



## Performance and measurement of power quality due to harmonics from street lighting networks

Manzano E.R.<sup>1</sup>, Carlorosi M.<sup>2</sup>, Tapia Garzón M.<sup>3</sup>

<sup>1</sup> Depto. Luminotecnia Luz y Visión, FaCET, Universidad Nacional de Tucumán, Av. Independencia 1800, 4000, Tucumán, Argentina, Phone/fax: +543814361936 [emanzano@herrera.unt.edu.ar](mailto:emanzano@herrera.unt.edu.ar),

<sup>2</sup> Depto. Ingeniería Eléctrica, FaCET, Universidad Nacional de Tucumán, Av. Independencia 1800, 4000, Tucumán, Argentina. [vmcarlorosi@herrera.unt.edu.ar](mailto:vmcarlorosi@herrera.unt.edu.ar)

<sup>3</sup> Electrocivil S.A., San Miguel de Tucumán, Argentina. [electrocivil@arnet.com.ar](mailto:electrocivil@arnet.com.ar)

**Abstract.** The municipality government of San Miguel de Tucumán city in Argentina is interested in applying energy saving policies to street lighting facilities. In this frame, devices like astronomical programmable clocks and electronic control gear (ballast) will be used to replace photocells and inductive control gear. Also luminaires in use could be replaced by more efficient ones. A technical-economical evaluation was necessary and the technical aspect was request to the Lighting Department of Tucumán University. The performance of the devices and the power quality impact in the lighting networks evaluation was also necessary to evaluate.

The study carried out involved outdoor and laboratory test. During 1,5 month six lighting networks with 273 semi-cutoff luminaires were tested. Network selected belong to residential areas which represent more than 60% of total city lighting facilities (26.000 luminaires). In addition laboratory test were conducted with a sample of inductive (in use) and electronic control gear, for high pressure sodium discharge lamps (HPS) 150W. Performance varying voltage input for aged was analyze.

Some results from tests points out that:

- The use of programmable astronomical clocks instead of photocell produces 11% of energy saving because of actual time on and off schedule set.
- Electronic control gear instead of inductive control gear produces 28% energy saving.
- Luminaire replacement of current HPS 150W by HPS 100W with Electronic control gear and photocell control produces 43% in energy saving.

Outdoor test results from measurement of electrical input parameters and harmonics of existing inductive control gear in street lighting, indicate that: while THD V voltage is about 2,8%, THD A current can be reduced from 38% to 6,5% even when electronic control gear is set to the lower output power step (70% of power output and 60% of initial average illuminance value).

The results obtained will be used as arguments for the widespread replacement in the city which would involve considerable investment and a new experience in the region.

### Key words

Energy saving, lighting networks, power quality, harmonics.

### Referentes

- [1] Resolución ENRE 99/97, Power quality for energy companies (1997)  
<http://www.enre.gov.ar/web/bibliotd.nsf/>
- [2] EN61000-3-2 (similar to IRAM 2491-3-2), Applying limits to harmonics.
- [3] EN61000-4-7. Testing and measurement techniques.
- [4] IRAM AADL J2022-2, (1995) Road lighting classification and lighting requirements
- [5] Fluke 1735 class B (2008)
- [6] Fluke 435 class A (2008)
- [7] AC power supply KIKUSUI serie PCR-L 2000L
- [8] LMT Iph I 1000 photo current meter with V(1) correction filter