Parimala Rangan Fidel Castro (India), Alexander G. Korotkikh (Russia)
Tomsk Polytechnic University, Tomsk
Scientific supervisor: Korotkikh Alexander Gennadievich

TURBULENCE MODELS FOR NUMERICAL SIMULATION OF TEMPERATURE DISTRIBUTION IN SCWR

In the present study, computational fluid dynamics (CFD) simulation was conducted for 2×2 rod bare bundle using water at supercritical pressures. Main objective of the simulation is to compare calculation results with varying temperatures. CFD simulation was performed to replicate the results from the experiment of heat transfer to supercritical water in 2 × 2 rod bundle conducted at Shanghai Jiao Tong University [1]. This report presents the results to assess capability of the commercial CFD software Ansys fluent in simulating the convective heat transfer of water at supercritical pressures in nuclear fuel rod. The type of flow for simulation is taken as steady state flow. The mass flux is 800 kg/m2s and the heat flux is 600 kW/m2. The experiment was performed for the pressure of 25 MPa The temperature varies from 300°C, 340°C and 380°C. This simulation is conducted for steady state i.e. all the physical properties of water such as density and viscosity are considered as constant. K-epsilon turbulence model is used for our CFD simulation. K-epsilon model gives better results when there is mixing in the fluid flow. Solutions methods and scheme used for our investigation are provided in the table below.

Table

Solution methods

Solution method	Scheme	Solution method	Scheme
Pressure	simple	Energy continuity equations	2nd order Upwind
Pressure-velocity comp.	simple	Gradient	Least square cell based
Momentum equations	2nd order Upwind	Turbulent & kinetic energy equa.	2nd order Upwind

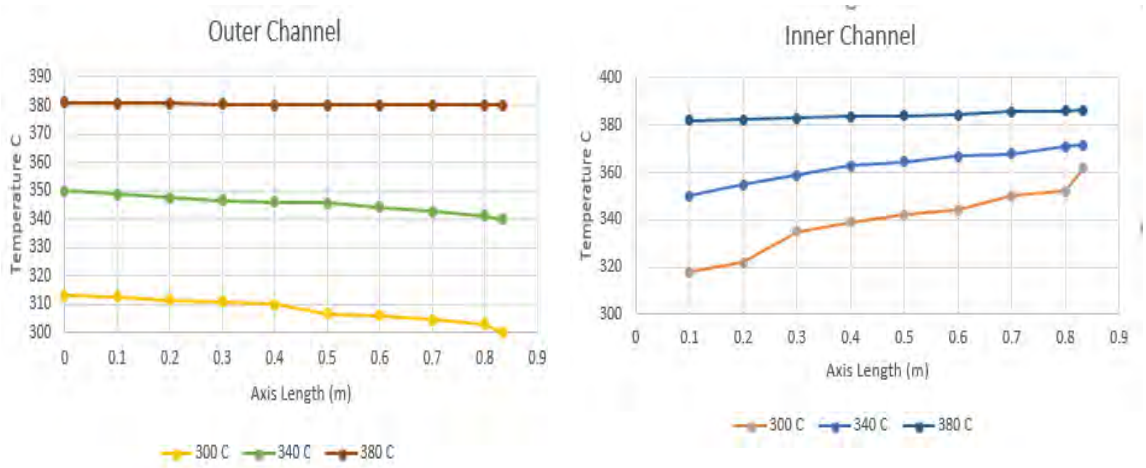

Fig. 1. Dependence of the coolant temperature at 300°C, 340°C , 380°C on the channel length

The results obtained from CFD simulation comes in close agreement with the experimental data as shown in Fig 1. Temperature is plotted along the radial length for inner and outer channels. The graph obtained is compared with the experimental results. All three turbulence models give results in acceptable range closer to the experimental data (5-10) %. The results were obtained for three inlet temperature of 300 °C, 340°C and 380 °C for 25 MPa pressure.

REFERENCES

1. H.Y. Gua, Z.X. HuD. Liua; X. Cheng, Experimental studies on heat transfer to supercritical water in 2 × 2 rod bundle with two channels //Nuclear Engineering and Design Volume 291, September 2015, Pages 212-223

Patz Matheus Osmar (Brazil)

Tomsk Polytechnic University, Tomsk

Scientific supervisor: Ivashkina Elena Nikolaevna

SYNTHESIS AND APPLICATION OF ZEOLITES IN THE PROCESSES OF FIELD PREPARATION AND PROCESSING OF PETROLEUM FEEDSTOCK

Because of the enormous volume of waste, ash from materials from the combustion of solid fuels for energy production can be an environmental liability. [1, 2] One of the leftovers, ash, can be used to make zeolites, which, in