EXPERİMENTAL (BY TLC METHOD) AND THEORETICAL ANALYSE OF HEAT TRANSFER CHARACTERISTICS ON A RECTANGULAR CROSS-SECTION DUCT WITH IMPINGEMENT JET

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The heat transfer characteristics are analyzed in a rectangular cross-section duct where impingement jet technique is applied for the purpose of heating and cooling. The object of this study is determine the ideal combination model in which the heat transfer is the best. Heat transfer characteristics on surfaces are calculated by Fluent 6.2.16 program licensed for Sakarya University Mechanical Engineering Department in study. The Fluent 6.2.16 is used for theoretically analyze and findings are compared with by TLC method experimental study beforehand.

Data found are theoretically conducted. In order to define optimum heat transfer parameters, different cross-section geometric size models are used. The geometric models are of six lined impingement jets based on air source, whose temperatures shifts as per time. Because of time depending, time-depended solution method is selected in Fluent 6.2.16.

Impingement jets are an array of six inline circular jets with the same diameter. Jet diameter is 7.94 mm and gap (the distance of parallel surfaces -the space between jet plate and target plate) is altered up to five different values. Impingement jets are restricted by the model volume and air which goes out to exit one way. Five Reynols numbers are used for each geometry and case. The time depended resolution is worked out for a case by assuming compressible flow or uncompressible flow.

Flow characterictics, heat transfer characteristics, and the effect of croos-flow effect on surfaces are investigated. Heat transfer characteristic contour images and mpegs which are time depended are obtained. The obtained results are compared with Uysal's study in Pittsburg University Mechanical Engineering Branch which concluded with an experimental investigation using Thermochromic liquid crystal (TLC) method.

Cross-flow effect, compressible or uncompressible flow situation, Nusselt Numbers, the effect of the jet-to-plate spacing issues are presented in different Reynolds numbers. The results are shown on the contour graphs and images on jet plate and target plate in both theoretical and experimental circumstances.

In addition, it is investigated target-jet plate distance to and selecting air as a fluid compressible or incompressible effect of the results. Experimental and theoretical data are compared. Heat transfer characteristics are investigated on surface of a rectangular cross-section geometric model applied on six impingement jets.