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AUTOMATIC INSPECTION OF THE MAIN PRIMARY CIRCUIT PIPING AT THE SOUTH UKRAINE NUCLEAR POWER PLANT

A. TANARRO

INTRODUCTION

In response to GOSKOMATOM requests, the TPEG (from The Commission of the European Communities) undertook development of the general approach to the Project, or Terms of Reference, with a view to procuring complete financing of the project through TACIS funds.

Subsequently UNESA (Unidad Eléctrica, S.A.), as the organization responsible for the On-site Assistance Project for South Ukraine NPP, jointly reviewed the contents of the project with the Plant and coordinated development throughout the initial phase, which finishes in May 1995.

From the very start the definition of the Project covered all the Activities required to ensure its final objective: full autonomy for the Plant to perform inspections and the capacity required for this to be achieved to a suitable level of quality.

PROJECT SCOPE

Three groups of activities were considered:

- Inspection Engineering.
- Necessary equipment.
- Non-Destructive Testing Technology.

Inspection Engineering

Four Activities were established within the first group, Inspection Engineering:

- Fracture Mechanics study of the piping covered by the Project: The aim was to con-

sider the criteria used in the initial manufacturing design and to compare them with those currently required by the ASME Code.

- Inspection Program Proposal: Following definition of the applicability of the ASME Code, and based on it, the aim was to prepare an In-Service Inspection Program for the component in question, at both Plant Units.

- Feasibility study: In order to ensure that the Program proposed and its performance using automatic equipment was possible, an in-the-field study was planned for verification of geometric interferences, the surface finish of the welds and the levels of environmental radiation.

- Indications Assessment Manual: In order to facilitate correct evaluation of the possible indications to be detected, and allow for the application of safe and economic criteria and rapid decision making, drawing up of an Indications Evaluation Manual based on fracture mechanics studies was included in the Project.



Tecnatom delivers the equipments to the South Ukraine NPP.

of specific procedures and training of the personnel in their application. The aforementioned blocks would be a highly valuable tool for this purpose.

PHASE 1. ALREADY COMPLETED

As has been pointed out above, this first phase was coordinated by UNESA. It included the initial inspection engineering tasks and the provision of physical equipment or resources. The foreseen Fracture Mechanics studies were performed, these confirming the feasibility of applying the ASME Code in relation to inspection of the main primary circuit piping, for the remainder of the service lifetime. An inspection Program was drawn up and a computer platform for tracking was provided, this consisting of a database including both the information and graphic documentation available at the time of preparation and the capability to incorporate future in-service inspection results.

As was planned, a feasibility study was performed, this providing satisfactory results inasmuch as the applicability of the automatic ultrasonic inspection systems for the tracking of primary circuit weld integrity was confirmed.

The foreseen tendering process was accomplished, resulting in supply to the Plant of the following equipment, manufactured by TECNATOM:

- SUMIAD equipment for automatic ultrasonic data acquisition and storage, with a capacity for eight simultaneous channels, complete signal and SIROCO controller integrated in the console.
- PIPE mechanical equipment for automatic inspection.
- DAMUT mechanical equipment for manual acquisition and data storage.

Data acquisition and control system.

In this way, on completion of the Project the Plant would have at its disposal studies justifying the application of a meticulously developed standard widely used in the western world. It would likewise have an In-Service Inspection Program and a computer tool for its management and development. Finally, the Plant would have the capacity to rapidly take decisions in response to the appearance of eventual indications.

Inspection Equipment

One of the fundamental aims of the Project, and the one most sought after by the Ukrainians, was that the Plant should have available the physical resources required for performance of the inspection.

The equipment making up the automatic inspection system would be acquired using TACIS funds. Following development of the Technical Specification by UNESA, the tendering process would be carried out, this culminating in delivery to the South Ukraine Nuclear Power Plant of the resources required for implementation of in-service inspections.

Supply of the equipment, with all the software in Russian to facilitate operation by the Ukrainian technicians, was to include operating and maintenance manuals, training courses, technical assistance during the first inspection, a one year guarantee and another free after-sales services for the Plant.

Furthermore, it was planned that the Ukrainian Plant should be provided with a collection of blocks with induced defects, the design of which was to be inspired by Appendix VIII of ASME Code Chapter XI. These blocks would be used for training of the inspection personnel in the ultra-

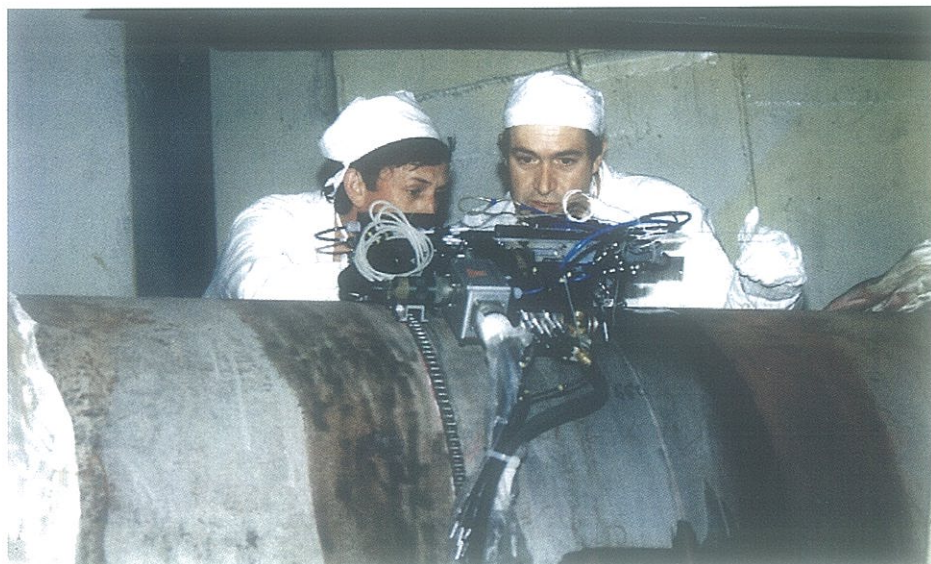
sonic techniques and procedures required for both detection and dimensioning of the possible indications. Another important function of these blocks might be to demonstrate to the Ukrainian authorities the quality of the new systems and procedures, application of which is aimed at improving in-service inspection practices.

Ultrasonic Technology

One last aspect which had already shown itself to be very important for completion of the Project was the transfer of Non-Destructive Testing technology.

Although other TACIS Projects already dealt with generic training in NDE techniques, guaranteeing the success of the South Ukraine inspection Project required the development

Pipe inspection equipment.



- MASERA equipment for advanced data processing and display and the drawing up of reports.

The delivery of the equipment by the foreseen date and the intensive training of the Ukrainian technicians, carried out at both the supplier's premises and at the Plant itself, made it possible for the first actual inspection to be performed in May 1995, as planned.

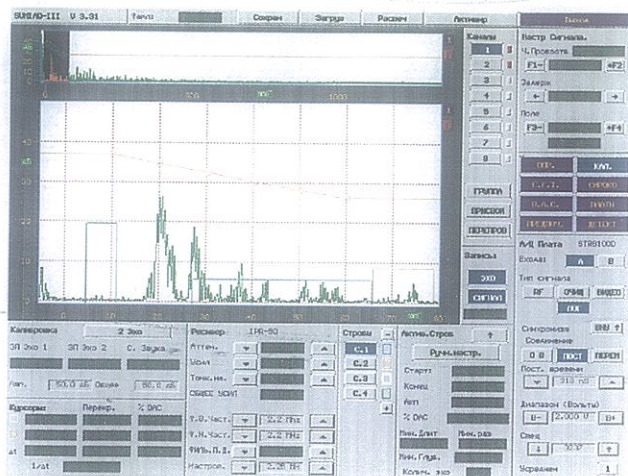
This inspection allowed the technicians receiving the System to become familiar with its operation and to gain confidence and security in relation to its performance. They were able to appreciate the ease with which the System is used and were motivated into making full use of it.

FINAL PROJECT FORECASTS

Transfer of the equipment having now been accomplished and the Inspection Engineering Activities being now almost completed, with only the Indications Assessment Manual pending, this phase will deal fundamentally with the NDT technology. The specific inspection procedures are currently being drawn up, coordinated by DTN (Nuclear Technological

Development. Economic Interest Grouping), the aim being for the Ukrainian technicians to first apply the new System using the old procedures of what was the USSR and then have sufficient knowledge to be able to implement the procedures in use in the western world.

Both procedures - the traditional Ukrainian and new ASME type - will be applied to the available blocks, and the ultrasonic operators will have the opportunity to become familiar with their peculiarities and draw up their own criteria regarding their advantages and disadvantages. In parallel to this process of transfer and training, licensing of the System and inspection procedures has begun with the Ukrainian authorities. The initial phase having been com-



Typical screen display during calibration in the SUMIAD acquisition system.

pleted successfully, the objective now is to generally apply the Inspection System during the refuelling outages scheduled for 1996. By this time the Indications Assessment Manual will be available, the equipment and procedures will be licensed and the personnel trained to a degree sufficient for safe, high quality, autonomous application.

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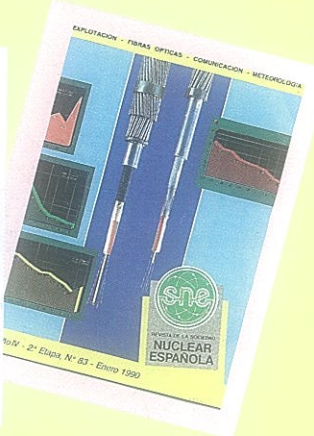
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