UNIVERSIDAD DEL NORTE
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERINGS
Power Electronics IEN 7140

Lab 1: Power in home appliances

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I. Objective

The purpose of this practice is to measure the power consumed by a home appliance. This is achieved basically by measuring its instantaneous voltage and current, which is known as "load signature". Later, the 100Vac mains voltage is controlled using thyristors and is supplied to a dimmable device.

II. Select appliances

Get the following appliances:

- Linear, resistive: a soldering iron "cautín", or a light bulb.
- Linear, inductive: a fan, blender, etc.
- Non-linear: an electronic device.

III. Measurement method

Use the method with a *shunt resistor* in series with the device. Use an oscilloscope to measure the instantaneous supply voltage and current consumed. The current is obtained as a voltage over the shunt resistor. With these waveforms you can obtain all types of powers.

Be aware that the devices may be in different states, and the consumption pattern will vary for each state. For instance, a printer draws a very different current waveform when it is resting, as compared to when it is actually printing. Choose one or two relevant states and do the power computations for them.

IV. Power computations

Perform the computation to find out :

- instantaneous power ($p(t)$)
- active (average) power (P)
- reactive power (Q)
- harmonic power (D)
- full apparent power (S)
- power factor (PF)
- harmonic distorsion of the current (THD_I)

There is a Matlab code provided by the teacher to do the computations over the waveforms measured by the oscilloscope.

V. AC controllers

Propose a circuit using thyristors to control the amount of power delivered to the linear resistive load. The input is the 100Vac mains and the output is an AC waveform where there is a delay angle before triggering the AC voltage. The phase control is done with a potentiometer and it should vary the output RMS voltage from 0V to 110V (approx).

- Connect your load to the output of the AC controller.
- Your "new non-linear load" is the set of the AC controller together with the resistive linear load.
- Describe how the active, reactive, apparent powers and the power factor changes for different delay angles and with respect to the measurements in points III and IV.

V. Report and defense

Follow the "lab guidelines" and prepare a report showing the relevant findings, waveforms, and power computations required. Your have to do an oral defense of the results. Due dates are on the course syllabus!

VI. Reference material

There is a Matlab code, some papers, the lecture slides.