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POSSIBLE ALTERNATIVES TO ASBESTOS AS A FRICTION MATERIAL*

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INTRODUCTION

I HAVE been asked to talk on the possible alternatives to asbestos as a friction material. The facts are that if by "alternative" we mean a new or better fibre which might shortly be available as a replacement for asbestos in conventional friction materials, then I think the chances are so remote as to be not worth considering.

This is not to say that if the world supplies of asbestos dried up we would not eventually find a substitute, but it could well be at the expense of a considerable loss in performance, and also at a considerable increase in cost.

THE ROLE OF ASBESTOS IN FRICTION LININGS

Having started on what may appear to be a rather depressing note, let us examine the reasons why asbestos occupies the role of an almost universal constituent in friction materials at the present time.

The first automotive friction linings were made from cotton textile material impregnated with drying oils which were subsequently cured to form a strip of material which, while being flexible and conformable, still exhibited great mechanical strength. The main function of the drying oil was to protect the cotton from attack by atmospheric oxygen, which, even at the temperatures reached by early brakes, would have resulted in the cotton burning had its surface been exposed. A second function of the drying oil was to prevent the cotton from fraying under the influence of mechanical abrasion.

As brake operating temperatures increased, it was found that cotton started to degrade and lose its strength even though still protected from attack by oxygen. In other words, it suffered thermal degradation instead of oxidative degradation.

Around 1910, a technological break-through was achieved when it was discovered that textiles could be woven from asbestos and used to replace cotton, because asbestos neither burns nor loses its strength below about 500°C. However, as brake operating conditions became steadily more severe, a point was reached in about the middle 1940's when, despite the continual improvement of synthetic resins with which the asbestos textile was impregnated, further heat resistance was required, this time because the organic part of the composite was proving inadequate. The solution proved to be to mould brake linings from powdered resins, using short fibre unwoven

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