

Development of a Primary System to Measure the Thermal Conductivity of Fluids

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The transient hot wire technique is suitable for measurement of heat conductivity of simple and complex fluids. This technique is used to measure thermal conductivity of gases, organic liquids, electrical non-conducting and conductor liquids. Furthermore, it is possible to achieve a precision of 0.1 to 0.3 % and uncertainties from 0.3 to 0.5 %. To implement this technique in the Centro Nacional de Metrología (CENAM) of Mexico it was realized a design of a measuring system for both simple and complex fluids. In this technique a Pt-wire is immersed in the fluid of interest. When an electrical current passes through the wire heat is dissipated by Joule effect. Once the wire is energized its temperature tends to a steady value. The key feature of this technique is to measure the wire temperature during the transient time between the initial temperature and the steady state condition. The heat rate transfer from the wire to the fluid depends on the thermal conductivity of this one. On the other hand the heat transfer is expected to be only by conduction, thus radiation and convection effects should be minimized by design. The cell design is such that for a short time of measurement (of the order of 1 second) convection is negligible and it is not present in the heat transfer phenomena, in that time the measuring system should be able to collect enough data to evaluate the thermal conductivity. We present the operational tests.