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The coupled cooled-heated wind tunnel is a wind tunnel with special features. This wind tunnel consists of two connected parts; the first part will be cooled using special cooling technology and the other part will be heated using the solar energy. The temperature difference will create a flow of air through the tunnel from the cooled region to the heated region.

In this article, we will develop a mathematical model to study the flow phenomena. The mathematical model involves the use of the heat equation to model the air flow through each channel. Suitable boundary conditions are used for each channel part and analytical solution was obtained using the Fourier series. The results obtained represent the velocity vector field and the heat distribution inside each channel. The effect of the temperature difference on the flow field will be presented. The industrial application of the suggested method will be presented and the use of the model in renewable energy application will be discussed. (Received September 09, 2015)