Abstract

The pinion and crown are key components in an automobile's transmission system. The surface characteristics of high-carbon steel have a major effect on differential gear action. As a result, gear damages and increased downtime for repairs are experienced over time. To address this issue, manufacturers have started using alternative materials such as aluminium alloys and composites to improve the durability and efficiency of the transmission system. Engineers can now adjust the design of crown and pinion gears for best performance thanks to developments in computer-aided design and simulation tools. This has led to the development of more compact and lightweight transmission systems that offer better fuel efficiency and acceleration. However, these innovations come at a cost, as they require specialized manufacturing processes and materials that can be expensive. Nevertheless, the benefits of improved transmission systems are clear, as they can significantly enhance the driving experience while reducing maintenance costs over time. As technology continues to evolve, we can expect further improvements in material design that will further enhance crown pinion performance and reliability. To overcome these failures and increase the material's life, high-carbon steel is preferred. In this study, high-carbon steel composites with various material proportions (100% to 0%, 99% to 1%, and 97.5% to 2.5% of high-carbon steel, and silicon carbide, respectively) are experimentally investigated and evaluated for better structural strength and surface behavior of the crown pinion. The crown pinion is thoroughly

analyzed using salt spray corrosion testing and X-ray diffraction analysis. According to the results, the proportion of 97.5% high carbon steel with 2.5% silicon carbide has better surface properties than the other proportions, and it is also recommended to make the crown pinion for future uses.

Keywords: High carbon steel ▪ silicon carbide MMC ▪ SEM analysis ▪ XRD analysis ▪ salt spray test