

# Pulling on precise power

Many industry trends are conspiring to make power analysis an important consideration for designers. **Tim Fryer** takes a look at this expanding arena.



As a rule, test and measurement companies need to be at the forefront of technology – their products need to be at least as capable as the equipment which they are being used to design. However, until recently, it seems that the traditional heavy hitters in T&M were happy to leave power analysis to the specialists in the field – notably Yokogawa, which claims to represent more than half of the market.

Times are changing and a combination of legislation and some significant market drivers have encouraged Tektronix to enter the fray, something it did earlier this year when it acquired Voltech's power analyser IP with a view to launching a new product range later this year.

But why enter the market now? Hailey Murdock, EMEA marketing manager for Tektronix, commented: "Power has become an increasingly important design segment that has seen significant growth over the past several years. Tektronix is

committed to offering customers a comprehensive set of power test solutions and has already been servicing this market with synergistic products from its oscilloscope and probes product lines. By offering new power analysers, Tektronix is rounding out its portfolio of power test products."

This significant growth, in a generally flat T&M market, is driven by a number of factors.

Hafeez Najumudeen is Yokogawa's product marketing manager for Europe and Africa for power analysers and power meters. "All the big players were always in the scope market," he said, "but the power analysis market is totally different – you need to have a precise and very accurate power measurement. This has been a growing need for the past few years, lead by renewable energy, energy conservation and efficiency."

Another key driver has been increased legislation and new European standards,

*Yokogawa's range of power analysers, including the new WT300 series*

particularly relevant being those on 'Standby Power' and 'Harmonics and Flicker'. Najumudeen commented: "They have made the standards more stringent so the products that you qualify them with – the power analysers – have got to be more capable."

Standby power is a growing issue. The EU-lead SELINA project predicted that 4.6billion products will feature a standby power option by 2020, consuming 15TWh of electricity per annum – the same amount of electricity consumed by a country like Portugal. Legislation was introduced last year and with all legislation comes the need for the equipment to test for conformity.

Standard test equipment will not do the job, according to Murdoch: "Power analysers provide a number of capabilities beyond what's possible with oscilloscope based solutions. While it may be possible to cobble together functionality that approximates the

capabilities of a power analyser, such an approach would be lacking the necessary accuracy and repeatability provided by a dedicated power analyser."

#### Harmonics

Another legislative issue that is becoming more topical is harmonics. John Outram, managing director at Outram Research, commented: "New Engineering Recommendation G5/55 is in the pipeline. It is not strictly legislation – the standards [EN 61000/3/2] will probably be catching up – recommendations are the planning arrangements which the utilities use to see if they can add capacity or load to sites, so it is an enhancement to the G5/4 recommendation that has been around for a while. However, it will have impact on people who are designing equipments that potentially produce harmonic emissions, like inverters and UPS, and it will go to the 100th harmonic."

This last point is relevant as Engineering Recommendation G5/4, and associated legislation, goes to the 50th harmonic, but an increase demand, particularly at high voltages, as resulted in higher level harmonics – a demand met by Outram's latest PM7000I analyser.

Another change in the recommendation will be the way in which users are charged by utility companies. Accurate monitoring and control of harmonics emissions will become increasingly important, and the instruments to do this will need to become equally more capable.

For engineers feeling the need to invest in a new power analyser, there are two critical factors to consider, advises

Murdoch: "The first is the ability to maintain measurement accuracy, even on highly distorted 'real world' waveforms common in many of today's power conversion devices. The PA4000 [Tektronix' new platform] accomplishes this through the use of two highly accurate internal current shunts. The novel Spiral Shunt design maintains accuracy over a range of variable conditions. The second factor has to do with productivity and cost of ownership. The power analyser should simplify application specific conformance testing and provide a rich set of standard features to reduce the need for expensive add on options."

Najumudeen agrees that accuracy is the main thing, but says that it needs to be understood properly. "It is a little different [from mainstream T&M] because, when you are looking at power analysers, we are not talking about accuracies of voltage or accuracy of the current. Instead, we talk about accuracy of the power as a percentage of the value. So we say the uncertainty of the instrument might be 0.02% of the reading and that is what we guarantee. The second parameter is the range in which you give your accuracy – whether you talk about 10% of your range or 100% or more than 100%."

Many industry trends point to a continued requirement for accurate power analysis. Included in these trends are: the \$75bn China plans to spend per year on green energy initiatives; the EU directive to boost energy efficiency by 20% by 2020; the 25% annual growth in the wind and solar inverter market; and solid state



*(Above) The PM7000 from Outram Research can measure the 100th harmonic – and beyond. (Below) Tektronix has entered the power analyser market with its acquisition of Voltech's IP*

lighting – now 5% of a \$90bn market and expected to grow by 30% per annum.

Murdoch believes there is no single factor driving this market. "In general, increased energy efficiency in all types of power conversion devices, the growth of new 'green' power generation technologies and design innovation leveraging new semiconductors are the key factors driving innovation and engineering development worldwide," she commented. "This development, in turn, requires measurement instrumentation with increasing levels of precision and accuracy. Recent innovations in GaN and SiC power semiconductor devices, which are capable of high switching speeds and performance levels significantly greater than earlier silicon based technologies, drive the demand for higher bandwidth test instrumentation."

Despite the maturing of some technologies and the consequent requirement for power analysers in the production environment, Najumudeen sees such equipment as being just important in the design environment. "With this long term growth, R&D plays a key role as you need to develop your product efficiency. For renewable energy, we will have to invest in R&D if we are going to meet the EU target in 2020. Most of the research and investment in this field comes from the very large companies, but you can't ignore the fact that smaller companies also make important contributions," he concluded.

