

GANTRAIL PRODUCTS AT HIGH AND LOW TEMPERATURES - behaviour of rubber components

INTRODUCTION

Users of cranes often suffer service temperatures above or below the normal world-wide range of about -25 to 60°C. The Gantrail brochure quotes a normal operating range for the steel reinforced Mark VII pad of -25 to 100°C. For the discontinuous Mark II pad the figures are -25 to 75°C. For service in environments outside these limits the general affects of high and low temperatures on the rubber components should be considered when specifying Gantrail products.

Gantrail pads and clips consist of both metal and rubber components. The metal can withstand a wide range of temperatures without difficulty, but the rubber behaves differently, as explained below. The rubber is strongly bonded to the metal to ensure the whole part behaves as a single entity.

ELASTICITY: FACTS OF LIFE

Materials exhibiting rubbery elasticity will only do so over a limited temperature range. At low temperatures the rubber will behave as a glass (all rubbers have a 'glass transition' temperature, below which their behaviour is no longer like a rubber but like a glass, being very hard and brittle) and at high temperatures they will suffer from chemical breakdown of the structure, leading to loss of strength and loss of dimensional stability.

RUBBERS AT LOW TEMPERATURES

At temperatures below about 0°C all rubber types will begin to stiffen (harden) in behaviour. As the temperature decreases further, each type of rubber will reach its characteristic glass transition point: below this point the material is non-rubber, and application of a load can cause the article to fracture. This point is obviously well below the lowest useful service temperature. Rubber compounds are normally tested for stiffness increases at low temperatures, and a criterion for the lowest acceptable service temperature taken. Should temperatures fall below this level, (provided the rubber is not fractured), when the temperature rises again the changes are reversible and the rubber will be unaffected by its experience.

RUBBERS AT HIGH TEMPERATURES

Temperatures above about 70°C are 'high' for rubber. As temperature increases, the vulcanisation chemicals in the rubber can be activated, and reactions with the environment (oxygen, ozone, sunlight and other agents) take place, these are generally irreversible and lead to a loss of elastic properties. The higher the temperature, the faster the reactions, the longer the time at any given temperature, the worse the effect.

MARK II PAD

This pad uses Ethylene Vinyl Acetate (EVA) as the rubbery component. It is polar and oil resistant, and is in common use world-wide for crane and railway applications. The EVA used can be described as a 'soft plastic' and can be satisfactorily used as low as -25°C, but its high temperature performance is limited to 75°C for continuous use, its maximum short term temperature should be limited to 100°C, or dimensional changes will occur.