PROGRAMA DE DOCTORAT EN ENGINYERIA ELECTRÒNICA UPC-UIB

CURSOS i SEMINARIS DE FORMACIÓ DOCTORAL – CURS 2011-2012

SHORT COURSE: **PULSE WIDTH MODULATION FOR SINGLE- AND THREE-PHASE INVERTERS - ANALYTICAL APPROACH**

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COURSE DESCRIPTION:

This course will show how is possible to deal with different modulation strategy in a single-phase and three-phase inverter dedicated to supply loads in different applications. The single-phase; two and three-level, and over-modulation principle algorithms are developed here in traditionally-analytical way. The electronic circuit called PWM modulator can be realized from the described algorithms by using micro-computer technology and the knowledge described here is also a good base for further investigation into PWM switching strategies. The over-modulation phenomenon can help to professionals to speculate with the inverter's parameters, for example it is possible to obtain the necessary magnitude of the output voltage by decreased dc input voltage.

PROGRAM:

DAY1: Monday 18th June, 2012, 16:00 – 20:00h, Aula de Postgrau, 116, Edifici C5, Campus Nord UPC, Barcelona (http://maps.upc.edu/)

1.- Introduction. The motivation for preparation of this tutorial course and all relevant references will be discussed here.

2.- Single-phase inverter- structure. The single-phase inverter structure is introduced and all relevant elements necessary for power conversion are described.

2.1. Description of modulation principles. The switching and duty-cycle function necessary for PWM analysis are discussed here.

DAY2: Tuesday 19th June, 2012, 12:00 – 14:00h, Aula de Postgrau, 116, Edifici C5, Campus Nord UPC, Barcelona (http://maps.upc.edu/)

2.2. Generation of two-level output voltage and its spectrum calculus. The inverter output voltage can be organized as two-level signal and its spectrum can be evaluated analytically, what will be shown in this section.

2.3. Generation of three-level output voltage and its spectrum calculus. In this section the three-level organized inverter output voltage is evaluated. Both two and three-level spectra are compared with the FFT spectra in order to verify the procedure.

DAY3: Wednesday 20th June, 2012, 16:00 – 20:00h, Aula de Postgrau, 116, Edifici C5, Campus Nord UPC, Barcelona (http://maps.upc.edu/)

3.- Over-modulation phenomenon in single-phase inverter. The first harmonic magnitude can be increased over DC input voltage when over-modulation is applied. This property, obtained by over-modulation, is welcome in some applications but additional spectrum lines appear as a consequence of this phenomenon.

3.1. Duty-cycle function evaluation. In order to calculate the over-modulation spectrum the duty-cycle function should be reconsider in such a way that the spectrum evaluation is possible.

3.2. Over-modulation specter calculus. The three-level output voltage signal at the converter output and over-modulation's influence on the frequency spectrum will be calculated in this section.

DAY4: Monday 25th June, 2012, 16:00 – 20:00h, Aula de Postgrau, 116, Edifici C5, Campus Nord UPC, Barcelona (http://maps.upc.edu/)

4. Three-phase inverter –structure. The same procedure for harmonics spectrum evaluation can be used for three-phase inverter.

4.1. Description of modulation principle. In this section the three-phase modulation algorithm is developed based on the description of single-phase system (three-level output voltages).

4.2. Generation of Three-phase output voltage and its spectrum calculus. The there-phase voltage spectrum is analytically evaluated and results are again compared with FFT calculation in order to verify the procedure.

DAY5: Tuesday 26th June, 2012, 12:00 – 14:00h, Aula de Postgrau, 116, Edifici C5, Campus Nord UPC, Barcelona (http://maps.upc.edu/)

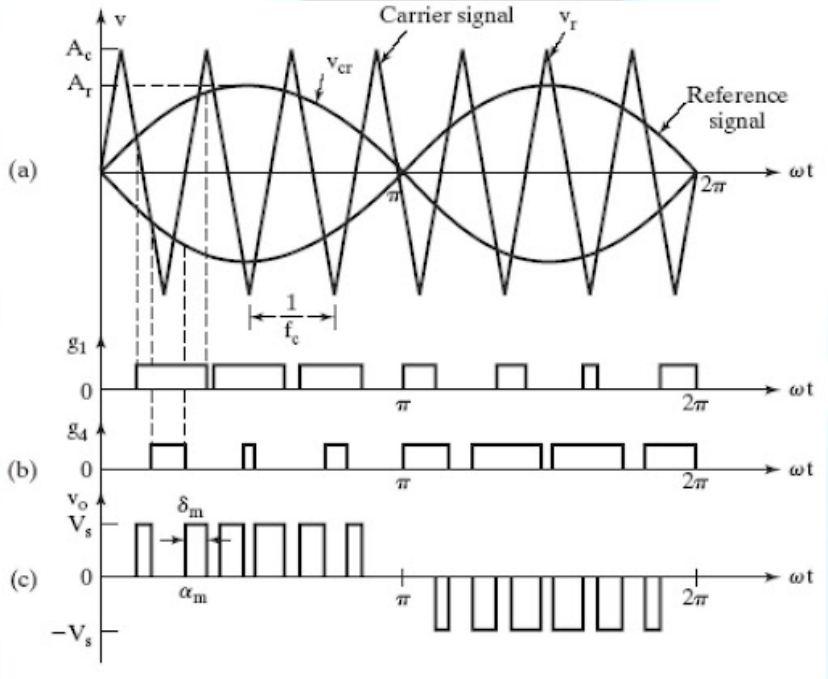
5.- Over-modulation phenomena- three-phase inverter. The over-modulation phenomenon is welcomed also in three-phase systems, because the magnitude of the first harmonic component can be higher than DC input voltage.

5.1. Duty-cycle function evaluation. Also in this case, in order to evaluate the low-harmonics spectra the duty-cycle function must be reconsider when compare with the normal modulation procedure to enable the evaluation of the spectrum.

DAY6: Wednesday 27th June, 2012, 16:00 – 20:00h, Aula de Postgrau, 116, Edifici C5, Campus Nord UPC, Barcelona (http://maps.upc.edu/)

5.2. Over-modulation spectrum calculus. Low-harmonic spectrum components are calculated.

6.- Discussions and Conclusion



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ATTENDANCE CERTIFICATE WILL BE PROVIDED.

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