Contribution ID: **678** Type: **Contributed Oral Presentation**

C3Or2B-07: Research on measurement technique of phase distribution and void fraction for cryogenic two-phase flow based on capacitance

Wednesday, 24 July 2019 15:45 (15 minutes)

Cryogenic two-phase flow widely exist in the cryogenic fluid transport processes. While accurate measurement of phase distribution and void fraction has always been a difficulty in practical engineering applications. In this study, the boundary capacitance values are used as a non-invasive measurement method to detect the phase distribution and void fraction of cryogenic two-phase flow. Firstly, the phase distribution of cryogenic fluids is obtained by electrical capacitance tomography (ECT). And the inversion images by the algorithms of simultaneous iterative reconstruction technique (SIRT), iterative Tikhonov regularization, Landweber iteration and TV regularization are compared. Moreover, the algorithms are modified in order to improve the calculation speed, suppress the artifacts and enhance the ability of noise resistance. Then, the support vector regression is used to fit the boundary capacitance vector with the void fraction, and the anti-noise performance of the obtained fitting formula is enhanced by fuzzing an appropriate fuzzy membership. The dimension reduction scheme for the capacitance vector is also studied. Finally, the capacitance sensor applied in cryogenic fluids and the multi-channel anti-jamming micro capacitance measurement circuit are designed. Verification experiments are carried out by using Polydimethylsiloxane (PDMS)-nylon as the working medium pairs with the permittivity ratio close to liquid nitrogen- vapor nitrogen. The proposed measurement scheme can measure the void fraction and phase distribution simultaneously based on the same set of hardware equipment.

Primary author: Mr XIE, Huangjun (Institute of Refrigeration and Cryogenics, Zhejiang University)

Co-authors: Mrs CHEN, Hong; Dr GAO, Xu; ZHOU, Rui (Zhejiang University); WANG, Shunhao (Zhejiang University); Mr ZHANG, Xiaobin (Zhejiang University)

Presenter: Mr XIE, Huangjun (Institute of Refrigeration and Cryogenics, Zhejiang University)

Session Classification: C3Or2B - Thermal-Fluid Transport and Properties for Fluids Boiling Above 50 K