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Editorial: Thermal-hydraulics in once-through steam generator (OTSG) for nuclear reactors

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Editorial on the Research Topic
Thermal-hydraulics in once-through steam generator (OTSG) for nuclear reactors

As a strong support for achieving the low-carbon goal, nuclear power generation plays an increasingly important role. The nuclear safety has always been the focus of the international community. The steam generator is the key connection component between the primary and secondary circuit in nuclear power plants. In recent years, the Once-Through Steam Generator (OTSG) has been widely used in small modular reactors and lead-bismuth cooled fast reactors. However, its flow and heat transfer characteristics are significantly different from conventional inverted U-tube steam generators. During the operation of OTSG, there is a two-phase flow phase change process from single-phase water to superheated steam in the secondary side of the working medium. The heat and water storage capacity of the secondary side are very small, leading to the quick respond of operating parameters. Especially during start-up and shutdown, there are strong flow instability and wall temperature fluctuation in OTSG, which easily leads to continuous flow oscillation, as well as flow-induced vibration and large stress of tube sheet structure.

In order to solve these problems, it is necessary to focus on the works on the thermal and hydraulic behaviors in OTSG. Finally, four articles were collected and published in this Research Topic, covering the experimental and numerical research of thermal hydraulic problems in OTSG.

Zheng et al. have contributed an article: "*Experimental study on friction pressure drop and circumferential heat transfer characteristics in helical tubes*". Correlations of flow resistance and heat transfer were proposed for the single-phase and saturated boiling two-phase flow respectively. The predicted values were improved compared with the prediction results of correlations in the existing literature.

Rui et al. have contributed their research relevant to: "*Study on physical prediction model of liquid film development and dry out point in helical tube*". The physical model and physical mechanism of the liquid membrane in helical tube before dry out are analyzed and validated with experimental data.

Chen et al. have presented article in title of: "*Numerical study on flow characteristics in the primary side of a once-through steam generator under ocean conditions*". Numerical simulation is conducted to study the flow characteristics of the primary side of the OTSG under different ocean conditions, including heeling, trimming, rolling, pitching, heaving and combined conditions.

Lu et al. have presented their research article of: "*Development and preliminary verification of a 1D–3D coupled flow and heat transfer model of OTSG*". The shell side of the OTSG was simulated by FLUENT, and the tube side was simulated by the system code LOCUST. Through spatial mapping, the 1D and 3D simulations were coupled to analyze the three-dimensional flow and heat transfer characteristics of the OTSG.

Through revision and update for almost 1 year, this Research Topic finally closed with above four papers published in the journal Frontiers in Energy Research. This Research Topic presents a chance to public to follow these high-quality papers related to this Research Topic. The journal will always open to accept more papers and all editors are welcomed to contact the journal for further information.

Author contributions

LZ: Conceptualization, Writing–original draft. YS: Writing–review and editing. XD: Writing–review and editing. WD: Writing–review and editing.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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