e-REW Express

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HK Electric 港燈

Welcome

to our "e-REW Express". In this issue, we will present the last topic of this series on power quality, the harmonic interference. We will illustrate the causes of harmonic interference and some measures that you can implement to prevent and/or minimize the impact of harmonic interference.

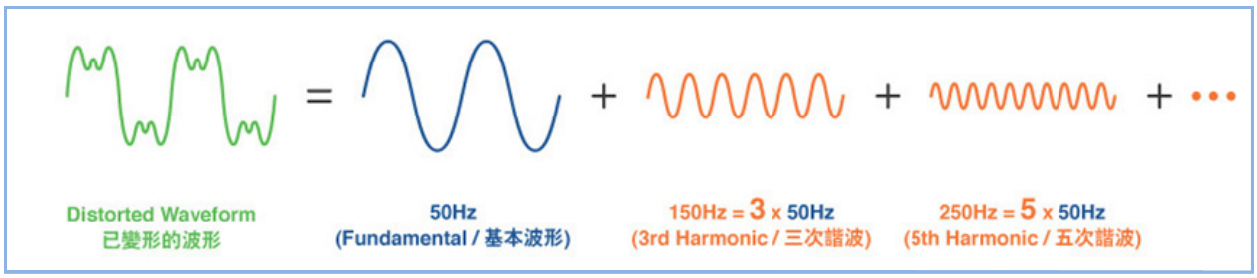
If you have any suggestion, please send an email to us at mail@hkelectric.com or contact our Customer Installation Section at 2887 3455 so that we can further improve our service.

Harmonic Interferences and its Mitigation Measures

To begin with, let us have a closer look at its definition of harmonic interferences based on the European Standard EN 50160.

1. Harmonic Interferences

Harmonic voltage is defined as a sinusoidal voltage having a frequency equal to an integer multiple of the fundamental frequency (i.e. 50Hz) of the supply voltage.



Harmonic Interferences

Harmonics of the supply voltage are mainly caused by customers' non-linear loads connected to the supply system. Harmonic currents flowing through the system impedances give rise to harmonic voltages. Some possible impacts due to harmonic interferences include:

- Overheating of motors / transformers
- Overheating of electrical wiring
- De-rating of electrical wiring and devices
- Decreased motor performance
- Abnormal operation of protection devices like breakers, relays or fuses
- Telecommunication interference
- Abnormal operation of sensitive electronic devices like motor control circuits

Overheating of Wiring

2. Common Causes

While electricity generated by the power station is practically free of harmonics, our electricity supply may be contaminated by customers' equipment which injects harmonics to the electrical system.

Harmonics are generated by any load which draws current that is not proportional to the voltage applied. In other words, harmonics are generated by non-linear loads that draw non-sinusoidal current. Harmonic currents flowing through the impedances of the electrical system give rise to harmonic voltages. Thus, harmonic currents and harmonic voltages both vary with time. Such non-linear loads include but are not limited to the following:

- Fluorescent lamps
- Electronics machines (copiers and faxes)
- Power electronics controlling device of motors
- Battery chargers

Photocopiers

Fax Machine

Fluorescent Lamps

3. Possible Enhancement / Mitigation Measures

3.1 Harmonics Limits for Equipment

It is always more economical to eliminate problems in the design stage rather than carrying out remedial works afterwards. New equipment with non-linear load characteristics should be specified to comply with the harmonic limits in the relevant international standards such as IEEE519. HK Electric Supply Rules have also specified the harmonic current and harmonic voltage distortion levels at HK Electric's supply points, which must be complied with to prevent/minimize mutual interferences with other customers.

Supply Rules

3.2 Installation of Harmonic Filters

Harmonic interferences can be minimized by installing harmonic filters. There are passive and active harmonic filters. Passive harmonic filters have a pre-determined frequency bandwidth and are capable of minimizing fixed orders of harmonics only. Active harmonic filters are more sophisticated and can inject anti-phase harmonic currents to the systems for harmonic compensation. They are therefore suitable for dynamic harmonic conditions where harmonic contents are varying.

Harmonic Filters

3.3 Isolation from Harmonics Source

To prevent incorrect operation, customers are recommended connecting all essential and sensitive to harmonic interferences equipment to "clean" electrical circuits and as far as possible isolating them from the non-linear loads.

Note : The above information is provided for general reference only. Customers should consult a qualified electrical engineer, consultant or contractor for the actual application of these harmonic interferences mitigation methods and measures.