

Karakteristik medan tekanan pada aliran dengan pembesaran mendadak akibat pengaruh injeksi gas panas = Characteristics of pressure field of a sudden expansion flow with the influence of a heated gas injection

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Abstrak

ABSTRAK

Injeksi gas panas ke dalam aliran resirkulasi pada backward facing step menyebabkan perbedaan medan tekanan yang signifikan antara upstream dan downstream akibat perubahan temperatur injeksi, letak injeksi dan rasio spesifik momentum injeksi. Penelitian ini difokuskan pada pengaruh perbandingan momentum injeksi ($I = 0.1$ dan 0.5), pengaruh letak celah injeksi ($I_f = 2H$ dan $4H$) serta perubahan temperatur injeksi ($T_i = 27\text{ }^\circ\text{C}$, $100\text{ }^\circ\text{C}$ dan $300\text{ }^\circ\text{C}$) pada variasi medan tekanan yang terjadi. Medan tekanan diukur secara rata-rata dan fluktuatif pada bidang dua dimensi sepanjang sumbu simetri kanal search aliran.

Hasil penelitian menunjukkan bahwa penurunan tekanan pada aliran dengan pembesaran mendadak akibat injeksi gas panas disebabkan oleh kenaikan temperatur injeksi dan rasio momentum injeksi. Penurunan tekanan lebih besar terjadi di dekat celah injeksi pada daerah downstream. Semakin jauh letak celah injeksi dari reattachment point ($I_f = 2H$) maka penurunan tekanan di daerah downstream semakin besar. Akibatnya, fluktuasi tekanan yang terjadi pada daerah ini juga lebih besar. Hasil ini dikuatkan oleh puncak histogram menjadi mendatar dan frekuensi fluktuasi pada power spectra yang makin meningkat akibat kenaikan temperatur injeksi dan rasio momentum injeksi. Sedangkan dekat celah injeksi di daerah upstream pada $I_f = 4H$, kenaikan tekanan disebabkan oleh free stream bertemperatur dingin terseret ke dekat celah injeksi akibat adanya blocking effect udara injeksi. Hal ini menunjukkan temperatur injeksi dan rasio momentum injeksi kurang berpengaruh besar pada variasi medan tekanan di daerah tersebut. Penurunan tekanan di daerah upstream lebih seragam jika celah injeksi diletakkan $\frac{1}{2}$ dari reattachment point.

<i>ABSTRACT</i>

Hot gas injection through re-circulation zone in a backward facing step causing significant different of pressure field between upstream and downstream flow due to the changing of injection temperature, location, specific momentum ratio_ This experiment is focusing on to the influence between the injection momentum ($I = 0.1$ and 0.5), injection location ($I_f = 2H$ and $4H$) and the changing of injection temperature ($T_i = 27\text{ }^\circ\text{C}$, $100\text{ }^\circ\text{C}$ and $300\text{ }^\circ\text{C}$) at the pressure field variation, which occurred. The pressure fields are measure as average and fluctuate in the two-dimension surface along the axial of test section stream wise.

The experiment showing that the decrease of pressure of a sudden expansion flow with heated gas injection caused by the incremental of injection temperature and the specific momentum ratio. The pressure drop occurred near the whole injection in the downstream area. If the further the location injection from the reattachment point ($I_f = 2H$) then the pressure drop in the downstream area is getting higher. As a result the fluctuation of is pressure, which happen in that area is getting higher. The result is strengthening, by the peak of histogram becoming flat and the fluctuation frequency at the power spectra which upward due to the temperature and specific momentum ratio of injection increasing_ Meanwhile near the injection hole at

upstream with $I_f = 4H$ happens the increasing of pressure caused by cold free stream which falling near the injection hole due to the blocking effect. That shown the temperature and specific momentum ratio of injection is not significant to the pressure field variation in that area. The pressure drop in the upstream area is more uniform if the injection hole is located halfway from the reattachment point.</i>