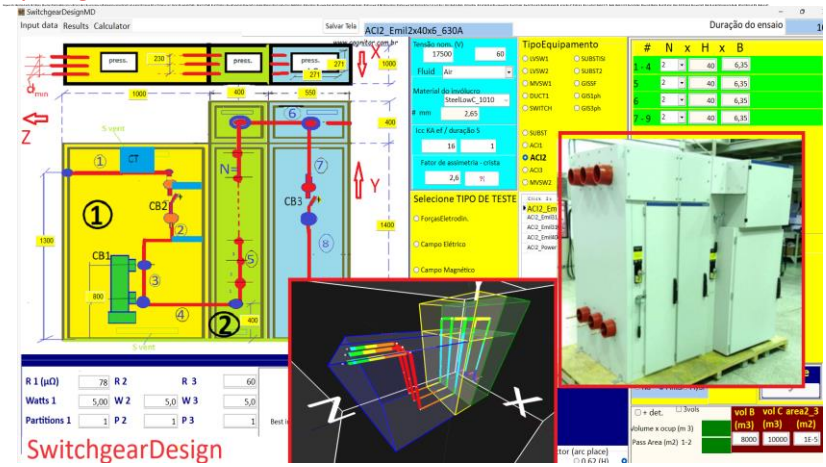
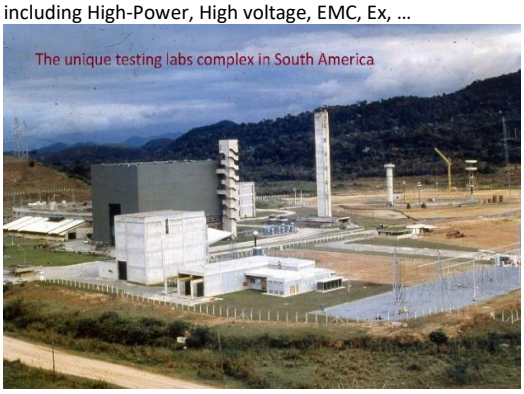
High-power (small) testing laboratory + R&D switchgear development services

A sustainable enterprise for developing countries.

By Sergio Feitoza Costa



Sergio Feitoza, author of this article, helped to design, construct operate and to manage this set of 14 testing labs. including High-Power, High voltage, EMC, Ex, …



1. **REASONS TO ENCOURAGE MORE EFFICIENT AND MATERIAL-SAVING ELECTRIC POWER PRODUCTS**

A growing electrical industry in developing countries like Brazil produces impacting results in development, employment & income. To maintain this industry growing depends much more on creativity and sound knowledge than significant investments. At a time when the global focus is on seeking more efficiency and drastically reducing environmental impacts, there are many opportunities for patents and true innovations. These initiatives will not come from large international manufacturers. They prefer to maintain existing lower-efficiency designs, which they sell all over the world. Leaving a comfort zone is not an easy task. This is clearly and well reflected in the IEC technical standards. They do not even mention or encourage saving materials and resources. Tell me just one that at least do this. Their focus is only on passing expensive tests.

I participated intensively in an entire process of to implement a relevant electric industry in Brazil, in the 80's to 90's. Nowadays, could be done better and faster in many parts of the World, especially Africa, Asia, and Latin America. The results in Brazil were very good, visible, and easily verifiable via web. Just compare the size and profile of the electric industry in the beginning of the 70's and now. There were very good results, from the technological improvement of products for substations to the excellent electrification program for areas without access to electricity.

The incipient electric industry of the 70's growed and became solid and competitive generating employment and development. A rich country like Brazil would go to the G7 – very fast – if invested much more in a higher level of education. This is our weak point. I wrote about this in recent book whose links are in the end.

About using the electrical industry as an instrument to bring development, we must remember that in most countries of the world it has been shown that the electric industry is the best organized area. In the case of Brazil, the catalyser was the creation of high power and high voltage testing laboratories and an electric energy research centre.

The world changed and to do something with similar effect today we should think about smaller scale testing laboratories, using less investment but with more innovative ideas like to mix this with testing simulations. The key is to be a financially sustainable business.

The path of the stones is to create a small electrical testing laboratory but doing more than regular testing services. The company would include, beyond the testing team, a team focused on R&D to develop innovations in substation equipment (60% testing team + 40% R&D team). The focus would be to help the electric industry manufacturers to

design and develop more efficient equipment with lower Kg/MVA (read Ref. [3] below). If this course of action is followed, the results should show up as an economically sustainable business in 3 to 5 years.

Most research centers and testing laboratories were built, around the world, in the 50s to 80s. They had the vision of motivating regional development. Few were created in the last 2 decades because, from the point of view of private investors, they are not the best investment for amounts like 20 to 100 million American Dolars. Some were closed because already fulfilled their original mission or did not percept the World changes. Others progressively faded away as they lost their drive to continue operating as a financially sustainable business.

About the strategy to operate the company, we could combine a group of seasoned experts (20%) with a group of professionals with a medium-few years' experience (50%) and a group of recent or soon-to-be university graduates (30%). Initially, "experienced" individuals would do R&D tasks. The "intermediate" group would be responsible for conducting the regular tests activities. Depending on the skills they displayed, members of the younger group category would actuate in either the testing or R&D groups. The labs that I managed in Brazil up to the end of the 90's worked more or less like this very successfully.

About the financing of the initial steps imagine that, in a certain region, 5 to 15 companies (manufacturers, certificators, universities,1 to 3 electric industry federations) come together to create a neutral 3rd part company. If it is well planned, sized, and managed, it is an interesting initiative from an economic point of view. The few world-wide laboratories that survive today live from the provision of testing services and need to have many employees because they are big installations. We are not proposing things like this. We are talking about some 1o to20 people, trained to be very well qualified. We are talking about investments of some 10 to 20 million American Dolars. A laboratory for 2500MVA tests is an investment like 100 million American dollars.

So, the central idea is to implement the construction of a small - medium-sized 3rd part laboratory. In addition to the conventional testing services the R&D team will provide support to manufacturers of substations and lines equipment and equipment certificators. A well-dimensioned laboratory, managed from the perspective of private companies, will immediately get a big market because (a) there is no or few availabilities of labs (b) the focus is to create conditions for the growth of an electric industry (c) the growth of the renewable energy market (d) big buyers like oil, gas and mining companies, needing to take care of the environmental image, will prefer to buy products with lower kg/MVA

2. WHAT and HOW TO DO IT?

The implementation of a 3rd part laboratory going beyond test services, additionally providing support to manufacturers for development of power products is a real innovation. If the team and installations are well dimensioned, and the lab is managed as a private company, will be a self-sustaining enterprise with the sale of testing services and R&D services.

Most of the medium-big labs, all over the world, still have a conservative view that "everything should be tested" and furthermore, that a third-party lab should not help manufacturers to develop products because would be conflicting with the interest of "doing neutral tests". These labs still think like 40 years ago and forget that more than 95% of their clients go to the lab only to have a test report in hands. There is no conflict in supporting manufacturers along developments.

An important new tool, for whom have limited financial resources for testing, is the use of low-cost testing simulations to develop products. I see in the working groups I participate in Cigrè and IEC that the major world-wide manufacturers use them intensively. However, the others, which would be the immediate beneficiaries – rarely know they exist. There are recent CIGRE brochures demonstrating applications and validations like CIGRE 602 (Internal Arc), 740 (Low-Cost Substations) and 830 (Temperature Rise). In IEC the openings for testing simulations were finally created as in IEC TR 62271-307. I am co-author of these Cigrè and IEC documents and participated of the WGs. The big manufacturers were there actively working.

3. THE SERVICES" IMPLEMENTATION

The focus is implementing a commercial venture with an acceptable return on investment for investors. In the feasibility study, it should be properly considered that the return on investment involve revenues from the sale of

tests, patents, and other R&D consequences as improvement of system quality indexes (see Ref. [4]). The enterprise will have two lines of action:

- A small - medium sized laboratory to carry out the high - power tests described below and,
- A parallel activity of "Support for development of equipment for substations" with worldwide operations, including lower-cost solutions to amplify the use of renewable energy. This market is not still explored by testing laboratories and may bring incomes even higher than the tests sales.

Direct business revenue will come from

(a) conducting conventional tests like in the list to follow,
(b) to provide, to manufacturers, technical support for the development of more efficient products,
(c) testing simulations and training to reduce development costs and
(d) neutral lectures, on behalf of manufacturers, on products that - clearly - help to improve energy efficiency.

Testing Laboratory: the main tests to be performed will be:

- Tests of short time current withstand and crest (short-circuit) up to 80 kAef - 1s
- Temperature rises to 10,000 A permanent on MV/LV.
- Low voltage internal arc (some)
- Low voltage breaking tests (and some for MV endurance)
- Dielectric tests up to medium voltage equipment.
- Remote viewing of tests like F.A.T.

For companies that show real interest in the idea I can provide information and expertise like:

- Economic technical feasibility studies and business plan
- Detailed market study
- Estimated implementation costs and future revenues
- Team size
- I have 45+ years' international experience in the subject.

- CV of the author https://www.cognitor.com.br/Curriculum.html
- Things the author helped to do: https://www.cognitor.com.br/HelpedToDo.pdf

---------- END OF THE ARTICLE ----------

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[2] **CIGRÈ BROCHURE 830 (2021)** – "SIMULATIONS FOR TEMPERATURE RISE CALCULATION". (Sergio Feitoza Costa is co-author)

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