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Review on Wheel Defects in Indian Railways

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Abstract: *Wheel deformation is one of the major failures in Indian Railways. In this paper we study the most efficient methods of wheel maintenance for interaction of dynamic forces and rate of wear between rail and wheel. The erosion of wheel influence the dynamic characteristics of the vehicle and the dynamic force strike on the wheel flange by the rail line results in derailment. The erosion of wheel mostly depends on abrasion and inappropriate maintenance on board. Therefore the wheel should take into consideration as the major derailment happens due to wheel deformation of the ride. When brake applies on ghat sections and down gradients due to continuous application and releasing of brakes, defects such as pitting mark, wheel shelling and heat check occurs.*

Keywords: *Derailment, Pitting mark, wheel shelling, wheel deformation, wheel failures, Indian Railways.*

I. INTRODUCTION

Wheels are the important component of every vehicle, to make vehicle more efficient and comfortable, wheel plays an important role. Therefore the maintenance should be proper and defects should be minimised for generating optimum output. Most of the population in India travel through railways. Hence the travelling vehicle should have minimum failures, so that people should not face troubles and casualties. For this, vehicle mainly wheels should be properly maintained and have lesser defects in it. After 2016 India started using LHB (Linke Holfmann Busch) coaches which are lesser in weight and have designed to run at high speed. As the speed is more the application of brake should work efficiently and all comes to wheel to stop the train at right time. This deals more damage to the wheels. As wheel failures already a huge problem in railways hence we must have to focus on wheel conditions and its failures.

II. WHEEL DEFECTS

Wheel is the most dynamic part in railways, also make vital role in safe travelling. In railways wheel make two important functions i.e. bears the weight as well as guiding the wagon hence defects in wheel leads to a serious damage. And mainly defects are found in wheel profile. Some of the defects are as follows

- A. Sharp Flange- When radius of flange is wear up to 5mm. This defect is known as sharp flange. Due to continuous hitting of flange the inclination of flange reduces and can cause derailment.
- B. Deep Flange- If depth in flange is wear up to 35mm, this defect in wheel is known as deep flange, this can damage to fish plates, fish bolts, and check bolt also a cause of derailment mainly at check blocks.
- C. Hollow tyre- because of erosion on the wheel tread caused by inappropriate brake block material composition, the the wheel tread wears out and forms the arc due to inclination given on the wheel.
- D. Thin tyre- Generally the thin tyres recognised by thickness of the tyre, may reduce up to 25mm.
- E. Thin flange- in this type the thickness of flange minimizes up to 16mm. The thickness of flange must be calculated at the 13mm from the tip.

III. HOW DOES IT OCCUR?

- A. During ghat sections and down gradients continues application and releasing of brakes should be done, so that vehicle should not attend high speed. Due to continues application the temperature of the wheel increases and becomes warm, and cools due to surrounding temperature, due to continuous of this treatment material becomes hard and wear out some chips called as shelling of wheel, heat check forming of wheel tread.
- B. If brakes not fully released by loco pilot from engine, or defect in brake equipment some of wheel defects occurs such as flat tyre, metal deposition on wheel tread.
- C. Inertial drag due to sudden movement of the train at start can cause flat tyre.
- D. Brake block composition also develops the defects in wheels.
- E. Brake block boundaries fail and brake block back plate touching to the wheel tread also develop groove in wheel tread.

IV. PARAMETERS FOR DEFECT ALLOWANCE

| Type Of Defect | Designed Parameter | Allowed Limit |
|-------------------------------|---------------------|---|
| Sharp Flange | 14.5 mm | Less than 5 mm |
| Thin Flange | 28.5 mm | Less than 16mm |
| Less radius at root of flange | 16 mm-IRS 14 mm-WWP | Less than 13 mm |
| Hollow Tyre | ----- | 5 mm or above |
| Deep Flange | 28.5 mm | More than 35mm |
| Thin Tyre | ----- | Since no tired wheel, dia of the wheel is the criteria. |
| Flat Tyre | ----- | 50 mm or more-Coaching 60 mm or more –Goods |

Table 1. - Allowed limit parameters with type of defect

V. REMEDIES

- 1) While application of brakes from train engine sufficient time to be used for releasing the brakes.
- 2) Brake component i.e. D.V., S.A.B, B.C., check properly during maintenance and follow time to time oiling and maintained piston stroke.
- 3) Maintained brake power according to wheel diameter.
- 4) Standard brake component to be used in braking system.
- 5) Specify breaking block to be used during maintenance and time to time replace before allowed limit.
- 6) No break pressure leakage allow in brake power pipe, joints, air hoses, D.V., B.S.Y.L. and antilock.
- 7) Maintained B.P. and F.P. pressure in prescribed limit i.e. 5kg/cm² in engine and rear brake is 4.8 kg/cm² and F.P. in engine 6 kg/cm² and rear brake valve 5.8 kg/cm²
- 8) Time to time maintenance schedule should be carried out.
- 9) Check wheel in schedule maintenance after applying gauge.
- 10) Before start the train check break power properly released throughout the train.

VI. CONCLUSION

Defects present in wheel may cause unwanted noise and vibrations which are uncomfortable to the passengers, more power would be required to carry the defected wheel. Defected wheel may cause of derailments, accidents also can cause damages to the other part of the wagon. Major derailments occurs in Indian Railways to avoid such type of problems prescribed remedies should be take into consideration.

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