K. D. K. COLLEGE OF ENGINEERING, NAGPUR

DEPARTMENT OF MECHANICAL ENGINEERING

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Session 2014 - 2015

# CERTIFICATE

This is certify that, the project entitled **"FAILURE ANALYSIS OF CAR FRONT SUSPENSION LOWER ARM"** is a bonafide work done under my guidance and is submitted by **Sushilkumar P. Taksande** to Rashtrasant Tukadoji Maharaj, Nagpur University, Nagpur for the partial fulfillment of requirement for the award of Post-Graduation degree, **Master of Technology (M. Tech.)** in **Mechanical Engineering Design (MED)**.

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# ABSTRACT

The front suspension lower arm is a independent suspension used in Tata indica car. The lower control arm takes most of the impact that the road has on the wheels of the motor vehicle. During the actual working condition, the maximum load is transferred to the lower arm which creates possibility of fatigue failure in the front suspension lower arm. Similarly, impact loading produces the bending which is not desirable. Hence it is essential to focus on the stress strain analysis study of front suspension lower arm to improve and modify the existing design.

In this study we are consider the von-misses stress analysis of present front suspension lower arm to carried out the static deflection and von-misses stress. The result shows that maximum deformation range is 0mm to 67.779mm. And von-misses stress shows minimum value of 9.62Mpa and Maximum is 6068.2Mpa. As the maximum von-misses are above the yield point of material some corrective action is to be done. After observing the stresses produced on front suspension lower arm we are increasing the some metal thickness at the lower plate of front suspension lower arm to avoid the failure. After change in design the Minimum value of deformation range from 0.00 mm to maximum value of deformation is 47.89 mm. and the maximum stress developed is 4490 Mpa. and maximum stress shown at only stress concentration area. Means change in design increases load capacity of arm in dynamic condition and as stress and deflection decreases so frequency also improved. So for the material optimization more safer the material IS2061 Fe410 is well suitable steel material available for front suspension lower arm as per Indian Standard.

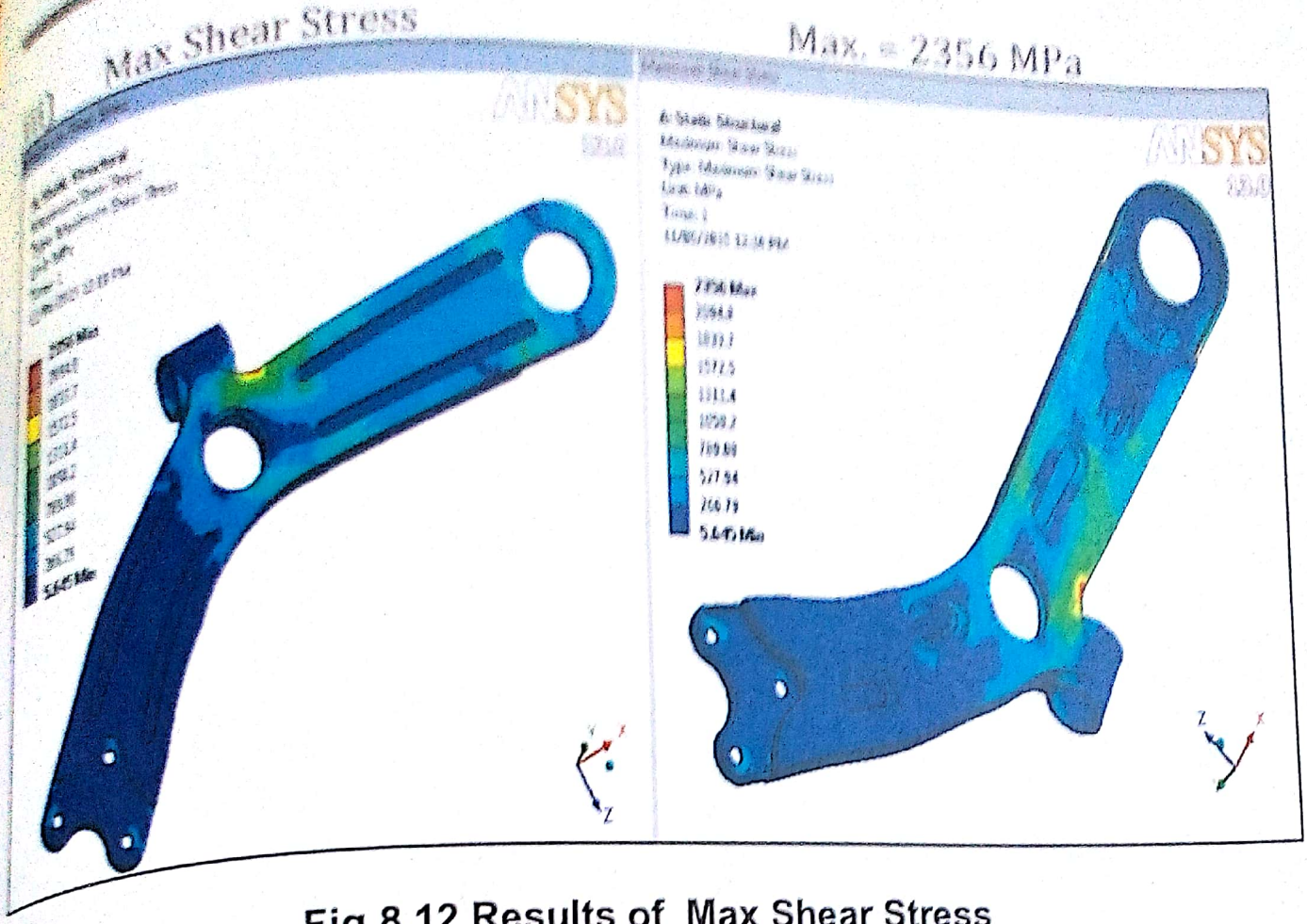


Fig.8.12 Results of Max Shear Stress

Analysis results clearly shows that the stresses for Fe410 material was much better than the EN 24 material. and it is also shows in tabular form :

| LOWER ARM RESULTS | Existing | | Modified | | | | | |
|---|---|---|---|---|---|---|---|---|
| | EN 24 | | EN 24 | | Fe 410 | | Fe 590 | |
| | Max | Min | Max | Min | Max | Min | Max | Min |
| Total Deformation (mm) | 67.779 | 0 | 47.907 | 0 | 47.892 | 0 | 50.302 | 0 |
| von-Mises Stress (Mpa) | 6068.2 | 9.6247 | 4494.4 | 10.494 | 4490 | 10.729 | 4494.4 | 10.494 |
| Max. Shear stress (Mpa) | 3166.5 | 5.5297 | 2356 | 5.645 | 2359.8 | 5.7598 | 2356 | 5.645 |

Table 8.1 : Result Comparision

# 9.0 CONCLUSIONS & FUTURE SCOPE

In this project it has been seen that the maximum value of force transmitted by tyre to the body of vehicle through lower suspension arm. The front suspension lower arms control both lateral and forward and backward movement of the wheel and the car tends to bounce up and down a lot over bumps it is subjected to high stresses because of that Failure of lower suspension arm of vehicle was reported. Plastic deformation and cracks were observed frequently during on road running of vehicle. Stress analysis was performed using finite element method. Further corrective actions that are modifications in design will be carried on the basis of results analysis.

First stage results show higher stress effects on the component. The existing part is concerned with material properties distribution in which optimization is performed on a model to create a new suspension lower arm for increasing the thickness of lower plate of lower suspension arm to improve the strength. In this project, the stress analysis is done with the help of ANSYS 13.0 software. The stress and deformation effect on suspension lower arm was investigated under vehicle loading. The behavior of lower arm are very important parameters in stress distribution near loading and bush portion of the lower arm.

In this project, we conclude that the stress analysis for considering lower arm deformation, von-Misses Stress and Max shear stress and also using different lower arm materials were tested and it was observed that IS 2061 Fe410 material was much better than the EN 24 material.

# DEPARTMENT OF MECHANICAL ENGINEERING

**Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur**

**Session 2014 - 2015**

## CERTIFICATE

This is certify that, the Project entitled "**DESIGN AND DEVELOPMENT OF NON-CONTINUOUS TYPE PNEUMATIC CONVEYING SYSTEM**" is a bonafide work done under my guidance and is submitted by **Hitesh M. Tupkari** to Rashtrasant Tukadoji Maharaj, Nagpur University, Nagpur for the partial fulfillment of requirement for the award of Post-Graduation degree, **Master of Technology (M. Tech.)** in **Mechanical Engineering Design (MED)**.

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# TO WHOM SO EVER IT MAY CONCERN

This is to Certify that **Mr. Hitesh M. Tupakri** of **" K.D.K. College of Engineering, Nagpur"**, has successfully completed his Industrial training at Bajaj Steel Industries Limited, (C-108) Hingna, MIDC, Nagpur from 11th August 2014 to 31st March 2015.

He has prepared a project on **"Design & Development of Non-Continuous Type Pneumatic Conveying System for Ginning Industries "** in the areas of **Design Department at Bajaj Steel Industries Limited C-108 Nagpur.**

During training, his performance was satisfactory. He always expressed curiosity to learn, observe and suggest as the opportunities came up from time to time. His conduct was good and disciplined.

We wish him great success for all future endeavors.

Date :30th June'2015
Place :C-108,
Hingna MIDC,
Nagpur.

BAJAJ STEEL INDUSTRIES LTD. C-108

For Bajaj Steel Industries Ltd (C-108)

Authorized Signatory

# ABSTRACT

In ginning industries where bulk material is to be conveyed from multiple source of point to a single point, material handling systems are required. Various types of conveying systems are available in the market like belt conveyors, screw conveyors, vibrating conveyors etc. having their own characteristic features. This conveying system resulted in significant improvements in conveying methods with reduce operating cost and improved equipment reliability. The main advantage of pneumatic conveying system is that material is transferred in close loop, thereby preventing the environmental effect on the material and vice versa. No standard procedure is available for the design of pneumatic lint conveying system. As the configuration of the system changes, variable involved also changes, and one has to change the design considerations based on the applications. So there is wide scope for experimentation in the field of pneumatic conveying system.

This concept of conveying lint from intermittent ducting from various source of point has lot of present problems in ginning Industries, such as jamming of lint collection box/hopper, power consumption is more due to high CMH requirement.

Here we are designing & implimenting Pnuematic conveying system in ginning industry for conveying lint from each DR GIN machine. The Pnuematic lint conveying system comes under dilute phase system consist of a suction fan to create negative/vaccume pressure, lint collection box,on-off flap, ducting line, air separator, and a cyclone.

# 9. CONCLUSION

After implementing the design of non-continuous (Intermittent) system the main conclusion is that this developed system really provides a great solution for reducing the running power consumption with low CMH & eliminates the jamming of lint in the hopper & hose pipe. This project is implemented & running successfully in ginning industry at M/S. "Parasnath Ginning Industry, Pandhurna (M.P)" Also the future scope we can do CFD analysis of this design and also it can be identified as a new development. Even this system not only has application in ginning industries but also has wide important in various field because of its following benefits

1) Completely dust free operation
2) Flexibility in routing
3) Careful and gentle handling of product
4) Low maintenance and low manpower cost
5) Minimum floor space.
6) Ease of automation and control.
7) One pipeline can be used for variety of products.
8) High operational reliability due to few moving machine parts.