Headlines

- **ENSA CTA: Design and development of Wi-Fi cameras for weld monitoring**
- **Hu Xiaoshuang (Amy) joined the SNGC in November of 2014**
- **TECNATOM agreement with Teledyne in relation to valve diagnosis technology**
- **ENUSA: Research on irradiated rods. Fuel rod shipment to a hot cell laboratory**
- **Fabrication order for 7 Hi-Storm 100S system casks for ASCO NPP**
- **Tecnatom delivers the full-scope simulator to ANGRA-1**
- **ENUSA: Oxide Coating Cladding Equipment at Juzgado Manufacturing Plant**
- **TECNATOM USA, our new subsidiary**
- **ENUSA signs an agreement with Westinghouse for manufacturing of nuclear fuel assemblies and associated services for EDF reactors in France**
- **ENUSA: Expansion of cooperation with Yibin Fuel Plant**
ENSA CTA: **Design and Development of Wi-Fi Cameras for Weld Monitoring**

**December 2014**

**WWW.ENSAsa.es**

The Automation unit of the ENSA Advanced Technology Center (CTA) has developed and refined a new Wi-Fi camera system for the Hot Wire TIG welding systems in production.

The purpose of this digital system is primarily to avoid the need for the worker who is monitoring the weld to be near it. This new technological development is expected to facilitate the work of monitoring welds by displaying them on a monitor, together with a series of antenna that receive and process the signal emitted by the camera.

The main advantages include an unlimited ability for rotation, supported by the camera’s features; it is a wireless devise that prevents a possible contact of wires or other elements with the weld.
HU XIAOSHUANG (AMY) JOINED THE SNGC IN NOVEMBER OF 2014 - DECEMBER 2014

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Amy Hu will be working in the SNGC Beijing Office.

In 2008, Amy Hu graduated from Inner Mongolian Technology University with two bachelor’s degrees (English and Business Administration). Currently, Amy Hu is working and also studying in the RenMin University of China for a master’s degree in business.

After graduation, Amy Hu signed a contract with the state-owned international construction company named Sinohydro for commercial work.

Her main responsibility is to assist the Commercial Manager in any commercial matters.

In November 2014, Amy Hu joined SNGC and her main responsibility is assisting domestic market development and supporting the member companies’ commercial activity in China.

TECNATOM AGREEMENT WITH TLEDYNE IN RELATION TO VALVE DIAGNOSIS TECHNOLOGY - DECEMBER 2014

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One of Tecnatom’s lines of technology consists of providing valve diagnosis services, which we perform periodically at the Spanish nuclear power plants and also in other countries such as Mexico, Brazil and the Czech Republic.

With a view to offering a more integrated service and widening the scope of the services supplied, Tecnatom has signed an agreement with the American company Teledyne Test Services, in order to become the exclusive supplier of its diagnosis equipment, sensors and related services on different international markets. This alliance will give us preferential access to the technology, helping us to increase the quality of our services.

Teledyne Test Services belongs to the Teledyne Technologies group, which performs services for industries demanding high technology and reliability. Specifically, Teledyne Test Services has more than 50 years of experience in the development of torque and force measuring equipment and sensors for mechanical equipment, and it is the most widely recognized manufacturer internationally for valve diagnosis equipment.

Through this agreement Tecnatom extends its portfolio of services and products for the nuclear sector, consolidating our position at the forefront of technology and providing our clients with the most reliable and efficient services.
ENUSA: Research on Irradiated Rods. Fuel Rod Shipment to a Hot Cell Laboratory - December 2014

Key research programs at ENUSA require a specific post-irradiation examination (PIE) in a hot cell facility in order to get reliable data to characterize the properties and conditions of different products and materials. The shipment of the irradiated material from the nuclear power plant to the hot cell laboratory is a very complex process that involves important fuel handling operations, as well as administrative tasks concerning authorities from many countries. Last October 2014, ENUSA successfully transported 10 irradiated fuel rods from the Almaraz NPP in Spain to the Studsvik hot cell laboratory in Sweden.

Fuel rods were selected for inclusion in a number of different research programs, some of them in collaboration with our Spanish PWR utilities, and others with domestic or international partners such as CSN, Enresa, Westinghouse or Mitsubishi Nuclear Fuel.

The purposes of the programs include the characterization of advanced cladding alloys, the determination of significant fuel rod mechanical properties in relation to the spent fuel, and the validation of on-site PIE technics.

ENUSA has selected the suitable irradiated fuel transportation cask based on previous shipping experiences, the maximum allowable fuel rod burn-up, the licensing status, and the compatibility assessment performed jointly with the cask owner and Almaraz NPP operators and Studsvik operators. Based on these considerations, the R72 cask owned by the Belgium company Transnubel has been selected and accepted by all the parties involved in this transportation.

It was the first time that the R72 cask was used in Almaraz NPP and in Studsvik hot cell; therefore, before the shipment, all the handling operations were qualified during a detailed blank test at both sites.

Beginning >
FABRICATION ORDER FOR 7 HI-STORM 100S SYSTEM CASKS FOR ASCO NPP

DECEMBER 2014
WWW.ESNA.ES

Last November, Ensa received an order from Holtec for the supply of 7 HI-STORM 100S system casks for the Ascó Nuclear Power Plant, to be delivered throughout 2016. Ensa has previously manufactured this type of cask for the same site, and Ensa/ENWESA personnel also took part in the loading and storage of a total of five MPC-32/Hi Storm system casks in the plant’s ATI (individual storage facility), two Unit I casks during the 2013 campaign and Unit II three casks during the 2014 campaign. It is expected that Ensa/ENWESA will continue to be present during the forthcoming loading campaigns of the Ascó Nuclear Power Plant.

TECNATOM DELIVERS THE FULL-SCOPE SIMULATOR TO ANGRA-1 - DECEMBER 2014
WWW.TECNATOM.ES

On November 14th, the minutes of a meeting were signed at Angra-1 nuclear power plant (Brazil), ratifying compliance by the Angra-1 full-scope simulator with the requirements of the technical specification to reach the Ready For Training status. In order to achieve this milestone, it has been necessary to successfully pass the acceptance tests performed in the building constructed by Eletronuclear to house the simulator. These tests have consisted of the execution of a number of operating scenarios, along with several hardware and software trials. These tests were carried out by a mixed team of Eletronuclear and Tecnatom engineers over a period of several months.

It should be noted that both simulation models of this full-scope simulator have been developed in full using technology developed by Tecnatom, with tools such as Team_Suite and TRAC_RT, and the graphic user interface (Team_Sketch tool) and hardware interface (TESIS+ technology), as well as the configuration management system (CMS). This project has also involved our subsidiary Tecnatom do Brasil, which has provided personnel who continue to be on site at the Eletronuclear facilities supporting the project.

Eletronuclear is expected to start using the simulator officially in June 2015 for delivery of the necessary training to its operators, thus replacing the Almaraz nuclear power plant simulator on which the Brazilian operators have been trained to date.
In the PWR market, the historic operating experience shows that a significant cause of failure for fuel assemblies manufactured at ENUSA or Westinghouse is debris fretting.

In order to improve fuel performance against debris fretting, three features of “Defense-in-Depth Protection” were developed and incorporated into the fuel:

1. Debris filter bottom nozzle (DFBN), designed to mitigate debris-induced fuel rod fretting failures,
2. The protective grid (P-Grid), which traps any debris that passes through the DFBN against the elongated solid fuel-rod-bottom end plug avoiding penetration of the clad, and
3. The oxide coating cladding over the bottom of each fuel rod to increase the surface hardness, thus increasing wear resistance over uncoated cladding.

Enusa included the DFBN and the P-grid in the fuel in 1991 and 1997, respectively, and now it is in the process of including the third defense-in-depth protection: the oxide coating cladding in order to provide an additional margin of debris and grid-to-rod fretting damage resistance and to improve fuel reliability.

The oxide coating was introduced in the mid-1990s in Westinghouse for US customers and the performance experience for the 17x17 RFA and RFA-2 fuel through the end of 2013 shows that there have been zero leaks in more than 7300 fuel assemblies with all three debris mitigation features, including oxide coating.

The oxide protective coating on fuel rods consists of a 2- to 6-micron thick coating protection over the bottom end plug, the bottom end plug welding and a portion of the cladding (114 mm to 178 mm).

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The current spent fuel inventory in Spain is about 4,600 tU, most of which is in spent fuel pools. Three independent spent fuel storage installations (ISFSIs) are in operation – one at the Trillo Nuclear Power Plant, one at the José Cabrera plant, and one at the Ascó plant. An ISFSI at the Santa María de Garoña plant is planned for 2016. The total estimated amount of spent fuel generated in Spain, assuming each reactor operates for 40 years, will be 6,700 tU, or about 20,000 fuel assemblies.

At Trillo, the dry storage system used is the ENSA-DPT metal cask, licensed for storage and transport. The ISFSI, which is inside a concrete building, has an 80-cask capacity.

The shuttered José Cabrera plant uses Holtec International’s HI-STORM 100Z system, deployed on an ISFSI that has a capacity of 12 casks. The HI-STAR transport cask was licensed in Spain in 2009.

The Ascó plant also uses the HI-STORM 100 storage system. The ISFSI there consists of two open concrete pads, each of which can store 16 casks. These casks will also be transported using the HI-STAR transport cask.

At Santa María de Garoña, the storage system used is the ENSA-ENUN 52B, which was licensed for storage in November 2014; the transport license is expected by next month. This plant has two open concrete pads, each of which can store 16 casks. The first loading campaign is expected to start in early 2016.
The Almaraz and Cofrentes plants use wet storage only. At Almaraz-1 the storage pool will be full by 2018; at Almaraz-2 the pool will be full by 2021; and at Cofrentes the pool will be full by 2019. These reactors will ship spent fuel to the ATC (Almacén Temporal Centralizado) interim storage facility that is under construction at Villar de Cañas.

The first shipment is scheduled to come from the Almaraz-1 pool in 2018. Since the vault storage will not be ready by that time, an ISFSI is being built at the ATC to store the casks until the vault storage is ready to operate. The ISFSI will be ready to receive the loaded casks in 2018.

Spanish regulations require that all spent fuel that is loaded into a cask should be able to be transported just after loading or after a storage period. Classifying the spent fuel for transportation is important. The transport of intact and/or undamaged fuel is not a concern in Spain due to the relatively short storage period of about 10 years, even for high burnup fuel. The transport of damaged fuel, however, is a different matter. Several variables must be considered, including leakage, cladding corrosion, mechanical damage or fuel assemblies with defects (where the fuel assembly is altered such that it cannot perform its fuel-specific or system-related functions).

Damaged fuel can be divided into two groups based on the fuel-specific or system-related functions. Damaged fuel with leaks (breached) may be transported inside a special sealed damaged fuel can if feasible. Other damaged fuel (corrosion and/or mechanical damage) will be transported in a standard damaged fuel can.

At the ATC, fuel from the transportation casks will be transferred into welded canisters inside a dry hot cell. The canisters will be able to accommodate either intact, undamaged or damaged fuel (with its damaged fuel cans). Canisters are designed for 100 years of storage, which includes a renewal period. The canisters used at the ATC will accommodate a small number of fuel assemblies; if these canisters will eventually be used for transportation to a permanent disposal facility, design adjustments will be needed to meet the transport requirements. A huge number of shipments would be required to ship these small-capacity canisters to a repository, which could have a possible social impact. Other transport combinations are under evaluation.

Tecnatom USA, the new Tecnatom Group subsidiary, has recently come into being as a further step towards our strategic goal of internationalization. The company brings the corporate personality and innovation that characterizes our subsidiaries and will be the reference for our activities on the demanding American market and in other countries in its area of influence. The company will also serve as an operational and administrative base for the Group’s activities in the United States.

The primary objective of Tecnatom USA is to render a wide range of engineering and technical support services to the electricity industry, and in particular to nuclear power plants. These include activities such as consultancy, training, simulation, inspection technologies, maintenance, safety, radiological protection and the quality control of products and equipment.

Thanks to our technological independence, this new subsidiary will also be able to supply equipment developed in accordance with the specific needs of the clients, providing a customized service and ensuring maximum added value in our services.
ENUSA SIGNS AN AGREEMENT WITH WESTINGHOUSE FOR MANUFACTURING OF NUCLEAR FUEL ASSEMBLIES AND ASSOCIATED SERVICES FOR EDF REACTORS IN FRANCE - DECEMBER 2014

On December 16th, 2014, ENUSA and WESTINGHOUSE signed an Agreement for Manufacturing of Nuclear Fuel and Associated Services for the EDF Nuclear Power Plants in France. This signature follows the award to Westinghouse by EDF of a long-term contract to provide several thousand tons of nuclear fuel, continuing the current contract expiring at the end of 2014.

The supply of nuclear fuel and services to EDF takes place under the European Fuel Group (EFG) Agreement, on the basis of which both ENUSA and Westinghouse cooperate on an exclusive basis in the marketing, design, engineering, manufacture, sale and servicing of PWR fuel for the European market.

The first version of the EFG Agreement was signed back in 1991 and since then it has been renovated a number of times between ENUSA and Westinghouse.

The nuclear fuel for EDF is manufactured under the terms of the EFG Agreement at the Westinghouse facilities in Västerås, Sweden and Springfields, U.K. and at the Enusa plant in Juzbado, Salamanca-Spain.

ENUSA: EXPANSION OF COOPERATION WITH YIBIN FUEL PLANT - DECEMBER 2014

CNNC Jianzhong Nuclear Fuel (CJNF) and ENUSA have entered into a new agreement whereby ENUSA, in cooperation with TECNATOM, will supply additional fuel inspection equipment to the Yibin Fuel Plant in Sichuan province (China) to complement the capabilities of the ultrasonic inspection equipment already delivered to the Yibin plant.

The system to be delivered in 2015 is intended for the detection of defects on the surface of fuel tubes by eddy current testing and it will make use of the know-how acquired by ENUSA at the Juzbado fuel factory and TECNATOM’s extensive experience in eddy current non-destructive examinations.