

Wear Improvement in EN19 by Manganese Phosphate coating

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ABSTRACT- The project is aimed at improvement of wear resistance on metals by chemical coatings especially phosphating. Phosphating is the most widely used metal pretreatment process for the surface treatment and finishing of ferrous. Due to its economy, speed of operation and ability to afford excellent corrosion resistance, wear resistance, adhesion and lubricative properties. It plays a significant role in automobile, process, and manufacturing industries. Manganese phosphate based coating decrease the coefficient of dry sliding friction considerably. The application of phosphate coating also improves the adhesive bonding of plain carbon steels. Phosphating is widely used method of reducing wear on machine elements and moving parts. Phosphate coating function as lubricants, in addition their ability to retain oil and soaps further enhance this action. Heavy manganese phosphate coatings supplemented with proper lubricants are most commonly used for wear resistance applications. The manganese phosphates widely used in automotive industry are the best to improve the ease of sliding and the reduction of associated wear of two steel surfaces sliding one against the other. This review addresses the various wear resistance application aspects of phosphating.

1. INTRODUCTION

The reduction of wear and friction is a key element in decreasing the energy losses, particularly in engines and drive trains. Surface treatments and coatings contribute to a better lubrication with oils and can participate significantly in achieving these goals. Among protective coatings, the class of carbon-based materials shows interesting properties, combining low friction with a good wear resistance. For these reasons, they are increasingly being used as protective films for moving parts. The use of such Non-metallic surfaces with new additives leads to investigations into the interaction between these protective over layers and the base material. This project shows you that phosphating is one of the surface coating method which will improve friction properties and wear properties thus increase fatigue life. In this work, the investigation effect of phosphating surface coating on piston pin of different material is studied. Chemical conversion coatings are adherent, insoluble and inorganic crystalline or amorphous surface films, formed as

an integral part of the metal surface by means of a non-electrolytic chemical reaction between the metal surface and the solution in which they are dipped. Chemical conversion coatings are preferred because of their adherent nature and high speed of coating formation besides being coating processes are classified into Phosphating, chromating and oxalating according to their essential constituents, viz, phosphates, chromates and oxalates respectively. Phosphating process is the treatment of a metal surface so as to give a reasonably hard, electrically non-conducting surface coating of insoluble phosphate which is contiguous and highly adherent to the underlying metal and is considerably more absorptive than the metal. EN19 is a high quality alloy steel with tensile strength. With a combination of good ductility and shock resistance, EN19 is suitable for applications with very high loading such as engine gear boxes. Popular in the automotive sector it is possible to machine the material extremely accurately, in recent years EN19 has become an established material in the Oil & Gas sector. The material lends itself well to any application where strength is a primary consideration.

Phosphating is the process of converting a steel surface to iron phosphate. This is mostly used as a pretreatment method in conjunction with another method of corrosion protection. A layer of phosphate coating typically includes iron, zinc or manganese crystals. Dilute phosphoric acid based solutions of one or more alkali metal / heavy metal ions which essentially contain the phosphoric acid and primary phosphates of the metal ions contained in the bath. When a steel panel is introduced into the Phosphating solution, a top chemical reaction takes place. In this reaction the ion dissolution is initiated at the micro anodes present on the substrate by the phosphoric acid present in the bath. $Fe+2H_3PO_4 \rightarrow Fe(H_2PO_4)_2+H_2$ Manganese phosphate coating is created by chemical conversion, and the main component of the film is hureanlite, $(Mn, Fe) 5H_2(PO_4)_2$. Phosphate coating range thickness is usually quantified in terms of weight per unit area (usually as g/m² or mg/ft²) and commonly referred to as coating weight.