



30 YEARS **REIVAX**

REIVAX
30 YEARS

controlling
energy, generating
development



Over 30 years controlling energy
and generating development...

Introduction

This book will tell you a bit more about the 30-year successful journey of an engineering company that could be considered one of the greatest in its area.

As soon as the engineer João Marcos Soares had an idea, he almost immediately received support from his colleagues in Eletrosul, Frederico Figueiredo and Fernando Pons, who were also engineers. The idea gained momentum and, in 1987, REIVAX Automação e Controle was founded. In the following year, Paulo Marcos Paiva, another engineer and former colleague from the electrical sector joined the team, followed by Nelson Zeni Jr, in 1998. All of them held great technical knowledge on power generation control.

REIVAX is proof that any established goals can be achieved when the journey is based on good, purposive ideals, such as hard work and determination. Those ideas served as the basis for REIVAX, which did not have great financial resources to rely on and a small 40 m² room. Nowadays, REIVAX has subsidiaries abroad and offers products and services to several countries.

A company that, since its very foundation, has been working towards its goals, officially stated when it established its quality standards (ISO 9001) regarding learning and applying technology to create solutions to the automation and control industry.

However, long before it became the journey of a company, it was a journey led by people who worked as entrepreneurs, people who worked and still work hard in this company as well as people who believed and still believe in this company like many of its partners, clients, suppliers, consultants, advisors and our friends do.



A technology company that could be considered one of the greatest in its area.

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Acknowledgements

Over the past 30 years in the history of REIVAX, countless people and companies have worked together in order to successfully honor our core-values, development, success, credibility and hard work.

It would take several pages to properly thank each person, but we have been doing so in one way or another over the years. For this reason, we selected a few of these people and companies to turn this book into something even better and thank them for their hard work.

Let us begin by our employees. Shareholders and directors have a lot to be thankful for when it comes to our employees, which are responsible for making REIVAX an ever-growing, inspiring company. It would be necessary to bring to the table a few hundreds of names, not to mention our current and former staff. That said, we asked Igor Ferreira Figueiredo, who has worked with us since the very beginning, to represent such a large team of amazing people.

We would like to thank CERTI Foundation and its founder, Professor Carlos Alberto Schneider, who has provided much support to REIVAX in the beginning when designing the Technology Businesses Incubator (IET). We would also like to thank Tony Chierighini for all the support during the time he was the manager in IET, which, since then, became the Advanced Technologies Development Center (CELTA).

In addition, we would like to thank the engineer João Xavier, who decided to work with us after retiring, in 1991. He offered great contributions based on his experience and charisma while working with our management team. For several years, we had the privilege to work with him, a role model for dedication and a noble human being as well.

We would like to thank the extraordinary work performed by our first engineering designers, Nilson Figueiredo, responsible for mechanical and hydraulic projects, and Álvaro Arioni, responsible for developing our first digital control systems (both hardware and software).

We would also like to thank the companies CESP and CEMIG for believing in our work, always based in quality and innovation, and using our first control systems (power system stabilizers as well as tension and speed controllers) in important hydroelectric power plants.

We would like to thank the engineers Nelson Martins, from CEPEL, and Hélio Valgas, from CEMIG, for all the support given to the Power Department, as we have worked together as partners in several technical papers in important seminars.

We would also like to thank our partners, Mike Walling, from REIVAX North America, and Fariborz Shokoofh, from REIVAX of Switzerland, for giving us so much support during this process of making a dream come true from the moment we said we wanted to expand our company beyond Latin America to work in the international market.

We would like to thank our former employees, partners, and advisors, who were kind enough to share their memories and statements with us for this book, making it something remarkable.

Statements Directors



João Marcos Castro Soares

"When I founded REIVAX in a small room at IET, in 1987, I already knew we would have to step up our game to compete with the best companies in the world. I did not imagine, back then, that Brazil would pose such a challenge and that it would be a hindering progress. For someone who lived his teenage years in the most radical time in recent history, the 1960s, and had chosen nationalism as a less dangerous ideology than those gathering followers back then, this was the biggest challenge posed to me: 'How could I keep supporting a country that did not support its people?' Regardless of those issues (which we hope to overcome soon), we are still keeping up with our goals in this company: learning and putting it to practice, and helping those who have worked with us to become better professionals and better human beings. Many others will come, and let's make sure they feel welcome!"



Fernando Happel Pons

"It is with great joy that I find REIVAX celebrating its 30-year journey, during which we were able to develop products and services with cutting-edge technology and innovation, to conquer markets abroad and specially to generating jobs, helping people to grow, mostly young professionals recently graduated from college and special courses. It is part of our company policies to accept challenges and find a solution in order to keep winning!"



Paulo Marcos Pinheiro de Paiva

"I undoubtedly feel honored for actively having taken part in writing REIVAX's history since the period before its creation, when it was still an idea inside another state company, and during the establishing and initial development phase until the 1990s, when many seemingly unsurmountable challenges were overcome and made way for new technological and market achievements. These were vital, clear achievements for companies in expansion throughout the American continent and abroad, as it still happens today. This is the reason why I feel like a true explorer. Together with João Marcos and Fernando Pons, the founders, we unveiled this project with a fearless attitude, leaving aside the stability and other perks of working for a state-owned company. We simply worked our way through it all. This is the main reason why we are now celebrating 30 years of history. We can surely say that during this journey, we have grown, learned, and lost a few hours of sleep working until late, but also crossed paths with a lot of brilliant people, partners, clients, and employees who have joined us and helped us achieve so many fantastic outcomes."



Nelson Zeni Junior

"A 30-year journey is not that simple to achieve, especially in our market, where half of the companies shut down in their first four years and more than a half shut down in 10 years. But we survived with pride, and we survived one of the greatest economic crises one has ever faced in its history. We have a lot to celebrate, despite still living a chaotic economic scenario. May we keep moving forward always growing ever more."

Statements Partners

In the end of the 1970s, when facing stability problems identified in the southern region system, there came the need to create the Coordinating Group for Interconnected Operations (GCOL) in the Southern Region. Such problems led to the propagation of power swings and the opening of the south/south-east bus ties, and considered the limiting of great charge blocks in the Southern Region as well as the fact that such system was normally importing power. We had a work group designed to perform field work in the sense it used trustworthy models of power generating unit controllers for the main power plants in the southern system in order to enable the development of electro-mechanic stability studies and, therefore, determine optimization parameters for such controllers and conceive other control actions.

As a representative for Eletrobrás, I have had the privilege of taking part in this work group, which consisted of engineers from CEEE, Eletrosul, COPEL, and CESP. We had engineers with a vast background on research as well as others whose area of expertise was site work. The result of such endeavor was undoubtedly extraordinary. Back then, I did not know that, but I believe that the main idea behind REIVAX was conceived in this period.

Nelson Zeni, João Marcos, Fernando Pons, Paulo Marcos dreamed of building something that could contribute to improving the dynamic performance of the National system. By the end of the 1980s, they had founded REIVAX. As the years went by, REIVAX emerged strong and grew fast, standing out in the market. Determination, constant hard work towards qualifying its own team and the always-present search for excellence in its products and engineering solutions over the years led the company to a higher level of credibility and a new level of challenges to be faced. Nowadays, REIVAX operates in several countries, having offices and partners in the US, Europe, and Asia.

During meetings and conversations with experts from abroad, we realized the level of importance REIVAX had achieved. To conclude, I can say that REIVAX is

an example of hard work and a reason for being proud. I am honored for being able to be a part of such a successful journey.

Paulo Gomes | ONS



*For us, REIVAX is a reason
for being proud.*

I would put on record that, to me, it was an honor taking part in as well as being chairman for REIVAX's board.

REIVAX is the result of dreams, perseverance, determination, and creative skills of its partners as well as a goal-oriented technical team committed to the company's goals.

REIVAX is a company that has thrived in a hostile market since its foundation, not to mention the strong competition both in the domestic and international markets, which are a common habitat for big, multinational corporations. REIVAX established itself in the domestic market even under a messy economy.

The company found a way to turn what could be seen as an unsurmountable obstacle into a reason to believe and overcome any obstacles that could have come up on the way.

Statements Partners

I do believe that the hard-earned wisdom during the first turbulent 30 years made REIVAX a solid company and inspired it to search for constant self-improvement.

I congratulate the shareholders, directors, employees, and all those who, like me, had the privilege to contribute to what is a success case today.

Congratulations, REIVAX.
Yours truly,

João Alberto da Silva | Former Director

“

REIVAX is the result of dreams, perseverance, determination and creative skills of its partners.

I would like to share some personal memories as we celebrate REIVAX's 30 years of presenting quality solutions on automation and control for the electric power industry, facing (and overcoming) obstacles, innovating and operating with ethic and commitment to the job. As an electrical engineer, I have worked in several hydroelectric power plants as a site engineer and as a back-end engineer. This has granted me the privilege to be one of the first users of REIVAX's integrated systems for excitation and speed governors, the well-known RTVX.

These microprocessed regulators, both integrated and discrete separate, replaced the old ones commonly used in the 1970s and before. This enhanced the work of controllable variables, reducing problems regarding unavailability and, thus, improving service quality and ensuring safety to the interconnected power system.

REIVAX has always been a renowned, solid company in the field of automation and control. As I see it, it is also a company ahead of its time.

By taking all of that into account as well as REIVAX's pioneering nature, I would like to join the other partners and the board of this company to celebrate this important event, congratulating all of you involved for such a beautiful, successful journey. I wish you all many more years of success and prosperity!

Juarez Emilio Moehlecke | Ciclo 365 - Solar Energy Company

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REIVAX has always been a renowned, solid company in the field of automation and control. As I see it, it is also a company ahead of its time.

The History of Electric Power Control

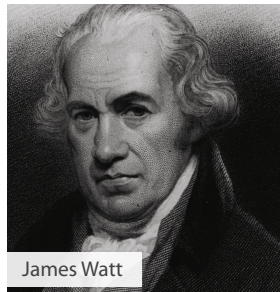
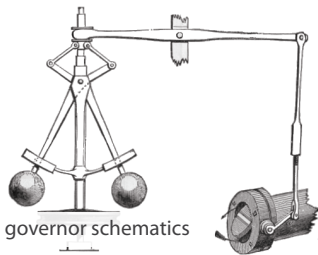
The History of Control

The history of control tells us that the construction of control systems dates centuries ago as a project designed by Heron of Alexandria in order to open and close gates of temples.

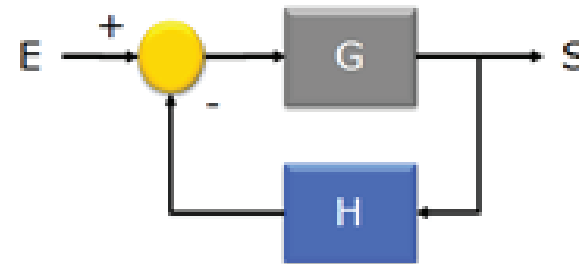
The control systems, then, were seen from a more analytical point of view by the 19th century.

By the end of the 18th century, with the creation of the steam engine speed control, designed by James Watt, and the beginning of the industrial revolution (which used machines in a much larger scale), there was a need to establish a stricter analysis regarding Control Systems.

Flyball Governor (Centrifugal Regulator):



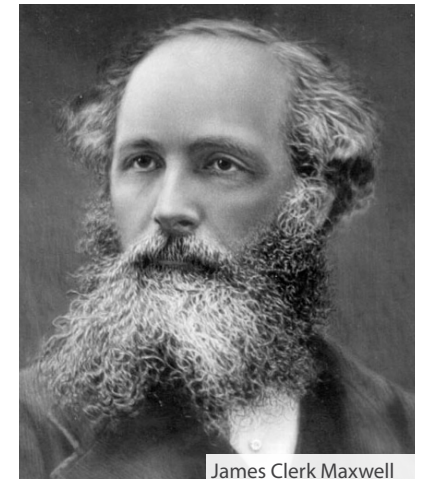
Feedback, the idea:



The English had polished the flyball mechanism to the point of degrading damping for the grade control with the goal of reducing loss by friction in the mechanism. After such "improvement" (which aimed at increasing efficiency), a number of machines entered into a permanent oscillation state and there was no proper explanation. The issue was brought to James Clerk Maxwell, who balanced the calculations and found a solution. Such work marks the birth of control as a subject of science.

Nearly 30 years after the work performed by Maxwell, Routh and Hurwitz stood out by publishing their own individual stability analysis methods. During the 1930s, the work carried out by researchers in Bell (such as Bode, Nyquist, and Black) resulted in the development of the control theory. It also led to the registry of trade patents for the first amplifier working on a feedback system (Black started working on it in 1923).

By the end of the 1940s, Evan's Root Locus Method Theory came around as a powerful tool for analysis and designing procedures in control systems.



But in the 1950s, the researches carried out by La Salle and Bellman were the ones under the spotlight.

During the 1960s, the control theory faced quick development, especially because electronics evolved at a faster pace, enabling the outlining of more complex control laws. Nowadays, control systems are a part of our lives and there are clear examples of this in our daily lives, such as the fridge, the air conditioner, the digital tuning system in radio and TVs, fuel systems, among others.

Control in the Electrical System

In electrical power systems, the need to have a control system is clear in several levels: generation, transmission, and distribution.

Particularly in generation and especially in excitation control, the technological development became clear and electronics enabled the replacement of old philosophies that included electro-mechanic power regulators.

Digital Controllers

Nowadays, fully digital controllers based on microprocessors, microcontrollers and digital signal processors are now part of our reality. Control laws which could not be implemented at the time due to hardware deficiencies now are perfectly usable.

Control in Electric Power Distribution

The electrical power system has control loops at several levels. In distribution, there are voltage regulators in a closed loop operating to correct voltage deviations by replacing tapes in autotransformers. This kind of correction procedure takes time since it occurs by relying on charges coming from a motor. In order to avoid wearing in the tips (which shall be analyzed after 100.000 replacements), the tape replacement per minute must be limited (from 0.5 to 4 replacements/min). Therefore, it can be concluded that such control corrects the voltage in a steady state. Each type of system allows the voltage remote control since the regulator has a line drop compensation system. Such type of regulator can also be found in the transmission system. In this case, it can be used to optimize reactive power flow into the system and specially to correct voltage in electric loads supplied by radial systems.

Control in Electric Power Transmission

In transmission systems, synchronous compensators can be shown as control devices as they act as a source of reactive power injection or absorption, according to a current/voltage law. Due to the great discoveries in voltage electronics, synchronous compensators are constantly being replaced by static compensators.

Furthermore, in the transmission system a bit more, we can mention direct current transmission since it has rectifiers and inverters based on power electronics such as the back-to-back converters in Itaipu. Therefore, it holds a large number of controls, which can be used to improve the dynamic stability in an electric power system through convenient modulation under the controllable variables.

The biggest developments in power electronics applied to power systems are currently being used in control systems for substations. These control systems are called FACTS (Flexible AC Transmission Systems). Such devices consist of the combination of parallel and in-series elements (capacitors and inductors),

which, as determined by specific control laws, allow great improvement in performance of the transmission system. The FACTS elements enable a better reactive flow through the transmission system under proper control of the line reactivity in which they are inserted. These may also avoid problems related to subsynchronous resonance and other usual dynamic problems related to the electric power system.

Control in Electric Power Generation

The biggest number of control devices (and certainly the most important ones) are present in generation. According to two basic factors to be controlled (voltage and frequency), several other control actions emerge, working according to a three-level hierarchy.

According to the speed and power (or opening) measurements, speed regulators establish a control relation for a turbine in steady state, which has been named as “droop”. There are a number of speed control-related philosophies, but all of them aim at establishing a linear relation between speed and power on steady state. As a result, speed drops as power generation increases. This relation is only valid if there is no action on the control references, thus allowing the proper operation of the machine in the power system. Also, as all machines in a system must have the same level of droop, this contributes to the absorption of variations in the electrical loads by all machines in a proportional pattern back to their nominal power.

Primary, Secondary, And Tertiary Control

The speed regulator performs primary regulation functions. In several power plants, there is a secondary regulation called “joint load control”. The objective of this control loop is to transform a number of units in the power plants into

an “equivalent machine” from the point of view of the speed control. The “joint”, or joint control, regulates the parallel line frequency or balances the active power inside the generating units. As a result, the procedure operates upon one sole reference so as to handle the electrical load and the power plant, or the machines operating in “joint” mode as one sole machine.

There is still a third control loop operating on primary machines: the Generating Automatic Control (GAC). GAC is a centralized control aiming at regulating frequencies and keeping the power exchange between several areas in the electrical system closer to the number established.

Input variables are programmed and verified, as well as the frequency from a representative line in the system. GAC operates by balancing power in the power plants remotely via a communication link by action on the “joint control” reference (in the power plants) or directly on the speed regulators references.

Excitation systems operate on the field winding generators. Not only they perform voltage regulation, but they also carry out other tasks. Such tasks include improving the regulator for high-voltage lines; enabling a stable parallel between the generating units; block machine operation in dangerous regions, something that could cause loss of synchronism or rotor overcurrent; balancing power swings resulting from electro mechanics sources in the electrical power system. In order to perform such functions, the excitation system must measure several factors, such as voltage, active and reactive currents, electrical power, frequency deviation etc.

The excitation system operates on only one machine. There is the relative load joint control operating on the excitation system in a similar way to the electrical load joint control, regulating the high voltage line in the power plant beyond balancing reactive electrical loads between several operating machines. Generally speaking, primary loops can be taken as the fastest for both speed control and voltage control as the intermediary loops are used by them. The secondary and tertiary controls are slower and are used to perform corrections in “steady state”.

Up to five different controllers can operate on the same generating unit, although a sixth control loop is starting to be implemented worldwide. This sixth control loop works as a centralized clearing for reactive electrical load or tertiary voltage control. This fact is related to the intrinsic characteristics of the power system, such as the non-linearities (generators and transformers saturation, phasor equations of the grade etc.), topology variations (modifications in the system due to the opening of lines, generators removal etc.), uncertainties regarding electrical loads, different generation and transmission setups, and non-linearities related to turbines and generators. These elements result in a complex issue, which requires a lot of time and funding in human resources and materials in order to develop a solution.

Electric Power

Electric power is a vital requirement for the development of any country. It is one of the basic needs to enable industries to develop and, overall, to improve quality of life for the general population.

As the electric power market grows, investments in power stations and their transmission and distribution capabilities become a reality.

Electrical power is an ordinate form of energy, it can be obtained as a primary source for a particular moment or circumstance.

It turns out to be crucial to perform proper control of electrical power regarding what is related to the speed control as well as the excitation control. This can be seen in several benefits among which the most important are: improvement of the electric energy offered to the customers and increase in credibility due to the fact that we can offer greater integrity in our electrical power system in case of severe disturbances. On the other hand, the proper operation of generating control equipment helps us uphold generation itself by avoiding operating in prohibitive conditions.

Adapted by: Cristiano Bühler

REIVAX



REIVAX started its activities in April, 1987, and took very little time to establish itself as one of the greatest companies in systems and solutions for power generation control. Nowadays, REIVAX is a leading company in modernization of control systems for power plants all over the world.

With headquarters in Canada, Switzerland and Brazil, REIVAX is a multinational company that has its own technology and develops power generation control systems for the most demanding and challenging applications around the globe.

Ahead of a 30-year journey in this market, REIVAX was the pioneering company in digital controllers, power system stabilizers and integrated voltage and speed micro-processed controllers.

The main challenge is to seek innovating and trustworthy solutions proving its commitment to the success of the customers.

*We believe that controlling **energy** generates **development**.*



Strategic Policies

Mission

Developing profitable solutions for electric power control and automation, creating sustainable results for our clients and for society.

Business Vision

To be a world reference in electric power control and automation solutions.

Values

Focus on results

Continuously obtaining results for the company as well as its employees and clients.

Quality

Committing to quality standards when it comes to products and services in order to make sure our customers are always satisfied.

Innovation

Identifying opportunities and developing new solutions that may generate results.

Ethics

Acting with honesty and respect, both in internal and external relations.

Professional Behavior

Acting in an efficient, responsible manner and aiming at reaching results through a committed, focused behavior.

Timeline



1987

- REIVAX was born out of the courage of engineers from the Automation and Control sector, in the Hydraulic Generation Department of Eletrosul. They left behind the stability of a job in a state-owned company to start a new company.



- How was the name chosen?** It started out as a joke between João and Fernando. João remembered a medication called “Xavier” regulator, to which Fernando replied, “That name already exists, but what if we invert it and turn it into REIVAX Regulator?” The name stuck with them and ended up being an accurate tribute to the engineer João Xavier, João’s father, who supported them in starting a company and, after retiring from Eletrosul, worked with them.

- April 1st | REIVAX Automação e Controle foundation, based in ACATE, in a rented room at the IET Center, coordinated by CERTI Foundation / UFSC.

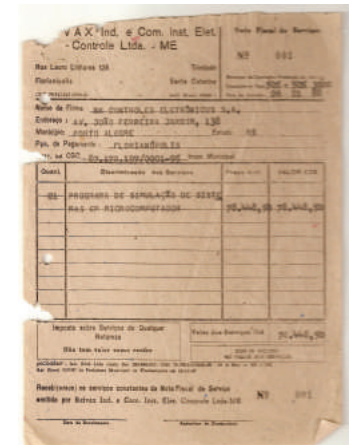
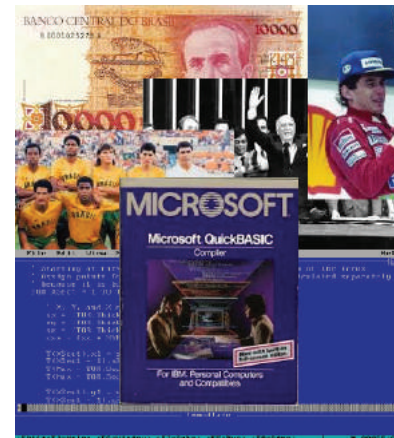


- Company’s Initial Formation: Engineer João Marcos Soares, Engineer Fernando Pons, and Engineer Frederico Figueiredo (support from engineer João Xavier).



1988

- SSD - Software for Dynamic Systems Simulation in QuickBasic (Recipe No. 001 for BK Nobreaks).



- Admittance of the engineer Paulo Marcos Paiva as a partner, who had been in charge of the Automation and Control Department at Eletrosul, besides having worked at CEMIG and ENGEVIX.



- Control system for a Kramer Cascade | COEMSA.



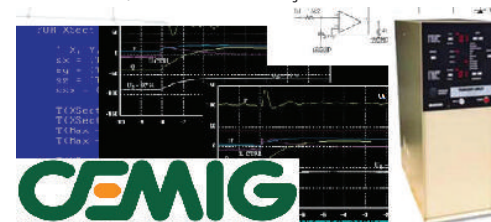
Kramer Cascade: a complex control system for a Generating Group in the testing chamber for large transformers, for the company COEMSA, in Canoas, State of Rio Grande do Sul.

1989 | 1990

- First voltage regulators and speed regulators (with proportional valve) – CESP – HPP Jupiá, receiving support from the mechanic Nilson Figueiredo. During the bid process, one of the other companies' representative said: "For this final bid, you will starve to death!" This "curse" did not work on us and, a few years later, a well-known regulators manufacturer shut down.



- First Power System Stabilizer (PSS) model IEEE 2A manufactured (PWX300 analogic, sold to CEMIG, HPP Emborcação e HPP São Simão).



1991 | 1992

- When the first digital speed controllers were manufactured:
Technology: Model of microcontrollers Intel MCS 96 16bits. The basis for the first line of products is laid down and it is based in rack and wire wrap;
RTX: Voltage Regulator;
RVX: Speed Regulator;
PWX: Power Stabilizer;
AQX: Hardware used for data gathering and debugging in real time based on a IOs ADA part.

- 1st exporting batch to Colombia.



1993

- First digital speed regulator installed in Brazil, at CEMIG - HPP Salto Grande. It still works today and made way for a change in the market.



1994

- Development of the DA16 board, resulting in the new AQX500.



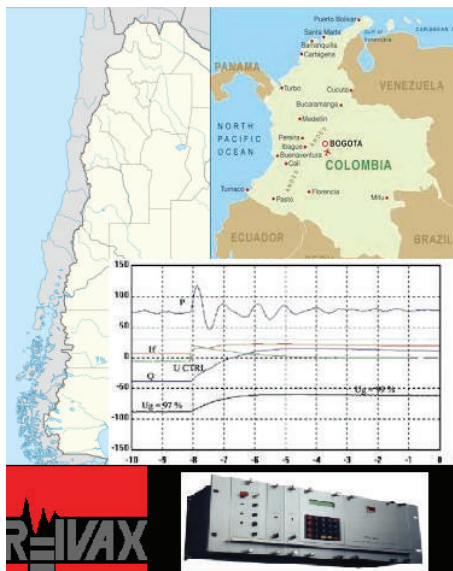
- REIVAX's participation in an event for the electric power industry (SEPOPE, sponsored by Itaipu, in Foz do Iguaçu/Brazil). Several local authorities and renowned professionals.



- First digital voltage regulators:
COELBA - HPP Alto Fêmeas
CELESC - SHP Celso Ramos



- The first IEEE PSS2B stabilizers made in Brazil that were installed in Colombia and in Argentina: PWX500.



1995 | 1996

- Software developing for debugging and monitoring:
SMO: Software for signal delivery setup;
SVC: Software for curve display;
SMX: Deviation registry system with events synchronized by GPS.



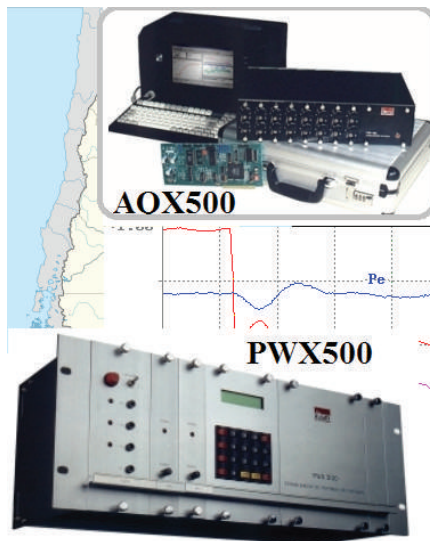
- 1st exporting batch to Argentina and Paraguay.



- Change of headquarters.



- Stabilization of the whole electric power system in Argentina by using the PSS PWX500 model and monitoring by using the model AQX500.



1997

- 1st exporting batch to Uruguay.



1998

- Admittance of the engineer Nelson Zeni as a director. In 2002, he became a partner and, like the other shareholders, Nelson had also worked in the field of control and automation for the electric power industry.



1999

- Approval of programmable voltage regulators based on the CPX2000 model from the 16bits microcontrollers series. CPU 32bits 386, 486, 586, Pentium or similar; Serial Comm 232, 485, and Ethernet; Modbus Protocol; Coding in Windows with its own tool: SEC.



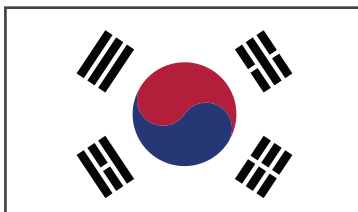
- PWX600: A new version of the power stabilizer including all new features of the technology applied to the CPX2000 model, allowing users to have connectivity, coding and development for new protocols, such as remote monitoring.



- Processes certified by ISO9001 quality standards.

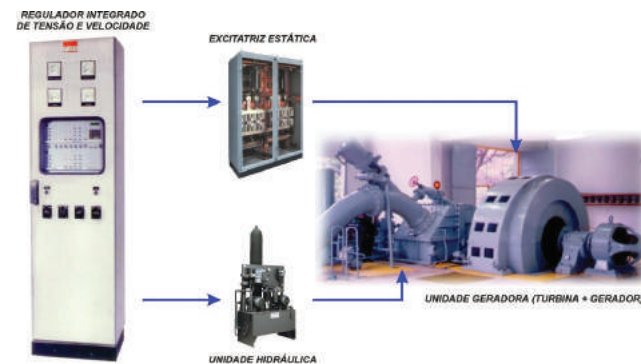


- 1st exporting batch to South Korea.



- Presentations at the IEEE Panel Sessions, in New York (USA) and Edmonton (Canada) about the stabilization project for the Argentinian electric power system.

- First RTV integrated regulators based on the CPX2000 model being supplied, RTVX100 - SHP Piçarrão, CEMIG.



2000

- 1st exporting batch to Bolivia and Guatemala.

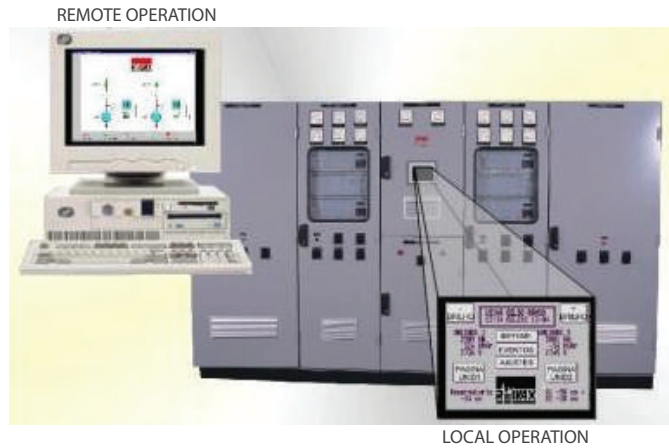


2001

- 1st exporting batch to Costa Rica.



- HMI's for local and remote operation.



2002

- Creation of the Research and Development Department (R&D) directly linked to the Company's board.

Rodrigo Mussatto

De: Fernando H. Pons
 Enviado em: quinta-feira, 8 de agosto de 2002 19:06
 Para: all@reivax.com.br
 Assunto: Pesquisa & Desenvolvimento

MEMORANDO INTERNO

Data: 08.08.02 Ref.: MEM-ADM - 0037/2002

De: DIRETORIA

Para: Todos os Colaboradores

Ref.: Pesquisa & Desenvolvimento

Considerando a importância estratégica que as atividades de desenvolvimento tem em uma empresa de base tecnológica como a nossa e sua vinculação com as necessidades de mercado, a Diretoria resolveu que a área de desenvolvimento do Departamento de Engenharia estará, a partir desta data, vinculada diretamente a ela.

Esta área passará a ser denominada de Pesquisa & Desenvolvimento e será gerenciada pelo Diretor Nelson Zeni Jr., que continuará a exercer cumulativamente a Diretoria Comercial.

Atenciosamente,

Fernando Happel Pons
 Diretor

2003

- Advanced serial communication protocol released, such as DNP and IEC 61870-5-101. Considering the model Modbus, already available, CPX2000 becomes a highly-interoperable platform.



IEC60870-5
 Transmission Protocol



- RTX1000

Low-cost power regulators for small power plants, the SHPs. Based on DSP technology.



- REIVAX builds and moves to its own headquarters.



- 1st exporting batch to Peru.



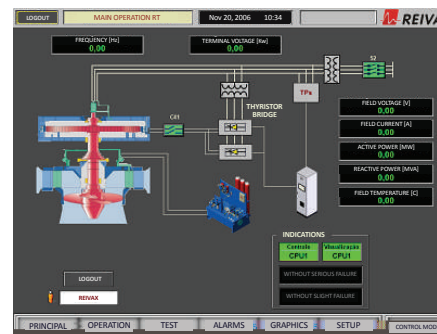
2004

- 1st exporting batch to Ecuador and Honduras



2005

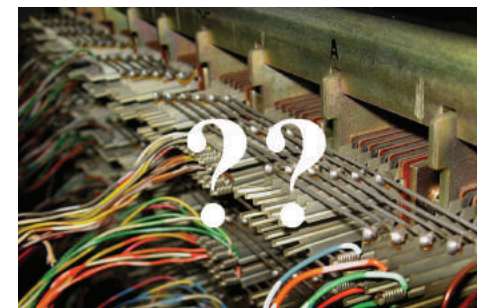
- HMI's Touch Screen Panel



- Also aiming at RTX1000's low cost, we created the speed governor RVX1000.



- The challenge to replace the whole product platform from REIVAX in terms of rack structure and wire wrap IOs by using interconnected modules in an industrial communication network.



- 1st exporting batch to El Salvador and Angola.



2006 | 2009

- 1st exporting batch to Chile.



- Release of initial version of the regulators with fieldbus and distributed I/O.



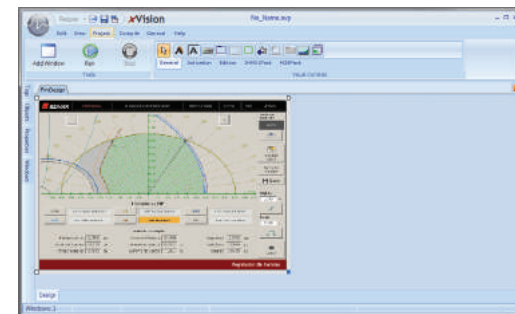
- 1st exporting batch to the United Arab Emirates.



- Installation of the first Control and Automation Integrated Systems (RTVAX).



- Use of xVision (a software developed by REIVAX) as a software platform for a local HMI.



- 1st exporting Batch to India and Puerto Rico.

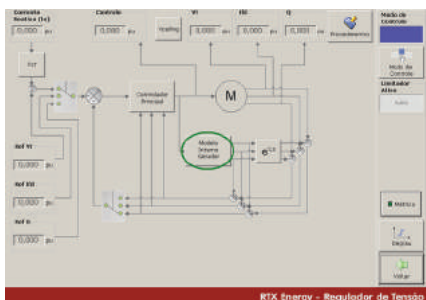


- Start of the supply of power drives for controlling field windings. So, the series DRV01, DRV02, and DRV03 are created.

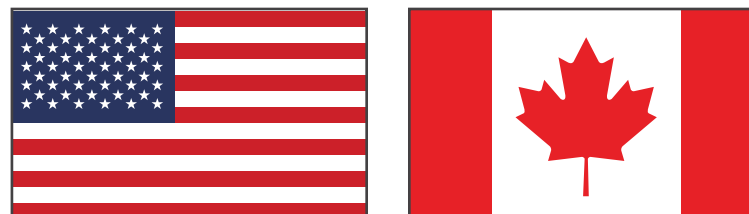


2010 | 2011

- Development of advanced technology for power regulators (Predictive Control). Field tests carried out successfully!



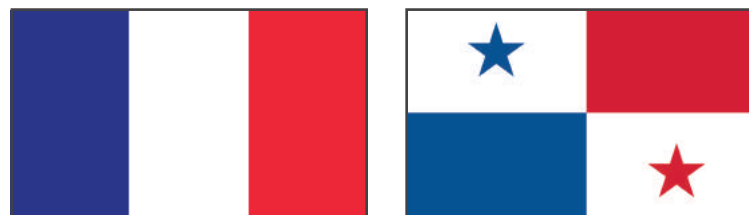
- Opening of the branch **REIVAX North America - RNA**



- 1st exporting batch to Mexico and Dominican Republic.

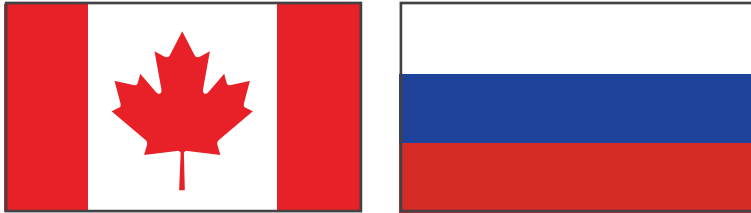


- 1st exporting batch to France and Panama.

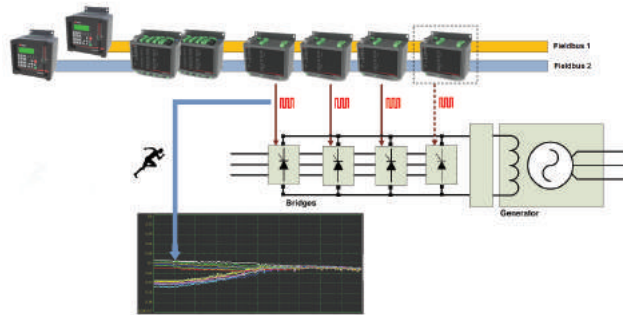


2012 | 2013

- 1st exporting batch to Canada and Russia.



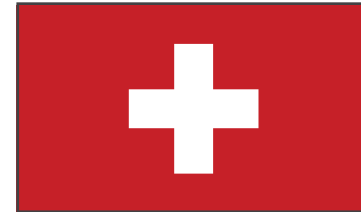
- Balancing of multiple bridges currents by using individual thyristors.



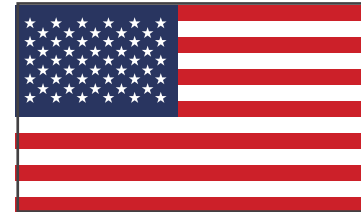
- Release of second version of the regulators with fieldbus and distributed I/O (G2). Main controller for the Power solution: CPX05. Beyond modules, a new generation of SEC and FAP has been used in this platform.



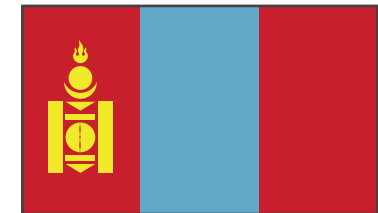
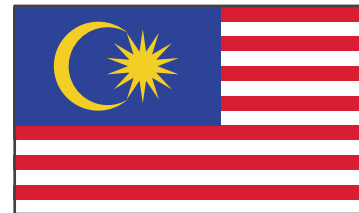
- Opening of the branch **REIVAX of Switzerland - RoS.**



- 1st exporting batch to the USA - Arnold Engineering Development Complex.



- 1st exporting batch to Malaysia and Mongolia.



- Inclusion of the MMS protocol of the IEC61850.



2014 | 2016

- 1st exporting batch to Singapore, Thailand, Indonesia and Turkey.



And for the next 30 years...

Our goal is to keep learning and applying new technologies in order to keep innovating even more and, thus, become an international reference in control and automation solutions for electric power. As a result, we aim at developing and commercializing solutions, generating sustainable results for customers and society.

And much more...

REIVAX NORTH AMERICA | RNA

In 2008, REIVAX performed a study in order to verify how the company could increase its exportations. The project's name was Start Export and was carried out with the help and assistance of FIESC, aiming at analyzing the company and determining a new market to which it could export its product, once REIVAX was already a renowned exporting company. Based on the results coming from this study, it was noted that the market that, back then, could offer a better opportunity of expansion was the North American market. In that same year, in Sacramento, California, REIVAX took part at the greatest conference focused on the hydro power market in the US: the HydroVision International. The event is annually held in different cities and gathers suppliers, developers and especially renowned leaders and companies from the industry.



In the next year, concluding the Project and the decision that REIVAX would like to sell its products to the North American market, the company structured itself and started taking part in the first public bids with the help of a local contractor. Then, the first business trips started happening for prospecting customers, resulting in the launching of the branch REIVAX North America, LLC

founded in March 1, 2010, in Doral, Florida. The branch opening did not go unnoticed. It was announced at Hydro Review, a specialized magazine in the field of electric power industry. This caused a positive reaction from businesspersons, who praised the bravery and pioneering spirit of taking such action.

Our work kept on and, in 2011, Mike Wallin joined us as a local partner, sharing great market knowledge and expertise obtained during his 20 years working in the field of excitation systems for ABB Canada, where he was vice-president. REIVAX, then, transferred its headquarters to Montreal, in Quebec, Canada, and it is still there until today. It became REIVAX North America, Inc, a multinational company.

Marketing and sales actions increased, including Formula Indy races, sponsored during the APEX period.

It was just in 2012 that an advertisement published in Hydro Review showed results, as someone called our brand-new toll free number 877-7- REIVAX, and asked us about the chance of developing an excitation system for a project in British Columbia, Canada. The project was called Volcano Creek and became our first commissioned system in the North American market.

■ Brazil's Reivax launches U.S. branch
 Reivax, a Brazil-based firm that provides automation and control technology for hydropower and other industries, announced the launch of Florida-based Reivax North America LLC.

Initially, the company's first North America location will provide business sales support and sales promotion for customers in Mexico, the United States and Canada, Reivax reported.

Reivax Automation and Control recently was awarded a contract with Endesa Chile for the modernization of the excitation systems and speed governor control of five hydro plants operated by the Chilean group.

With its own department of Research and Development, Reivax has teams specializing in hardware design, software design and system integration.

■ COMPANY NEWS ■ CONTRACT AWARD ■ ONLY

10 HRW / July 2010

REIVAX

Reivax North America, LLC
 Excitation Systems
 Speed Governors
 Power System Stabilizers
 Integrated Excitation & Governor Control

2315 NW 107th Avenue Toll Free: 1-877-7-REIVAX
 Doral, FL - 33172 contact@reivax.com
 Phone: 305-600-2232 www.reivax.com

But we were craving for more: We still needed a sale case that could provide us a reference and open the market with the help of two major US government agencies, the USACE (United States of America Corps of Engineering) and the USBR (United States Bureau of Reclamation), which, together, control nearly half of the hydraulic generation in the US. The opportunity came around in 2013 with a project to produce 18 excitation systems to the biggest technological development complex for aeronautical tests and simulators in the world: the AEDC (Arnold Engineering Development Complex), which is directly linked to the US Air Force. Being successful in this project was the key to open many doors. First of all, we stood out among tough competition with the biggest companies in this industry by providing 4 systems, which were tested and approved with distinction. This caused the client to negotiate directly with us, without the need to dispute the bid with other companies and assuring a project consisting of 14 systems in the following year.



REIVAX company provides Voltage Regulators for U.S. Air Force

The company REIVAX, which develops systems and solutions for the control of power generation, has just signed a contract for supply of voltage regulators for the U.S. Air Force.

We are proud to say that, after nearly 10 years of hard work and dedication from our team, REIVAX North America has already installed over 70 Unit in

North America and is closer to installing over 100 commissioned systems very soon. It is surely a fair reason for celebrating these 30 years. Somehow, we made it.

Writer: Alexandre Augusto Benitti

Statements RNA

In the autumn of 2010, I received a phone call from Paulo Marcos. He said he was working for a company called REIVAX from Brazil. I frequently get scam phone calls from different countries from people trying to obtain bank information, so I must say I was somewhat sceptical as I did not recall hearing about a company called REIVAX. Little did I know at that time, how much the call would mean to me.

After doing some research on the company I decided to accept an offer to come to Florianopolis to learn more about the Company, to see the Products and to meet with Nelson, Fernando, Joao and Paulo to discuss a possible cooperation. What struck me the most during my visit was the friendliness and honesty of the people I met. While I did not know much of the Product at the time, I did notice that the developed Technology looked very interesting and I could envision many good applications for the Technology. And so it started, I agreed to join REIVAX and after some weeks (or months...) of discussions a contract was signed and the work could get started.



Back then, I could not have possibly imagined how much that call would mean to me.

From a blank sheet of paper, the RNA footprint was laid out with intended work to be done in Brazil and what to do in North America. A service structure was created, using 3rd party contractors and the company was registered and an investment was made by the shareholders into the company. Then the tough work started. I visited maybe 30 different customers in the US and Canada and presented our capabilities and also consulted their input. During this process, I like to thank Alex for his great support on the sales side and Henrique for his tremendous support to implement the functionality requested by our north american customers and for the support during the certification of RTX Power with Kestrel Power.

On Oct 24th, 2012 it happened ! We received our first Purchase Order for \$381,018.00 CAD for two (2) excitation systems. It was good that we had plenty of time to design and manufacture these units, because we had our problems... In fact during the FAT we encountered an incredibly difficult problem, which still today remains a mystery. However, a "patch" solution was found. After many laughs and tears... we were able to deliver the first REIVAX excitation system in North America, which became a very important reference, as no one likes to "buy the first one".

After much hard work, after very long days (and nights), a 2nd Purchase Order was received from AEDC for about 3,100,000.00 USD to deliver, install and commission eighteen (18) static excitation systems. When this order was received, I had some doubts, as RNA at this time only consisted of myself and Harrieth, who was working 2 days a week. However, with great help from REIVAX S/A personnel, Murilo, Jonatan, Adelson, Henrique and many others we were able together to deliver and commission the project to the customers full satisfaction. In fact, as a result we received another small order through Siemens from AEDC this year and I received a phone call yesterday that we might be receiving an order for another eight (8) static excitation systems for AEDC as well.

At this time, RNA was still being operated from a coffee shop, most of the time Starbucks :). With the AEDC project I decided it was time to get an office space, about 3m x 3m, which we shared for 3 people.

Over the last few years, the company has continued to grow, and I have had the great pleasure to spend time with some incredibly talented people from REIVAX S/A and RNA and also many great customers (and a few difficult ones as well. Murilo knows which ones I mean..). While there has been many times when I was wondering if I was on the right path during tough times, I never gave up and I never stopped believing in the people that was supporting the business.

To conclude, I am very happy to be part of the REIVAX family, and on a day-to-day basis have a chance to spend time, and interact with my incredible fellow colleagues. I foresee a great future for REIVAX and it's employees and I look forward to work hard with everyone to change the world of Control and Automation for the Power Generation Industry.

On behalf of Harrieth, Peter, Mark, Marcos, Paola, Thiago, Adrian and myself we wish everyone at REIVAX S/A a great 30 year anniversary !!!

Mike Wallin | CEO REIVAX North America inc.

“

We were able to deliver the first REIVAX excitation system in North America, which, then, became a very important reference.

REIVAX of SWITZERLAND | RoS

On December 1, 2013, during the visit made by Mr. Fari Shokoofh to Florianopolis, we officially launched REIVAX of Switzerland AG (RoS). Fari was already close to the company's directors. A senior executive who came and shared his knowledge on the excitation business, acquired in over 30 years. He then became a partner in this new, bold endeavor.



RoS opening in December, 2013

But something had already happened before the admittance of Mr. Fari, when REIVAX's products became popular in the North American market, making way for us towards Europe, Africa, and Asia.

In 2011, we signed a deal to sell products to Jeumont Electric in France, with which we temporarily worked on the supply

project for submarines for Brazil Marine Corps. In June 2013, while still in planning phase and preparatory activities, RoS started negotiations with a new partner in Singapore. While discussing the first quote presented, we signed the first deal with them, greatly celebrated. It reassured our business potential.

Then by the end of 2013, RoS started its operations in full mode. In 2014, RoS moved its headquarters to Baden, Aargou, Switzerland, where its quality center is also located.

From the day of its official launching, RoS was responsible for managing contacts with clients and quickly managed to bring in



Central Hidrochicapa, Angola



RoS headquarters, in Baden

new ones, establishing a commercial network with new partners and integrators who had visited our main headquarters and, nowadays, use our products in different countries.



Excitation system assembled in India with REIVAX controllers.

In 2015, we went to China and signed a deal to sell 22 speed governors to Jirau with Dong Fang and ESBR (Energias Sustentáveis do Brasil). One of REIVAX's most successful projects and what came to be an international case of success on development of adaptive control technology, on the biggest bulb-type turbines in the world.



Working site at Central La Mina Chile

In 2016, we continued working with marketing and bringing in new clients. RoS attended for the first time at Power Gen Europe, an important electric power trade show in Milan, Italy.

We also developed the capability to assemble panels in Switzerland, India, and Singapore. New orders kept coming in and RoS AG is still going hard towards establishing itself as an international leading company, with more than 50 systems all over Asia, Africa, and Europe (including excitation systems, speed governors and integrated systems).

With representation and strategic partners in over 10 countries in 4 continents, the future is bright.

Writer: Alexandre Augusto Benitti



Speed regulator UG33 | Jirau



Statements RoS

It was the year 2000 and I was running ABB's excitation business in Turgi, Switzerland, when our colleagues in Brazil complained that a small company, called Reivax, has made their life very difficult.

We visited Reivax in Florianopolis several times, with the aim of acquisition. I noticed an agile company with good products and a deep knowledge on technical as well as on local market with an army of 150 engineers all dedicated only to excitation business. This is not small, I do not believe any of large players had more people dedicated to excitation business.

However, our liaison did not give fruit to any party except that later Reivax could engage Mike Wallin and myself.

Nonetheless, our first visit did not show much, but, later, REIVAX united Mike Wallin and me.



What I found was a quick company offering good products and holding deep technical knowledge.

In 2013 Reivax decided to start their cooperation with myself in Switzerland and the aim was to cover the market of the rest of the world from Switzerland. That is, North American market was covered by Mike and Latin America by Brazil and the rest would be covered by Switzerland. Thanks to Paulo Marcos Paiva's support, in November of the same year I could register the company in Switzerland and in January 2014 we announced the birth of REIVAX of Switzerland and started.

In 2015 we could secure Jirau project with 22 Speed Governors and since we have more than 10 systems installed in Indonesia, sold over 50 small units in

India and have extended our installed base to Turkey, Malaysia, Indonesia, Thailand, Sri Lanka, Vietnam, Bangladesh, Pakistan and France.

In 2016 we could assemble and test the first system made in Switzerland, thanks to Luca Federli and Brazilian friends supporting us.

Now, I must admit that I am enjoying the very support and kindness of my Brazilian colleagues. I noticed that Brazilians are very kind and friendly and I always attributed that to the generosity of the nature there. Herewith I shall thank the full support of Alex Benitti, Fernando Amorim da Silveira, Thiago Kleis Pereira, Cristiano Buhler and Joenio Costa da Silva Junior. Joenio, in addition of being a very pleasant person to work with, has saved our life in a few occasions.

Luca Fedeli and myself wish everyone at REIVAX S/A a great 30 years anniversary.

Fariborz Shokoofh | CEO REIVAX of Switzerland AG

**When memories
become History...**

The Golden Goose

In 1988, the basic ideas that would be the basis for our power system stabilizer (PSS) were already established, as described in an article we presented in 1985. It had a structure based on accelerating power (according to the schematics proposed by the Canadians at Ontario Hydro) and a ramp-tracking filter. The latter idea came up during a conversation at my home, when I found out the problem faced by stabilizers regarding generation disturbances, and Nelson Zeni, just like a typical control Professor, replied by proposing a first structure filter project. Our PSS input signals, electric power (P), and rotation (w), with the letter X from REIVAX determined the name "PWX" for the product.

In that same year, Paulo Marcos, who had worked at Eletronorte (as an advisor at Engevix), was working at CEMIG. Just like that, he kind of felt as a corporate spy, doing all the work of introducing several new control concepts to his colleagues. Hélio Valgas, operation engineer at CEMIG, decided to put that idea to action and became the first one of a kind of special client that we would eventually bring in: a client focused on finding a solution.

By trying to present an industrial design to our PWX, we hired a specialized lab. Two designers, who we got used to calling Antonio Carlos and Jocafe, delivered us a design and a prototype. The main feature of such prototype was a "jaw" that opened showing the testing terminals as if they were decaying teeth.

As testing tools, we had great versions of BASIC from SSD (Software for Simulation of Dynamics) and AQX (Data Acquisition Equipment). In order to perform the site testing, my partner Fernando and I developed our first board for data acquisition based on an 8-bit converter and an ISA bus interface of a computer. Back then, the computer used was called "Solution" by Prológica, a local computer manufacturer, a portable computer which was awarded for its industrial design regarding its acute angles in a plastic case. We called it "Problution".

On the inside of the prototype, we decided to make a printed-circuit board containing the whole stabilizer. Fred designed the project and Igor had some rough times when printing the circuit. We reached an agreement with CEMIG to carry out a demonstration test of our PWX, in São Simão hydro power plant.



In São Simão, after sleepless nights of hard work, and powering PWX at site, the tests were performed and everything went out just fine, including the data acquisition system, which caused a good impression on CEMIG's staff. I decided to show them what we were capable of and I programmed the SSD in the structure of the PWX to receive data from the analogic transducer through the A/D (Analog/Digital) board. I believe it was the only time the "Solution" had such a moment, controlling a generator with hundreds of MW. By the way, this "Solution" guy was a road warrior, as the works performed at CoEmSa customer with RVX10 (speed governor), in Canoas, Southern Brazil and the model controller identification for the thermal generating power complex, in Manaus, in the middle of the world's biggest rainforest located on the Northern region of Brazil, were both made with it.

We won the bid for CEMIG later, and then without the previous prototype but with a modular analogic structure in a 19" rack, we supplied the PWX300 to São Simão and Emborcação hydro power plants in 1989. This started a long and successful career for the PWX series. We would also develop an analogic version, the PWX400, for the Segredo power plant, COPEL, which was the last and one of the best analogic systems we made before achieving the digital version, the PWX500, which is used in the main hydro power plants of the grid system.

In Argentina, PWX is the main dynamic stability controller of its electric power system. In concept PWX's structure was standardized in 1990, by Ontario Hydro, and copied by multinational competitor companies (one of them managed to keep one of our PWX rack in its facility in Germany for some time, before releasing its official digital model to the market).

Sometime before that, I had been to São Simão to test excitation systems limiters. By pulling the telescopic drawer of the controller, I felt a strong sense of nostalgia: there were the old PWX300s exactly as I had left them, operating flawlessly, as if time had not passed at all. Throughout the years because of its advanced and economical conception, target marketing, easy of assembly and fast commissioning, the PWX has been our golden goose. New projects have a lot to learn from it.

Writer: João Marcos Soares



Learn and Teach

REIVAX was my first job as an electrical engineer and, back then, the challenges were big. We were installing the first RTX300 voltage regulators, which included in its digital system not only the control loop but also the transduction of the generator electric parameters and the pulse generation for tip and thyristor control. Considering speed regulators, we were developing the RVX200 model and, although the digital system did not pose great challenge, we were still taking the first steps to take over the hydraulic systems technology.

Back then, I already knew something about power systems control thanks to a scholarship in the Universidade Federal de Santa Catarina, but the environment in which I found myself had a much more complex feeling to it, involving technical aspects of developing and applying them to the equipment in a hydroelectric center. This involved aspects of the relations with clients, including expectations, which had to be met. We must also mention difficulties associated to the theoretical aspects of controlling a hydroelectrical power plant and the practice of putting a designed piece of equipment, especially to each application in operation.

In this scenario, I could have easily found many difficulties and give up, but the company environment was a positive aspect to me. The fact that there were no previous studies about the subject was not a problem to me, and, most importantly, the basic data and approaches to find a solution were all taught. In a second, I would find myself in deep trouble and, in the next second, I would learn how to find solutions. In such a way, my "technical independence" was built, and my contribution to the team and the company would grow over time. This idea of a learning environment that we had and still have at REIVAX was even stronger back then, because in the first REIVAX's facility (an old building), we used to sit in chairs with tables arranged like a classroom, all in the same room. Of course, those times were different and, if my memory serves me well, we were just 13 employees.



I graduated from an environment in which I learned about the need and benefits of learning and teaching. What I learned with the founders of REIVAX and its first employees, who also supported this fantastic way of working. Before I noticed, I was part of REIVAX's team, teaching new employees and, therefore, working towards my qualifications in learning and teaching. After a few years being part of a well-rounded team, I had the perfect scenario to chase other professional challenges. The excellent results I had professionally in the companies to which I have worked for in search of these challenges, where achieved in the same place in which I could apply the same learn-teach-learn philosophy and create teams for companies and other successful businesses.

I would also like to mention I am writing this from Angola, where I am giving support in structuring an operation and maintenance team, which, initially, will work at the largest electric power hydroelectric power plant in the country

currently in the final building stages. Beyond teaching technical and management aspects involving a power plant, I always tell people trained that they must teach their fellow colleagues, ensuring that the learning-teaching-learning cycle never reaches its end. This is a way to share knowledge by working in teams and making each one of you prepared for the constant challenges that will come up when working with electrical power systems, be it operating a plant, designing it, building or commissioning.

Writer: Fernando Pedrassani Costa Neves



The Helicopter Flight

The clearest memory I have from the period in which I worked for REIVAX was a site work followed by a commissioning in 2002, in Colombia. Back then, Colombia was a country facing some political and military instability due to clashes with the FARC. Nonetheless, it was not that clear how bad were these clashes nor how could we be affected as foreign professionals providing a service.

The first visit to the power plant aimed at performing site survey. During this visit, Fernando Pons and I were part of the team alongside our client and REIVAX's commercial representative in Colombia. However, there was a peculiar request (or maybe a demand) coming from our client: the transportation between Medellin and the power plant should be done by helicopter to avoid any kind of confrontation with guerrilla soldiers in case we used a car to reach the place. I can imagine the cost for this kind of transportation might have been really high and paid entirely by REIVAX.



Once we got there, there was an armed bodyguard (holding a gun) during the whole landing. He, then, accompanied us to the car that would take us to a town near the power plant. During the period in which we were there, we noticed several roadside, small barricades with heavily armed soldiers. By the way, inside the power plant facilities, it was normal to see armed soldiers walking up and down.

During the next visits to the power plant for commissioning (for several machines), the transportation always occurred by car with no problem at all. We heard stories of an Italian engineer who had been kidnapped by guerrilla soldiers years before. The commercial representative in Colombia insisted we kept a "low profile" when walking on the streets, but nothing ever happened to us, just the feeling of the possibility.

Writer: Edgard Wiggers

A Dream Come True

30 years ago, a group of young professionals and entrepreneurs by nature, used to sit by a table and discuss the dream of designing an electro-hydraulic speed governor to replace the existing ones used in a centrifugal pendulum and articulated bars. However, the dream was just a dream.

Between daydreaming and serious remarks, REIVAX was born. The name was due to a common kind of medication among women at the time and it was called "XAVIER", but quickly turned into REIVAX. Like that, step by step, the group engineered the dream into reality, but not without sacrifices and risk-taking. REIVAX had its headquarters in an incubator, which was used for innovating endeavors. Initially, all worked as "regulation" service providers, but the company's structure grew thanks to our group strong grip. As a result, 30 years have passed and we now have a solid company with international presence.

As an eyewitness to all of the steps taken by the company, I would like to make clear how proud I am of such a VICTORIOUS DREAM. I congratulate all of you, managers and employees! I know the dream will still live in and always going even further than we could have ever dreamed.

Writer: Nilson Figueiredo

A Traveler's Tale

In 1996, we sold a good amount of stabilizers to Cammesa, in Argentina. There was a total of 85 to be installed in several power stations. But we all wondered: "Who is going to do it?" And an invitation from Lázaro Ferreira came: "Let's take a tour". I accepted and Evandro Moritz joined our team. We left for Argentina on February 2, 1996, stopping at Neuquen, even though we did not know a word in Spanish.

The first center was Planice Banderita. Once we got there, we got some "good news": the machines would only stop operating by midnight. We all thought: "Well, I guess there's no way out since we're already here." But I thought it was wonderful. I called a local "hermano" employee to join us. Let me stress this: I didn't know a word in Spanish. And him? He was a stutterer. And just like that, we worked together until 8 a.m. using only hand gestures. By the end, we managed to finish two machines.

We also worked at El Chocon, Alicura, Central Nuclear de Embalse, Rio Grande, Los Reyunos, Agua del Toro and, thus, finished the first stage. We left on May 5, 1996, for the second stage, but Evandro Moritz could not join us. We also worked in the following power plants: Salto Grande, Agua del Cajon, and Piedra del Aguila. The client decided to do the job himself in Yacyreta.

It felt great and I thought it was amazing how much I learned from being in another country, visiting several places, meeting a lot of people and learning so much about culture. Of course, I tasted some good wine.

Writer: Valdinei Valdir de Quadros



ENDESA

Project F09036, also known as Project ENDESA, was the most important job to REIVAX both financially as well as in terms of manpower and amount of work. In order to conclude this project, we had to create a special task force called "Endesa Team". In it, there were employees from several: Electrical department, mechanical department, software design, service etc.

At the most important stages of the project, we had 12 REIVAX employees on site, working on installation and commissioning. It really was a project of huge proportions, but also of great lessons. A lot of stuff was developed during this project, such as different kinds of site work beyond what we were used to do. This helped us in future projects.

All in all, the project took 7 years from the moment the deal was signed to the moment we provided the in-field services, resulting in 5 retrofitted hydroelectric power plants in a total of 23 power units. If we sum up the power from all the machines, we would have a total of 303 MW. This amount is enough to power up a city with a population of nearly 1 million people. The energy generated represented 1.5% of the total capability installed in Chile and 5% of the energy capability installed in hydroelectric power plants all over the country.



We made many trips and collected many good stories as well. I seem to recall one in which an employee came to the power plant to help us solve a few problems that a project of this magnitude would surely present. People said he locked himself in office for a few days. During a meeting on Charla de Seguridad, which over 40 people (employees, client etc.) attended, someone said loud and clear: "Which REIVAX employee is responsible for this service?" Then, Guilherme (GRD), also known as "Barreira", pointed down to the employee on his side and said: "The dude with the 'beanie'" (it was really cold at that time of the year near the Andes). He was referring to Kleiton Schmitt, also known as KS.

Writer: Ricardo Vituri Fernandes

In 30 years...



Controls over **145 thousand MVA**.



We have **over 400 thousand hours** in field work, which amounts to **45 years non-stop**.



We have driven **over 1.5 million km** all over the world, which is equivalent to going around the world **37 and a half times**.



We own over **1.450 equipment** sold all over the world.



Over **652 people** are part of our history, and a few of them followed other career paths and others are still with us today.



We operate in over **25 countries** and in **4 continents**.



The greatest **controlled generator:**
Tractebel | Jorge Lacerda Complex (UTLC) - **411,76 MVA.**



Largest **equipment we provided**: Excitation systems for 300 MVA and 250 MVA Synchronous Compensators SSs Tijuco Preto (FURNAS), Santo Ângelo and Embu Guaçu (CTEEP).



Greatest **project**: ENDESA/ENEL (Chile) | Modernization of 5 hydro power plants, 240 cubicles distributed in 12 RTVX POWER, 12 power units, 12 excitation transformers, and auxiliary power, protection, and automation panels.



A few moments...





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Images: REIVAX files and image database

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