# Pertumbuhan jejak aliran tak-mantap melalui silinder bulat

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Abstrak

Pertumbuhan jejak aliran tak-mantap fluida kental inkompresibel melalui silinder bulat pada Re 11 000 diamati dan dianalisis secara numerik dan eksperimental. Pengujian eksperimental dilakukan dengan teknik visualisasi aliran menggunakan zat pewarna sedangkan simulasi numerik dilakukan dengan bantuan paket program CFD (computational fluid dynamics), yaitu melalui penyelesaian persamaan Navier-Stokes dengan metoda finite volume.

Pertumbuhan ukuran symmetrical close wake di belakang silinder menunjukkan kecenderungan yang sesuai dengan hasil penelitian lain pada Re yang berbeda, yaitu semakin tinggi Re maka ukuran maksimum close wake semakin kecil. Panjang symmetrical close wake ditentukan berdasar pengamatan plotting vektor kecepatan dan distribusi kecepatan pada center wake. Awal pecahnya symmetrical close wake dijelaskan berdasar posisi inti vorteks dan nilai vortisitas di belakang silinder, sedangkan titik separasi ditentukan berdasarkan nilai nol vortisitas dinding (wall vorticity). Fenomena vortex shedding hasil visualisasi eksperimental dibandingkan terhadap hasil simulasi numerik pada selang waktu yang sama untuk mendapatkan perbandingan kualitatif pota aliran di belakang silinder. Hasil simulasi numerik dalam tesis ini memberikan gambaran mengenai fenomenafenomena dasar yang berkaitan dengan pertumbuhan jejak aliran tak-mantap yang sulit diperoleh secara eksperimental.
<hr>The wake growth process of the unsteady flows of a viscous incompressible fluid past a circular cylinder with Re 11000 were observed and analyzed by means of both flow visualization experiment and numerical study. The color dye track technique was employed to visualize the flows, while the numerical simulation was performed by means of CFD package based on a finite volume of the unsteady Navier-Stokes equations.

The size growth of the main vortex,i.e., the symmetrical close wake behind the cylinder has trendline that agrees well with the existing experimental study. The length of the main vortex can be determined by both vector plotting and velocity distribution at the center wake. The beginning of symmetrical close wake collapse can be explained to base on the vortex center position and the vorticity value behind the cylinder. However the separation point is found by calculation of zero value of wall vorticity. The vortex shedding phenomenon by flow visualization is then compared with that of numerical simulation. The present numerical study elucidates more detail about fundamental mechanisms corresponding to the wake growth that is very difficult to obtain experimentally.