UNDER-VOLTAGE PROBLEM IN SRI LANKA: A CASE STUDY

C.J. GAJANAYAKE, J.R.S.S KUMARA, M.K.M. SANA, A. ATPUTHARAJAH AND M.A.R.M. FERNANDO

Department of Electrical and Electronic Engineering, Faculty of Engineering University of Peradeniya

Under-voltage is one of a critical power quality issue in some of the power distribution networks in Sri Lanka. However, attention to these power quality problems and standards are minimal. Therefore, most of the consumers face problems related to power quality. In this paper, a case study of under-voltage problem in the faculties of Agriculture (Agric) and Veterinary Medicine and Animal Science (Vet) of the University of Peradeniya are presented.

Initially, a survey was conducted to collect the information related to the electrical installations at Agriculture and Vet faculties. Then, electrical measurements (voltage, current, power, power factor, harmonics etc) were monitored at the main panels and sub-panels of the buildings of these faculties. This was done under normal load, which covered working hours, lunch break and weekends. The measurements were continued in all the buildings while loading gradually up to the possible full load. Two test set-ups; one using a clamp-on-power meter interfaced to a laptop and the other a power meter interfaced to a data logger were used to record continuous measurements in main panels and sub-panels respectively. The maximum full loads with equipment-based and socket outlet-based were estimated for all the buildings by assuming an overall power factor of 0.9 and diversity factor of 0.75. The whole system was simulated under maximum loading using IPSA computer package.

It was found that the phase voltages of the administration building of the Agriculture Faculty, reduced significantly (below 10%). The voltage in R phase was even 70% of the rated 230 V. However, the building consisting Departments of Biology, Soil and Food Sciences of the Agriculture Faculty had a stable normal voltage level since it was directly supplied from the transformer. The Animal Science buildings had voltage drops up to 12% of the rated voltage. The main building and the Department of Clinical Studies of the Vet Faculty also experienced some under-voltages. In general, these under-voltages are due to unbalance loading and improper selection of LV cabling. However, the other buildings and transformer terminals were within acceptable limits.

To improve the voltages at the Agriculture administration building, it was suggested to supply it directly from the transformer with a cable of the double sized cable and to balance the loads within the building. To improve the main voltages of the overall system, it was recommended to increase the voltage at the supply end of the transformer by 5% and to increase the size by a factor of two of main cables in the buildings which had experienced under-voltage (Department of Farm Animal Production and Health, main building and Department of Veterinary Clinical Studies of Vet Faculty). Replacement and modification of main panels of Animal Science old, Animal Science new, Vet administration and Vet Clinical are also recommended.

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