

Chapter One

INTRODUCTION

Of the various factors contributing to economic and increased productivity in modern foundry practice, choice of the right type of foundry sands and accessory materials is very important. The production of castings, especially through mechanized methods, needs careful quality control. Among the different raw materials employed in a foundry, sand is the chief variable as it occurs in nature with considerable diversity of composition. Besides, any variation introduced while processing sand during mixing or while ramming the mould considerably affects its performance during moulding and casting. These factors eventually result in increased fettling cost and in some cases incomplete rejection of the castings due to hot tears, blow holes and other defects. Hence, careful selection of sand to suit the type of castings required to be produced is necessary. Proper control over the properties of the prepared sand mixture is also important since it eventually results in economy in production by reducing the number of rejections, giving superior quality castings and ensuring smooth cyclic operations.

In India, there are at present more than 1,500 established foundries engaged in the production of iron and steel and non-ferrous castings. Till a few years ago the foundries were not as conscious of the importance of sand control as they are today. In many foundries sand mixtures are standardized on the basis of a great deal of experimentation and correlation of observed defects in a batch of castings. The compositions of sand mixtures are even today kept closely guarded secrets. The primary factor responsible for this approach has been the lack of adequate technical data on the chemical, physical and moulding characteristics of sands. The total potentialities of the indigenous foundry sands and bonding clays have not also been fully assessed.

The Second and Third Five-Year Plans have set the pace for industrial development and with the establishment of basic and other engineering industries, the foundry industry has a leading role to play in producing castings not only in tonnages but also in quality. It is anticipated that by 1960-61, 80,000 tons of steel castings would be required. The 130 crore Rs. foundry and forge plant being set up at Ranchi is projected to undertake the production of castings of 100 tons and above in iron and steel. Establishment of steel foundries during the Third Plan period both in the private and public sectors is also envisaged.

In the context of such developments, it is all the more necessary that

foundry industry should have the necessary data pertaining to indigenous resources of raw materials, especially synthetic sand (silica sands and bonding clays) which is used to a great extent in steel foundries. To fill in the lacuna, systematic studies were taken up at the National Metallurgical Laboratory, Jamshedpur, on indigenous moulding sands and moulding materials on a country-wide basis. Two questionnaires were addressed to the foundries with a view to collecting information on the types of foundry sands used by them, the surface quality of castings produced and the defects usually encountered. The replies to the questionnaires have been taken into account for planning the investigations in the Laboratory.

This monograph embodies the results of investigations with respect to 42 samples of moulding sand from different locations in the eastern, western, southern and northern regions of the country. Of these, 20 samples constituted natural sands, 11 crude silica sands, 10 high silica sands and one was a special zircon sand. Besides, 4 samples of bentonite clays were examined for their suitability as bonding materials.

Part I, pages 1 to 23 covers the general aspects of the study and Part II, from page 24 onwards gives the experimental results.