

**R&D of ELECTRIC PRODUCTS, CREATIVITY, COSTS and HIRING THE TEAM:
IS YOUR COMPANY COMPETENT TO PUT A NEW IMPACTING PRODUCT ON THE MARKET?**

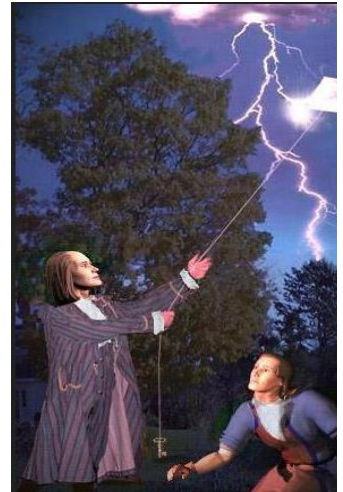
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<http://www.cognitor.com.br/PostImpactingEN.pdf>

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1) POTENTIAL & BARRIERS FOR DEVELOPING IMPACTING PRODUCTS

The dream of manufacturers of electrical equipment for substations is to develop or to improve a product that becomes, in the commercial market, a successful example of a new, cheaper, energy saving and creative product. I am used to hear from people, in manufacturing companies, that they frequently have ideas for products that looks promising but does not know how to turn them into a commercial product.

They mention that the two main barriers are:

- (a) to do the engineering calculations necessary to define the product conceptual project;
- (b) after succeeding in the first step, how to deal with the high costs of the laboratory tests to be done to develop the prototype and, after, to get a type tests report based on IEC standards.

The differences between the successful companies, which overpassed these steps, are not their size or the money they have to invest in new ideas. The difference is usually only in the attitude, vision and creativity of some 2 or 3 persons of the company technical team.

Here comes the aspect of having a proper R&D view in the moment of hiring the team, particularly the engineers and designers. Of course, this can be only achieved when there is a direction with a view in the medium and long term future. My first experience in this theme was some 30 years ago, when I was the manager of a set of big high power and high voltage testing labs within an electric energy research center

We had to mount a team, contracting persons that would work initially in testing activities but with a vision that some of them would be, after getting some years of experience in testing, the main researchers and R&D managers of the center. The products of the research center were tests (in the testing labs having as clients mostly manufacturers) and, in separate, R&D projects (with a separate team having as clients mostly power utilities).

The profile of testing engineers and researchers have some key differences. The fact is that, in the initial team of some 30 engineers and technicians, only some 4 of them became high level researchers and R&D managers.

So, the first “must” for a company to reach success in developing impacting products is to have some 2 or 3 persons reasonably technically prepared to go beyond the routine production activities of a manufacturing company. It is necessary to invest in these persons with some training and participation in technical events in which they can improve and compare the results of their R&D activities. The main motivation of a good R&D staff is not money but instead, to create and win challenges. This is the fire that shall be maintained on.

There are companies that perform these first steps but, years after, loose the way and put the R&D staff to do routine work. This example of bad management is very common all over the World.

The profile of the members of the “new products developer team” should be like:

- Need to have sufficient engineering calculations abilities (electricity and mechanics) and, beyond this, an excellent disposition to learn new things out of the main area of knowledge. As an example, it is very good when an electrical engineer knows also how to do some mechanical structures calculations.
- Shall be a disciplined person in the work and persistent in reaching goals. It is useless to have very intelligent people who cannot keep their focus on the goal to achieve. They rarely generate results, complain all the time and overload the rest of the team.
- Must have good skills to write the results of the work and to defend them, speaking in public.

I have witnessed that, the highest potential for new creative products is in small and medium-sized companies. The big ones, after arriving to the comfort zone produce more advertising and marketing than R & D. The big size international companies I know, only produce R & D and knowledge in their headquarters. This technology will reach its subsidiaries in less developed countries 5 to 10 years later.

2) HOW TO DEAL WITH THE BARRIERS AND ARRIVING TO NEW PRODUCTS

The main barriers mentioned by the companies are to do the engineering calculations of the conceptual project and the costs of the investment in laboratory tests.

About the engineering calculations, for developing electric products, the team shall be prepared, at minimum, to calculate things like:

- Temperature rise of components submitted to currents
- Forces and mechanical stresses during short circuits and structures to support them.
- Overpressures caused by internal arcs and supportability of structures
- Magnetic and electric fields near equipment and near substations
- Transients of voltages and currents in electric power circuits.
- Inductances, resistances and capacitances of conductor systems
- Supportability and time life of conductive and insulating materials to electric, mechanical and thermal stresses

It is also a must to understand the requirements of specification and testing in IEC standards like IEC 62271-200 , IEC 61439 , IEC 62271-307 , IEC 62271-100, IEC 61641, IEC TR 60890, IEC 61117, IEC 60865-1, IEC TR 60943.

If the team engineers, technicians and designers have reasonable fundamentals obtained in their regular formation courses it is easy, with short duration trainings, to prepare them to the calculations above.

About the costs of the investment in laboratory tests many things changed in the last years. Tests remain necessary as the past. High power and high voltage tests are inherently expensive because the installations used to do them are expensive. These last years I am passing again, as 35 years ago, the experience of being part of a team constructing a new big high power lab 2500 MVA, a High Voltage lab (class 550 kV) and a temperature rise lab (25 kA). The order of magnitude of an investment like this is around 100 million Euros

A test is considered expensive when the equipment fails and the test need to be repeated. When it is approved, I some way the test costs will be absorbed by the future users of the product.

The new thing about the investment in development and type tests is that nowadays it is possible to design equipment with a much lower probability of failures in the lab tests using cheap testing simulations. You simulate the tests alone, adjust your design for having approval in the tests and, after, go to the lab. Doing this way, the probability of failures during the real test become lower than 1% even using an optimized design for more severe test conditions.

For using software tools, it is necessary a small training. When I write, small I refer to some 4 to 10 days of work, depending of the skills of the trained person. This is not so much for a company wishing to grow based in solid fundamentals. Outsourcing companies to make the calculations is a management error and can be even more costly. The good strategy is to train your own team

Some 16 years ago, when I left the testing labs in which I worked during 25 years I started to develop a tool for testing simulation (SwitchgearDesign). The reason was exactly because I could not pay for expensive tests. Tools like this are essential for the R&D team. There is information about what is possible to do with it in the "Downloads" and other parts of the site <http://www.cognitor.com.br/en/site/>

Thank you very much for your attention

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In other languages

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Link para versão Portugues ** (link for version in Portuguese) <http://www.cognitor.com.br/PostImpactingPT.pdf>

If your company need mount and train a R&D team to develop new electric products we possibly can help you. In this case please write your needs to the email sergiofeitoza@cognitor.com.br

If you wish to speak with Sergio Feitoza, my Skype name is sergiofeitoza1. I can speak in English, Spanish and Portuguese. I can also understand well (and speak a little) French and Italian

My CV is here <http://www.cognitor.com.br/en/site/index.php?sec=1>

- Link with parts of the trainings applied by Sergio (in English, Spanish or Portuguese):

https://www.youtube.com/channel/UCyQtdE7dQTvsZPHBw3ostMg/videos?view=0&sort=dd&shelf_id=0

- Other LinkedIn posts by Sergio:

https://www.linkedin.com/today/author/0_0Qwvfip2RwUUnZw30ieO2m?trk=mp-reader-h

- **To do songs is more challenging (for an engineer) than doing engineering calculations**

In the vacant time of my electrical engineering activities I am a musician, composer, singer and writer. Here are some scenes of a recent show last November, 2016. Most of them are in Portuguese but there is one in English and another in Spanish

https://www.youtube.com/user/SergioFeitoza/videos?sort=dd&shelf_id=0&view=0