THE DEVELOPMENT OF BRAKE LININGS

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A brake lining is a very small component, rarely seen but absolutely vital to the safe operation of a vehicle.

For over 100 years now, development has progressed to evolve effective materials for increasingly severe operating conditions. It is beneficial to pause and review the progress that has been achieved to date. Thirty years ago the brakes of heavy vehicles had to cope with maximum speeds of say 65 kph and gross weights of about 10 or 11 tonnes. Nowadays many countries allow up to 19 tonnes on two axles and expect the brakes to perform correctly under all conditions with speeds of over 90kph being allowed legally: in fact within that short period of three decades there has been an increase of duty level of over 500% - and the brakes cope!

A great deal of research and development,time and resources have to be spent in order for this to be achieved in order to satisfy the requirements of not only the Operator but the Vehicle Manufacturer and now increasingly so, the Legislator. The main requirements are for consistent performance under all possible variations of speed, temperature, environment and pressure without incurring rapid lining wear and without damage to associated components or rotors. A typical lining quality contains more than twenty ingredients; the asbestos content is usually of a mix of relatively short chrysotile fibres and the resin matrices include phenolic or cresylic polymers, modified with rubber or elastomers and other compounds, or acrylonitrile butadiene popolymers. Various fillers are designed to impart specific friction, wear and lubricating properties.

The performance obtained however is still"work sensitive" and in practise a brake lining will "condition" on the surface depending on the severity of usage - a very intense heavy duty cycle producing a slight increase of output level if continually sustained. A heavily used lining will eventually take on a subtly different type of output characteristic to that of a lightly used one, (fortunately the temperature sensitivity progressively improving as work increases). The replacement of worn linings on one brake in isolation however could lead to having a vehicle equipped with a mixture of conditioned and unconditioned linings across an axle and at least lead to a Differential output. It is essential therefore that the relining of brakes should always be carried out across an axle and preferably the whole vehicle at one time. The amount of variation of performance experienced will of course vary depending upon the intensity and the frequency of heavy duty but also upon the type of brake used - more particularly so with brakes designed to produce a high output.

Over the last ten years the major focus of development has been directed towards the replacement of asbestos. This has been a great challenge because of the excellent properties of asbestos related to heat resistance and strength. No one material has been found to provide comparable results and so complex and expensive permatations of often up to four or five other replacement materials have had to be developed. The end result is that asbestos-free materials are now available that can improve on the high temperature stability achieved previously. For example one major truck manufacturer can now insist that as one of their minimum requirements their vehicles shold be capable of discending in top gear when fully laden, a 16 kilometre 8% alpine gradient and still produce a residual braking performance. This can now be achieved despite drum temperatures of 600°c being excluded.

Development of course continues and will continue to do so.