“Safety” Enhancements For Farm Tractors

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Abstract

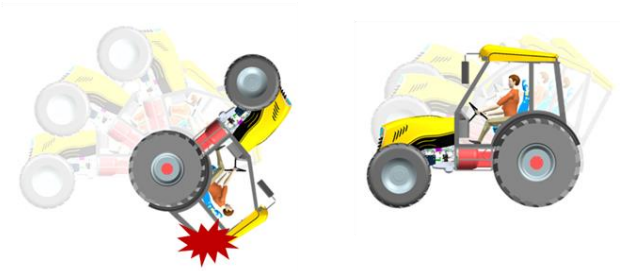
Statement of the Problem: A Tractor is a vehicle specifically designed to deliver a high tractive effort at slow speeds to be used for a variety of operations from tillage to haulage which may work on a farm road or on a concrete road, on levelled surface or on steep slopes. Agricultural implements may be towed behind or mounted on the tractor, and the tractor may also provide a source of power if the implement is mechanised. Whatever the case may be, the most important consideration is to provide safe operation to the driver. This is possible when a tractor is stable during static and dynamic situation. Harbarta (1971) investigated to achieve longitudinal stability and manoeuvrability of the tractor and emphasized that the load of the front axle in static condition on plane ground should be at least 25% of the instantaneous mass of the tractor. Rearward overturning takes place when dynamic front wheel reaction is reduced to a threshold amount which can be due to excessive drawbar loading, reduced soil reaction against the front wheels, tractor is operated on a steep slope, etc. The objective of this investigation and the proposed new system is to ensure safe operation of the vehicle against the overturning.

Methodology & Theoretical Orientation: The angle of the vehicle with respect to the ground needs to be continuously monitored for possible countermeasures against overturn. As the angle of tilt is continuously measured and before the vehicle reaching the “Point of no return”, the torque can be controlled as precautionary measure to avoid further lifting and overturning of the tractor. To adopt this procedure, a method and system (Electronic control unit) have been designed and developed. Further, using the device thus developed, a study was conducted on scale down model of tractor to understand the working of whole system.

Findings: Farm tractor accidents are estimated to claim many lives annually throughout the world. McClure and Benson (1961) reported that 67% of overturnings were to the side and 33% were to the rear. They also reported that rearward overturnings are more likely to be fatal than the sideways overturnings.

Conclusion & Significance: This invention is based on overturning of tractors creates new pathways for improving safety of drivers working in extreme conditions.

Without Anti Lift Protection | With Anti Lift Protection



Recent Publications

1. Harbarta F. (1971). Determination in relation to safety of operation of the minimal load on the front axle of a tractor with implements attached. J. Agric. Eng. Res. 16(2):126-140.
2. Koch J.A., Buchele W.F. & Marley S.J. (1970). Verification of a mathematical model to predict tractor tipping behavior. Trans. ASAE 13(I):67-72,76.
3. McClure W.R. & Benson J.L. (1961). An analysis of 212 fatal Ohio farm tractor accidents. ASAE Paper No 61-129, ASAE, St. Joseph, Mich.
4. Dennis J. Murphy, Professor, (Revised 2/2014) Tractor Stability and Instability. Agricultural Safety and Health
5. Kumar A. & Pandey K.P. (2012). A device to measure dynamic front wheel reaction to safeguard rearward overturning of agricultural tractors program in visual basic for predicting haulage and field performance of 2WD tractors. J. Comput. Electron. Agric. 87:152-158.



Parminder Singh is senior technical lead at MBRDI. He is graduated in Mechanical engineering in 2007 from Punjabi University, Punjab. He has got 10 years of Automotive Industry experience in Product Design & Development. His investigation based on overturning of tractors creates new pathways for improving safety of drivers working in extreme conditions. He has devised the new system after years of experience in research & development.

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