

Project Summary

A Study on Exposure Characteristic of Extremely Low Frequency Electro-Magnetic Field of Electronic Industrial Equipment

1. Objectives

In the LCD manufacturing process, LCD panels are processed through various processes and extremely low frequency magnetic fields are generated from various facilities. Therefore, it is necessary to prepare a work environment management plan for protecting workers' health by evaluating extremely low frequency electromagnetic field exposure level that can be generated in the LCD manufacturing process.

2. Methods

1) Research content

We tried to obtain the basic data for the protection of workers' health by analyzing the level of exposure to extremely low frequency electromagnetic fields, in four LCD processing lines and two module lines in two domestic LCD manufacturing sites.

2) Study method

In the LCD manufacturing process, we surveyed the actual situation of the exposure through the measurement of the extremely low frequency electromagnetic field for various production equipments and suggested the work environment management plan by creating the job exposure matrix of the workers.

The EMDEX Lite (ENERTECH, USA) was used for the measurement of individual exposure during working hours of workers, and ELT-400 (NARDA, Germany) attached 3-axis isotropic probe was used.

3. Results

The individual exposure level of the Fab line workers was $0.51 \pm 0.45 \mu\text{T}$, and the average of individual exposure levels of the module line was $0.56 \pm 0.27 \mu\text{T}$. On the ceiling value, the range of exposure level of Fab line workers was $0.03 \sim 43.50 \mu\text{T}$ and the exposure level of module line workers was $0.68 \sim 10.50 \mu\text{T}$.

The individual average exposure level was $0.57 \pm 0.50 \mu\text{T}$ in the Fab line, $0.56 \pm 0.27 \mu\text{T}$ in the module line, $0.53 \pm 0.67 \mu\text{T}$ in the CF line and $0.46 \pm 0.28 \mu\text{T}$ in the LC process. The Ceiling values were $1.50 \sim 43.50 \mu\text{T}$ at the Fab line, $0.03 \sim 29.50 \mu\text{T}$ at the LC line, $1.04 \sim 16.50 \mu\text{T}$ at the CF line and $0.68 \sim 10.50 \mu\text{T}$ at the module line.

The average individual exposure level for engineers was $0.52 \pm 0.50 \mu\text{T}$ and the average individual exposure level for operators was $0.49 \pm 0.21 \mu\text{T}$. Ceiling values ranged from $0.03 \sim 43.50 \mu\text{T}$ for engineers and $1.04 \sim 10.50 \mu\text{T}$ for operators.

The regional exposure was $0.08 \sim 96.48 \mu\text{T}$ in the A-1 line, $0.07 \sim 124.8 \mu\text{T}$ in the A-2 line, $0.21 \sim 198.7 \mu\text{T}$ in the A-module line, $0.06 \sim 287.2 \mu\text{T}$ in the B-1 line and B-2 Line, and an extremely low-frequency magnetic field of $0.19 \sim 42.07 \mu\text{T}$ was generated in the B-module line.

4. Conclusions

As a result of the personal exposure assessment, employee exposed to

highest extremely low frequency electromagnetic field was exposed to 43.50 μT . The worker's job was Sputter PM engineer in the Fab line.

Although there was no case that exceeded 1 mT of ACGIH exposure limit, extremely low frequency magnetic field of 287.2 μT occurred. As a result of the local exposure assessment, equipment such as power distribution unit, power supply, power cable, pump, solenoid valve, and ceiling rail were the devices that produced a very high level of extremely low frequency electromagnetic field.

In order to reduce the level of workers exposure from the extremely low frequency magnetic field, the distance between the equipment and the working position must be sufficiently controlled.

Key words:

TFT-LCD, harmful factors, extremely low frequency electromagnetic field, electromagnetic wave