ACOUSTIC EMISSION AS A NON-DESTRUCTIVE TESTING METHOD FOR DETECTION OF INCIPIENT FAILURES IN NUCLEAR REACTOR PRESSURE VESSELS*

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In USA and Western Germany development work is done which shall lead to the application of acoustic emission as a means of continuously monitoring nuclear reactor pressure vessels for flaw growth. This monitoring system is supposed to give a hint on the locus of growing cracks and it should give a signal in due time before a catastrophic failure of the reactor pressure vessel occurs. The method applied is based on the measurement of elastic waves emitted by propagating cracks by means of piezoelectric transducers. There are a number of problems to be solved which are studied now.

1. The acoustic emission signals have to be detected in the presence of sonic and ultrasonic noises which are generated by a working reactor. For this purpose we are measuring these noises at frequencies up to 1 Mcps on the reactor vessel in Gundremmingen. These measurements are performed in order to find out a frequency band of low noise level.
2. The acoustic emission method should allow to estimate the size of critical flaws. Measurements with notched specimens showed that there are clear relationships between the size of the plastic zone at the crack tip (which can be described by the stress intensity factor K, known from fracture mechanics) and the rate and/or intensity of acoustic emission.

We intend to use the acoustic emission method at first for proof testing of reactor vessels. Experiments with pressurized notched tubes proved that acoustic emissions can be noticed in case of ductile crack growth before brittle fracture some time before the failure occurs.

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*Paper not received

DISCUSSION

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P. WEYERMANN, Switzerland

You indicated, that you are actually measuring the background noise at the nuclear power plants Gundremmingen and Obrigheim. Please, give an estimate how long it will take and how difficult it will be to get useful results ?

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J. EISENBLÄTTER, Germany

We made these measurements only a few weeks ago; therefore I cannot give here final results. These results will be available after a few months.