

MEASUREMENTS INSIDE THE STRUCTURAL CONCRETE OF A PCPV AT ELEVATED TEMPERATURES

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The prototype vessel with elastic hot liner and adjustable wall temperature at Seibersdorf Research Center was monitored during all phases of operation - including a one year operation at elevated temperatures up to 120°C wall temperature - by an extensive instrumentation which covers

- . temperature measurements within the structural and insulating concrete and on the liner
- . strain measurements within the concrete and on the liner
- . stress measurements within the prestressed concrete and on the tendons
- . measurements of the stability of shape and proportion of the structure
- . measurements of humidity of the concrete

For the comparison with the structural analysis emphasis was layed on strain measurements. In order to interpret these data some basic knowledge was necessary:

- . the properties of the gauges (calibration, temperature behaviour, drift, aging, etc.)
- . the properties of concrete (Young's modulus, thermal expansion, shrinkage, creep, etc.) depending on age, moisture content, temperature- and stress-history
- . the actual history of temperature and stress of the structural concrete of the PCPV

Selective tests have been performed on various types of gauges and on the properties of concrete. A test facility was used to measure creep and thermal expansion.

The testing parameters are set as close as possible to the physical state of the prototype vessel. Sealed and unsealed test specimens cast from the original mix are used to represent the different moisture conditions of the inner of the structural concrete and the outer surface.

Special attention was directed to the first thermal cycle on the prototype vessel which we call the "phase of stabilization".

First the temperature was risen in steps, each step long enough to allow both the measurements on the vessel and the laboratory test to show clean and interpretable results. During this period most of the stabilization was done. Later on the temperature was kept at 120°C for three months to observe the long-term behaviour of both the gauges and the structure at elevated temperature.