

Research and Industry: Towards a Non-Existing Gap

Dear readers,
This month, the guest author for the Future Trends in Instrumentation and Measurement column, dedicated to a young and brilliant engineer, is Mohamed Khalil. Mohamed is a young, brilliant and brave engineer. In fact, after having worked for a few years outside the academic world, he decided to take a step backward and to begin to study again to follow his dreams... So, presently, he is a Ph.D. student at the Politecnico di Milano, Italy, where he is distinguishing himself for his tenacity, his willpower and his talent. Because of his experience, his nice contribution can really be a bridge between the two "separate" worlds of industry and research.

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It was a big pleasure when Simona proposed that I publish in her column, considering the fact I am still a Ph.D. student and how captivating I found the previous published articles. During the process of writing I discovered it's quite hard for me to write an article free of technical tint. I guess it's our engineering background, which stands far away from literary smoothness and, quite naturally, forces us to express everything in terms of equations and models. If you are spending

most of your academic life involved with science, then it shouldn't be surprising you won't find another Edgar Allan Poe inside yourself. But as far as my capabilities allow me, I will try to articulate my thoughts quite clearly.

Before I started my Ph.D., I worked for six years as a testing engineer for high-voltage power transformers. It was a tough decision to leave a promising career and start a life of a student again. Many of you passed through a similar change in your life and understand how hard it is to be back

again at a university. I remember that it took me months to determine and finally decide to do it, with all the consequences just to explore myself and find new aims according to that.

I spent most of my short industrial career in many laboratories in different countries supervising transformers' quality before they were released. During this period, I believed in

measurement as a bridge that connects manufacturers and customers. No matter what the obstacles are during the quality control process, measurement is always the only understandable language that interprets the exact condition of the manufacturer's product in terms of numbers below or above the agreed values. These agreed values are declared in contracts between manufacturers and customers who strictly follow these values with certain tolerances stated in relative standards.

There has always been a missing term in the quality control of my field, which leads to disputes and arguments. This term is "uncertainty." Uncertainty is not limited only to engineering, economics and finance; it also arises in philosophy, psychology and sociology. Unfortunately, it is absent in the quality control dictionary. It would be really hard to find this term mentioned in contracts and specs.

Generally, the whole testing process of a product is regulated based on two main references: the signed contract and the relative standards. Not surprisingly, these two basic references lack measurement uncertainty. The reason is simple: there is a gap between industry and research. So far, this gap shrinks gradually over time, but still there are a lot of efforts to be carried out.

Let us turn our minds to the main reason behind this gap: the absence of common interests. Private sectors are always asking for short-term projects with fast revenues, which are sometimes quite hard to be fulfilled by research. This results in more investment for the product/application development with little attention given to basic and applied research.

I remember when I was chosen to serve on a committee that was formed to supervise abroad the factory tests of 220/66/11 kV power transformers. During the turns-ratio test there was a deviation of 0.5% from the values declared by the contract, which meant a rejection according to IEC 76. The factory asked to repeat the test again with another instrument, and the results were slightly different but lower than the 0.5% deviation. Both parties went into a huge altercation that ended with a check into the expiration of calibration certificates in order to determine which instrument to accept. Of course, no one considered that the true value of a measurand lay within a coverage interval.



In my opinion, the absence of instrumentation and measurement fundamentals in quality control is a consequence of the gap between research and industry, and a lot of future efforts are still necessary in order to fill in this gap. Let us hope one day uncertainty will be more applicable in the various industrial fields.

Mohamed Khalil (mohamedmahmoud.khalil@polimi.it) received his B.S. (2007) and M.S. degrees (2012) in electrical engineering at the Ain-Shams University in Cairo, Egypt. During his masters, he carried out a survey on failure causes of 1922 power transformers in the Egyptian transmission network

in the period 2002-2009 and published the results in a number of journals and conferences. From 2007 to 2013, he worked as a power transformer engineer in Ministries of electricity of Egypt and Kingdom of Bahrain. He erected, commissioned and tested many power transformers in transmission and generating stations, worked as an on-call engineer for outages and accidents in power stations and was a participant in several committees of technical specifications for power transformers tenders and many testing committees in different laboratories. Currently, Mohamed is a Ph.D. student at Politecnico di Milano, Italy, where his activity focuses on failure causes of photovoltaic plants and their reliability assessment.