

## **SPECIAL PROBE FOR OSCILLATING FLOW MEASUREMENT**

The work of designing and developing a probe for measurement of time variant flow (oscillating flow) was entrusted by National Institute of Ocean Technology (NIOT), Chennai. Involved in setting up and commissioning of a wave Energy Facility at the tip of backwaters at Vizhinjam harbour, Thiruvananthapuram.

Sea wave displace a volume of air collected in a concrete dome structure. The two openings on top of the dome provide the passage of air to the atmosphere, causing unidirectional rotation of wells turbines placed at the exit of the passages. An oscillating flow occurs depending on the frequency of oscillating air column caused by the wavy motion of the sea waves. It is intended to measure the point velocities at four points along the annular section of the pipe before and after the wells turbine and obtain the flow by integration. FCRI was entrusted the work of supplying calibrated probes for measurement of low in the oscillating air medium.

The probe consist of four numbers of sensor which are used to convert the poin velocity to propotional electrical signal. Velocity is measured at four fixed distance along the radial axis of annular pipe section through which the oscillating flow occurs. The probe gives electrical voltages propotional to the flow velocity at each point. Each transducer is calibrated in steady flow conditions using a pre-calibrated Hot Wire Anemometer(HWA). The HWA has high frequency response and hence can be used in the oscillating flow medium. The HWA is also used to test the probe in the simulated oscillating flow conditions. The sequence of steps involved in the development of the probe was as follows.

1. Design, fabrication and assembly of probe.
2. Calibration of HWA using a pre-calibration pitot static tube in steady flow, in the wind tunnel for a velocity range of about 0-40 m/s.
3. Calibration of the four sensor of the probe in steady flow for a velocity range about 0-40 m/s using HWA at different temperatures of about 20°C, 25°C and 29°C.
4. Testing of each sensor for a velocity range of about 0-35 m/s at 25°C in the oscillating flow facility with HWA as the reference. The graph shows a fluctuating velocity signal in an oscillating air column.

