

Effect of Residual Stress in Plate Section

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Abstract— There are many software packages available for effect of residual stresses in plate Analysis and in India we generally use STAAD and ANSYS Software. All the two software packages, for plate bending analysis of thick and thin plate contain a four noded quadrilateral element (or three noded triangular elements) with different formulation. In these paper results of bending moment, bending stress and shear stress of Rectangular and Square Plates using STAAD are computed with and without residual stress results. In this paper two experimental methods data are taken i.e. shot pinning method and section method. In that methods taking maximum residual stress values and used in STADD software and find out the bending moment, bending stress and shear stress. This results compare with without applying residual stress in plate i.e simple plate and find out what effect on plate of comparing that parameters. A parametric study of Rectangular and Square plate with edges simply supported and for a uniformly distributed load has been carried out. It is concluded that the STADD software provides more values using with residual stresses as compare to without residual stresses.

Key words: Residual Stress, Shot Pinning Method, Static Test, Dynamic Test

I. INTRODUCTION

Residual stress is a process-induced in a molded part, that exist in the body in the absence of external loading. It is also define as the residual stresses remain in solid material after removal the original cause of stress. Residual stresses play a significant role in determines their behavior and strength when steel plate is used in structural steel members. In surface treated component the residual stresses are self-equilibrating and the profiles of the residual stress field are dominantly dependant of the material and treatment method. Residual stresses play a significant role in determining their behavior and strength when plate is used especially in structural steel member. Because of so many factors affect the distribution of residual stresses, it is difficult to obtain the distribution of residual stresses using analytic methods. Therefore, software is the easiest way to understand the distribution of residual stresses using analytic methods. Residual stresses can be desirable or undesirable residual stresses in a surface of component can be either tensile residual stresses or compressive residual stress. in particular near surface tensile residual stresses tends to accelerate the initiation and growth phases of the fatigue process while compressive close to a surface may prolongs fatigue life. For plastically deformable materials, the residual and applied stresses can only be added together directly until the yield strength is reach. In this respect, tensile residual stresses may accelerate the onset of plastic deformation while compressive residual stresses delay it.

II. METHODOLOGY

A. By shot pinning method

in shot pinning method dynamic test is used to find the residual stress in plate. in dynamic test 76.2 mm steel ball was dropped on to the 200x200x75 mm plate. the collision speed in this case is approximately 6.3 m/s this test are performed in dry conditions. the shape of indentations was measured with a roughness meter and the distribution of residual stress inside and outside the indentation was obtained by x-ray residual stress analysis.

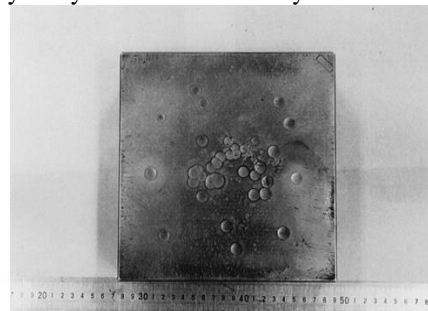


Fig. 1: Residual stress distribution at static and dynamic tests (plate:200mm \square 200mm \square t75 mm, ball: 76.2 mm)

in this graphs taking maximum residual stress value and using this value in STADD software and find out effect of residual stress in plate. after find out the shape of residual stress with used of residual stress then compare this shape by simple plate i.e. without residual stress in plate. finally find out results which is given in table(1)

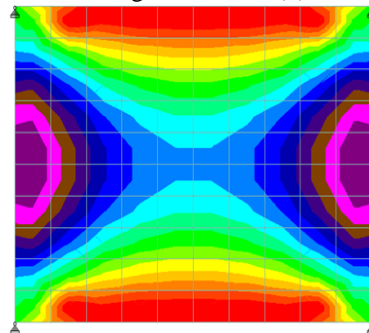


Fig. 2(a): Effect of plate in the absence of Residual Stresses

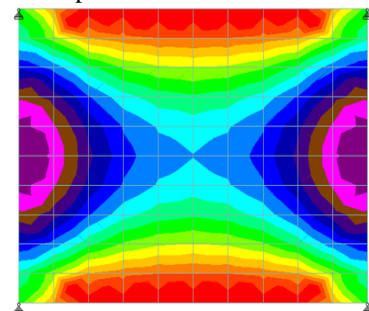


Fig. 2(b): Effect of plate in the absence of Residual Stresses

Loading	Result	In the Absence of Residual stresses		In the presence of Residual stresses	
		Max	Min	Max.	Min.
UDL	Bending Moment(kN/m)	0.00	0.01	11.16	282.7
	Bending Stresses(kN/m ²)	-2.4	1.02	123.0	972.0
	Shear Stresses(N/m ²)	0.03	0.03	843.1	843.1

Table 1: Result of Bending moments, Bending stresses and Shear stresses:Ref.(1)

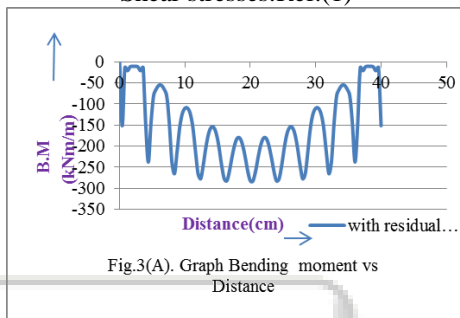


Fig. 3:

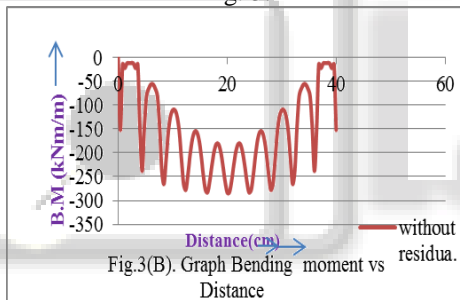


Fig. 4:

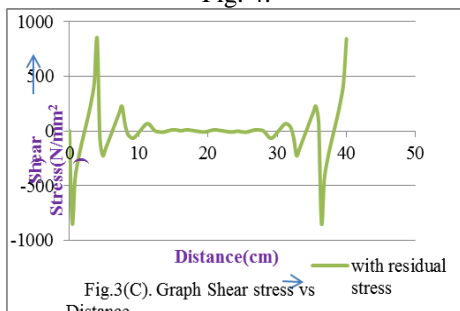


Fig. 5:

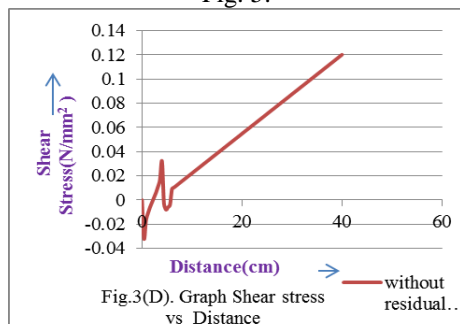


Fig. 6:

III. DISCUSSION

- 1) In this method the dynamic tests are used and the results are calculated experimentally.
- 2) The results obtained from paper as listed in ref.[1] are taken as input to the STAAD pro.
- 3) The bending moment, bending stress, shear stress is calculated with the used and without used of residual stress.
- 4) Compare these results and plot the graph.

IV. CONCLUSION

- 1) in this paper the shot peening methods data are taken and compare this data with the used of STADD pro. Finally it conclude that the stresses and bending moment with the used of residual stresses gives a maximum values as compare to without residual stresses.
- 2) Graph shows a perfectly comparison between with and without residual stresses.
- 3) Software gives a better result found

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