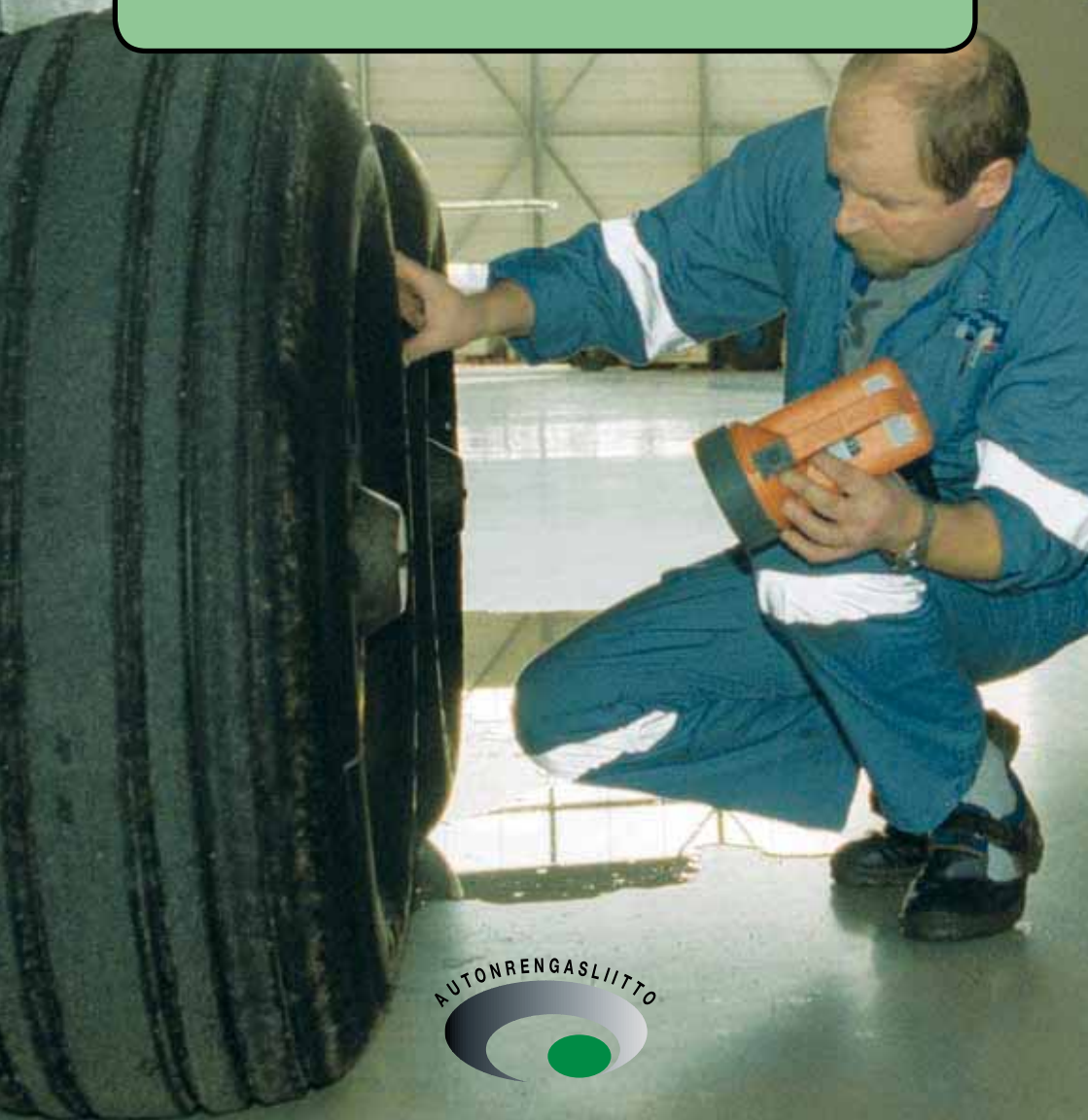


RETREADED TYRES

QUALITY, ECONOMY AND ECO-EFFICIENCY



RETREADED TYRES

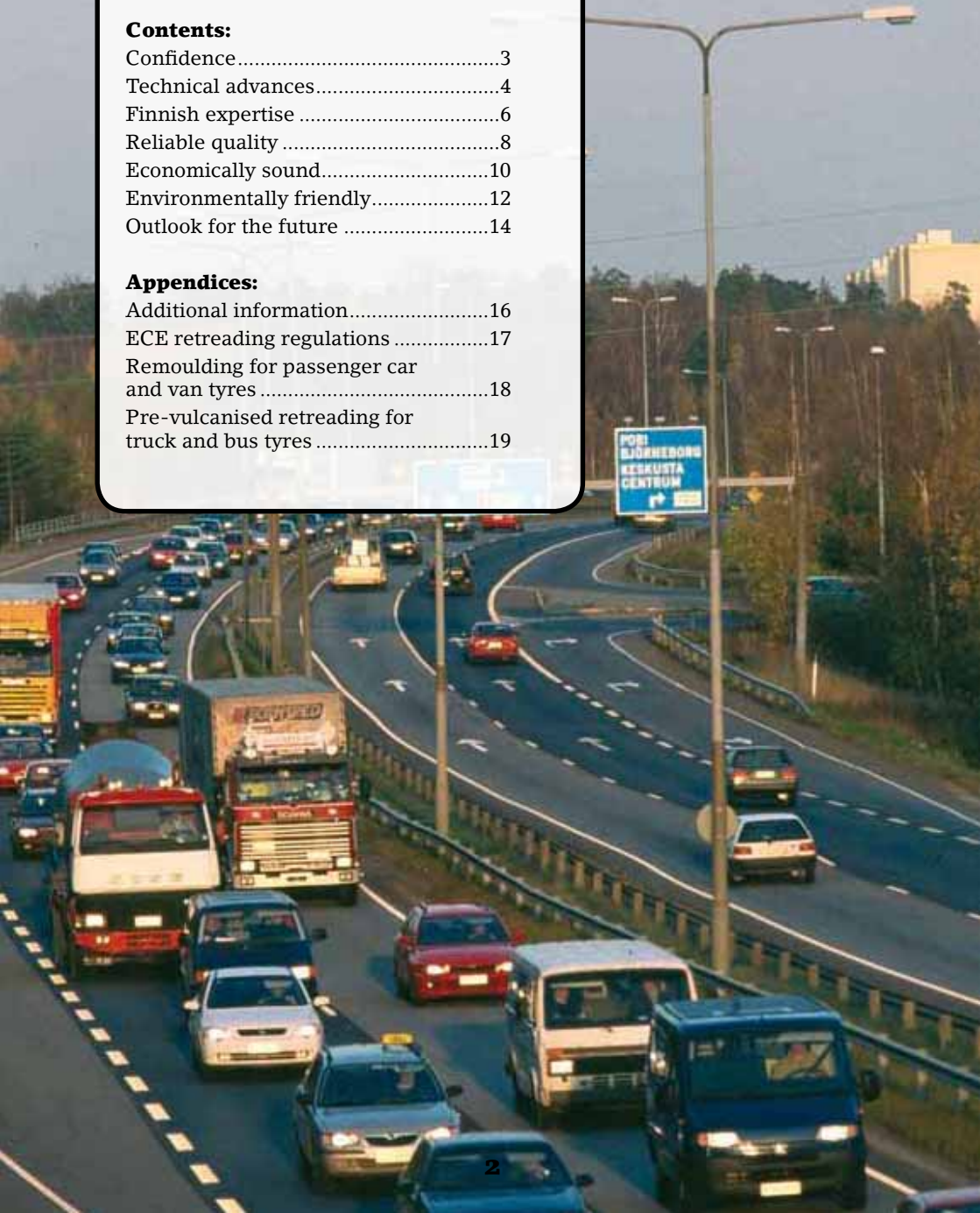
Quality, economy and eco-efficiency

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CONFIDENCE



Did you know that retreaded tyres are used on aircraft? In fact, no less than 95 per cent of aircraft tyres are retreaded, and each tyre is retreaded an average of five times during its life. Aircraft tyres are used under demanding conditions, which means that tyres must meet strict criteria during the re-treading process.

Most people are probably more familiar with retreaded tyres on road vehicles. This publication will focus on the tyres used for cars and vans (referred to here as “passenger cars”) and trucks and buses (“trucks”). Retreaded tyres are also used on earthmovers and other construction and industrial vehicles.

Pioneers in tyre retreading and recycling

Finland has a long history of retreading tyres. Products and services have developed according to customers’ needs in a very competitive market. The Finnish retread ratio for truck tyres is among the highest in the world.

Finland is also a pioneer in tyre recycling on a broader scale. Almost 100% of the material from used tyres

is collected and recycled. The majority of tyres that are unsuitable for re-treading are used as raw materials in earthworks.

It makes financial sense to retread the best tyre casings several times, so that one tyre can run even one million kilometres without compromising on safety. Users must feel confident in the performance of their tyres, even under extreme conditions.

ECE regulations

EU requires type approval for all re-treaded passenger car and truck tyres. This approval covers both the retreading process and the quality of the final product. Retreaded tyres are tested to the same standards as new tyres.

This publication seeks to increase general confidence in retreaded tyres. We aim to offer basic information in a simple format and provide reasoned material for industry professionals. Dedicated sections cover the quality, economy and eco-efficiency of re-treaded tyres.

*Tyre Specialists of Finland
Retreading Group*

TECHNICAL ADVANCES



The tyre is a continuously developing technical innovation. Thanks to international competition, we are able to enjoy increasingly better tyres for every need. Advances in retreading follow developments in the tyre industry, yet the basic idea has remained the same: a new tread extends the life of a tyre.

Quality casings

Put simply, a vehicle tyre comprises a casing and a tread. The casing is designed for a specific load capacity and performance level, and also to endure the stresses exerted upon it. The tyre tread plays a key role in grip and transmits mechanical forces between the vehicle and the road surface.

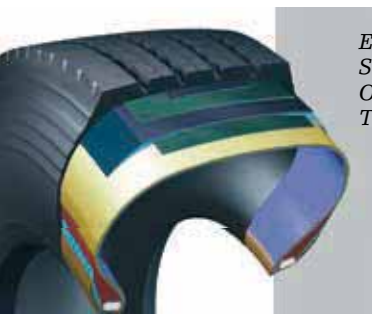
A worn tread does not make the whole tyre useless. High-quality tyre casings for heavy vehicles retain their properties well and can be retreaded several times. Passenger car tyres shall, however, only be retreaded once.

Vulcanisation

Wheels have turned for thousands of years beneath a variety of vehicles. In 1839, Charles Goodyear invented vulcanisation, which significantly increased the potential range of uses for natural rubber. Vulcanisation occurs through an interaction between pressure, heat and time. Various synthetic rubbers are now also used alongside natural rubber.

Pneumatic tyres replaced solid rubber wheels at the end of the 19th century. Tyres then developed rapidly to meet the needs of the automotive industry. Durability was first improved using cross-ply structures before a general switch to steel radials. Not only tyre structures, but also ply materials, rubber mixes and tread patterns have changed over time.

After the Second World War, rubber repair shops gradually switched their focus from fixing tyres to retreading them. Radial tyres became more common, and pre-vulcanised retreading rather than remoulding began to be used for truck tyres. When a tyre is remoulded, vulcanisation and retreading are carried out in a mould as per the manufacture of a new tyre. Retreading involves using a cushion gum to attach a pre-vulcanised tread to a tyre casing. This is then vulcanised in a pressure chamber.



*EXAMPLE
STRUCTURE
OF A TRUCK
TYRE*

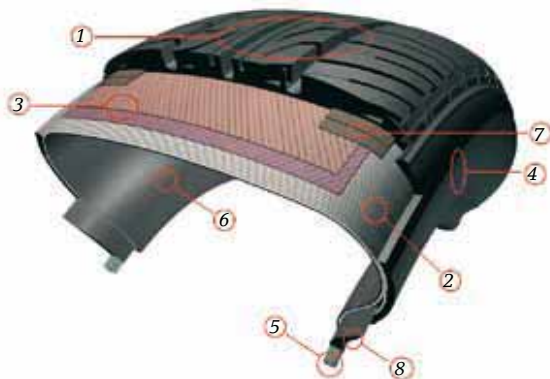
RETREADED TYRES



Image: Vainion Liikenne

STRUCTURE OF A PASSENGER CAR TYRE:

1. Tread
2. Tyre casing
3. Belt structure
4. Sidewall
5. Bead wire
6. Inner liner
7. Radial ply
8. Bead rubber



FINNISH EXPERTISE



Finland has profound expertise in the manufacture and retreading of tyres. Tyre users have developed confidence in tyre companies' services and the high quality of their retreads. For example, truck tyres are retreaded an average of two times in Finland compared to less than once in the rest of Europe.

A high standard

According to statistics from the Tyre Specialists of Finland, over 250,000 tyres were retreaded in Finland in 2011. Almost 70 per cent of these were tyres for commercial vehicles. Just under 70,000 tyres were recycled for passenger cars and vans: most of these were made into winter tyres.

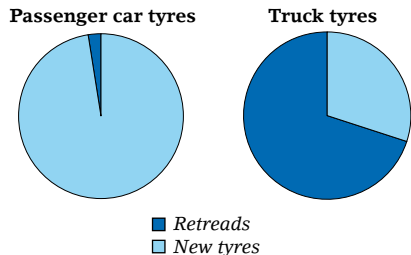
About 3.3 million passenger car and van tyres are sold each year in Finland. 2-3 per cent of these are retreaded. Almost 300,000 truck, replacement truck tyres are sold annually, of which 70 per cent are retreaded. Most retreading of truck tyres uses the customer's own casing, although cap and casing retreads are becoming more common.

Service packages

The high standard of retreaded tyres in the Nordic countries is not a coincidence. We are familiar with both our customers' needs and winter conditions, and we have learnt to meet these challenges by offering excellent service and competitive products. Through training and experience, we acquire professional skills and generate confidence. Co-operation is based on long-term customer relationships.

Retreaded products have always been easily available, often as part of tyre companies' service packages. In addition to tyre sales, companies offer a broad range of fitting, maintenance and repair services. Many companies will also store winter and summer tyres for their customers. If problems arise, customers can call a 24-hour emergency hotline for assistance from the nearest member of the co-operation network.

TYRE MARKET SHARES FOR RETREADS

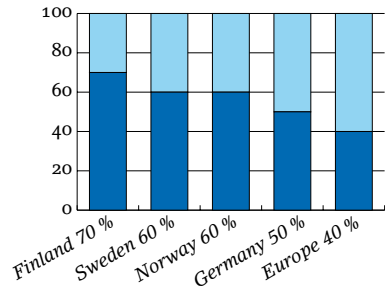


RETREADED TYRES



When compared globally, the share accounted for by sales of retreads in Finland is particularly high for heavy vehicles. The average is about 40 per cent in European countries and 29 per cent globally.

TRUCK TYRE MARKET SHARES FOR RETREADS:



RELIABLE QUALITY



A top-quality end product is the result of a controlled process involving several stages. Each stage is monitored to ensure that work is carried out correctly and each tyre fully complies with quality standards.

The condition of casing is first inspected visually. Potential repairs and retreading are then specified, taking the tyre's future usage into account. Non-destructive inspection equipment uses the latest laser and computer technology to detect hidden flaws. Another thorough inspection is carried out before finishing.

Individualised monitoring

Tyres are retreaded using tread patterns suitable for their use. New and retreaded tyres will last almost for the same number of kilometres, and the truck tyres you see lying in tatters by the roadside are not all retreads. Analyses have shown that it's usually a case of damage caused to both new and retreaded tyres during use.

Every tyre goes through an individualised retreading process so that its use and condition can be monitored throughout its lifetime. Traceability is an advantage in any issues concerning warranties or product liabilities. Retreaders guarantee all retreading work and, if the customer buys a cap and casing retread, are also liable for the tyre casing.

Quality guarantee

Retreading regulations drawn up by the United Nations' Economic Commission for Europe (ECE) are mandatory to all member countries. Type approval – covering both the retreading process and the quality of the finished product – is required for all passenger car and truck tyres. Retreaded tyres are tested to the same standards as new tyres, which can be seen by the 'E mark' on the sidewall.

Further details on ECE retreading regulations are presented in Appendix 2. See also the retreading process descriptions in Appendices 3 and 4.

EXAMPLE RETREAD MARKINGS:



RETREADED TYRES



TYPE APPROVAL COVERS BOTH THE RETREADING PROCESS AND THE QUALITY OF THE FINISHED PRODUCT

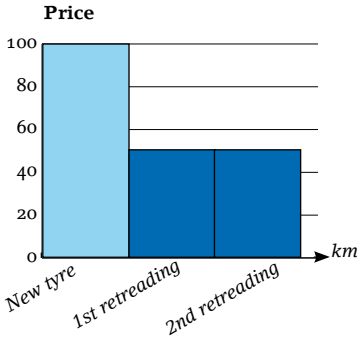


FINANCIALLY SOUND



Retreaded tyres are a sound economic choice for transport companies in particular. A professional tyre company's assistance can lead to significant savings without compromising safety or reliability. Tyre costs are generally calculated in cents for each kilometre driven during a tyre's useful lifetime.

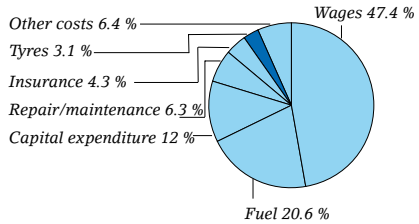
EXTRA KILOMETRES FROM THE SAME CASING



The graph illustrates the financial advantage of retreading. Assuming that a retreaded tyre costs half less than a new tyre and that both tyres have almost equal useful lifetimes in terms of kilometres, tyre costs will be reduced by up to 30 per cent if the tyre casing is retreaded two times.

Partly thanks to retreading, the share of transport companies' total costs accounted for by tyres is normally 3-4 per cent.

TRUCKING COSTS:



Supply and demand meet

In Finland, tyre retreading is a purely domestic industry. Retreaders market their products to their Finnish customers either directly or through retailer networks. Although foreign retreads are not really imported, cheap imports of new tyres from the Far East are competitively priced in comparison to recycled Finnish tyres.

Finnish retreading companies have so far been able to offer competitively priced products and services. In Finland, the retreading of commercial vehicle tyres is a natural part of tyre companies' service packages and such retreading looks set to continue at a high level.



ENVIRONMENTALLY FRIENDLY



Retreading tyres reduces the amount of tyre waste. Retreading also saves non-renewable natural resources, as it requires significantly less oil and rubber than the manufacture of a new tyre. Retreaded tyres often end their lives as raw materials for noise barriers, or are put to other practical uses.

Retreading a truck tyre requires 70 litres less oil than the manufacture of a new tyre. Retreading a passenger car tyre uses only one third of the oil needed for a new one. Retreading a truck tyre saves over 40 kilos of rubber material and a retreaded passenger car tyre 4–5 kilos.

Tyres recycled efficiently

Annually in Finland about 50,000 tonnes of tyres are removed from the service. Tyre manufacturers, importers and retreaders are required to take care of the tyre disposal according to producer’s liability laws. Finnish Tyre Recycling Ltd has created a system where almost 100% of tyres are collected and recycled.

Recycling is financed by a recycling fee, what is collected from the consumer at the purchase of a new tyre. Consumer can bring the used tyres (not on rims) without a fee to any tyre sales depot. A consumer does not have a mandatory recycling scheme, but a

responsible consumer will take care of worn tyres respecting both safety and environment.

A new tyre life

Casings will be re-used mainly by re-treading or reusing them as material. Tyres are a perfect material in various solutions like traffic noise barriers, frost insulation and in construction of dumping yards. Tyre crumb is also a good material for softening the riding fields and artificial turf for sporting grounds.

There are constant innovations taking place for recycled tyres, because, for example closed dumping yards are becoming less. Truck tyre treads that are being made as explosion carpets also serve well as forestry roads temporary construction. Also there are positive experiments using tyre stacks as vibration absorbers in road and railroad construction.

TYRE RECYCLING IN FINLAND 1996–2011:

Received tyres: 576,410 tonnes



*Utilization: 529,269 tonnes
(Material 95% / Retreaded 3% / Energy 2%)*



THE TYRE LIFE CYCLE:



OUTLOOK FOR THE FUTURE



There will be a clear demand for re-treading in the future as quality, economy and environmental issues become even more important. Attention will be paid not only to the useful lifetime of a tyre in terms of kilometres, but also fuel efficiency, wet grip and external rolling noise. Tyre savings will be sought – but hopefully not at the expense of safety.

EU tyre labelling

As of November 2012 all new passenger car and truck tyres must have an EU tyre label, what indicates fuel efficiency, wet grip and external rolling noise. This label will give to consumer additional information on tyre properties and environmental impact. Retreaded tyres are being included as of March 2016.

After a tragic traffic accident near Konginkangas, Finland (2005) R&D requirements were listed to improve heavy road transport safety. With regard to tyres, the possibilities raised included the mandatory use of winter tyres and increasing minimum tread depths during the winter months. Research into the effect of incorrect tyre pressure on vehicle handling was also suggested.

According to the Tyre Specialists

of Finland's annual summer tyre survey, there has been a reduction in the number of tyres in poor condition. However, there are still an estimated 440,000 poor-condition passenger car and van tyres on the road. Tyre pressures must be controlled regularly because this shall save both environment and wallet.

Solid life cycle thinking

As tyres wear, they will release particles in the air. Today, tyres are being produced without harmful polyaromatic (PaH) oils. The street dust issue that we do have every spring is currently investigated in two different studies. Helsinki city investigates if reducing the usage of studded tyres would improve air quality without sacrificing the traffic safety.

New waste disposal law will become effective in stages 2012-2013. The renewal of the complete Waste disposal law compares to requirements of current waste and environment policies and EU requirements. The purpose is to reduce the total amount of waste and harmfulness of them and enhance the usage of natural raw materials. Tyres will be also in the future re-used primarily according to waste hierarchy.



APPENDIX 1. ADDITIONAL INFORMATION

Publications and surveys

Retreading Vehicle Tyres (Ismo Rätty, 1993)

Procedures and guidelines for ECE approval (Tyre Specialists of Finland, 2003)

Tyre Standards (The Scandinavian Tire & Rim Organisation, 2012)

Heavy Road Transport – Safety Situation and Research Needs (Ministry of Transport and Communications, 2005)

Summer Tyre Survey 1997–2010 (Tyre Specialists of Finland, 2011)

Winter Tyre Survey 2000–2001 (The Finnish Road Administration, 2001)

Winter Tyre Survey 2001–2010 (VTT, 2010)

Tyre Pressure Survey (The Finnish Road Administration, 2001)

Legislation and Regulations

Finland’s Road Traffic Act and Vehicle Act

Retreading regulations (ECE 108 and 109)

The approval of tyres with regard to rolling sound emissions (ECE 117)

The Finnish Council of State Decision on the recovery and disposal of discarded tyres (1246/1995)

Amendment to the Finnish Council of State Decision on the recovery and disposal of discarded tyres (583/2004)

Amendment to the Finnish Waste Act (452/2004)

A new Finnish Waste Act (611/2011)

The Tyre Specialists of Finland’s

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Useful websites:

www.trafi.fi

www.autonrengasliitto.fi

www.rengaskierratys.com

www.greentyres.com

www.bipaver.org

APPENDIX 2. ECE RETREADING REGULATIONS

Retreaded tyres will continue to be tested using the same methods as new tyres. In this publication, ECE retreading regulations refer to ECE Regulations 108 and 109, which cover passenger car and truck tyres respectively. The previously voluntary regulations became mandatory throughout the EU from 13 September 2006.

These regulations bring standardised requirements for tyre retreading and also promote road safety and environmental protection. According to the European Commission's decision, in order to gain EU market entry, retreaded tyres must be manufactured in accordance with the standards set by the United Nations' Economic Commission for Europe.

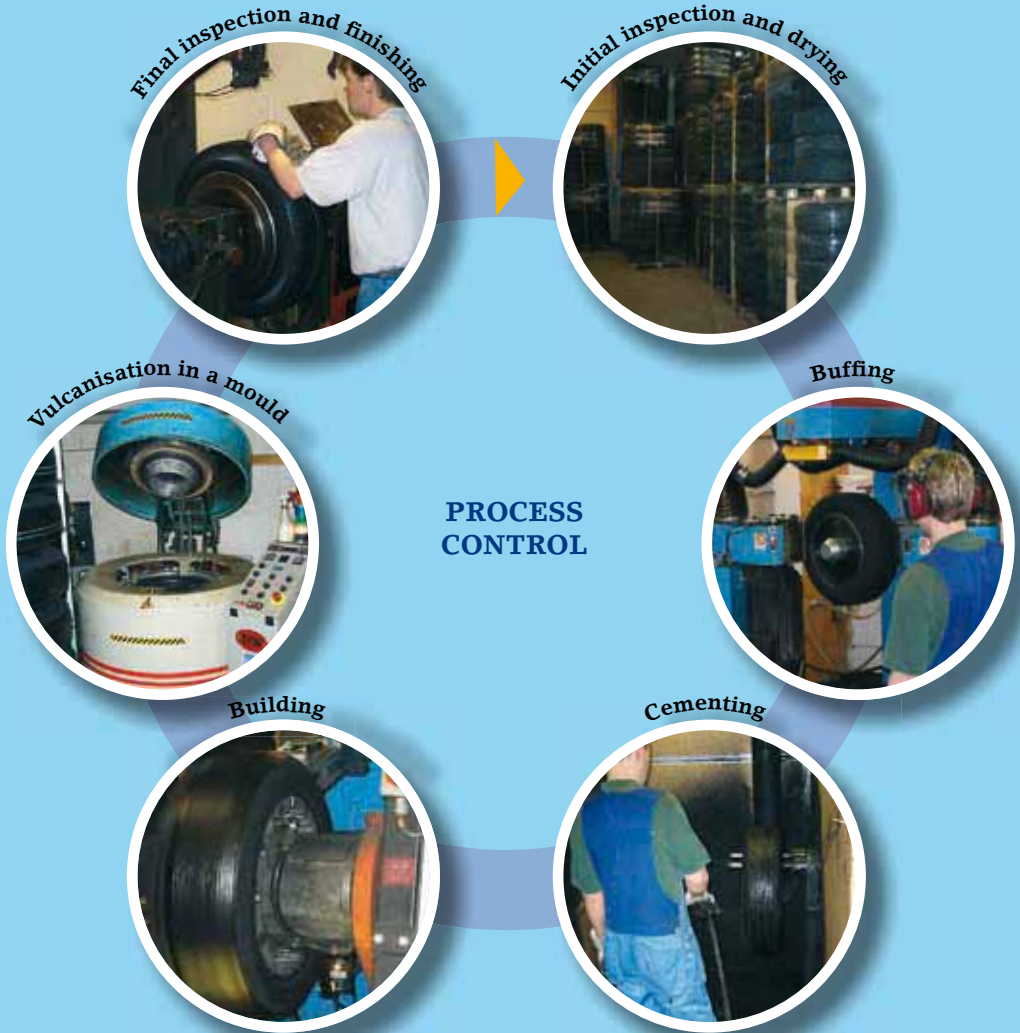
Retreading companies must now have a comprehensive quality system and conduct regular product testing. In Finland, the type approval for retreaded tyres required by ECE regulations is granted by The Transport Safety Agency Trafi, which inspects a company's quality system either itself or through an authorised inspector. A Trafi-accredited test institution handles tyre testing.

The majority of manufacturers in Finland had already received type approval before it became mandatory. Quality systems are generally based on the ISO 9000 standard, which simplifies the approval process. A quality system does not have to be certified, but it should truthfully describe how the company controls its operations and processes, both starting from and ending to the customer.

Retreaded tyres must pass the same type approval tests as new tyres. At least five tyres representative of production must be tested for initial approval to be granted. After that, 0.01 per cent of annual production must be tested, with a minimum of at least two truck tyres and five passenger car tyres per year.

The retreader marks each tyre with the appropriate 'E mark'. Tyres also display the following markings: 'Retread', the retreader's ECE approval number and trademark, as well as the date of retreading and maximum speed indexes.

APPENDIX 3. REMOULDING FOR PASSENGER CAR AND VAN TYRES



APPENDIX 4. PRE-VULCANISED RETREADING FOR TRUCK AND BUS TYRES





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