Measurement of Steady State Thermal Conductivity of Rubber Compounds

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This Project is based on the Measurement of Steady-State Thermal Conductivity by Lee's Disc method. The main purpose is to facilitate measuring the thermal conductivity by minimizing the inherent errors of the original process. Thermal conductivity is the ability of a material to conduct heat, and it represents the quantity of thermal energy that flows per unit time through a unit area with a temperature gradient of 1°per unit distance. Thermal conductivity is a necessary feature to dissipate the transformed thermal energy in a system. Thermal conductivity is a fairly very important material property for processing of rubber during part manufacturing because temperature distribution affects degree of crosslinking and hence maintaining the properties of the end part correctly. The thermal conductivity of a rubber compound ideally needs to be studied as a function of its state of curing and temperature. However, the device is presented at this stage is a steady state instrument which is capable of measuring the thermal conductivity of a compound at any temperature within the range 40°C to 180°C.

The instrument uses an electric heat source which transfers a steady quantity of heat through the test specimen which heats up a metallic mass to a steady temperature. The power generated at the steady state of the system is balanced by the power dissipated directly from the source and the power dissipated through the test specimen to the heat sink. The steady state temperatures are used to calculate the thermal conductivity of the material.

Keywords: Lee's Disc method.