Nanocrystallization of CK60 commercial steel by drilling method.

ABSTRACT

Drilling as a novel Surface Sever Plastic Deformation method (SSPD) has been applied to commercial CK60 steel plate to create a Nano Crystalline (NC) structured layer. In present study, the CK60 steel plate has been quenched in room temperature water from 950 °C (1 Hr) and tempered in 350°C for one hour. Drilling has been done with use of Ti-Carbide coated drilling bit under 10, 15 and 20 m/min speeds. The microstructure of the samples was studied by light microscope and high resolution SEM. The formation of NC layer having grain size in the order of 50nm was confirmed by the SEM observation and applying Hall-Pitch formula on the samples drilled with 15 m/min speed. The created fine grain zone is separated from base metal structure and clear boundary with 1 to 10 microns thickness where the drilling speed changes from 15 to 20 m/min. The microhardness test result illustrates that the hardness of surface NC layer increases almost more than twice when compared with coarse grain structure of base metal.

Keyword: Nano Crystallinization; SSPD; Drilling; CK60 steel.