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STEAM GENERATOR TUBE EXTRACTION

DELORME, H.

Framatome, 92-Paris-la-Defense (France)

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STEAM GENERATOR TUBE EXTRACTION

AS REQUIRED BY THE SAFETY REPORT, EDDY-CURRENT EXAMINATION OF STEAM GENERATOR TUBES IS PERFORMED DURING EACH UNIT SHUTDOWN, TO CHECK FOR THE APPEARANCE OF TUBE DEFECTS SUCH AS THINNING, DENTING, OR STRESS - CORROSION CRACKING.

THESE DEFECTS MAY RESULT IN TUBE RUPTURE AND LEAKAGE OF REACTOR COOLANT AND FISSION PRODUCTS TO THE SECONDARY SIDE.

TO ENABLE TUBE EXAMINATION ON STEAM GENERATORS IN SERVICE, FRAMATOME HAS NOW DEVELOPED A PROCESS FOR REMOVING SECTIONS OF STEAM GENERATOR TUBES.

PRINCIPLES

TUBE SAMPLE

THE SECTION OF TUBE TO BE EXAMINED IS TAKEN FROM THE LOWER PART OF THE STEAM GENERATOR, BETWEEN THE PRIMARY SIDE OF THE TUBE SHEET AND THE FIRST SUPPORT PLATE.

EXTRACTION

TUBE EXTRACTION IS NORMALLY CARRIED OUT ON THE CHANNEL HOT SIDE, WHERE TUBES ARE MOST SUSCEPTIBLE TO DAMAGE. THE PROCESS MAY NEVERTHELESS BE USED EFFECTIVELY ON BOTH THE HOT AND COLD SIDES.

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EXAMINATIONS

VARIOUS EXAMINATIONS ARE PERFORMED ON BOTH THE TUBES AND THE TUBE SHEET TO OBTAIN INFORMATION REQUIRED PRIOR TO TUBE EXTRACTION, ESPECIALLY :

- ELEVATION OF FIRST TUBE SUPPORT PLATE ;
- INTERNAL DIAMETER OF THE TUBE.

OPERATION

ALL PHASES OF THE OPERATION ARE CAREFULLY TIMED AND ARE PERFORMED IN THE FOLLOWING ORDER :

- FASTENING THE REMAINING SECTION OF TUBING, TO PREVENT VIBRATION DURING STEAM GENERATOR OPERATION ;
- CHECKING THAT THE TUBE IS SECURELY FASTENED TO THE SUPPORT PLATE ;
- REMOVING THE TUBE - TO - TUBE SHEET ;
- TUBE CUTTING EXAMINATION ;
- TREATMENT OF TUBE EXPANDED AREA IN THE TUBE SHEET ;
- TUBE EXTRACTION ;
- CLEANING OF TUBE SHEET HOLE ;

- FITTING A SPECIAL THIMBLE ;
- EXPANSION AND WELDING OF THE THIMBLE ;
- THIMBLE PLUGGING.

CONDITIONS

- PRIMARY NOZZLE DAM FITTED.
- STEAM GENERATOR SECONDARY SIDE EMPTIED.
- MONITORING OF OPERATIONS INSIDE AND OUTSIDE THE CHANNEL HEAD BY MEANS OF VIDEO UNITS.

PERSONNEL REQUIRED

- 1 COORDINATING ENGINEER ;
- 1 Q. A. TECHNICIAN ;
- 7 VERSATILE QUALIFIED WELDER ;
- 1 QUALIFIED NDT INSPECTOR ;
- 2 TRAINED JUMPERS ;
- 2 TECHNICIANS FOR FINAL PLUGGING OPERATIONS.

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WORK TIME

UNDER NORMAL CONDITIONS, FRAMATOME TECHNICIANS ARE CAPABLE OF COMPLETING STEAM GENERATOR TUBE EXTRACTION OPERATIONS IN ONLY THREE DAYS, BROKEN DOWN AS FOLLOWS :

- EQUIPMENT PREPARATION ;
- SETTING UP THE EQUIPMENT ON SITE ;
- TUBE EXTRACTION : 2 x 8 HOUR SHIFTS PER TUBE ;
- CLEARING AWAY EQUIPMENT, SORTING, DECONTAMINATION, AND RESTORING TO INITIAL CONDITIONS.

RADIATION EXPOSURE

EXPOSURE IS APPROXIMATELY 3 MAN-REMS PER TUBE EXTRACTED FOR A CHANNEL HEAD WITH A DOSE RATE OF 10 RAD/HOUR.

ADVANTAGES

THE FRAMATOME METHOD HAS THE FOLLOWING ADVANTAGES :

- 7/8 " DIAMETER TUBES IN ALL STEAM GENERATOR TYPES CAN BE REMOVED . THE PROCESS CAN ALSO BE ADAPTED TO OTHER TUBE SIZES (3/4", ETC.).

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- TUBE SECTIONS CAN BE REMOVED WITHOUT BEING DAMAGED, BY MEANS OF A METHOD FOR TREATING THE TUBE SECTION EXPANDED IN THE TUBE SHEET ;
- THE TUBE LENGTH REMAINING AFTER EXTRACTION IS PREVENTED FROM VIBRATED DURING STEAM GENERATOR OPERATION BY A METHOD THAT FASTENS THE TUBE TO THE SUPPORT PLATE BEFORE EXTRACTION BEGINS ;
- THE VARIOUS CHECKS PERFORMED ENSURE THAT OPERATIONS ARE CARRIED OUT SMOOTHLY AND IN STRICT CHRONOLOGICAL ORDER ;
- THE OWNER'S STEAM GENERATOR IS RESTORED TO SERVICE IN ITS INITIAL CONDITIONS OF SAFETY AND OPERABILITY, FITTED WITH A SPECIAL THIMBLE AND ADDITIONAL PLUGGING DEVICE ;
- THE RESULTS OBTAINED SATISFY ALL APPLICABLE CODES AND STANDARDS.