

**HARMONICS IN THE DISTRIBUTION SYSTEM OF SRI LANKA****J.B. EKANAYAKE**

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In Sri Lanka, since early 1980s there has been rapid growth in electrical demand for the industrial and domestic consumers. As a result, various types of electrical, electronic and computer equipment, that either polluting the electrical system or which are sensitive to the various electromagnetic phenomena, were brought in to the country. Some of the major issues emerged due to these loads are increase power demand, low power factor operation, voltage fluctuations, introduction of harmonic into the system, etc. Ceylon Electricity Board focused only towards first two issues and corrective measures were taken. By commissioning new hydro and thermal power plants the power demand was partially met and in order to force the consumers to increase their power factor new tariff system was introduced. As third issue is only nuisance to the consumer, they start taking corrective measures by introducing power conditioning equipment. One of the major issues, which did not attract any attention, was harmonics introduced by the non-linear loads. Harmonic issues were only became nuisance to the system after number of computer controlled sophisticated equipment were increased in the electric system. Now it is time to impose harmonic standards to improve the power quality and if measures were not taken now, it will become a very serious problem in near future.

Work presented in this paper is mainly focused on the harmonics appears in the distribution system in Sri Lanka and techniques that can be used to reduce harmonic distortion. Data were collected from a few small industries and large industries and harmonic content and possible problems that can cause by them were studied. However, with the limited resources available only a few industries were subjected to these tests and before proper harmonic standards were laid down, it is required to study the harmonic problems in vast range of industrial loads.

All the domestic loads such as televisions, CFL bulbs all contribute for harmonics. However, the effect of them to the electric system is small and can be neglected. As far as small industries are concern, one of the main loads, which create many problems to the system, was arc-welding plants. As there are many plants connected to the system, the cumulative effect is very high. Various types of arc-welding plants were studied to understand their effect to the electric system. It was found that, the main problem with them is absorption of large amount of current but in discontinuous manner. Most of these welding plants are operated either on single or two phase supply. Therefore, they will introduce second and third harmonics to the system. These harmonics could cause problems to the neighboring houses and other small industrial loads.

The harmonic distortion caused by two large industrial loads was also studied. Their impact to the neighboring systems was investigated by computer simulations. As these loads are equipped with power factor correction capacitors, how resonance effect could alleviate the harmonic problem were also investigated. Finally a simple corrective measure which can be implement with minimum cost was presented.