In recent years different countries are looking for different types of oils as substitute for diesel fuels. For example, soya bean oil in USA; rape seed and sunflower oil in Europe; and palm oil in South East Asia (mainly Malaysia and Indonesia) are being considered. However, diesel engines with vegetable oils suffer from operational and durability problems. Thermodynamic studies of vegetable oil or biodiesel with diesel fuel binary or ternary mixtures have shown that the draw backs of using vegetable oils and biodiesel in diesel engine can be minimized by blending of vegetable oils and biodiesel with fuel oil. Thermodynamic properties of liquid mixtures are also required for their use in chemical engineering in design calculations involving chemical separations, heat transfer, mass transfer and fluid flow. These are employed for the development of thermodynamic models and to extract information about the molecular interactions existing in liquid mixtures. The nature and strength of molecular interactions along with state of aggregation of the constituents of mixtures have been successfully investigated by measuring their thermodynamic properties like excess molar volumes, excess molar enthalpies, excess Gibb's free energy and excess isentropic compressibilities etc. and analyzing them in terms of various theories/models of liquid mixtures.

Cyclic ethers represent a class of technically important compounds frequently used as solvents in the chemical industry. They can also serve as potential fuel additives in near future if they can gain their economic worth. Tetrahydropyran is an excellent aprotic solvent, soluble in all proportions with water, alcohols, ethers and all common solvents. It is also used as a good solvent for plastics, resins and polymers, a dispersing agent for textile processing, and a reaction medium solvent in organic and biological processing. Mixtures composed of tetrahydropyran and aromatic hydrocarbons or cyclo or n-alkanes comprise a substantial portion of liquid mixtures of practical importance. Although much effort has been made towards understanding tetrahydropyran mixtures, it still remains an area of active research. Thus, it is worthwhile to measure thermodynamic properties excess molar volumes, excess molar enthalpies and excess isentropic compressibilities of binary tetrahydropyran (THP) + benzene or toluene or o- or p- or m-xylene or cyclohexane or n-hexane or n-heptane mixtures.
Chemical Graph theory is interested in the nature of molecular structure of a compound. According to chemical Graph theory, if atoms are represented by colored vertices and bonds forming them by lines, then resulting graph describes the total information contained in a molecule. One of the general problems of Graph theory is, how to relate molecular structure reflected in molecular graph with measurable physico-chemical and other properties of chemical compound. In the last few years, we have made an attempt to employ topology of the constituents of mixtures to evaluate excess molar volumes, excess molar enthalpies, excess isentropic compressibilities of various binary and ternary mixtures (components differing in size, shape and polarity). It would, therefore, be of interest to analyze the observed thermodynamic data of the investigated mixtures in terms of Graph theory (which in turn depends on the topology of a molecule) to extract the information about the state of aggregation of components in pure and mixed state along with nature and extent of interactions in liquid mixtures. The observed data would also be analyzed in terms of Statistical theories of liquid mixtures, namely, (i) Flory's theory (ii) Sanchez & Lacombe's theory to gain insight about the molecular interactions of binary mixtures.

A ternary mixtures (i+j+k) is assumed to be composed of (i+j), (j+k) and (i+k) sub binary mixtures. In recent years, there has been a considerable upsurge in the theoretical and experimental investigations of the thermodynamic properties of ternary liquid mixtures. Compared to large number of data reported in the literature for binary mixtures containing tetrahydropyran as one of the component, the experimental data for ternary mixtures are scarce. It would thus be of interest to study excess molar volumes, speeds of sound of some ternary (THP (i) + benzene (j) + toluene or o- or p- xylene or cyclo or n-alkanes(k) ; THP (i) + toluene (j) + o- or p- xylene(k)) mixtures. Moelwyn - Huggins concept of interactions between the molecular surfaces of binary mixtures have recently been extended to ternary mixtures and an approach has been developed which describes well excess molar volumes, excess molar enthalpies and excess isentropic compressibilities data of few ternary mixtures. An attempt would be made to extend the Moelwyn- Huggins concept of interactions between binary mixtures to the ternary mixtures and to develop expressions which describe well the excess molar volumes and speeds of sound of the investigated ternary mixtures.