Francesc Casanellas
Chartered Engineer, Member IET, Life Senior Member IEEE

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Born in Barcelona in 1944.
I studied 2 years of Physics at the University of Barcelona and then Electronics Engineering. I am Chartered Engineer in the U.K.

1968 to 1984. Mecanica Moderna, S.A., company dealing in power transmission.

Starting as engineer for sales support, later as managing director, I started the new electronic department and designed and directed the manufacturing of:

- DC drives, up to 90 kW
- AC drives (three phase inverters) up to 11 kW: the first to be manufactured in Spain, using thyristors first, bipolar transistors later.
- Electronic tachometers, panel mounting and hand held (contactless).
- Speed controls and magnetic pickups for ships and submarines (EN Bazán).
- Speed and position controls for automobile and glass factories as: Citroën, Renault, Ford, Saint Gobain, etc.

1985 to 1992. Novat, S.A. As managing director (I owned 51 % of the shares, the rest belonging to a venture capital company) and chief design engineer.

- Range of three phase AC drives from 0.37 to 90 kW using MOSFETs and IGBTs.
- Special AC drives for conveyors and escalators of the new Djakarta airport (CNIM-Aéroport de Paris)
- Self tuned a.c. drives (these were the first self tuned a.c. drives in Europe): sold under the makes Novat (in Spain), CEGELEC (Alcatel) in UK, Rotrac in Holland, etc.
- Inverter to drive the compressor of refrigerators for cars and ships (Electrolux).
- Automatic control of a warping machine using a computer, an interface electronic with microprocessor, 2 stepper motors and a main 22 kW inverter.

I-1993 to I-1994. Heenan Drives Limited, Worcester, England

This company bought my previous company Novat and as part of the deal, employed me in a 2-year contract as a Research and Development Engineer.

Design of:

- Switched mode power supplies for inverters.
- New dead time compensation system for three phase inverters.
- Computer program and simulation algorithms to calculate the switching losses of IGBTs in three phased inverters.
- Three phase inverters up to 315 kW.
- Small, low cost, pump inverter drive.
- Hybrid (switched + linear) 750 W power amplifier with very low distortion and phase shift, for Schlumberger Industries.
- New control strategy for a fast response three-phase front end converter for power factor unity, regenerative. Simulation program.

1995 to 1997: ALP, S.C., again in Spain working in my own design company.

- Three phase portable phantom load generator with voltage (0-3x320 V) and current (0-3x00A) switched mode amplifiers, with very low distortion, supply 50 to 500 V (for Schlumberger Industries, now Actaris).
- Switched mode power supply fed from 1500 V (Heenan Drives).
- Three phase generator, distortion < 0.1%, 0-550 V, to test electric relays (for ENDESA the major electric company in Spain).
- Automatic control of electric locomotives, microprocessor driven with about 40 inputs and 40 outputs. (RENFE, the Spanish rail company).
- Special DC drives for a glass factory. (Asea Brown Bovery).
- Power unit with 2500 W 310 V to 24 V converter and two 3.5 kW three-phase inverters (for the pneumatic and the hydraulic pumps) for a hybrid bus. (Delphi (General Motors), Luxemburg. Electric Vehicles Inc., Calif.)
- 400 W ultrasonic generator using a resonant inverter and with automatic tuning (Industrias Esteves).
- 15 kV isolation amplifier for locomotives. (RENFE, the Spanish rail company).
- Switched mode, 700 W, modular battery chargers (Alcatel).
- Three phase inverter with control included, for automatic doors (Controlsa)
- Special power supplies (Powerbox).
- Battery regulators for motorcycles (FACOMSA).

From 1998. FACOMSA

They employed me to start the electronic department. There I designed:

- Electronic dashboards for motorcycles (for Honda, Peugeot, Piaggio, Yamaha, Benelli, KTM, etc).
- Electronic dashboards for cars (Santana 300, Iveco Massif).
- Battery regulators, flashers.
- Low cost capacitive level gauge.
- Wireless speed sensor for motorbikes, self supplied, without power supply nor battery.

From 2010. Consultant engineer.

- LED lamps for traffic lights (Vitri).
- Chlorinators for swimming pools, using electrolysis. Power converters up to 5400 W, including the control board and the software (BSV).
- Power supply with multiple outputs for medical equipment (Satelec).
- Control of shower, cascade, etc. for swimming pools, by means of a water-proof piezo-electric keypad (Filinox).
- Motor supervisor (underload, overload, phase sequence, etc.). (BSV Electronic).
- Power supplies for traffic lights (TACSE).
- Ultra-violet LED lamp (Polymetaal, Leyden).
- Inductive conductivity sensor to measure salt concentration (BSV).
- Electronic loads for converters (BSV).
- Very high impedance meter to measure the pH and the ORP inputs of the controllers (BSV).
- Multifunction controller, commanded via Bluetooth. (BSV).

Some papers:

"Teoria de los variadores diferenciales" (Theory of differential variators), DYNA (review of the Spanish Association of Engineers), November 1974: This papers deducts

equations to estimate powers and torques of differential mechanisms driven with variable speed.

"Cálculo de los elementos pasivos de conmutación en un inversor con SCR" (Calculus of passive elements of an inverter using SCR), Mundo Electrónico, 1984, no. 44. Full analytical analysis of McMurray and Burgunm-Nyhof inverters and deduction of equations to compute commutating capacitors and chokes or to deduct the commutated current from the components. (Note: up to then there was only the McMurray system using graphics)

"Perfil de velocidad optimo para posicionamiento" (Optimal profile for positioning), Automática e Instrumentación, 1990, no. 208. Shows different speed/distance functions for positioning and deducts the optimal speed profile, shows how to calculate motor temperature, etc.

"Losses in PWM inverters using IGBTs", IEE Proceedings of Power Appl. Vol. 141, no. 5, September 1994. Analytical deduction of the calculation of forward and switching losses of an inverter using PWM.

"Compensación del Tiempo Muerto y de los Retardos en Inversores y Amplificadores de Potencia Clase D". Elektor.

"High voltage, simple and fast inverter". Electronics World, november 2003.

"Circuit makes simple high-voltage inverter", EDN, May 27, 2004.

"Quasiresonant converter uses a simple CMOS IC", EDN April 15, 2004.

"Digitally programmable resistor serves as test load". EDN, March 3. 2005.

"Sencillos Circuitos para Electrónica de Potencia". IEEE seminar. Seminario anual de automática, electrónica industrial e instrumentación, Universidad de Oviedo, 2006.

"Calculation of the passive components and the commutating current in an assisted turn off inverter." IEEE seminar. Seminario anual de automática, electrónica industrial e instrumentación, Universidad de Oviedo, 2006.

"Power supply meets automotive-transient voltages specs". EDN, Sept. 18, 2008.

"∑-Δ Isolation amplifier transfers low frequencies across barrier". EDN, August 2013.

"Water and vandal-proof keypad uses piezoelectric disc as sensor and buzzer". EDN, April 2014.

"New slope compensation method stabilizes switches". EDN, March 2016.

Patents:

- Very simple high voltage inverter, US patent 4802075, 1988
- Self tuning system for three-phase variable frequency inverters, Spanish pat. 9003250, 1990.
- Voltage control system for low voltage three-phase inverters, protecting an inverter designed for Electrolux (based on an asymmetrical modulation scheme). Spanish pat. 9199950, 1991
- Hybrid (switched + linear) power amplifiers, applied by my customer Schlumberger, European patent 94400486.0, 1994).
- Microstepping driving system for stepper drives used in dashboards, Spanish pat. 9903259.