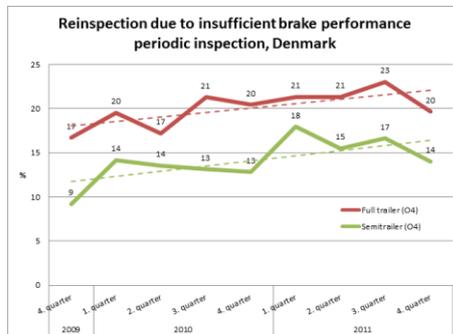


Jørn-Henrik Carstens, *Improved brakes on heavy vehicle combinations*

- amendment to UN-ECE regulation 13

The most common reason for rejections at Periodic Technical Inspection for heavy goods trailers is too low brake performance. In the Nordic countries approximately 20% of all trailers are rejected for reasons of low brake performance. According to the CITA Autofore study between 15 and 20% HGV trailers are rejected at PTI due to brake faults in EU.



It is reported by the brake component representatives that often not worn down brake linings have to be discarded because of lack of friction which can be explained by bad brake distribution between the brakes in the combination.

Vehicle owners are not happy with this situation due to uncertainty regarding road safety due to weak “sleeping” brakes, and would also like to have better and more economic use of the trailer brakes.

Studies and observations

- In 2005 The Nordic Road Association, Vehicles and Transport Committee, which is a forum of both haulier organizations as well as government representatives in Scandinavia, issued a study which recommended focus on better brake distribution of brake forces between truck and trailer as a mean to improve long term brake performance and reduce maintenance costs
- The ISO 20918 International Standard, “Road vehicles — Braking threshold pressures for heavy commercial vehicle combinations with fully pneumatic braking systems — Test with roller brake tester” from 2007 recommends a start pressure between 0,5 and 0,8 bar. It is said in the standard, that “the compatibility between motor vehicles and trailers relates not only to stability, but also to wear balance, or rather, to wear optimization. Wear optimization and low adhesion utilization require good braking balance between axles in the pressure range up to 200 kPa. This improvement in balance is achieved by minimizing the variation in pressure when all brakes start to develop a braking force.”
- In 2005 a Swedish voluntary test scheme was introduced and it recommended compatible start pressures between 0,5 and 0,8 bar.
- In Denmark a large study of HGV combinations was done. It found 38% underperforming trailers. As a mean of improvement better compatibility between truck and trailer was recommended.
- The IRU 2007 ETAC study found technical failures in 5.3% of all main causes for traffic accidents with trucks – queue accidents accounted for 20.6 per cent of all accidents. It will not be a wrong assumption to estimate weak brakes to play a role in some of these accidents. As those acquainted with accident reconstruction will know, it is often very difficult to reestablish a HGV to perform a realistic brake performance test after an accident.
- In 2006 proposed stricter Swedish compatibility demands requiring start pressure between 0,5 and 0,8 bar were not implemented due to the lesser ECE R13 demands of 0,2 to 1,0 bar according to the existing corridors in R 13, annex 10.

Objective

The Danish Transport Authorities (Trafikstyrelsen) proposed an improvement of HGV truck-trailer brake compatibility in UN ECE R13, which has been processed at the 71st and 72nd GRRF meeting at UN Geneva. The goal is to counteract sleeping or overloaded brakes by letting each individual wheel brake take its part of everyday brake events, which is below a pm of 200 kPa, and that each wheel brake should brake in relation to the load on its axle and that demands should be possible to confirm at PTI.

In short

- HGV wheel brakes are sensitive to use and to environment
- Each HGV wheel brake has to handle up to 15 times more energy compared to passenger car brakes
- HGV brakes are conditioned at everyday low demand
- In the event of emergency demand only well conditioned brakes will perform satisfactory
- Well performing HGV brakes are a prerequisite to function of
 - Automatic Emergency Brake System (AEBS)
 - Stability Control and Roll-Over Control Systems (ESC)
 - Adaptive and Advanced Cruise Control Systems (ACC)
- Compatibility at low pressures should be possible to confirm at PTI to assure continued long term performance

Initiatives

Both the Scandinavian network NVF and the International haulers organization IRU supports the proposed upgrade of ECE R13. In fact NVF and IRU have asked Denmark to prepare the proposal, which was presented to GRRF in February 2012.

Content

The proposal consists of three elements:

- The possibility to override the corridors by means of coupling force control allowances is somewhat narrowed in. Otherwise the corrections to the corridors would have little effect.
- Requirement for a test connection in the control line
- The compatibility diagrams also known as the corridors in annex 10 is narrowed at low pm pressures and apply at all load conditions below 200 kPa or 2 bar control line pressure

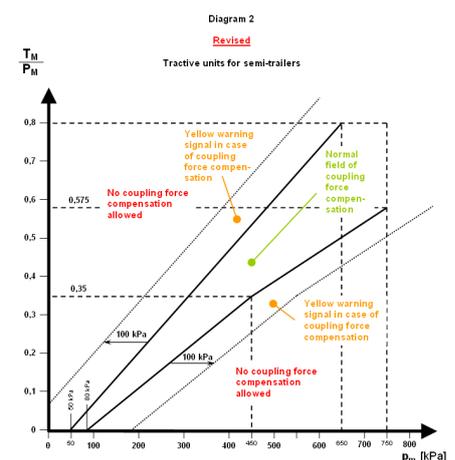
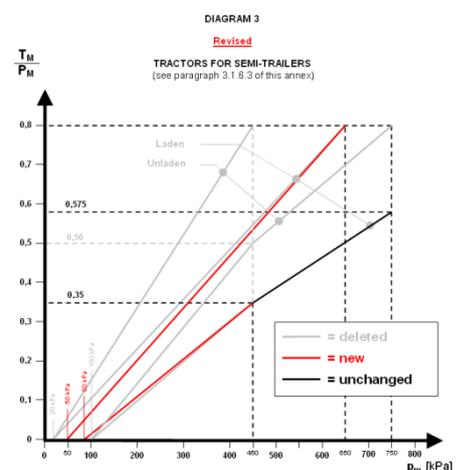
Compatibility diagrams

The principles for the proposed changes are:

1. Unladen curves are deleted. Since there is a demand for ABS on HGV and the demands in annex 13 for vehicles equipped with ABS requires the corridors for the laden situation only fulfilled, the unladen curves are no longer relevant.
2. The starting points for the corridors are narrowed down to 50 kPa and 80 kPa respectively.
3. New corridor lines are drawn from new starting points to nearest existing point on laden curves.
4. In all load situations, other than the laden situation, the corridors apply, but only up to 200 kPa. That is to assure that not only will the start pressure fall within 50 and 80 kPa, but the brake rate will continue to develop in proportion to the control line pressure.

Coupling Force Control (CFC)

The paragraph 5.2.1.28.5 allows quite wide adjustments of the pm pressure from the truck to the trailer. So a wish to enhance compatibility will lead you to have to look at the limits for adjustment of pm pressure justified by coupling force control.



The principles for the proposed changes are:

1. The limit curves for pm-correction is defined in relation to the known existing corridor lines
2. The normal field of variation falls within the corridors
3. Variations outside the corridors up to plus or minus 100 kPa in relation to the corridors is allowed, but the yellow ABS-lamp will have to be turned on indicating that something is probably wrong with the trailer brake performance.

Presentation

The working document and the updated informal document is submitted by Denmark, and it is coordinated and supported by the International Road Transport Union, International Commission of Technical Affairs (IRU CIT) and the Nordic Road Association, Vehicles and Transport Committee (NVF).

Conclusion

The key fundamental brake issues could be summarized to:

- “Use it-or loose it” is very much a phrase valid for the brake performance of the numerous single brakes of a truck-trailer combination
- All brakes shall accordingly simultaneously start to develop brake force
- The present legal requirements do not meet this demand
- The number of units and single axles in modern combinations is still rising. And by that a rise of the number of brakes that needs to activated to maintain the full brake performance needed in emergency situations
- The IRU is critical to uncertain road safety and the quite large maintenance costs
- The existing compatibility demands are basically 37 years old (Directive 75/524)
- The current technical level (EBS-electronic brake system) of brake control does permit the brakes to be engaged more appropriate by means of the programmable parameters in the integrated electronic control units, and will not put heavy extra costs on the vehicle manufactures – the possibilities are in fact already there and should be used in the future

The room for inconsistency at the most common brake event, which is at low brake pressures, is a disadvantage to road safety and vehicle owners - this disadvantage can be mitigated by the presented proposal.