

HIGHER TECHNICAL INSTITUTE

MECHANICAL ENGINEERING DEPARTMENT

DIPLOMA PROJECT

DESIGN AND CONSTRUCTION OF A PROTOTYPE

SHOT PEENING MACHINE FOR SURFACE HARDENING

M / 810

BY: ANDREOU ANDREAS

JUNE 1998

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**M/810**

by

**Andreas Andreou**

**Project Report**

**Submitted to**

**the Department of Mechanical Engineering**

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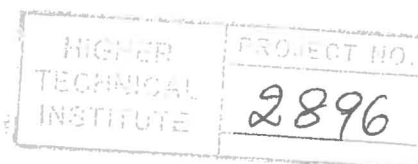
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## SUMMARY

### **Design and construction of a Prototype Shot Peening Machine for Surface Hardening.**

by Andreas Andreou

The purpose of this project was to study existing technology on shot peening design and construct a shot peening pneumatic system for the surface hardening of steel shafts.

Firstly, all information through the Internet was collected to study about this existing technology. Then a simple shot peening pneumatic system was designed with all drawings and calculations. Also, all parts of the shot peening pneumatic system was assembled and tested.

Finally, some experiments were performed and showed how steel shafts are hardened.

This project is divided into four chapters:

- |           |                         |
|-----------|-------------------------|
| CHAPTER 1 | Shot Peening Technology |
| CHAPTER 2 | Design and Construction |
| CHAPTER 3 | Experimental Results    |
| CHAPTER 4 | Cost Analysis           |



## INTRODUCTION

In engineering, many steel components such as crankshafts, connecting rods, gears must process hard and wear - resistant surfaces and at the same time, tough, shock - resistant cores. A low carbon steel will be tough but soft, whilst a high carbon steel will be hard when suitable heat - treated but will also be brittle.

To achieve the above combination of properties there are two processes: (i) carburising process and (ii) the Nitriding.

In carburising process the surface of the part is enriched the carbon content and as a result the surface hardness increases. This is done by heating the component in a carbonaceous material (rich in C) at about 900°C where the carbon atoms in the F.C.C. austenite phase of the surface, this increasing surface carbon content.

In the nitriding process components are heated at 500°C in an atmosphere of ammonia ( $\text{NH}_3$ ) which dissociates to produce nitrogen. Long soaking times are used depending on the depth or case required. Surface hardness is due to the hard nitrides formed on the surface.

In the next chapters the existing technology of a shot peening process for surface hardening is shown.