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Modelling and Static Analysis of Loco Wheel with Load

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ABSTRACT:

The article presents the modeling and static analysis of loco wheel with load and material, results of experimental investigations directed by material properties. Rail transport is one of the most important branches of economic activity of which is directed at support of internal and external transport relations .Safety of train operation depends much on reliable functioning of the assemblies and transport means. It is ensured by stable and optimal level of metal mechanical properties, as well as soundness of metal. Required level of mechanical properties of assemblies and components is provided by chemical composition of steel and structure after thermal treatment. Locomotive wheel pairs take and transfer weight of body and bogies with all equipment on rails, as well as dead weight. While moving wheel pair interacts with rail gauge, takes up shocks caused by track irregularities and guiding forces.

Wheel pair, in its turn, rigidly reacts on track. In addition, traction motor torque is transmitted to it, attractive and braking forces are realized in place of contact of wheels with rails. Magnitude and nature of effect of static and dynamic forces depend on conditions of operation and rail track state, model and parameters of locomotive under frame. Thus wheel pair is one of critical assemblies of under frame on state of which train operation safety depends. Therefore special demands are made to the material choice, Modeling the loco wheel in CAD software CATIA V5, and find out The results from geometric analysis are parameters of wheel, Static analysis gives normal stress under a specified loading condition analysis part in ANSYS software,

MODEL

INTRODUCTION:

Manufacturing of separate elements and formation of wheel pair Taking into account complicated working conditions and high requirements to the operational dependability, wheel tread surface should possess high strength, impact toughness and wear resistance, whereas metal of wheel disk and hub is to have required toughness. Compound wheels meet these requirements, where TIRES can be made of high strength and dead-hard steel, whereas wheel center – of more ductile and cheap steel. Upon reaching limiting wear or appearing of another operational damage a TIRES can be replaced without change of a wheel, TIRESs directly interact with rails.

Main characteristics of tires defining their quality and service durability are strength and hardness of TIRES body and flange. The higher strength and hardness are, the higher wear resistance is. Therefore TIRES material should possess high strength to resist wear and crumpling, and should be tough enough to resist impact loads during locomotive operation TIRES wear occurs over wheel rolling circle. So the metal earlier contained inside the TIRES will appear on the surface of the used TIRES, and this metal will work in conditions of contact with rails and brake shoes.

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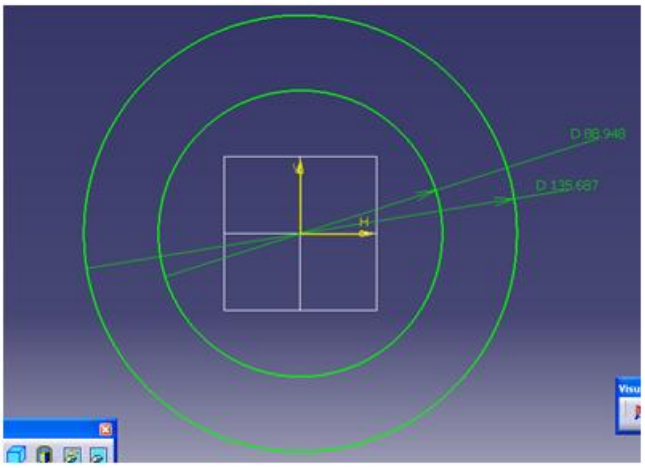
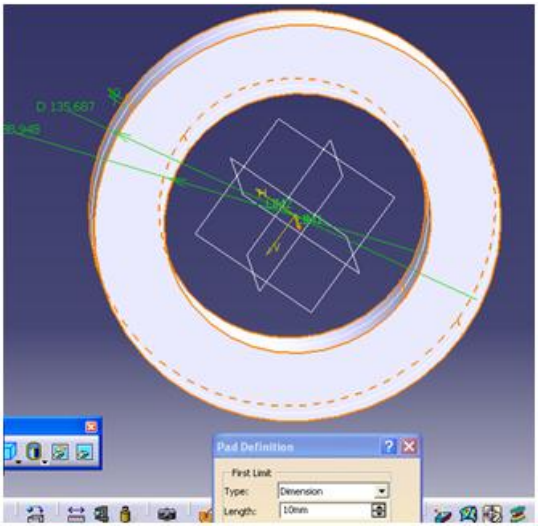
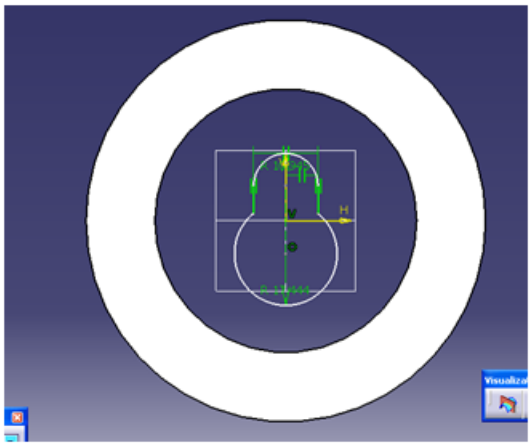
That's why metal in sectional view must meet technical requirements of normative documents.

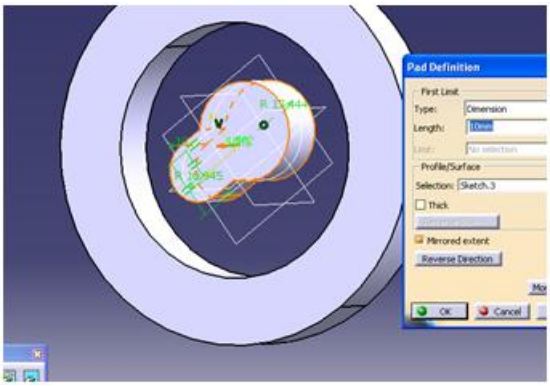
How to draw Loco wheel in catia v5

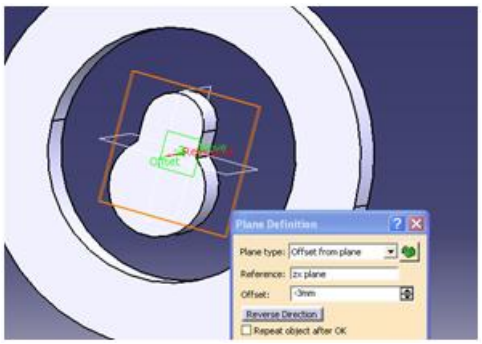
SKETCHER OF LOCO WHEEL

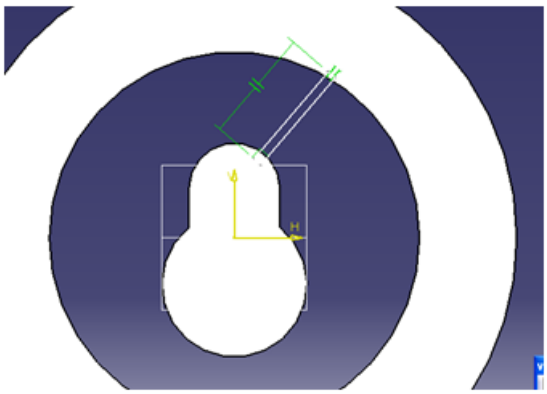












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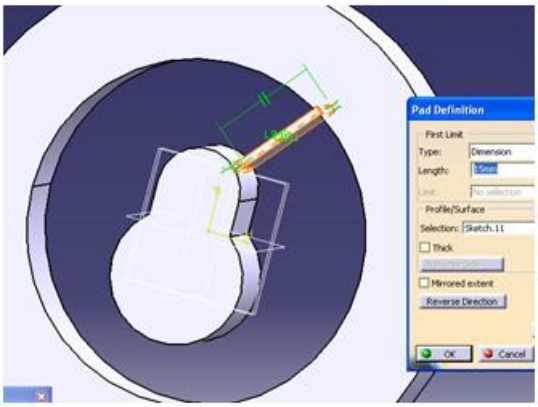
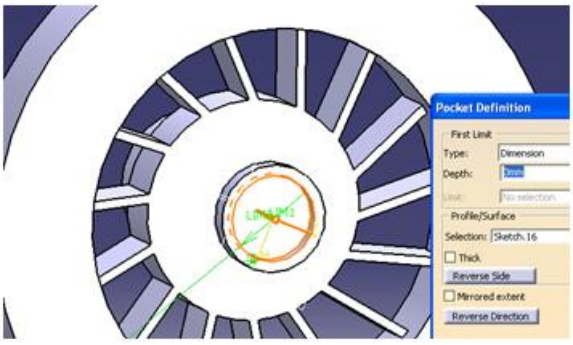
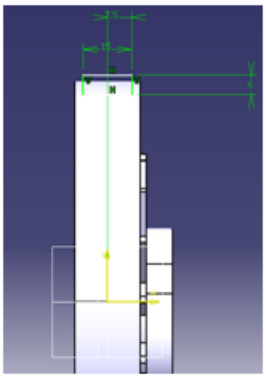
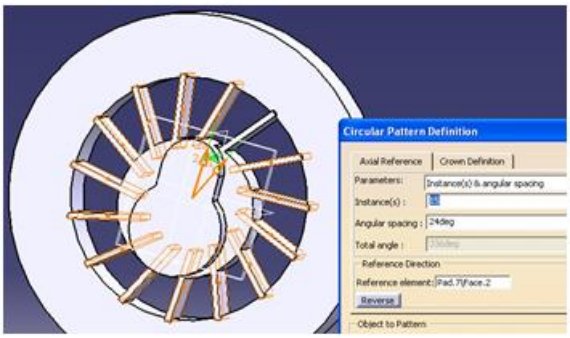
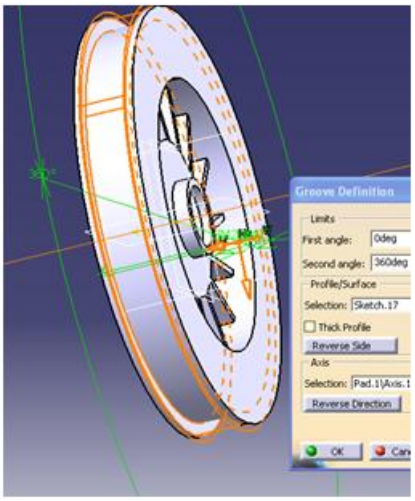
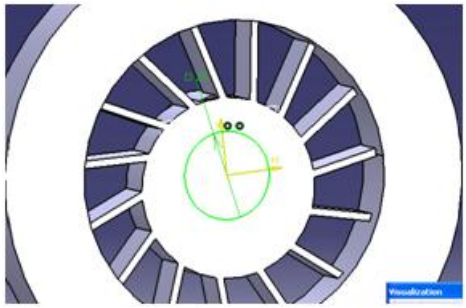


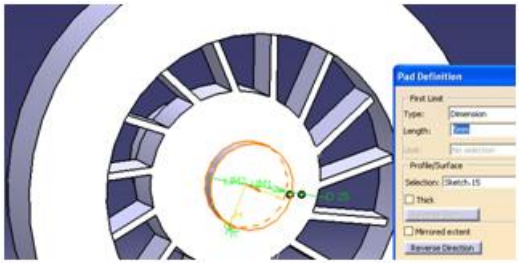




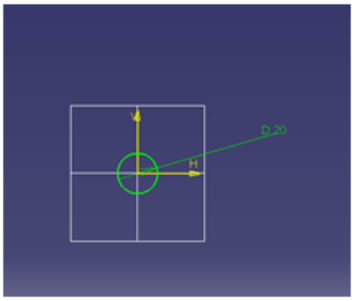








SKETCHER OF SHAFT



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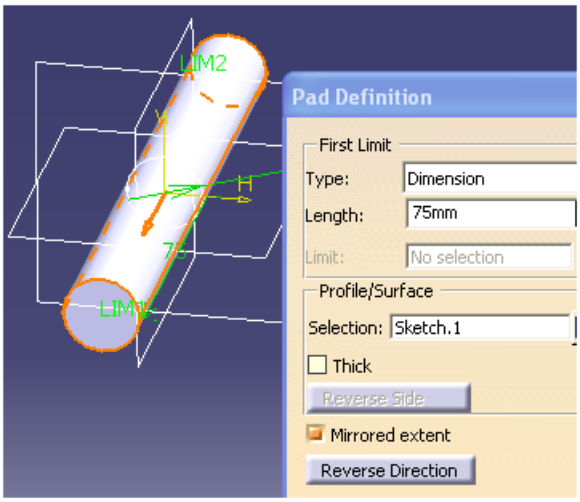
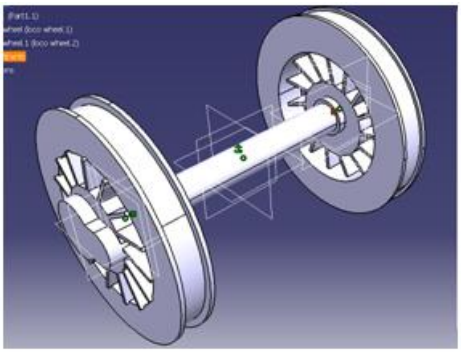
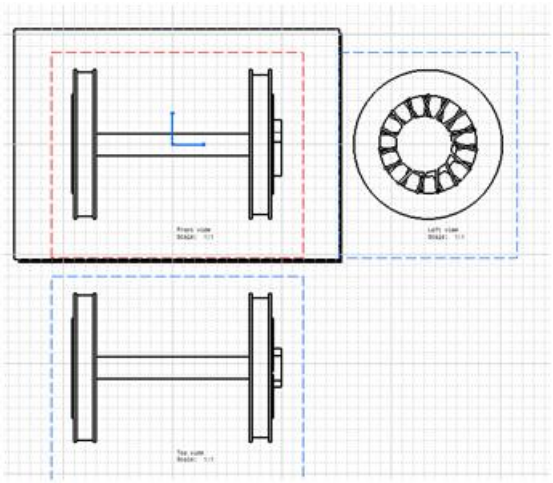


ASSEMBLY OF LOCO WHEEL

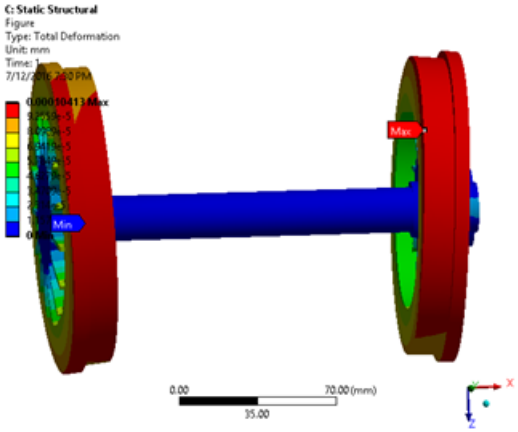


DRAFTING OF LOCO WHEEL



- **Material Data**
  - Gray Cast Iron

FIGURE 4
Model (C4) > Static Structural (C5) > Solution (C6) > Total Deformation > Figure



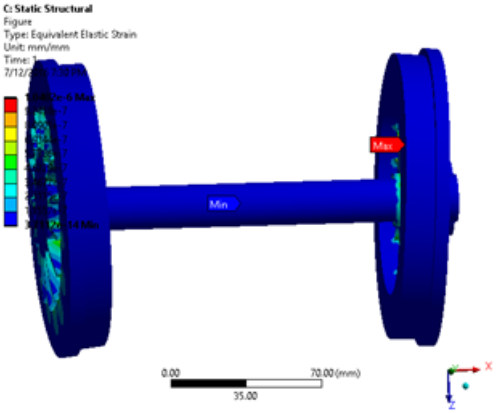
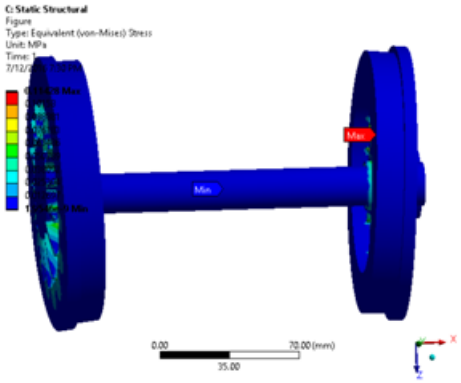


FIGURE 7
Model (C4) > Static Structural (C5) > Solution (C6) > Equivalent Stress



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Discussion and Conclusions

Design of an optimal wheel/rail profile combination is a complex interdisciplinary task combining geometric and physical contact of wheel and rail, vehicle–track dynamic interaction, profile design modeling, numerical optimization methods, mathematical programming, and interactive computer graphics. Expertise in all these fields is necessary to achieve satisfactory results. Each problem is described in this thesis. Together, they are combined in a wheel (rail) profile design procedure. The procedure of wheel (rail) profile design is developed, verified and presented in this thesis. The wheel (rail) profile design procedure uses optimality criteria based on the Rolling Radius ,Difference function, which to a large extent defines the contact properties of the wheel and rail. A new wheel profile is obtained by minimizing the difference between target and currentRRD. The MARS method is chosen as a general optimization technique. The design procedure allows development new wheel profiles with *a priori* defined contact properties. The dynamic simulation program ADAMS/Rail is used to assess wheel/rail interaction and vehicle behavior for the designed profiles. The results from the optimization show that the performance of a railway vehicle can be improved by improving the contact properties of the wheel and rail. Application of optimized wheel profiles results in improvement in wheel/rail interaction and railway vehicle dynamics, and wheel life is increased. Successful implementation of the design.