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# Validation of turbulent models as a key element in the development of CFD methodology for nuclear safety and design applications

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It is an unfortunate fact that no single turbulence model is universally accepted as being superior for all classes of problems. The choice of turbulence model depends on considerations such as the physics of the flow, the established practice for a specific class of problem, the level of accuracy required, the available computational resources, and the amount of time available for the simulation. To make the most appropriate choice of model for certain application, one needs to understand the capabilities and limitations of the various options. Therefore, the validation study presented in this paper aimed to assess the capabilities of different turbulence models for the prediction of turbulent flow and heat transfer in a tightly spaced bare rod bundle.
In fact, a comprehensive CFD approach toward the accurate prediction of the turbulent flow and heat transfer in a tightly spaced rod bundles was developed. Since the experimental database was not available, the numerical experiment was performed in order to generate the high fidelity reference database by means of Direct Numerical Simulations (DNS). In the first step numerical experiment was designed, later DNS was performed. Finally, the validation of lower-order turbulent models was performed. For the validation purposes six commonly used turbulent models implemented in ANSYS Fluent software were chosen. In the validation study the turbulent flow and heat transfer profiles were compared qualitatively and quantitatively against the obtained DNS results.

**Primary author:** KWIATKOWSKI, Tomasz (National Centre for Nuclear Research)

**Co-author:** SHAMS, Afaque (Mechanical Engineering)

**Presenter:** KWIATKOWSKI, Tomasz (National Centre for Nuclear Research)

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