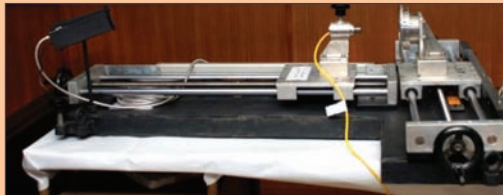


## Design, Development and Supply of UMAC system to NPCIL



Tool for holding Sensor



Sensor calibration manipulator



Data acquisition system

Ultrasonic Sensor with controller unit

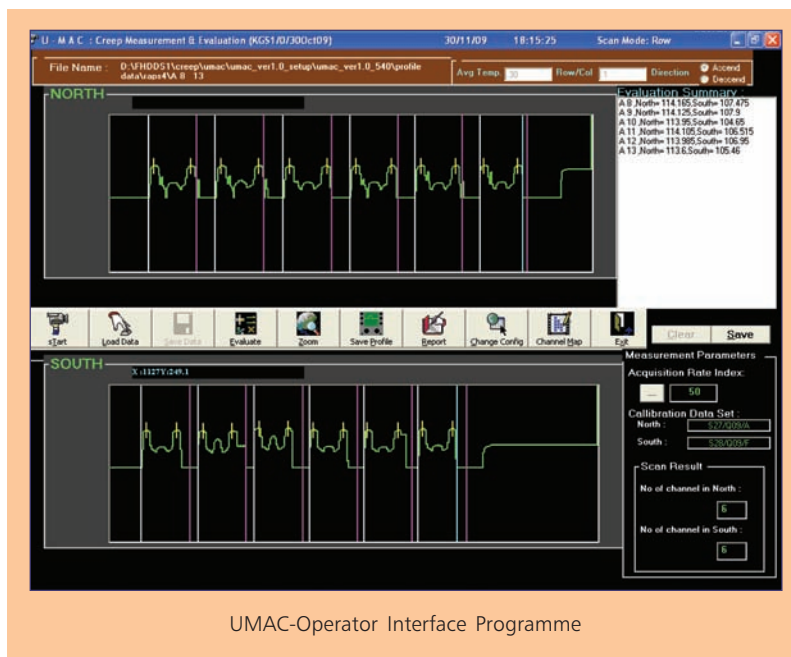
Axial creep monitoring of the coolant channels is required to be done, during every bi-annual shutdown in Pressurized Heavy Water Reactors. Previously the Refuelling Technology Division had developed a PC based Creep Measuring System called "Technique for Measuring Axial Creep (TMAC)" which is in use in all operating PHWRs. TMAC is the remote measurement system and it uses Fuelling Machines to monitor the creep. Existing Z motion potentiometers of fuelling machine are used as sensors for the system. The system completes creep measurement in approximately two shifts of operation without any significant man-rem expenditure.

Based on request from NPCIL, a new technique called "Ultrasonic Measurement of Axial Creep (UMAC)"

has been developed at the Refuelling Technology Division. The system generates creep data in tabular as well as graphical formats. Existing Fuelling Machines are used to carry the sensors to the reactor face. The fuelling machines do not contact the channel. UMAC measures the creep of all coolant channels within 4 hours. Man-rem consumption is almost nil.

UMAC has been successfully tried in operating reactor. UMAC comprises of non contact ultrasonic sensor to measure the distance between fuelling machine and channel, a fuelling machine compatible sensor mounting tool to take the sensor in front of the reactor face and a two-axis sensor calibration facility. The sensor signal is processed using indigenously developed microcontroller-based data acquisition system, which converts sensor output in digital format and communicates to a Personal Computer via RS232 port for further processing of data. A window based graphical user interface was developed to acquire, display and process measurement data for generating report instantly in the desired format.

After successfully testing UMAC system at ITF, Engg.Hall-7, the system was satisfactorily used on experimental basis in some of the operating PHWRs. A MoU was signed with NPCIL to supply nine sets of system one each for RAPS-1&2, MAPS-1&2,



UMAC-Operator Interface Programme



Fig 4: UMAC handing over to NPCIL (Seen in photograph from left to right), Mr. S.Bhattacharya, RTD, BARC , Mr. R.J.Patel, Head FHD&D Section, RTD,BARC, Mr. S. Vijaykumar,CE(CCD),NPCIL, Mr. K.B.Dixit, Director (Engg), NPCIL , Mr. Nageswara Rao, Director (Operation), NPCIL, Mr. R.G.Agrawal, Head, RTD,BARC, Mr. R. K. Sinha, Director, RD&DG and DMAG BARC and Mr. Rites Ranjon, RTD, BARC.

NAPS-1&2, KAPS-1&2, KGS-1&2, RAPS-3&4, KGS-3&4, RAPS-5&6 and TAPS-3&4. The systems were made ready. A four day training and certification programme (10-13<sup>th</sup> November, 2009) was

organized for operating plant personnel at Hall-7. The system was handed over to NPCIL on 13<sup>th</sup> November, 2009.