On-Site Field Services

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The Spanish nuclear industry has extensive experience in the development of services for nuclear power plants.

The moratorium on new projects in the decade of the 1980s led these nuclear industry companies to find and enter new markets.

The quality of their services, along with the long experience gained in the support of the Spanish plants, has enabled a significant number of companies to win relevant contracts in competition with leading corporations around the world.

European countries are an important market. The first experiments to support the operation in Central and Eastern Europe are being extended with work in neighboring countries. Meanwhile, Latin America is a nearby market for reasons of language and historical proximity, which is also present in the industry. It emphasizes the participation of Spanish companies in projects in countries of the Asia-Pacific region.

This article describes the experiences of four Spanish-owned companies and of the services division of Westinghouse in Spain.

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ENUSA

THE ENUSA STRATEGY FOR THE ACCESS TO INTERNATIONAL NUCLEAR FUEL MARKETS

Why "going abroad"

The reasons behind the progressive globalization of the ENUSA operations can be found in the behaviour of its reference markets. As it became clear in the '80s that the Spanish market was not going to grow in the years ahead, the company decided to break into the European markets. As a result ENUSA is now exporting products and services to France, Belgium and Sweden.

Now, given the reduction trend of the European PWR and BWR fuel markets (see Figure 1) ENUSA is looking abroad again to expand its business.

From the maximum in years 2009-2010 the market is expected to reduce its size in approximately 20% due to the early shutdown of 23 reactors within the period 2007-2023 and only two new connections to the grid. The major part is obviously due to the German phaseout although other countries will see some of its reactors shutdown too.

Another factor which contributes to the internationalization strategy is the high level of competition in the European fuel market. Currently there are five nuclear fuel factories in operation in Europe under the control of three different fuel vendors. Total installed capacity largely exceeds the current fuel needs.

The new markets being less mature than the European, offer clear advantages such as a significant demand for new technology and growing market size. In addition, these markets offer positive projections of nuclear development for the next decades. Overall, the new capacity up to 2030 in the most optimistic scenario is expected to exceed 350 GWe (Figure 2).

Segmentation

It is possible to make different segmentations attending to criteria such as geographical expansion areas, products and customers. A short review of each of these is presented below.

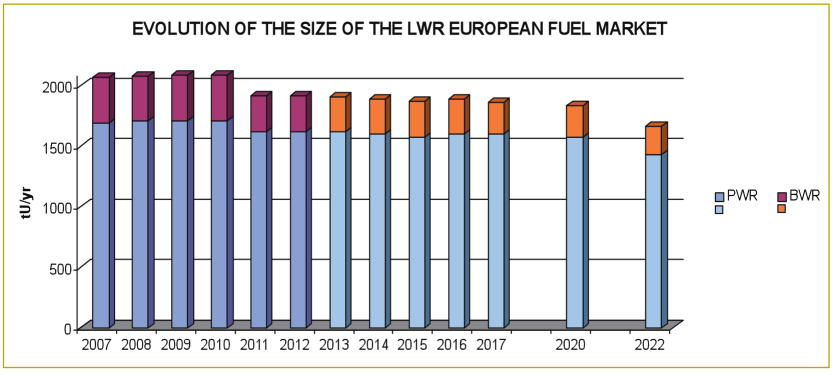


Figure 1: Evolution of the PWR and BWR European nuclear fuel market. (Source: ENUSA).

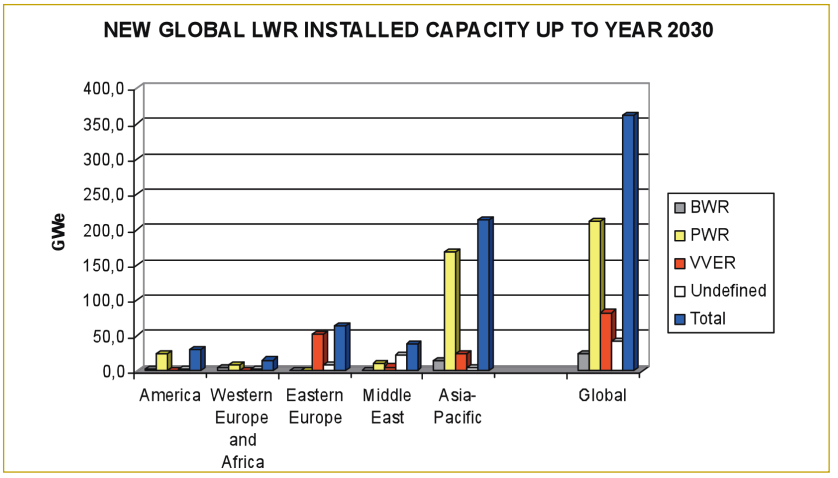


Figure 2: New global capacity in an optimistic scenario. (Source: ENUSA).

Geographic segmentation

Figure 2 shows how the new capacity is distributed worldwide. Weakness of the European market can be clearly identified when compared to the trends in regions such as Asia-Pacific. The expected added capacity in this region alone may exceed 200 GWe up to year 2030.

Other regions are newcomers to nuclear energy. Middle East countries are shifting from a traditional oil-based electricity generation to cleaner, carbon dioxide-free production systems based on nuclear and renewable electricity.

It is also relevant to focus on the South American market. Both Argentina and Brazil are building new reactors and there is a long-term investment plan for new nuclear capacity. These countries are developing their own industry which eventually will cover the entire fuel cycle. However some of its historic partners, in particular the German companies, are no longer in the nuclear business, what represents an opportunity for ENUSA.

Product segmentation

In the last years ENUSA has evolved from a pure fuel manufacturer to a more integrated fuel services vendor. Fuel services now include spent fuel, on site services have grown to add additional inspection capabilities and a new equipment design and manufacturing business is being created.

Nuclear fuel is the reference product of ENUSA and its credentials in the international markets. However the fuel market is a regional market where the fuel is produced close to the point of consumption. This limits the potential expansion of pure fuel vendors although it also explains the ENUSA success in the European market, well communicated and geographically small compared to other regions.

Commercialization of fuel inspection equipment offers many advantages. First, there is a limited competition in this field and second, normally it is not subject to political or technological barriers as the nuclear materials. ENUSA is working very actively in developing its technology together with its partner TECNATOM. As a result of these efforts new fuel inspection equipment has been sold to China and Brazil and there is a significant potential for new sales in other markets.

Finally a third pillar is constituted by the spent fuel services. The Spanish Interim Centralized Storage Facility ("ATC") project and the maturity of the Spanish nuclear sector has brought this topic to a first line of sight. ENUSA has decided to cooperate with ENRESA, ENSA and other Spanish companies to develop its own capabilities in this field, mainly linked to the dry storage of nuclear fuel.

Customer segmentation

The addition of new products and services to the ENUSA portfolio progressively broadens the perspective of potential customers. Traditionally the main customer has always been the utility/operator of a nuclear power plant and being the nuclear fuel a key supply for the power plant, the relation operator-fuel vendor will maintain its strategic nature either in the traditional or new markets.

In the new international markets however one can now find vertically integrated conglomerates such as the Chinese CGN and CNNC, which not only operate their own reactors but produce uranium concentrates, provide enrichment and conversion services, manufacture fuel assemblies, etc. These companies may search for virtually any kind of product in the market.

Finally, the accumulated experience at ENUSA in the design and operation of advanced inspection equipment paves the way to a direct relationship with the fuel manufacturers. Together with its partners, ENUSA can provide technological solutions for fuel manufacturing plants by adapting the technology developed at Juzbado plant to the specific requirements of other fuel vendors.

Association: best approach for mid-sized companies

The size, distance and complexity of the international markets make it advisable to search for the appropriate partners either in the country of origin or in the foreign market.

ENUSA has already adopted both practices. As a founding member of the Spanish Nuclear Group for Cooperation (SNGC) it is one of the four Spanish companies which have associated to join forces to enter into foreign markets. The SNGC provide marketing and coordination services to its members and performs a high level scrutiny of the most promising business opportunities.

The other approach ENUSA is following is the association with local companies in the export market. This is being done with the assistance of a sales agent who knows the specifics of the country and has direct contact with the local company. Once the company has been identified the usual approach is to sign a Memorandum of Understanding (MoU) to serve as a contractual umbrella for the relationship.

So far ENUSA has entered into a number of MoU with different Asian and South American companies (see Figure 3) and representation agreements in Brazil, Argentina and China.

Conclusions

Internationalization implies a cultural change in the organization. A significant effort on development of technology, quality improvement and efficiency must be undertaken throughout the company. ENUSA is working on these areas by implementing a more efficient organ-

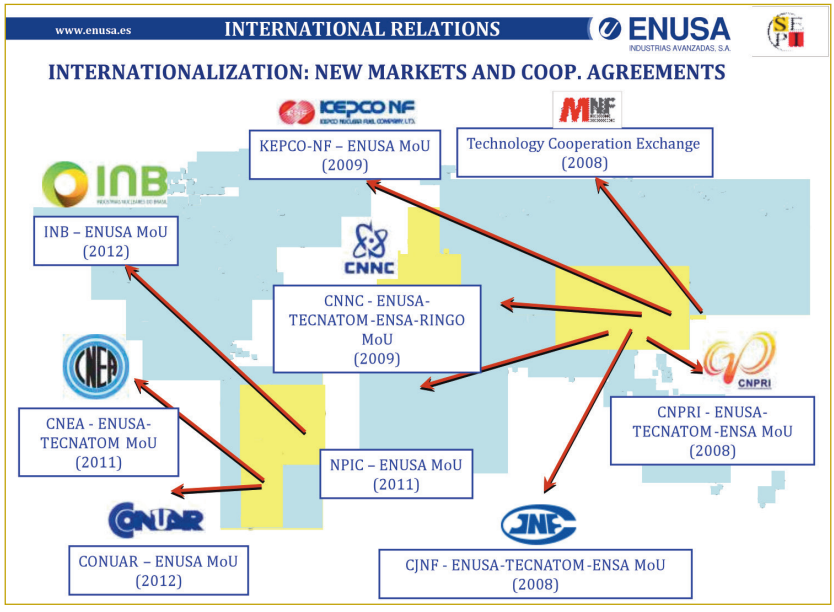


Figure 3: ENUSA international cooperation agreements.

ization, boosting its continuous improvement program and reinforcing its investment on R&D, which currently ranges between 6% and 10% of the total annual sales.

Internationalization also means growing business and this results in the need for additional human, technological and financial resources. This can only be achieved with a clear strategic determination and a strong institutional backing from the Administration. In the case of state-owned enterprises a third factor must be considered, which is the support of the SEPI holding, ENUSA's main shareholder, to internationalization initiatives. These conditions and the new reality of globalization present the best scenario for ENUSA to pursue its international development and reinforce its relevant place in the nuclear industry worldwide.

ENWESA

ENWESA IN THE INTERNATIONAL MARKET

ENWESA develops its international activity of nuclear services both in Europe (France, Finland, Sweden, Belgium, etc.) and America (Mexico and Brazil basically).

The international presence of ENWESA started right after its foundation in 1985, although it has been strengthened during the last years due to the important effort ENWESA has made in the French nuclear market.

In the middle of the last decade, ENWESA defined as strategic the French nuclear market for several reasons: its geographical proximity, its high potential and specially, the very good feedback received from the power plant managers to ENWESA's services portfolio. From that moment, ENWESA set out an ambitious plan that basically consisted in obtaining the required qualifications, training people specifically in French working methodology, and opening a well located branch office that brought ENWESA closer to the plants where services are performed.

At present, ENWESA has an important activity of maintenance services in French nuclear power plants property of EDF. These works of inspection and maintenance of equipment, valves and condensers are carried out both during the refueling outages and during the operation of the plants.

Part of the international activity of ENWESA is developed in collaboration with its shareholders EQUIPOS NUCLEARES and WESTINGHOUSE. Both companies have a significant international activity and ENWESA collaborates with them contributing with its capacity and providing highly qualified personnel in nuclear services.

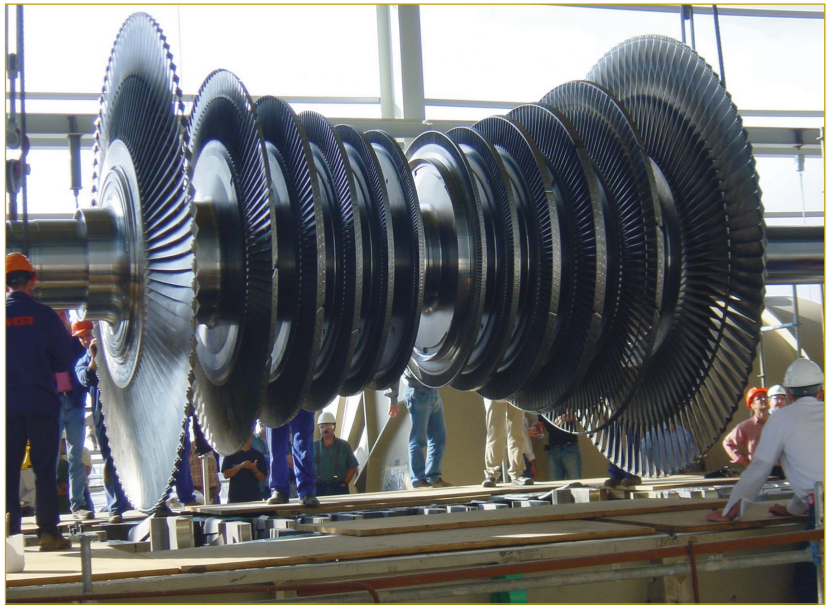
With EQUIPOS NUCLEARES, ENWESA participates the construction, mechanical erection and maintenance in nuclear plants of Finland and Sweden.

With WESTINGHOUSE, ENWESA participates in the inspection and maintenance of nuclear components in Slovenia, France, Belgium, etc.

Additionally, ENWESA cooperates with other important firms, like ENUSA, IBERDROLA INGENIERIA or AREVA, in activities related to nuclear fuel, reactor vessel, main coolant pumps, and so on.

Some of the main references of works performed by ENWESA out of Spain are:

- EDF: Maintenance of equipment and valves in Blayais, Tricastin,



Fessenheim, Golfech, Civaux NPPs (France).
- EDF: Condenser retubing in St. Alban I (France).
- ORTEC Group: Maintenance of valves in Cruas NPP (France).
- ENSA: Manufacturing and installation of AMS Neutron Shielding and installation of SG Pressure Equalization Ceiling in Olkiluoto 3 NPP (Finland).
- ENSA: Installation works and repairs in steam generators in Ringhals NPP (Sweden).
- ENSA: Collaboration in development phases for installation of vacuum vessel of ITER Project.
- WESTINGHOUSE: Maintenance works in cooling reactor pumps, reactor vessel opening and closure and equipment maintenance in Blayais and Gravelines NPPs (France), and Tihange and Döel NPPs (Belgium).
- ENUSA: Fuel inspection, and electro-erosion works in fuel top nozzles in Belgian nuclear plants.
- IBERDROLA INGENIERIA: Mechanical and QA supervision in erection works of condensers and MSRs in Bohunice NPP (Slovakia) and Laguna Verde NPP (Mexico).
- UDDCOMB ENGINEERING (AREVA Group): Orbital welding works in Oskarshamn NPP (Sweden).
- AREVA: Valves maintenance in Sizewell NPP (United Kingdom).
- AREVA: Several works related to cooling reactor pumps, steam generators, reactor vessel and fuel handling in Angra NPP (Brazil).

Besides, ENWESA participates as a founding member of Cluster of the Nuclear Industry in Cantabria (Spain), whose main objectives are reinforcing the nuclear industry in Cantabria, increasing the competitiveness and business opportunities of its founding companies, promoting the professional training and the creation of qualified employment. This Cluster is clearly internationally focused, with objectives like the participation in several phases of the "International Thermonuclear Experimental Reactor" (ITER) project, that is being developed in Cadarache (France).

It is worth to point out that holding an international activity in the nuclear market in the way ENWESA has done throughout these year involves an important factor of knowledge to our company and specially to our people, who pervade with different working methods, improving their professional qualification and enriching their technical background, which finally results in a better training to perform our services in the Spanish nuclear plants.

IBERDROLA INGENIERÍA Y CONSTRUCCIÓN

DEVELOPMENT OF LARGE INTERNATIONAL CONSTRUCTION AND SERVICE PROJECTS IN NUCLEAR PLANTS. RELEVANT EXPERIENCE OF IBERDROLA INGENIERIA Y CONSTRUCIÓN

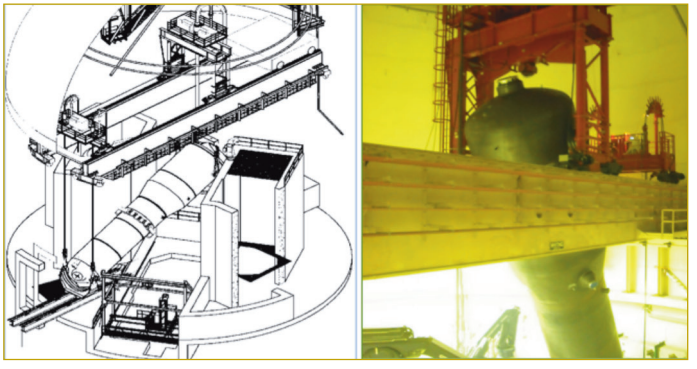
Summary

IBERDROLA INGENIERÍA Y CONSTRUCCIÓN (hereinafter IEC) has developed a significant number of large projects in several nuclear plants worldwide. Some of these plants are under operation, while others are under construction. Nowadays, IEC is actively participating in the design and construction of some safety and non safety class systems of Flamanville 3, for EDF, and has successfully closed the project for the refurbishment of Laguna Verde 1&2 turbine islands in Mexico, with a budget above 600 M USD. However, these projects cannot be understood without taking a look to the background of its international activities in the field of nuclear plants engineering and construction services.

The beginning: BRAZIL

International development of nuclear service and construction projects of IEC started in 1998 with the award of the outage service contract of Angra 1 in Brazil. This first international service contract, with duration of 5 years had limited scope involving management and services activities, although, it served as a scenario to show IEC capabilities to Brazilian customer, utility Electronuclear, supposing undoubtedly an important milestone for the award of the next contract in Angra I, for the replacement of the two steam generators by new ones.

The replacement of the steam generators contract was awarded in 2006. This large EPC contract involved an international consortium headed by IEC, involving Westinghouse, and Brazilian construction company Odebtretch. The successful integration of the partners drove to achieve foreseen outage schedule 2008. The scope involved Reactor Coolant System analysis, pipe cut and welding, auxiliary work and the opening of a large hollow in the containment, by using wire rob cutting of the prestressed concrete wall and band sawing for the steel liner to extract old steam generators and introduce the new ones. In addition, a high accuracy rigging work was developed for the exchange work with the required precision and safety, while minimizing the interferences with large safety class structures located in the vicinity, as for example large safety systems water storage tanks.

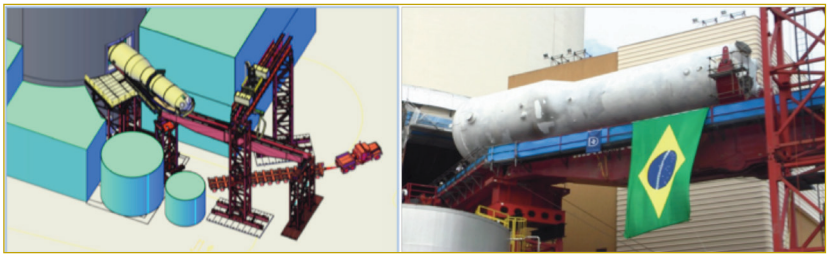


Design and Execution of Rigging Maneuver for extraction of old steam generator, Angra 1.

SLOVAKIA, a continuation and a sample of technology and cultural adaptation

In parallel to the expansion of the company in the Americas, several projects were awarded in Europe by Slovak company Slovenska Elektrarne.

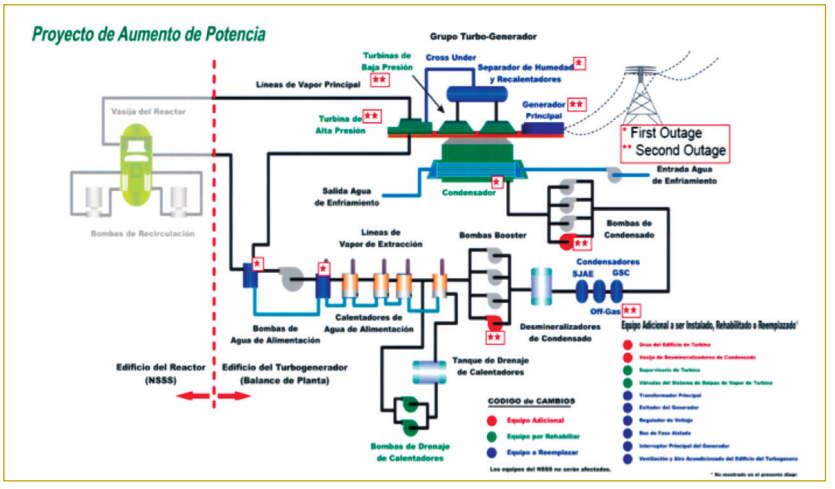
First project was awarded in 2006, consisting in the design, supply and on site supervision of the assembly of 2 condensers to Bohunice nuclear stations V1 and V2. The novelty of this project was customer requirement to on site assembly of condenser bundles, while these are commonly supplied already assembled for its instal-



Extraction Part 2. Design versus reality.

Rigging for new MSR Bohunice.

lation by customer. Condenser was designed to achieve outstanding efficiency to ensure adequate plant performance at demanding conditions of 9% expected power uprate of the plant. Design project involved was also focused in ensuring the required accuracy for the alignment and assembly in Bohunice workshop to comply with assembly and installation schedules. Of the outmost importance was the IEC supply chain for the components of the condenser, with specific mention to the local supplies, and the superb work



Scheme of Modifications developed in Laguna Verde Units 1 and 2. (not included off gas and turbine ventilation system upgrade).

Laguna Verde Unit 2 Condenser Installation sequence using Modularization scheme of construction (from top left to the right upto lowest right picture).

Detail of Open Top Installation of TG31 condenser bundles. Notice accurate constructability design.

developed by supervision personnel, which played a relevant work to ensure the constructability of the bundles.

Required thermal performance was complied in excess by the new bundles in front of a third party.

A new project was awarded to replace old Soviet design vertical Moisture Steam Reheaters by new ones of high efficiency design. Two important challenges should be underlined for this project. First one is that new equipment should be integrated in a previous design, coming from the former days of Soviet Union. Secondly, all installation works, not only supervision, was under the responsibility of IEC, which involved the utilization of local Supply Chain at its maximum extent. Contract was awarded to IEC in 2008, being a remarkable success in both aspects. To remark (1) the outstanding compliance of outages schedule, being of the outmost importance the constructability analysis, which minimized interferences and maximize usage of existing turbine cranes, and (2) the exceed of contractual performance guarantees.

MEXICO, LAGUNA VERDE, largest nuclear project developed by an Spanish company outside Spain

Laguna Verde is a GE BWR-5 station located in the Gulf of Mexico, near Veracruz.

In February 2007 the contract for the complete refurbishment of Laguna Verde Unit 1 &2 turbine island was awarded to IEC, with a budget

Picture 7. Installation of several Flamanville Safety Class HX (Open Top and Non Open Top).

Picture 8. Circulation Water Channel Construction. Flamanville 3.

above 600 M USD, after a long and demanding bidding process. The goals of the project were modernization and increase of capacity to adapt turbine island to the new expected conditions at new reactor power level of 120%, and to upgrade turbine island for new life extended conditions of 60 years.

Complete information may be found in reference [1].

The project was developed in a scheme based in two outages per unit, between 2008 and 2010, and involved the complete supply, refurbishment and upgrade for both units of turbine generator and auxiliary systems, condensers, feedwater heaters, condensate pumps, booster pumps, new turbine crane, main trafos, new isolated bus and main switch gear, turbine island ventilation system, with new variable frequency fans to adapt to the demanding environmental conditions, offgas system, etc.

FLAMANVILLE 3: the future

Electricite de France (EDF) in 2006 began construction of a new EPR nuclear reactor in Flamanville central. IEC has been involved for five years in five EPC projects in the construction of the EPR in both the nuclear island and conventional island in the pumping station. Scope of projects involved the design, supply and onsite installation of safety class 2 and 3 heat exchangers, and safety and non safety class equipment for the water intake and water treatment.

These projects represent a challenge from the technical point of view because of the high requirements applicable to the project by the return of EDF operator's experience and compliance with the new regulations arising from the realization of ultimate nuclear plant in France. Additionally, the state of the supply chain after several years without building new plants, and the requirement in some of the projects using European standards, customer not accepting American legislation, assumed an additional challenge.

Additional information about these projects may be found in reference [2)].

References

[1]. Spanish Society Magazine, November 2011. Monograph. Alejandro Merino, Jose Luis García- Serrano, Leticia Ruiz, Juan Jose González, Miguel Ángel Gabaldón, Ignacio Prieto.

[2]. Spanish Society Magazine, November 2011. "Iberdrola Engineering and Construction Projects in the Flamanville 3 EPR". Javier Zornoza, Henri Dumas, José Luis Sesma, Begoña Cubián, José Ignacio Díaz

LAINSA

LMQ. AN EFFICIENT METHOD IN ORDER TO RECOVER THE PERFORMANCE OF THE MSRS. A SATISFACTORY EXPERIENCE

Inspections on moisture separator reheaters in the French Nuclear Power Plant has shown evidence of significant clogging due to deposits of magnetite inside tube bundle whose presence could damage equipment and harm productivity. We have developed a procedure that consists of a mechanical pre-cleaning of all tubes of the MSR in order to unblock them, followed by chemical cleaning where magnetite is dissolved and flushed out of the tube bundle.

The undesirable phenomenon of erosion-corrosion produced in the steam pipes, puts in circulation significant amounts of iron, which are accumulated, in the form of magnetite, valves and above all within the pipes of the MSRs and other heat exchangers and on the outside of the tubes bundle of the Steam generator (secondary side).

MSRs Inspections made in French Nuclear Power Plants, induced by

Interior of MSR pipe with magnetite deposits.

MSR tube bundles in workshop for the LMQ process homologation.

a decline of the equipment performance determined that MSRs of Fessenheim and Bugey Nuclear Power Plants are subject to the build-up of magnetite deposits, resulting from steam eroding the tube system. As deposits build up on the inner surfaces of the tubes, they impede flow, and increase the pressure drop between inlet and outlet of the MSR. In some cases, the pressure drop amount has been found to be near the maximum design criterion. This effect could result in equipment damage and loss of plant productivity.

We present the alternative of changing the MSR or proceed with a regular cleaning. An economic analysis and time savings induce the second process carrying out.

With this project we developed a method to remove magnetite and oxide deposits from the inner tubes of the MSR in order to recover a passage diameter and an exchange surface equivalent to the original and to prevent loss of plant productivity. This removal should be done in a safe way for the base metal of the bundle tube, without producing the chemical pitting of the tubes, which would encourage new cycles of erosion-corrosion.

LMQ system of LAINSA

The method basically comprises a first step of mechanical pre-cleaning by running high pressure water, then introducing a rotary air operated tube cleaner through the tubes of the MSR to unblock the tubes without damaging them. The last step of mechanical pre-cleaning is a final rinse with high pressure water to eliminate all the residues resulting from mechanical cleaning and to facilitate the next step of chemical cleaning.

The second step refers to a chemical cleaning at low temperature (around 65°C) by using different combination of acids, preferably organic ones (citric acid, ascorbic acid, formic acid), and at low concentration, in order to dissolve the deposits from the inner side of the tubes.

The reaction of dissolution of magnetite by citric acid ($C_6H_8O_7 = AH_3$) is based on the following equation:

$$Fe_3O_4 + 4AH_2^- \rightarrow 2Fe(III) - A + Fe(II) - A^- + 4H_2O + A^{3-} \quad [1]$$

AH_2^- and A^{3-} are chemical species resulting from citric acid (AH_3), but the following acid-base reactions:

$AH_3 \rightarrow AH_2^- + H^+$, pKa1 = 3.15
$AH_2^- \rightarrow AH_2^- + H^+$, pKa2 = 4.77
$AH_2^- \rightarrow A_3^- + H^+$, pKa3 = 6.40

The chemical cleaning operation also includes the steps of passivation by introducing a passivating agent to create a thin oxide layer on the metallic surfaces to prevent posterior corrosion. A final rinsing step at alkaline pH is then carried out to eliminate all the passivation residues and to leave the MSR in good operational condition.

Procedure description

Before starting mechanical pre-cleaning, the MSR is sealed off temporarily with pipe end and pneumatic plugs, in order to isolate the system.

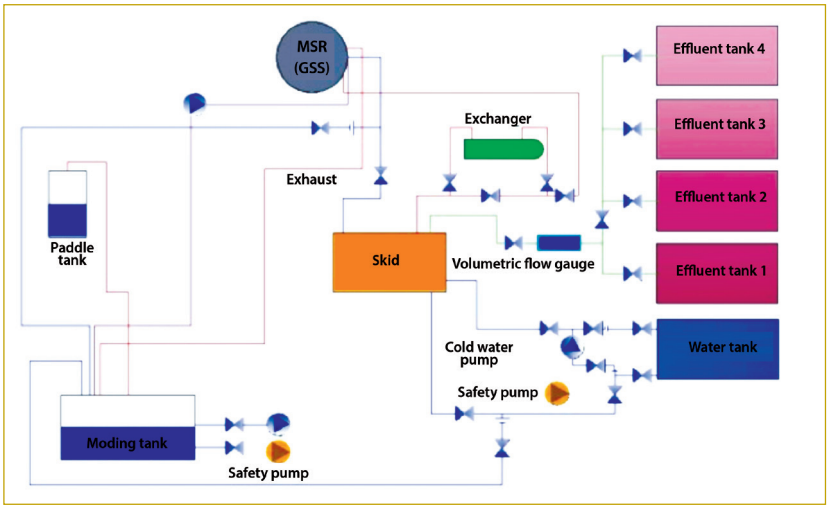
The first step of the process consists of checking for leaks by filling the system with water to a certain pressure.

The second step is mechanical pre-cleaning. Each tube is cleaned with a medium-pressure water jet (100-200 bars) from an electrical hydrodynamic unit (GHDE). This operation also enables creation of a map of clogged tubes.

The next step of the mechanical pre-cleaning process consists of using a rotary air-operated tube cleaner made of a flexible shaft, and a cleaning tool mounted to the tip of the flexible shaft. A final rinse with high-pressure water (400-600 bars) is carried out using the electrical hydrodynamic unit.

In the third step of the process, after a leak check (at 30°C), chemical cleaning with a recirculated aqueous cleaning solution (acid phase) is introduced into the system.

The cleaning solution used to dissolve the magnetite layers contains



Chemical cleaning schematic.

Sealing tool of the MSR water box.

citric acid, formic acid, a corrosion inhibitor and other chemicals. In order to improve the cleaning efficiency, the cleaning solution is heated to 65°C. This is done by an electrical heat exchanger connected in parallel with the chemical cleaning system.

During the chemical cleaning process, analytical controls are carried out periodically (at least each hour) to follow the following parameters:

- Temperature
- Acidity
- ph
- Ferric iron concentration
- Total iron concentration
- Inhibitor efficiency

Chemical parameter evolution gmph during the acid phase

The end of the acid phase is determined by the criterion of total iron concentration <14 g/L and by the stability of four measurements of total iron concentration.

The final step of chemical cleaning is passivation, which is also carried out with recirculation. The aim is to prevent corrosion of the tubes' metallic surfaces by creating a thin oxide layer which protects the surfaces.

During the passivation process, analytical controls are carried out periodically (at least each hour) to monitor the following parameters:

- pH
- Temperature
- Ferric iron concentration
- Total iron concentration
- REDOX potential

Three hours later, the solution is drained out of the MSR and the system is rinsed with alkaline solution.

MSR and chemical impulsion area.

LMQ Work Area.

Equipment supply area and wastes TK's.

Results

The results obtained during the various MSR cleaning (14) campaigns allowed the validation of the elimination of magnetite deposits. On sample coupons placed in the interior of the top of the MSR tube bundle, the loss of thickness caused by the cleaning process averaged about 10 µm. The load after cleaning (a measurement of delta P after restarting the unit) was comparable to new equipment.

Conclusions

EDF completed a follow-up of the fouling of the MSR by measuring the pressure delta (ΔP). We noticed that the plugging of the bundle begins to be significant from a threshold of ΔP of 2.5 bars; the maximum ΔP to avoid generation of plastic distortion, and thus MSR damage, is 3.4 bars. It can take four to six years to go from ΔP of 2.7 bars to 3.4 bars.

According to the maintenance strategy envisaged by EDF, when a MSR crosses the threshold of ΔP > 2.5 bar, a cleaning operation is scheduled for the most convenient shutdown less than six years away.

This process has been retained in EDF's MSR maintenance strategy.

WESTINGHOUSE

WESTINGHOUSE OPERATIONS SPAIN THE YOUNG EXPERIENCE

Westinghouse Operations Spain is increasing its capabilities around the world

Our operations in Spain are mainly located in Hospitalet del Infant (Tarragona) supported by a team located in Madrid. Our crews are able to help our customers around the world in some of the most important activities in the power plants.

Currently, our personnel has been giving technical advice and manpower in the fields of I&C, Cranes, Training, Reactor Vessel Head, Fuel activities, Steam Generators, Pumps and Motors. And this support is increasing every project thanks to our dedicated employees. We are proud to have in our facilities a mix of experience and vitality that allows us to achieve the goals of each project. We still have original plant start-up engineers in our crew as well as newly hired people able to provide a fresh perspective and new ideas in our group (and nuclear sector).

As a worldwide company our specialist are demanded to support nuclear needs in of qualified personnel. Below are some of the projects we have been involved with during the past years outside our local area.

We are supporting customers in South Africa, France and Great Britain performing the maintenance and outage support to fuel handling equipment. Our specialists are trained in help you in Instrumentation System as well as Mechanical systems to get the success of the outage. We are currently working on a refurbishment of an auxiliary bridge crane in a highly contaminated area of a decommissioning facility in Great Britain.

We are increasing each day our collaboration with a Slovenian facility to be one of its principal partners, this collaboration started with a RCP motor swap and other related activities. Currently, this collaboration is increasing with new projects, our cus-

Swapping a RCP motor at Krško NNP.

tomer wants to improve his facility trying to make it an example of nuclear safety culture, this is the reason we are designing a RTD bypass elimination for the reactor head, and in the creation of a isolated bunker for equipment similar to another which is currently build in a Swiss NPP.

We are always trying to meet or exceed our customer needs, especially when these needs are not expected. We know the importance to be in the plant as fast as possible and we try to be in the plant before 24 hours of any urgent issue as we did for the support complete hydraulic pump complete disassembly during a non programmed outage in Switzerland. This emergency support helps us to gain future contract of new parts and long duration material supply contract.

Some activities are rarely performed during the life of a power plant and require specialist to perform the work. It is our goal to have these specialists and train young people in these rare activities as we did in a Belgian facility modifying some fuel pins or the design of an OSPS for the RCPs in a Swedish NPP.

But not only in the non-routine jobs are needed specialist, during the normal maintenance activities of the outage is necessary that all work order for the correct function of the plant. This is the reason our French colleagues request our support in Reactor Head activities during the maintenance of the plant.

No country is too far for us, we have supported fuel activities in Brazil, and RCP frequently support activities in USA. Our goal is to help our customer with their activities and to grow and learn with them.

Westinghouse Operations Spain as part of Westinghouse group is working everyday for increasing the reliability of the Nuclear Power Plants and their auxiliary systems. Like our customers, we want to continue being a green and safe company to improve the quality of life around the world. ■