液晶顯示器、無塵室、室內環境品質、主觀滿意度

### EVALUATION FOR INDOOR ENVIRONMENTAL QUALITY AND SATISFACTION OF WORKERS IN A TFT-LCD MANUFACTURING FACILITY

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The manufacturing processes applied in high-tech industries often require the workers to stay long hours in a confined environment, and as such the indoor environmental quality (IEQ) in the fabrication was essential to protecting the workers' health and productivity. This study aimed to evaluate the subjective satisfaction of workers toward the IEQ in the clean room of a thin film transistor (TFT)-liquid crystal display (LCD) manufacturing facility to serve as a reference for improving the mechanical ventilation in the clean room. The study was conducted in 2013 and 2014 in a TFT-LCD manufacturing plant located in central Taiwan, and the evaluation consisted of both the workplace monitoring and the IEQ satisfaction survey. The TFT-LCD plant was divided into seven areas in accordance with their manufacturing characteristics. In each area, the environmental monitoring included the measurement of dry-bulb temperature, globe temperature, humidity, air speed, noise level, illuminance, and organic vapor concentration. The subjective satisfaction was surveyed using a questionnaire resembling the ASHRAE Standard 55 survey questionnaire to rank the workers' perception toward the performance of the facility in aesthetics, noise, illuminance, thermal status, ventilation, and overall IEQ. As the results show: 1) a majority of workers were dissatisfied with the overall IEQ, and through trend analysis the sources of dissatisfaction were found to be noise and poor ventilation; 2) the satisfaction toward overall IEQ was linearly correlated to those in aesthetics, noise, thermal performance, and ventilation among negative perceptions; 3) the elevated dissatisfaction toward ventilation was correlated with the significant presence of odor and dusts. To improve the IEQ in this facility, emphasis should be placed on strategies of noise reduction and increasing fresh-air ventilation.

**Keywords:** TFT-LCD, clean room, indoor environmental quality, subjective satisfaction