Section 2

Executive Summary of the Project:

Initially structured questionnaire survey [1] has been carried out by selecting 200 sample foundries to identify the present situation of Sri Lankan foundry industry and to recognize the important quality parameters of the foundry products which influence the total quality. The quality parameters are derived by analyzing the frequently appearing casting defects and can be illustrated in figure 1 with their occurrence. In this survey only the Dry Sand Casting process and hand ramming method, which is used to make mold are considered.

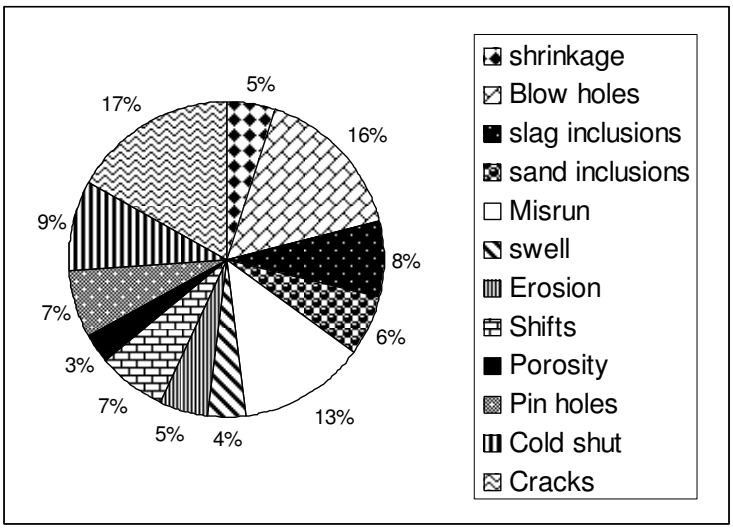

Figure 1 : Analysis of Casting Defects [1]

Out of above-mentioned casting defects, blow holes, slag inclusions, sand inclusions, swell, Erosion and cracks severely affects the surface quality especially the surface roughness of the castings. Hence the surface roughness is considered as the most significant quality parameter for local castings. Consequently, the attention was focused to enhance the quality of *brass* castings used as simple engineering components and ornamentals with simple shapes by reducing the surface roughness.

According to the results of an extensive literature survey, it was reveled that the surface roughness of sand casting is mainly governed by

(1) Properties of the Sand-Clay mixture
(2) Gating system of the mould
(3) Chemical composition of the metal used
(4) Pouring temperature (Figure 2)

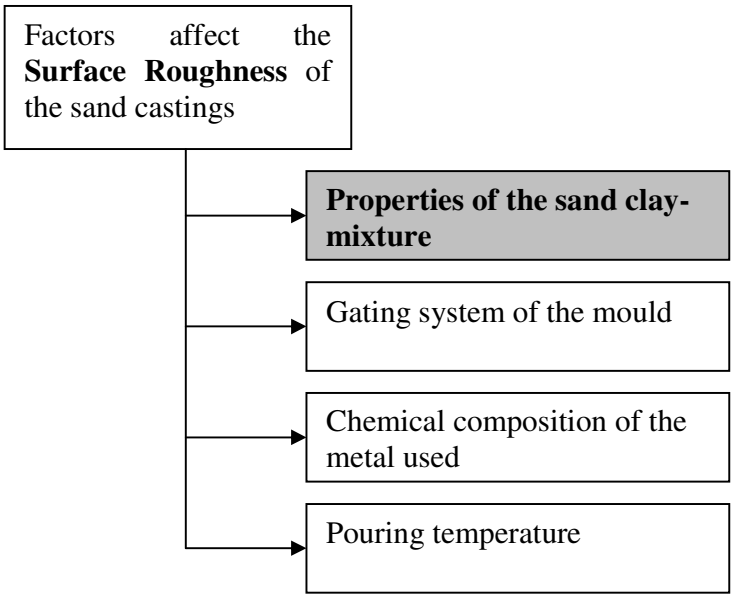

Figure 2: Factors affect to the Surface Roughness of the Sand Castings

Out of these factors, which affect the surface roughness, properties of the sand–clay mixture was selected in this research work since it has, according the literature, highest influence on the surface roughness than other factors [2].

Accordingly, it was decided to analyze the properties of *synthetically unmodified sand –clay mixtures* (locally available natural sand and clay mixtures without adding extra chemicals) with respect to a reference soil (naturally bonded sand-clay mixture) sample, imported from Japan, which gives a excellent surface quality. Under this investigation the mould dressing techniques (techniques used to improve the surface finish such as applying graphite coating, polymeric resin on the surface of the cavity) were not used because the intension was to improve the surface finish by using only mixture of naturally available sand and clay to reduce the cost. During the experiments, it was decided to keep other factors, which affects the surface roughness as constants. Further, in this work brass was used with a commonly used composition of Cu-65%, Zn-35% as the casting metal. Hence, it is possible to maintain a definite constant pouring temperature and as a result of this the casting defects such as cold laps/shuts occurs due to lower fluidity of the melt could be prevented.

Also in this research work attention was focused on the surface roughness of brass castings without using any finishing methods such as grinding and polishing as the intention was to acquire best surface roughness by using mixture of naturally available sand and clay with a minimum cost.

Presently local foundries use JISBO659 surface roughness gauge to assess the surface roughness but it gives only a comparative value for surface roughness and not an advanced scientific method. Hence in this investigation, the attention was directed to develop an advanced scientific method to measure the surface roughness of castings with improved accuracy and a surface roughness measurement method was successfully developed using ultrasonic methods.

According to the results obtained, following conclusions were made:

- It is possible to cast engineering components with less complex shapes with brass (Cu-65%, Zn-35%) using a mixture of locally available sand and clay without adding any chemicals and the achieve surface roughness which was very similar to that of castings made using Japanese sand-clay sample.
- The reusability of the sand-clay mixture is also an important factor for the local foundry industry and it should also be consider during the selection of the best sand-clay mixture when the optimum economical condition are considered.