

DESIGN AND CONSTRUCTION OF  
A GREEN SAND " SHATTER INDEX "  
TEST APPARATUS

by  
Doros Efstratiou

Project Report  
submitted to

the Department of Mechanical Engineering

of the Higher Technical Institute

Nicosia Cyprus

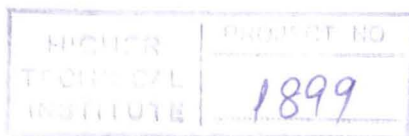
in partial fulfillment of the requirements

for the diploma of  
TECHNICIAN ENGINEER

in

MECHANICAL ENGINEERING

June 1991



## ACKNOWLEDGEMENTS

I would like to express my sincere thanks to my supervisor Mr. George Katodryti lecturer of the Higher Technical Institute for his assistance during the preparation of this work.

My thanks also extend to Nemitsas Company for the guidance throughout the design and construction procedure.

I also wish to express my thanks to Eleftheria for the time she spent on typing this project.

Finally I thank all those unnamed who have helped me in anyway by giving me information about desing and construction of my work.

## ABSTRACT

In this project the field of Green Sand and the relevant aspects is studied with particular reference on " Shatter Index " testing.

At a second stage the design and construction of a Shatter Index test apparatus carried out in order to produce this apparatus according to calculation and specification previously used in design, in order to be able to be used in the HTI'S Foundary laboratory.

Laboratory instructions on Green Sand Shatter Index test were made and also test to determine the Shatter Index of various Green Sand samples and to investigate the effect of moisture content .

In preparing this work, a number of previously published and internationally acceptable editions refering to this subject were studied.

Tables, references and manufacturing drawings of the apparatus are attached at the end.

## CONTENTS

Acknowledgments	I
Contents	II
Abstract	1
Introduction	2

	Page
CHAPTER 1	3
1.0 Materials used in greensand moulding and their properties	4
1.1 What is meant by " Greensand "	4
1.2 Effect of the casting operation	5
1.3 Circulation of moulding sand	5
1.4 General properties of greensands	7
1.5 Refractoriness	10
1.6 Raw materials used	11
1.6.1 Sand	11
1.6.a Calculation of AFS number	14
1.6.2 Clays	16
1.7 Organic additions	20
1.7.1 Coaldust	20
1.7.2 Peat and wood flour	20
1.7.3 Starch	21
1.7.4 Dextrin	22
CHAPTER 2	23
2.0 Basic routine tests for greensands	24
2.1 Sand Samples	24
2.2 Moisture Content	25
2.3 Green Strength	31
2.4 Dry Compression Strength	33
2.5 Shatter Index	33
2.6 Permeability	37

CHAPTER 3	43
3.0 Compositional test for greensands(part 1)	44
3.1 Coaldust Determination	44
3.2 Volatile matter determination	47
3.3 Clay grade and sieve analysis	51
3.3.1 Clay grade	51
3.3.2 Sieve analysis	55
CHAPTER 4	61
4.0 Interpretation of Sand test results	62
4.1 Plotting sand test results graphically	66
CHAPTER 5	70
5.0 Compositional test for greensands(part 2)	71
5.1 Methylene blue test	71
5.2 Solvent extraction	76
5.3 Sintering tests on foundry sands	78
CHAPTER 6	84
6.0 Special tests for greensand	85
6.1 Wet tensile test	85
6.2 Compressive stress	86
6.3 Mould expansion	91
6.4 Orloff test	91
CHAPTER 7	95
Laboratory Instructions on greensand	96
Shatter Index test.	

CHAPTER 8	101
8.0 Maintaining greensand quality using a control chart	102
8.1 Controls to maintain sand quality	102
8.2 Design of control chart	103
8.3 Interpretation of graphical records	104
8.4 Greensand tests on various greensand test samples.	108
APPENDICES	117
REFERENCES	
DRAWINGS	