Simplified equations for saturated steam properties for simulation purpose

Abstract

Steam is a very important fluid in industries and its thermodynamic properties have been tabulated. Graphs showing various relationships of steam thermodynamics have also been developed. However, the use of tables or graphs has a particular drawback: interpolation is often necessary. For simulation purpose or real time system which often needs hundreds or even thousands of data, interpolation will become very tedious and time consuming. Formulas for thermodynamic properties of steam are available and can then be programmed in a computer, which will then compute the thermodynamic properties quickly. Unfortunately, formulas for thermodynamic properties of steam are quite complicated so programming them for a simple simulation purpose is quite difficult and is therefore in convenient. This paper shows the results from simplified equations for saturated steam properties. The equations which are developed in this paper are for saturated pressure and temperature, and for enthalpy, entropy, and specific volume in saturated liquid and saturated vapour states. The equations are developed from data given in the International Steam Tables. The accuracy for each equation is fairly small, less than 2% except for saturated liquid entropy which is 3.22%, which is good enough for most applications. Since the number of parameter used for each equation is just five, those equations developed can be conveniently used for simulation purpose

Keywords

Formula; Simplified equations; Simulation; Steam properties