

ASSESSMENT OF VOLTAGE QUALITY PROBLEMS OF ELEVATOR EQUIPMENT DUE TO VOLTAGE SAG

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ABSTRACT. *This paper researches the mutual relation between elevator accidents and power quality such as voltage sags and interruptions. For analyzing the power quality at the elevator switchboard in an apartment, we measure the real-time power quality (voltage sags, swells, interruptions, harmonics and so on) and research the error messages (under voltage error, etc.) from an elevator control room. We evaluate the performance and susceptibility to incidents such as sudden stops, people getting locked in an elevator, etc. by testing three standards imitation elevator equipment by changing the magnitude and duration of the voltage sag. We draw the ITIC (Information Technology Industry Council) curve for three elevator models, each having a different M/C (magnetic contactor) control system. Through experiments, we verify that changes in the power quality can lead to accidents such as sudden stops leading to people being locked in the elevator and the M/C system is an important cause of the abovementioned problems. We propose that the normal operation be extended in order to decrease the uneasiness faced by elevator passengers.*

Keywords: Power quality, Voltage sag, ITIC curve, Elevator equipment, Interruption, Locked in elevator

1. Introduction. The damage caused by natural disasters such as lightning strikes and forest fires occurring on an annual basis impacts the industrial economy as a whole.

These natural disasters, particularly lightning strikes, damage devices that run on electricity to a large extent by causing power outages or drops in voltage [1,2]. As of June 30, 2006, the total number of elevators in use was 324,426. Fifty-five percent of these are currently being utilized in apartment buildings.

The number of elevator accidents causing casualties or loss of human life is increasing steadily; these accidents may lead to death and injuries of varying extents depending on the degree of damage.

However, on including those accidents that do not get reported, the number of victims may rise significantly. It has been reported that potential stops, jumps, sudden stops, and errors in floor display that can cause feelings of uneasiness among passengers and accidents resulting in injury occur around 6 times a year per elevator [3]. So far elevator