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VANDELLÓS 1 DECOMMISSIONING PROJECT

Safety before, during and after

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Abstract. The Nuclear Power Plant of Vandellós 1, a gas-graphite reactor (GCR), started operation in the 70's after 17 years running the decommissioning process began in 1998, and is expected to finish at the end of 2002 with the level 2 of decommissioning with a practically total scope reached, except the concrete reactor vessel and its internals that will remain for another 25 years in surveillance state (dormancy) until their total dismantling. During the last four years the activities related to decontamination and disassembly of the power plant system as well as the management of all this material have been carried out. One of the last phases of the project that will be performed this year, without doubt, one of the most representative of the operative difficulty of the task is the disassembly of some buildings which are more than 80 meters high and with some structures weighing more than 3.000 t, an operation, which is spectacular in terms of volume and mass involved. However one has to keep in mind that it has been preceded by the of clearance process of all these structures to be disassembled this summer. Hundred of thousands of radiological measures will confirm with guarantee that the destination of the dismantled materials is the correct one, assuring the protection of people and the environment. This is a process which has to integrate the principles of radiological safety and industrial safety. First, it has to be guaranteed that structures and components are below the values authorised by authorities for their free release, and, secondly, that the planned sequence of the process and manoeuvres in the disassembly of these colossal structures assures safety.

DESCRIPTION

Physical Description

The reactor building (Photograph 1) is a rectangular construction whose dimensions are approximately 42 m x 54 m and 82 m in height including the part belonging to the irradiated fuel building. The building basically houses the reactor pile, the new outdoor protective structure and the irradiated fuel building.

The structure of the building, which is metallic, consists of a set of 3 portals that are articulated at the base and strengthened to withstand horizontal stresses and with supports for the roof and windproof girders. This structure extends southwards, where there is an additional thatched portal on the outside of the enclosing walls.

The roof and the walls between elevations +16,00 and +85.80 are of metallic sheet, which is translucent in certain areas. To the south the irradiated fuel buidling is annexed, as separate entity independent from the metallic structure of the reactor building and open to it to the top at elevation +57.80.

The gantry crane is located in the upper part of the reactor building, at elevation +75.00.

In the centre of the building is the reactor pile, which stretches from elevation +8.65 to +57.80. This has been protected against the weather by a recently constructed metallic enclosure, which runs from elevation +19.00 to +63.80

The irradiated fuel building, which measures some 42 m x 10 m and 62 m in height, is built of reinforced concrete from elevation +3.50 to +24.85, and from here to elevation +57.80 is a self-

contained metallic structure with open areas and areas separated by concrete blocks, the exception being the testing station, which is entirely made of concrete.

The different rooms in this building have different structural elements, such as reinforced concrete of considerable thickness, for construction reasons and for shielding. Particularly significant among these is the irradiated fuel lock, from elevation +11.5 to +24.85, with 2-metre thick walls and forgings, and the testing station, which runs from elevation +32.0 to the roof, this measuring approximately 6 m x 9 m with 1-metre walls. Demolition is performed above elevation +16.00.

Radiological description

The internal metallic structure and the thatching of the reactor and irradiated fuel buildings, although they did not contain any radioactive material, are conservatively a part of the Active Parts Dismantling Plan. Therefore, this material has to undergo a specific process of declassification prior to being treated as conventional material.

The structural concrete elements of the irradiated fuel building have, however, housed contaminated material and have served to contain radioactive material, therefore, they have been included in the Active Parts Dismantling Plan and the Decontamination Plans for Specific Items and Walls. A part of this material has been managed as radioactive waste and the rest as conventional material following the surfaces declassification process.

MODELING

In order to address the dismantling of the reactor building in complete safety, it has been modeled with a view to verifying the stability of its structure in each phase of the dismantling, for the load hypotheses considered.

The simulated dismantling hypotheses aimed at serving as an envelope for the most unfavourable conditions that might occur during the disassembly of the reactor structure.

The model is used to check in the field that the removal of the part to be disassembled will not compromise the stability of the structure.

CONTROL POINTS DURING THE DIFFERENT PHASES OF DISMANTLING

Continuous surveillance is performed on the deformations arising in two significant beams of the main structure in order to gain insight into the stress status of the structure and facilitate avoiding loads exceeding those assumed for each of the phases of dismantling,.

The beam deformation is measured by means of axial strain gauges. Given that the loads producing the maximum stress are those due to winds from the North or West, the control of the deformations is performed on two beams in the main structure that are considerably exposed to winds blowing North-South and West-East.

OPERATION SCHEDULE

The activities carried out inside the buildings have been scheduled for the spring months with the greatest meteorological impact (North-west winds). Most of these activities (preparation and assembly of hoisting tools, cutting, etc.) are pre-requisites for the disassembly of the external walls and main structures.

Later in the spring, once the Northwest winds have died down and breezes from the East and South begin to prevail, the disassembly of the external thatching and main structures is addressed. These are activities in which the wind may have a greater impact, and will be completed by the beginning of autumn, before the Northwest winds prevail once more.

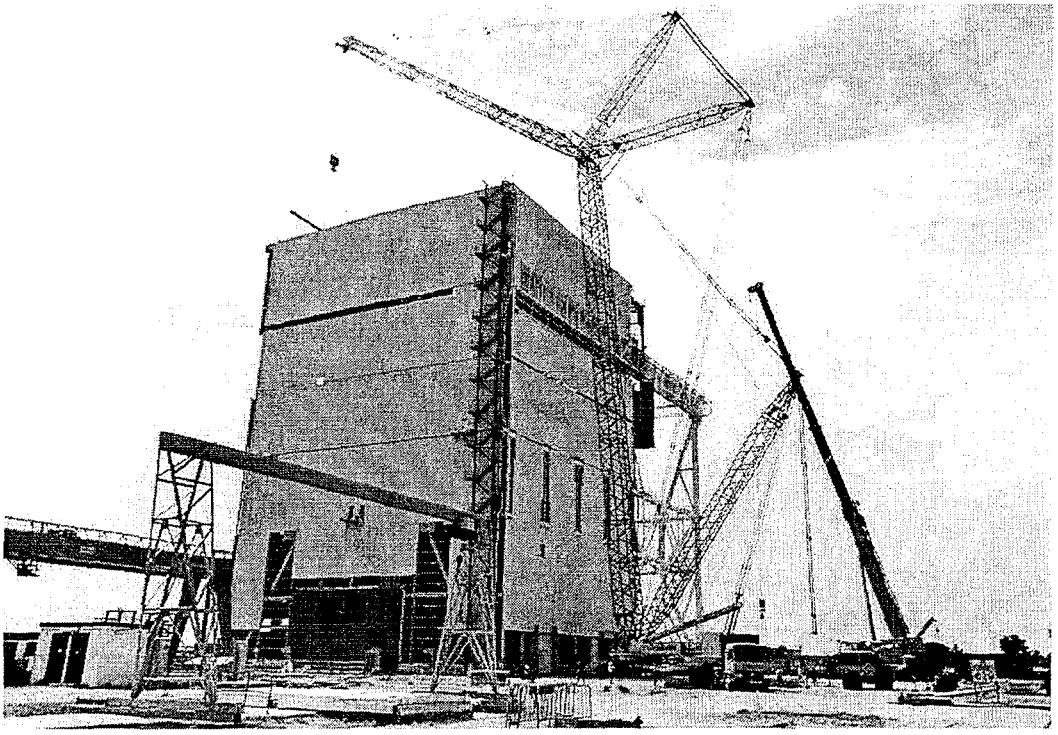
During the autumn months, the time of the year when the winds (North-west) blow hardest, the demolition of the concrete structures of the irradiated fuel building will be addressed.

SAFETY MEASURES DURING OPERATION

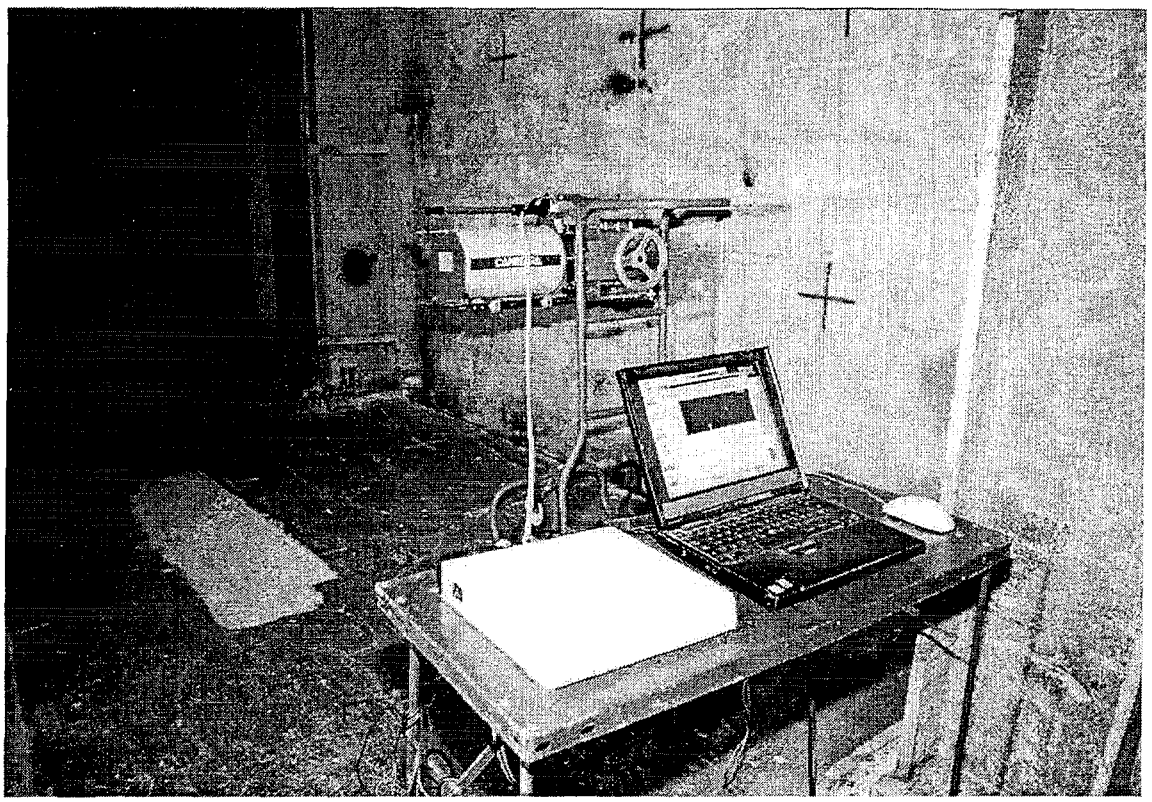
- Closing of the area where the 800 t crane is working.
- Individual and collective protection for the operating personnel.
- Displacement of loads as close as possible to the ground and prevention to the largest possible extent of trajectories passing over the new Protective Device, the Temporary Graphite Store and the Surveillance and Services building.
- Securing of facade plates and of any part of the structure that might have any degree of instability during the disassembly process.
- Daily control of weather forecasts, mainly as regards the wind.
- No performance of work with winds exceeding 40 km/h and strict compliance with crane limitations.
- Non-use of cables or slings that have not been checked for possible damage within their structure.

CONTROL OF DISMANTLED MATERIALS

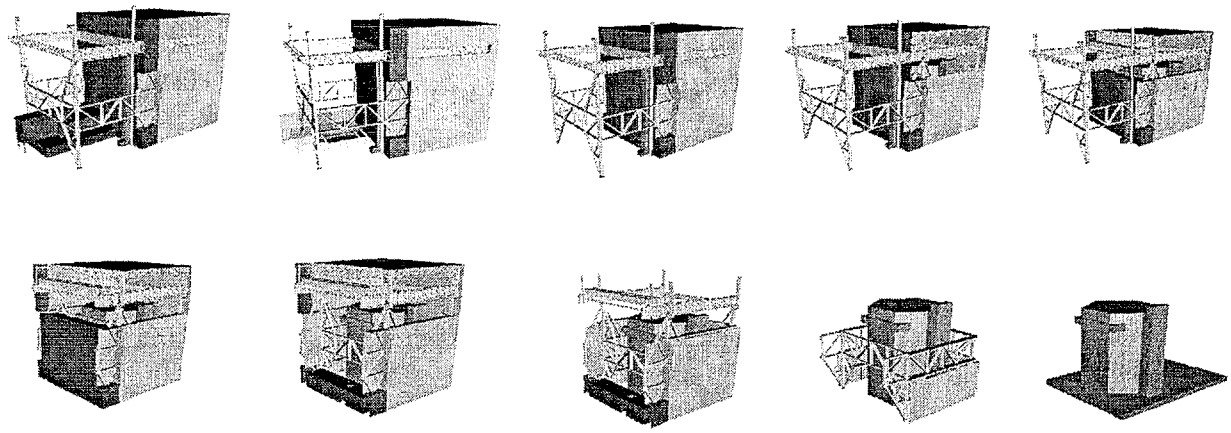
As has been mentioned above, for the metallic structure and thatching from the reactor and irradiated fuel buildings to be treated as conventional waste for recycling or reuse it has to be proven that they are not contaminated before they are released from the site. For this purpose, radiological measures (Photograph 2) have been taken from representative samples of the materials to be dismantled, in order to demonstrate that they are below the authorised declassification levels and to ensure that the radiological impact on the public of such recycled or reused materials will be negligible.



PHOTOGRAPH 1. 800 T CRANE AND REACTOR BUILDING



PHOTOGRAPH 2. RADIOLOGICAL MEASUREMENT EQUIPMENT (ISOCS)



DISMANTLING OF THE OLD BUILDING OF THE REACTOR

The works are divided in 10 big phases that will keep in mind the structural stability, the climatological conditions, the big weights and surfaces to dismantle and the prevention of risks.