

AN ANALYSIS OF RESIDUAL STRESSES
DUE TO THE GRINDING PROCESS

by

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To my wife,
Dr. (Mrs.) Shakuntala Mishra.

ABSTRACT

An analytical model has been proposed for determining residual stresses of thermal and mechanical origin due to surface grinding. The grinding process has been taken to be equivalent to the case of a moving force and a moving heat source, both distributed over the contact area between the grinding wheel and the work piece.

The finite element method has been employed for determining the elastic-plastic state of stress within the workpiece. Changes in mechanical behaviour and thermal properties with temperature have been incorporated in the analysis. An iterative procedure was employed for the step-by-step movement of the temperature field and the force in order to simulate the movement of the grinding wheel over the workpiece. The elastic-plastic stress history has been computed culminating in the residual stress state of the workpiece.

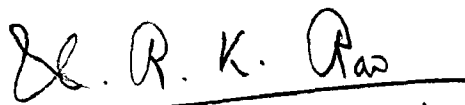
An adequately sensitive bending-deflection technique has been employed for the determination of the residual-stress distribution under some typical conditions of surface grinding. The experimentally determined stress distribution was compared with those obtained analytically.

The effects on residual stresses of the thermal and mechanical loads have been separately determined with the help of the analytical model and it has been shown that the mechanical force in grinding has negligible contribution.

The influence on residual stresses of processing parameters such as speed, feed and depth of cut have also been explained.

CERTIFICATE

This is to certify that the thesis entitled "An analysis of residual stresses due to the grinding process" by Ashutosh Mishra has been prepared under my supervision in conformity to the rules and regulations of the Indian Institute of Technology, Delhi. I further certify that the thesis has attained a standard required for a Ph.D. degree of the Institute. The research report and results presented in the thesis have not been submitted for any degree in any University.



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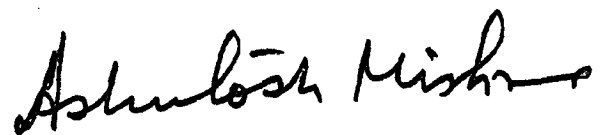
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CONTENTS

	Page
List of Symbols	9
CHAPTER 1 Introduction	12
1.1. Definition, origin and significance of residual stresses	12
1.2. Classification of residual stresses	13
1.3. Residual stress in grinding	14
1.4. Analytical model	15
1.5. Experimental measurement of residual stresses	17
References	20
CHAPTER 2 Literature review	23
2.1. Residual stress due to grinding	23
2.2. Mechanism of formation of residual stresses during grinding	32
References	35
CHAPTER 3 Development of analytical model	37
3.1. Physical model of the grinding process	37
3.2. The idealised model	39
3.3. Determination of the temperature distribution within the work-piece	42
3.3.1. The basic moving heat source model	42
3.3.2. The basis for computing heat input under given conditions of grinding	45

	Page
3.3.3. Computer programme	47
3.3.4. Results	47
References	50
CHAPTER 4. Residual stress distribution due to moving load by finite element method	52
4.1. Choice of finite element method	52
4.2. Finite element method and its concepts in the context of non-linear analysis	53
4.3. Stages in the development of the finite element programme in the present analysis	57
4.4. Finite element formulation for thermal stresses in an elastic continuum	57
4.5. Thermal stresses in an elastic-plastic continuum	61
4.6. Elastic-plastic stress-strain distribu- tion for the case of moving heat source and moving mechanical load	66
4.7. Main features of the computer programme	72
References	73
CHAPTER 5. Experimental techniques for the measurement of residual stresses	76
5.1. General	76
5.2.1. Review of experimental technique	76

	Page
5.2.2. X-ray method	77
5.2.3. Mechanical methods	79
5.3. Development of the technique	81
5.3.1. Requirements of the technique	82
5.3.2. The technique involving continuous removal of stressed layers	83
5.3.3. Measurement of the thickness of layer removed	85
5.3.4. Measurement of deflection	88
5.3.5. Other details regarding the experimental technique	89
5.3.6. Specimen preparation	91
5.4. Computation of residual stresses from experimental data	92
5.4.1. Relationship between the average stress in a layer and the change in curvature	92
5.4.2. Redistribution of stresses due to layer removal	93
5.4.3. Correction for the variation of stress within the layer	94
5.5. Results of experiments	95
References	96
CHAPTER 6. Results and discussion	101
6.1. Stress history of the solid as thermal and mechanical loads move on the surface	101

	Pages
6.2. Nature of residual-stress distribution due to moving thermal and mechanical loads	115
6.2.1. Representative cross-section	115
6.2.2. End effects	115
6.2.3. Effect of clamping	117
6.2.4. Relative effects of thermal and mechanical load	119
6.2.5. Salient features of residual stress due to grinding	124
6.3. Influence of process parameters on residual stresses due to surface grinding	124
6.3.1. Influence of wheel speed	126
6.3.2. Influence of work speed	129
6.3.3. Influence of depth of cut	132
6.3.4. Influence of wheel wear, cutting fluid and wheel grade	134
6.3.5. Influence of micro-structural changes	135
References	137
CHAPTER 7. Conclusions and suggestions for further work	137
7.1. Conclusions	138
7.2. Suggestions for further work	140