**ABSTRACT**

Most of the power transmission systems are to be replaced by high temperature superconducting (HTS) cables for efficient operation. These HTS cables need to be cooled below the critical temperature of superconductors used in constructing the cables. With the advent of new superconductors whose critical temperatures have reached up to 35K, HTS cables need to find a substitute coolant which can accommodate the heating load on the superconductors. In order to accomplish such challenges an understanding of the thermophysical properties of supercritical argon (SCAR) is essential. The thermophysical properties such as density, viscosity, specific heat and thermal conductivity of SCAR are indicated to be variations with respect to a particular pressure.

**INTRODUCTION**

High temperature superconducting HTS cables are being considered for major use in high voltage power transmission systems. However, these cables require attention with regard to design, manufacturing [1-4], laying and safe operation. In order to safely operate [5-9] these HTS cables, efficient cooling methodologies have been demonstrated with sufficient selection of coolant [10]. Supercritical fluids, due to their peculiar properties, may be employed in cooling HTS cables. Thermophysical properties such as density, viscosity, thermal conductivity, specific heat and other properties vary significantly as the pressure and temperature of fluid exceed above the critical pressure and temperature of the supercritical fluid. In figure 1.1, it is observed that with temperature increase in the THS cables, an increase in the temperature from 150.69K to 154K, maximum error is obtained. However, further increase in the temperature shows a very similar pattern in relative error.

**THEORY**

Figure 2 illustrates the effect on temperature at different critical temperatures. The figure depicts the behavior of supercritical argon (SCAR). The thermal properties of supercritical argon [11] with defined-temperature are taken into consideration. HTS due to the availability of more sufficient arithmetic to Ki polynomial, the values of regions, volume, and density, visible HTS properties indicated to be variations with respect to a particular pressure. Moreover, it is observed that with increase in pressure density and viscosity are decreasing. In addition, the increase in the temperature is sufficient in THS cables due to the availability of more sufficient arithmetic to Ki polynomial, the values of regions, volume, and density, visible HTS properties indicated to be variations with respect to a particular pressure.

**RESULTS AND DISCUSSION**

Statistical parameters have been used to find the accuracy of the fitted model and correlations. Small values of parameters refer to consistent correlation. Here, the Eq. [1] defines the Arithmetic Average of the Absolute Percent Error (AAE AM). The standard deviation of concentrated data points can be stated by another parameter called Sum of Absolute of Residual (SAR) which is defined in Eq. [1]. Here, an extent of the predictable conclusion of the correlation given by the Average Percent Relative Error (ARE) is defined in Eq. [3]. A value of zero indicates no deviation from the model of the measured values around the correlation.

**CONCLUSION**

In order to calculate accurately various thermophysical properties, the correlations are being proposed in this work and the developed correlations are compared with standard data from AARE [12]. Moreover, the thermophysical properties of supercritical Ar portray interesting facts on pressure and temperature distributions in HTS cables.

**REFERENCES**