A Project Report On

"STUDIES ON COEFFICIENT OF THERMAL EXPANSION OF GRAIN REFINED Al-Si ALLOY USING TiBAl AND AlSr AS GRAIN REFINERS"

(Approved by KSCST)

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Chapter 1

INTRODUCTION

When heat is added to most materials, the average amplitude of the atoms vibrating within the material increases. This, in turn, increases the separation between the atoms causing the material to expand. If the material does not go through a phase change, the expansion can be easily related to the temperature change. The linear coefficient of thermal expansion describes the relative change in length of a material per degree temperature change. The change in component's length can be calculated for each degree of temperature change. This effect also works in reverse. That is to say, if energy is removed from a material then the object's temperature will decrease causing the object to contract.

The dimensional change of aluminium and its alloys with a change of temperature is roughly twice that of the ferrous metals. Aluminium alloys are affected by the presence of silicon and copper, which reduce expansion, and magnesium, which increases it. Its high expansion should be considered when aluminium is used with other materials, especially in rigid structures, although the stresses developed are moderated by the low elastic modulus of aluminium. If dimensions are very large, as for example in a light alloy superstructure on a steel ship or where large pieces of aluminium are set on a steel framework or in masonry then, slip joints, plastic caulking and other stress-relieving devices are usually needed.

Thus, in the present work, investigations have therefore been concentrated on LM6 (Al-Si 12%) alloy refined with two types of grain refiner's namely TiBAl and AlSr. Castings were produced by liquid metallurgy route and coefficient of thermal expansion properties have been monitored/evaluated for the purpose of comparison.