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**ENHANCEMENT OF SURFACE QUALITY OF BRASS CASTINGS COST  
EFFECTIVELY USING NATURALLY AVAILABLE SAND AND CLAY  
AVAILABLE IN SRI LANKA**

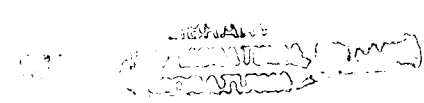
**By**

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A thesis submitted to the Department of Materials  
Engineering in the University of Moratuwa, Sri Lanka, in  
partial fulfilment of the requirements for the degree of Master  
of Philosophy



University of Moratuwa



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## DECLARATION

I certify that the Thesis with the title “**Enhancement of Surface Quality of Brass Castings Cost Effectively using Naturally available Sand and Clay available in Sri Lanka**” is entirely my own work. It has not been accepted for any degree and it is not being submitted for any other degree.

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## ABSTRACT

Through a survey done for the Sri Lankan foundry industry using a structured questionnaire it was revealed that one of the most significant quality parameter of the brass casting is the high surface roughness. Properties of the sand clay- mixture, the gating system of the mould, composition of the material to be melted and pouring temperature are the factors, which affect the surface roughness. Out of these factors the attention was focused in this work to the properties of the sand-clay mixture like fineness no., clay content, moisture content and permeability etc. to reduce the surface roughness. A synthetically unmodified sand-clay mixtures consisting of natural sand and clay from different locations in Sri Lanka were analyzed with respect to the reference sand sample (naturally bonded sand-clay mixture) imported from Japan, which gives a considerably low surface roughness.

In this research work the attention was also directed to develop a non-contact method to measure the surface roughness of castings using ultrasonic echo amplitude technique. With this method it is possible to measure the surface roughness of castings with improved accuracy and minimized cost.

The results of the experimental work done in this work show that it is possible to produce several number of mixtures made by mixing different sand and clay available in Sri Lanka and those mixtures give a relatively good surface roughness for the brass castings with compared to the casting made with Japanese reference sample.

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## LIST OF TERMS, ABBREVIATIONS AND SYMBOLS

AA	Arithmetical Average
RMS	Root mean square
CLA	Center Line Averages
h	Ordinates
Ra	Arithmetical Average Roughness
n	Number of ordinates
Rq	RMS Roughness
Rv	Valley Roughness
Rp	Peak Roughness
Rt	Total Roughness
L	Assessment length
l	Sampling length
Rz	Maximum peak to valley height of the profile in the assessment length
AFM	Atomic Force Microscope
TIS	Total Integrated Scatter
BRDF	Bi-directional Reflectance Distribution Function
$\alpha_m$	Attenuation due to the transmission medium
$\alpha_b$	Attenuation due to the beam spread
$\alpha_c$	Attenuation due to the surface roughness
$\alpha$	Total attenuation
$\alpha_e$	Attenuation due to the emery paper
$\alpha_t$	Attenuation due to the medium ,beam spread and glass sheet
$\alpha'_t$	Attenuation due to the medium ,beam spread, glass sheet and surface
AFS	American foundrymen's society
GCS	Green Compression Srength
DTA	Differential Thermal Analysis
XRD	X-Ray Diffraction
$\lambda$	Wavelength
$\theta$	Angle of incidence