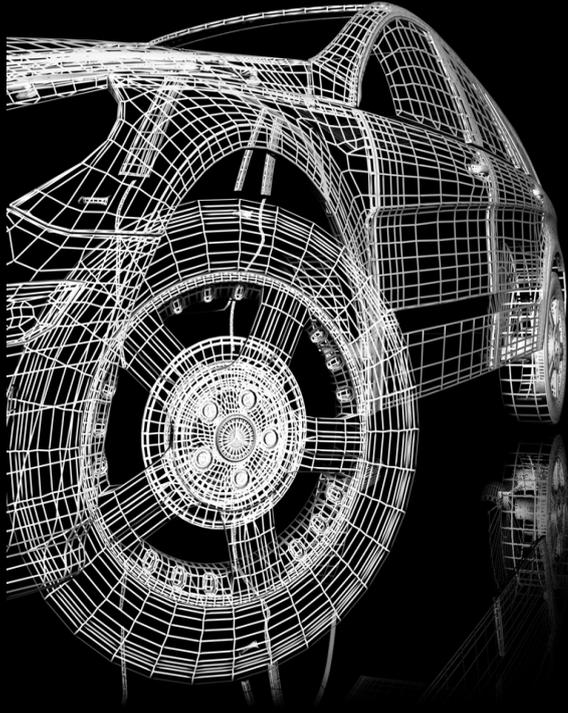




Vehicle Wheels

In relation to

EU Roadworthiness Package



Presented by
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www.nwautoalliance.com



Motor Wheel Service

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The NAA is a not-for-profit, membership-based company, which is a catalyst for raising the profile and competitiveness of the automotive sector in the North West.

Full details at www.nwautoalliance.com



Motor Wheel Service is a UK company with over 90 years wheel experience in the Classic Car, Caravan, Trailer and Commercial trucks sectors.

Full details at www.mwswheels.com

INTRODUCTION

Motor Wheel Service Distribution (MWS) first raised the issue of cracked commercial vehicle wheels with the UK Parliament's Department for Transport in June 2010, since when there has been two meetings, two Westminster Hall debates and numerous letters of correspondence with former Under Secretary of State for Transport, Mike Penning MP, and new Under Secretary of State for Transport, Stephen Hammond MP.

The initial discussions centred on a concern from MWS, Europe's largest distributor of commercial vehicle wheels, who recognised an escalation of dangerous second-hand wheels operating within the marketplace both during and after the recession.

The company estimated that approximately 10,000 take-off and second hand commercial vehicle wheels enter the UK aftermarket every year of which many may be substandard and potentially hazardous.

Of the 10,000 commercial vehicle wheels entering the aftermarket, these wheels have no history, no traceability and can be sold by anybody who has no technical abilities or examination procedures to check the history and fatigue of a wheel. The number for Europe is unknown.

At the start of 2012, research initiated by MWS through one of the world's leading wheel experts, Dr. Sundararajam of Wheels India, found that commercial vehicle wheels operating on spider and star shaped hubs are suffering untested load stresses which are causing cracks and halving life expectancy. The research was presented to the UK Parliament's Department for Transport in May 2012, and the Department for Transport is focusing on ascertaining the scale of the issue in the UK.

Throughout the campaign to improve CV wheel road safety the company has been fully supported and closely monitored by the North West Automotive Alliance (NWAA), Paul Goggins (Labour MP for Wythenshawe and Sale East) and Brian Simpson (Chairman of the European Parliament's Transport and Tourism Committee).

This report outlines activity to date and proof of a serious safety issue in the commercial vehicle wheel aftermarket.

BACKGROUND

Vehicle manufacturers in the production of a new vehicle will specify to the wheel manufacturer his needs. There is then created a specific wheel for a specific vehicle model which ensures conformity and the benchmark for future replacements.

Over the last thirty years the requirement for fast wheel replacements has taken precedence, and the availability of wheel parts has ballooned as speed of repair and efficiencies rise to reduce down time in distressed vehicles.

There has been a move in the aftermarket to find an interchangeable wheel that meets the specification of all the vehicle manufacturers. Companies like MWS understand that the wheel manufacturers specification list by vehicle model may run into the hundreds whereas in practice one replacement wheel can meet the needs of many models.

Over the years that has given rise in the commercial vehicle market that the majority of manufactured vehicles can be supported in the aftermarket with a limited number of commercial wheels, thus ensuring availability and speed of delivery.

Companies with this experience have also ensured that their replacement wheels are INTERCHANGEABLE thus equalling or bettering the range of OEM (Original Equipment Manufacturers) wheels and the tyre industry supply standard ETRTO.

The need to self impose quality systems is due to the lack of a European Aftermarket Group that are credible to the wheel manufacturers. MWS chose to meet this need by following the German example of TUV (seen as a way of standardising product arriving through different EU borders) and LBF Testing, a level of fatigue testing not achieved by other standards.

This presentation is not here to support any single system but MWS in the wheel aftermarket had to set a standard for guidance and has worked with TUV for over 30 years, and they in turn give credibility to our supposition that a particular manufactured wheel is suitable for a range of different vehicle models.

1 THE ROADWORTHINESS PACKAGE – CURRENT WORDING

Potential added wording to the Roadworthiness Package states:

“.....wheel size or type not in accordance with the requirements and effecting road safety will be assessed as a major deficiency during MOT tests.”

the knowledge, equipment or statistical feedback does not currently exist in the replacement wheel after market to maintain and monitor to these standards unless based upon OEM specification.

The adoption of OEM specification takes us back to non interchangeable wheels and the problems already outlined.

2. THE ROADWORTHINESS PACKAGE – REMOVAL OF THE NEED FOR WHEEL REFERENCE IN THE PACKAGE

This option has benefited businesses for sometime and the matter of wheels has been relatively ‘under the radar’, but recently as more business look to sourcing wheels globally the standards in place are easily bypassed leaving safety issues never before envisaged.

The presentation included, to the UK Parliament regarding spider hubs, which do not meet ETRTO standards, is an example of the lack of joined cooperation between the OEM manufacturer and the aftermarket.

If this type of problem is allowed to continue to happen without a platform for review as experienced in the spider hub case then the package will leave many business vulnerable to the whims of the manufacturer to resolve an issue like the spider hub to the satisfaction of all authorities leaving the aftermarket with years of resolving problems of cracking wheels.

3. THE ROADWORTHINESS PACKAGE – A MIDDLE GROUND

The supply chain currently works if it was lightly regulated to enforce existing standards and audited through inspection more closely. We believe by delivering a Standard EU guidance that recognises:

- Wheels are a safety critical item which in most cases will need replacement due to the total lack of skills, and equipment to know when it is fatigued.
- Wheels fatigue every day they are used. NO manufacturer offers a warranty over 12 months for a steel wheel. Vehicle owners should be informed that wheels on average have a service life of 5 years and consideration to replace them is advised.
- That all wheels and axles testing meets ETRTO standards.
- That all replacement wheels are fatigued tested.
- That wheel testing adopt the 10 point checks that are included in this presentation.
- That there is better communication with Wheel Manufacturers and aftermarket channels on customer experiences and developments.

Wheel Fatigue

POTENTIAL INFLUENCE OF THE HUB SHAPE ON FATIGUE LIFE
PERFORMANCE OF TRUCK AND TRAILER WHEELS

PRESENTATION TO:
THE EUROPEAN
PARLIAMENT'S
COMMITTEE ON
TRANSPORT AND
TOURISM (TRAN)

'THE
ROADWORTHINESS
PACKAGE' HEARING

ORIGINALLY PRESENTED TO:
MIKE PENNING MP, UNDER
SECRETARY OF STATE FOR
TRANSPORT, DEPARTMENT
FOR TRANSPORT, UK

3rd May 2012

POTENTIAL INFLUENCE OF THE HUB SHAPE ON FATIGUE LIFE

PERFORMANCE OF TRUCK AND TRAILER WHEELS

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INTRODUCTION

The issue of cracked commercial vehicle wheels was first raised with the Department for Transport in June 2010, since when there has been one meeting, two Westminster Hall debates and numerous letters of correspondence with Under Secretary of State for Transport, Mike Penning MP.

The initial discussions centred on a concern from Motor Wheel Service (MWS), Europe's largest distributor of commercial vehicle wheels, who recognised an escalation of dangerous second-hand wheels operating within the marketplace both during and after the recession.

The company estimates that approximately 10,000 take-off and second hand commercial vehicle wheels enter the UK aftermarket every year of which many may be substandard and potentially hazardous.

Of the 10,000 commercial vehicle wheels entering the aftermarket, these wheels have no history, no traceability and can be sold by anybody who has no technical abilities or examination procedures to check the history and fatigue of a wheel.

MWS agreed that the scale of the problem was unknown, and subsequent research undertaken by VOSA indicated this was a minor problem. Despite protestations, no further action has been undertaken by the Department for Transport or VOSA since.

Throughout the ensuing months and years, MWS, with the full support of Paul Goggins MP, has continued to argue that commercial vehicle wheels are a dangerously over-looked safety critical item, that VOSA checks are wholly inadequate, and that ultimately a problem exists.

This report outlines subsequent activity to date and proof of a serious issue in the commercial vehicle wheel aftermarket that has been overlooked by Government and leading CV industry bodies.

Throughout 2011 and into 2012, MWS, under its duty of care, raised the profile of the issue and approached leading industry bodies including: Association of European Wheel Manufacturers (EUWA); Freight Transport Association (FTA); Institute of Road Transport Engineers (IRTE); National Tyre Distributors Association (NTDA); Road Haulage Association (RHA), Society of Motor Manufacturers and Traders (SMMT).

The approaches culminated in a meeting with Ian Chisholm (IRTE), Ray Engley (RHA) and Nigel Base (SMMT) on January 23, 2012. MWS's clear position was to ask for cooperation for the set-up of an agreed reporting mechanism for the industry to submit examples of dangerous wheels operating on UK vehicles.

MWS was informed, in no uncertain terms, that there was definitely not an issue in the marketplace with cracked wheels operating on UK commercial vehicles, and that cooperation would not be forthcoming unless definitive proof could be presented to the organisations.

However, following the meeting, it was agreed that MWS would work with IRTE to help improve market literature and knowledge, where required, with the initial focus on IRTE's Wheel Security booklet.

CV WHEEL INDUSTRY BACKGROUND:

In the past, truck manufacturers produced vehicles on different axles which required different wheel specifications. The rise of the wheel specialist such as MWS, who could identify the correct wheel for the correct vehicle, was a specialised service for the tyre industry and vehicle operators.

Over the proceeding years the tyre industry and wheel manufacturers moved towards a set of standards that meant wheels could be safely interchanged as specifications became uniform.

All wheels were tried and tested to both the International Organisation for Standardisation (ISO) and European Tyre and Rim Technical Organisation (ETRTO) standards (further details available on page 10).

The standardisation was an opportunity for companies, such as MWS, to supply the aftermarket with wheels from around the world, providing the products met the strict specifications as laid down by ETRTO.

The inter-changeability has offered the opportunity for buyers in the tyre and trailer industries to direct purchase. Unfortunately, as a result of inexperience and little or no border standards in the UK for these items, both new and second-hand wheels and axle hubs have entered into the UK aftermarket that are not to specification.

Since 2008, MWS has noticed a marked increase in cracked CV wheels, both steel and aluminium. It was at first believed that there was a problem with wheel supply market, and this continues to be a concern. However, further research led us down a different route.

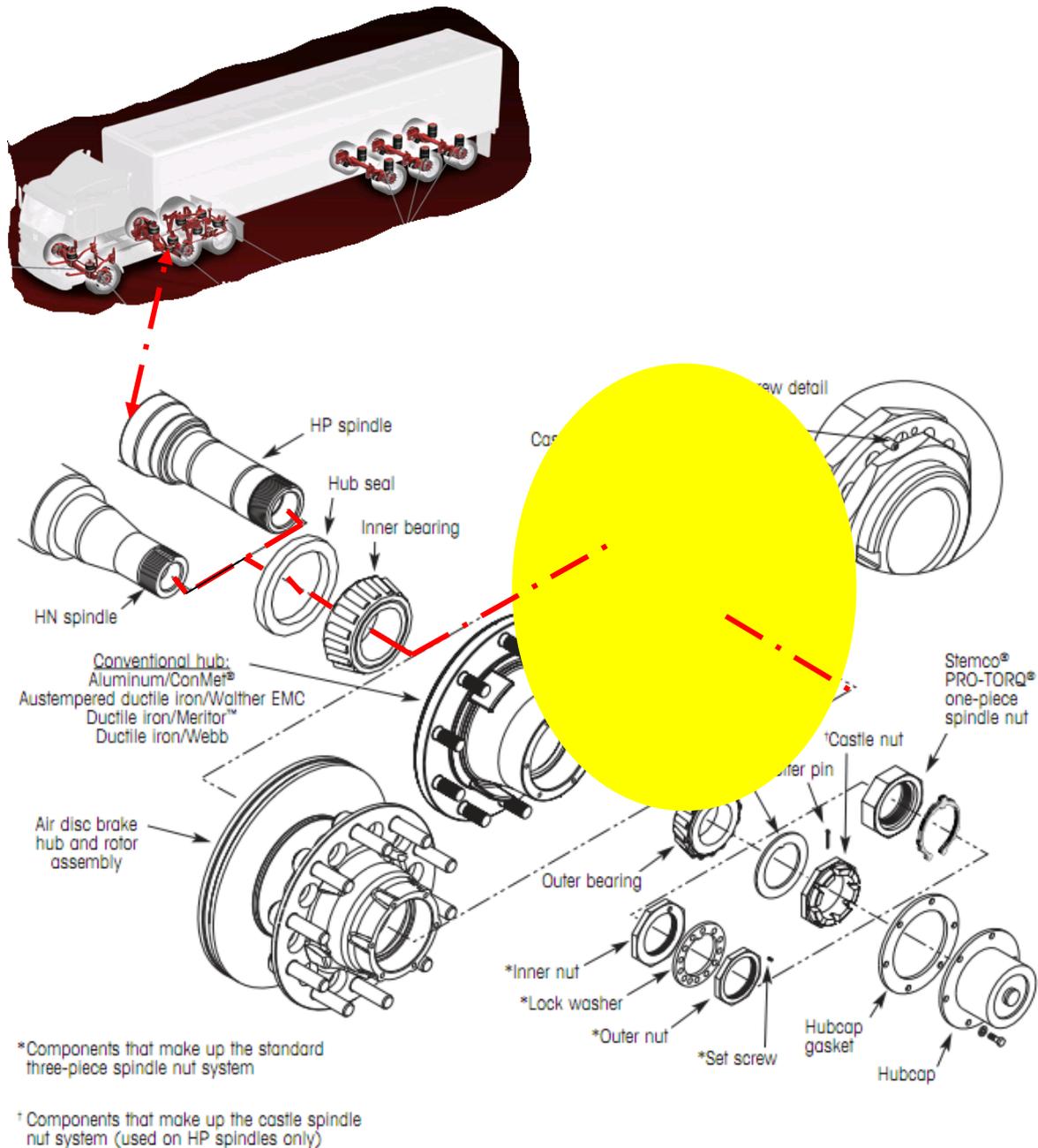
It is important to note that the amount of second-hand wheels in the market has made it difficult for a small company like MWS to find a particular problem in amongst the rest of the issues. The uncontrolled import of wheels has clouded the correlation of the problems until recently.

Following the meeting on January 23, 2012, MWS enrolled the services of one of the World's leading CV wheel experts, Dr. Sundararajan of Wheels India, to investigate the cracked wheels that had been returned to the company.

His findings can be found in the attached report: Spider Hub – Problems Associated with Wheel Rim (appendix one).

The image below shows the pressures placed on a wheel operating on a non-circumferential hub (left) and industry standard circumferential hub (right). A two-fold increase in stress was noticed on the localised region due to spider hub mounting, with the red marks showing where extreme stress is caused which will lead to the early failure of the wheel. In all tests the crack appeared on the inside face before becoming noticeable on the outside face at a later stage

SUPPORTING IMAGES ONE TO THREE: EXAMPLE HUBS ON UK CV VEHICLES



SUPPORTING EVIDENCE ONE: WORDING TAKEN FROM HAYES LEMMERZ 2012 PRODUCT CATALOGUE (HAYES LEMMERZ (NOW MAXION) IS THE LARGEST OF THE TRUCK WHEEL MANUFACTURER IN EUROPE)

TITLE: INTRODUCTION OF THE SAFE INTERCHANGE ABILITY OF STEEL AND ALUMINIUM WHEELS FOR COMMERCIAL VEHICLES USED IN EUROPE

Modern wheels for trucks and trailers are designed and fabricated according to international standards concerning e.g. rim profile, wheel fixation or fatigue test procedures.

The respect of those standards has the intention to make sure as possible that wheels can be mounted and interchanged between equivalent vehicles without potential safety risks.

One important point is the fixation of wheels which is defined in the standards ISO 4107 "Commercial Vehicles - Wheel Hub Attachment Dimensions", in DIN 74361-3 "Disc Wheels Dimensions and Fastening Devices for Hub Centring" and in SAE J694 "Disc Wheel/Hub or Drum Interface Dimensions".

In those standards the outer hub shape is considered as continuous diameter.

Analysis done by EUWA members (Association of European Wheel Manufacturers) for several vehicles on the market have shown that, besides the hubs as described above, various shapes exist which are not continuous but have a dented shape or star shape.

Wheels manufactured and supplied by EUWA members are tested and approved according to EUWA Standard and / or specific specifications of truck and trailer manufacturers.

As a precaution and in order to try to understand the potential impact of different hubs, EUWA members have tested wheels using a variant of star shaped hubs. Even though the wheels passed the corresponding tests successfully, reduced fatigue life has been experienced. FEM analyses are explaining this effect due to higher local stresses caused by the attachment face shape and diameter reductions of the star shaped hubs.

The failure mode is crack starters on the attachment face side along the edges of such a star shape.

Without further observation these initial cracks could potentially cause circumferential cracks.

Sharp outer edges as characteristic of the star shape design encourage the development of these initial cracks.

In case of other negative influences (such as reduced service conditions, reduced connection area between wheel and hub, overload...) such cracks could potentially occur at an earlier stage of the entire vehicle fatigue life.

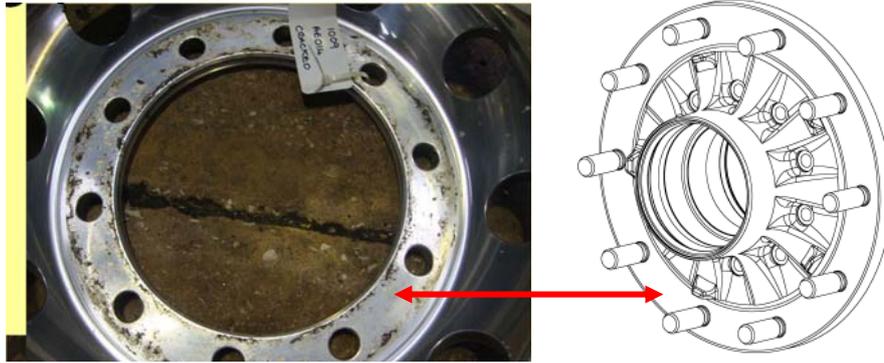
Also, due to the different characteristics of some of the star shapes (differences between axle manufacturers), potential imprints can show different shapes. In case of mounting those wheels on hubs with yet another shape, the drastic reduced attachment area can lead to an increased surface pressure and an undefined attachment of wheel to hub.

In order to maximize safety, EUWA strictly recommends for the vehicles equipped with non-circular hubs in the field, that the wheels used on such hubs have to be checked towards cracks on the inner and outer attachment face each 50.000km. In case of crack detection the wheels have to be replaced immediately --- in

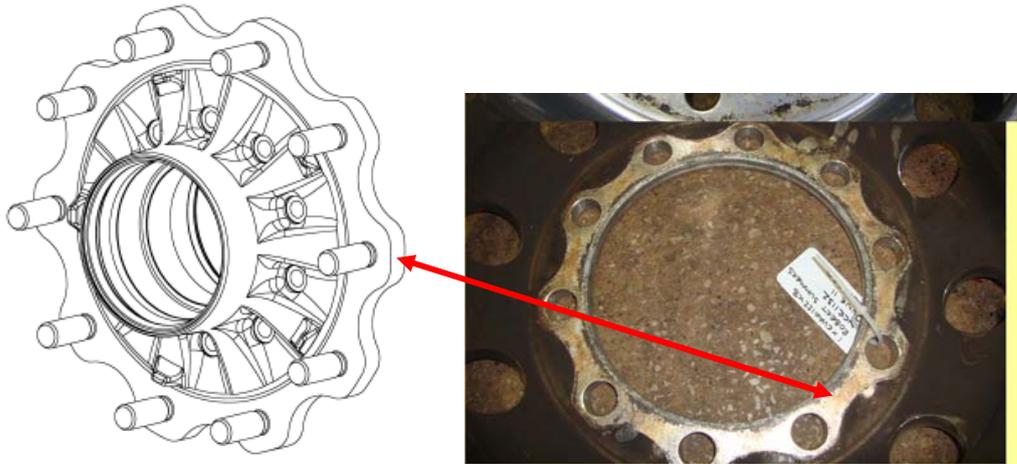
such cases also the hubs should be checked with regard to wear out and cracks and if necessary the hubs should be replaced.

For future production and developments EUWA strictly requires the use of wheels on attachment parts that are fulfilling the corresponding norms and specifications.

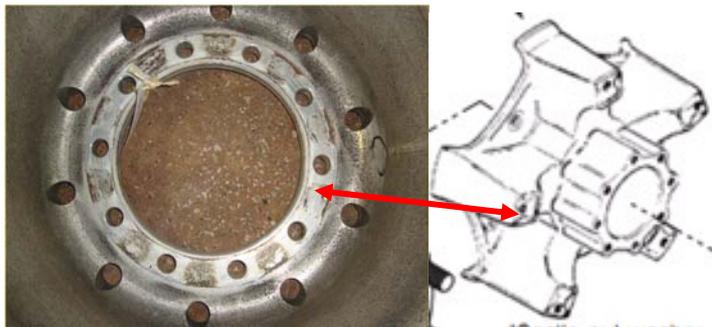




Full circumferential clamping, hub to European wheel standards
Wheel pattern seen in brakedust on the rear of a demounted wheel.



Star or Spider hubs, not to European wheels standards
Wheel pattern seen in brakedust on the rear of a demounted wheel.



Castellated hub, not to European wheels standards
Wheel pattern seen in brakedust on the rear of a demounted wheel.



Further various commercial vehicle wheel hubs



CONCLUSIONS

MWS was asked to prove a problem affecting wheels in the CV industry, and we rightly believe that this is an issue that requires further, immediate investigation. The following conclusions have been drawn:

- Wheels, designed and manufactured to ETRTO standards, are being placed on axles that are non-standard (non-circumferential). This is leading to the early fatigue of wheels, primarily displayed as cracks, approximately halfway through the lifetime expectancy.
- Wheel manufacturers and distributors are not responsible for the failure of their items if the wheel have been placed on a non-standard (non-circumferential) axle.
- The report from Hayes Lemmerz states:

‘In order to maximize safety, EUWA strictly recommends for the vehicles equipped with non-circular hubs in the field, that the wheels used on such hubs have to be checked towards cracks on the inner and outer attachment face each 50.000km. In case of crack detection the wheels have to be replaced immediately. More in-depth wheel checks are required at the general maintenance, six-weekly, roadside and annual tests incorporating both axle and wheel’ (Hayes Lemmerz Steel wheel technical catalogue 2012 – 2013:P16&17).

- The market as a whole, including Government and leading commercial vehicle organisations, is not aware of this problem. A breakdown in communications exists from the original equipment manufacturers through every level right down to the day-to-day operational staff of the vehicle operation itself.
- This independent research explains a rise in cracked wheels operating on UK roads and further investigation is required to identify the true scale of this problem.

QUESTIONS

As stated previously, MWS wishes to work in conjunction with the industry to address this vitally important issue and educate the market. The following questions require answering:

- How can we ascertain the size of the issue? Or an alternative wording to the question is how many vehicles are operating on UK roads with non-conforming axles?
- How can we take this message to the market and educate/protect the vehicle operator? It needs to be made clear that the problem exists with the hubs, not the wheels, so who controls the message to ensure a unified approach?
- To whom do MWS and industry bodies direct customers, including fleet managers who will be concerned about the affect on their fleet?
- How can companies be better protected and informed in the future from OEM decisions which may affect the aftermarket?
- What is happening to all the cracked wheels that are being removed from CV vehicles? Where is the proof that these are being removed from the supply chain?

ETRTO STANDARDS EXPLAINED:

ETRTO standards are specifications of international interest, including future developments, approved in accordance with the Organisation's Constitution and Rules of Procedure. Although not exclusive, they are based on sound knowledge and experience and will enable users to obtain good services from their tyres/rims/valves, but as they give only general advice, they cannot take into account special conditions of use and every different type of vehicle.

In consequence, the application of ETRTO standards does not absolve the user of them from any product liability responsibilities or legal obligations that may be required and which may vary from country to country. Further, ETRTO does not accept any responsibility for the infringement of patents relating to the data for tyres/rims/valves specified as ETRTO standards in this publication.

Further details can be found via this website: <http://www.etrto.org/page.asp?id=1594&langue=EN>

1 DENTS AND DAMAGE

A badly dented wheel will not run true. Basically any damage that distorts the wheel from its original shape for example,

if more than 10% wear in initial flange thickness – the wheel is effectively defective and should be replaced. (Not repairable)

2 CRACKS

Cracks can appear at certain parts of a wheel, therefore, the following should be checked...

- Ventilation hole to ventilation hole, ventilation hole to stud hole and ventilation hole to rim.
- Stud hole to stud hole, for example, loose nuts/small hub backup/ nuts may be too tight or in the wrong sequence.
- Leak under tyre bead or leak in well radius or leak at the butt weld.

3 SIGNS OF UNDER-INFLATION

Wear along circumference of bead seat on rim

4 CORROSION

Surface corrosion of the wheel rim can be wire brushed and cleaned. Excessive flaking or badly pitted metal indicates a need to scrap the rim

- Areas of concern are:
- Around stud holes on disc
- On mating surface such as wheel on disc.
- Around the centre hole/bore on disc
- Bead seat on rim
- Around valve hole on rim

5 MARKINGS ON NAVE PLATE

- Size and offset
- Date of manufacture
- Name of manufacturer
- Part number
- To assist with compatibility with tyre and vehicle if renewing

6 MATING SURFACE

All contact or mating surfaces on the wheel disc and axle hub must be clean, smooth, corrosion free.

7 CENTRE HOLE OR BORE

Warping, dent or buckle in disc. There may be damage to edge or severe corrosive pitting around the circumference sufficient enough to affect the centring and full contact mating of the wheel.

8 STUD HOLES

Firstly, the tightening sequence is important first two nuts – finger tight

Manufacturing tolerance of 1mm on stud hole diameter

Ovality of a hole will mean it's not fit for purpose because there is a possibility of stress lift leading to breakdown between nut washer and wheel surface – loose nuts

9 PAINT THICKNESS

Wheels are coated with anti-corrosion primer and silver top coat. The total thickness from production is approximately 45 microns with a maximum of 60 microns

The industry preference is not to have paint on mating surfaces and where repainting a wheel with minimal and even coverage needs to be checked; remember, paint brush coating will exceed maximum thickness

10 VALVE HOLE

Valve hole surface must have a clean and even surface and the area must be free from burrs and sharp edges. A leak at the valve hole is caused by damage or severe corrosion

This check plan is currently available from the MWS Technical book available for free download at <http://www.mwsheels.com/images/news/5.7.402MWSTrainingManualRev%201.pdf> Page 12



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