

Korelasi Baru Bilangan Tak Berdimensi untuk Analisis Aliran Sirkulasi Alami Kondisi Tunak Akibat Efek Termal pada Fasilitas Uji FASSIP 02 = New Correlation Non-Dimensional Numbers for Analysis on Natural Circulation During Steady State Conditions due to Thermal Effects in FASSIP 02 Test Facility

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Abstrak

Kejadian Station Blackout pada PLTN Fukushima daiichi membuat penelitian sistem keselamatan pasif pada sistem keselamatan nuklir menjadi lebih dikembangkan dan diterapkan. Penggunaan fenomena sirkulasi alam pada sistem keselamatan nuklir sudah menjadi perhatian bagi para peneliti didunia. Fokus penelitian adalah peneliti mampu mengkarakterisasi distribusi temperatur, mengkarakterisasi laju aliran massa dan mampu menghubungkan bilangan tidak berdimensi seperti bilangan Reynolds, bilangan Grashof dan rasio geometri menggunakan fasilitas eksperimen skala besar FASSIP-02. Eksperimen dilakukan dengan menggunakan metode pemanasan fluida kerja pada tangki pemanas selama periode tunak 5 jam pada masing-masing setting temperatur 50 oC, 60 oC, 70 oC, 80 oC, dimana metode pemanasan yang digunakan adalah pemanasan secara langsung ke fluida kerja di dalam Water Heating Tank. Berdasarkan hasil eksperimen didapatkan bahwa aliran sirkulasi alami berada pada rezim aliran turbulen dengan nilai bilangan Reynolds diantara 5233,77 – 13676,45. Korelasi baru bilangan tak berdimensi adalah $Re = 2,89 [Gr/NG]^{0,348}$.

.....The Station Blackout incident at the Fukushima Daiichi NPP made the research of passive safety systems in nuclear safety systems more developed and applied. The use of natural circulation phenomena in nuclear safety systems has become a concern for researchers in the world. The focus of the research is that researchers are able to characterize temperatur distribution, characterize mass flow rates and are able to relate non-dimensional numbers such as Reynolds number, Grashof number and geometry ratio using FASSIP-02 large-scale experimental facilities. Experiments were conducted using the method of heating the working fluid in the heating tank for a steady period of 5 hours at each temperatur setting of 50 oC, 60 oC, 70 oC, 80 oC, where the heating method used was direct heating to the working fluid inside the WHT. Based on the experimental results, it is found that the natural circulation flow is in the turbulent flow regime with Reynolds number values between 5233.77 - 13676.45. New correlation for Non-Dimensional Number is $Re = 2,89 [Gr/NG]^{0,348}$.