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The behavior of the wake behind a heated circular cylinder MORTEZA KHASHEHCHI, KAMEL HOOMAN, The University of Queensland, THE QUEENSLAND GEOTHERMAL ENERGY CENTRE OF EXCELLENCE (QGECE) TEAM — The thermal effects on the characteristics of the wake behind a circular cylinder operating in the mixed convection regime are considered at relatively high Reynolds number using Particle Image Velocimetry. The experiments were conducted in a horizontal wind tunnel with the heated cylinder placed horizontally. With such assumptions, the direction of the thermally induced buoyancy force acting on the fluid surrounding the heated cylinder would be perpendicular to the flow direction. Experiments were conducted for three Reynolds numbers 1000, 2000 and 4000, where each of them were run at three different temperatures 25, 50 and 75°C. By adjusting different temperatures in different Reynolds numbers, the corresponding Richardson number ($Ri_D = Gr/Re^2$) was varied between 0.0 (unheated) and 10, resulting in a change in the heat transfer process from forced convection to mixed convection. With increasing temperature of the heated cylinder, significant modifications of the wake flow pattern and wake vortex shedding process were clearly revealed. In low Richardson number, the size of the wake and the vortex shedding process in the wake was found to be quite similar to that of an unheated cylinder. As the Richardson number increased, the wake vortex shedding process was found to be altered and the relative position of the first detached vortices respect to the second one is changed. It was also found that the shedding frequency of the wake vortex structures and the wake closure length decreased with increasing Richardson number.

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