

Ultrasonic Doppler Flow Measurements Applied to Gas-Lift Pumping Technique

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Abstract: The Lead bismuth eutectic (LBE) is considered as the candidate spallation target material and coolant for the Accelerator Driven sub-critical Systems (ADS) as well as coolant for fast neutron reactor. Series of liquid PbBi loops named KYLIN series has been designed and built or under construction by FDS Team to investigate the key issues of LBE. One of the main objectives of KYLIN-II facilities was to investigate and confirm the possibility of using the gas-lift pumping technique to obtain a steady flow of liquid metal on significant scale, and make know the exact velocity profile in the gas-lift test section. The Ultrasound Doppler Velocimetry (UDV) is a non-intrusive way to measure opaque fluids and has the ability to deliver complete velocity profiles online. For this reason, The UDV was applied to the experimental activities performed to characterize the gas enhanced circulation technique and analyze the fluid dynamic behavior of the system.

Taking into account that UDV technique was restricted by some problems, such as high temperature, acoustic coupling and the wetting condition, the verification of the UDV was carried out in the gas-lift facility. At first, the velocity profile of water flow with no air injection in a rotating device was investigated by experimental and numerical approaches. Then, the echo signals reflected from air-water bubbly flow in the gas-lift test section were measured and the flowing profile were estimated by statistical analysis and velocity profiling process of echo signals. Good results were achieved during these tests, which mean that the UDV is available for the velocity measurement, and the application of UDV method to the gas lifting in KYLIN loop will be achieved in future.

Key words: Liquid metal facilities; UDV; Velocity profile

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