RESEARCHES ON THE EMULSIFIED OIL SYNTHETIC QUENCHING ENVIRONMENT

Hopulele Ion[1], Nejneru Carmen[1], Axinte Mihai[2], Perju Manuela-Cristina[1], Tugui Catalin-Andrei[1]

[1]*Technical University "Gheorghe Asachi" of Iasi-Romania, Department of Technologies and Equipments for Materials Processing, Blvd. Mangeron, No. 51, 700050, Iasi, Romania*
[2]*Technical University "Gheorghe Asachi" of Iasi-Romania, Department of Science Materials, Blvd. Mangeron, No. 41, 700050, Iasi, Romania*
e-mail: cryss_ela@yahoo.com

Abstract: *Using synthetic quenching media is relatively new and offers advantages such as non-flammability, safety of use and low cost price. Heating medium to be tested is emulsifiable oil dissolved in water at various concentrations, the test temperature being 30°C. By disolving water is obtained a synthetic solution with low viscosity, tensionreactive and lubricating properties. In the paper were measured cooling curves for specified synthetic media and calculated for the same media the cooling rate variation and heat transfer coefficient on intervals. The experimental data were compared with those obtained from traditional media: water and heat treatment oil TT 50.*

Keywords: cooling media, emulsifiable oil, heat transfer coeficient, cooling rate.

1. Introduction

The main physical condition imposed to liquid cooling medium, in order to ensure structural transformation hardening, is conditioned by the exchange of heat between the hot part and the cooling medium.

The heat transfer coefficient is determined by the heat transmission from the metal surface to the cooling medium which is achieved by radiation and conduction

In the case of the cooling liquid medium with the a vaporization temperature lower than the temperature of the molten metal surface to be cooled there are more stages depending on the difference in temperature between the cooling medium and metal surface:

a) Instant cooling of the metal surface by instant heating of the liquid medium up to evaporation by touching the work piece;

b) Calefaction, which consists in forming a vapor shirts at the metal surface that prevents heat exchange part;

c) Boiling, this is produced by the penetration and removal of vapor shirt due to the formation of bubbles which will condense, after removal of the hot metal;

d) Convection, which occurs after the metal surface has a lower temperature than the boiling point of the liquid medium.

In the first stage heat exchange is intense and short, in the second stage, due to the formation of a gas layer, the piece is isolated and therefore heat exchange is mainly by radiation, making the cooling rate to decline substantially.

At the shirt vapor breaking moment due to the boiling, the heat exchange intensifies and the cooling rate increases. After the metal surface temperature drops below the liquid boiling point the heat exchange occurs by convection and cooling rate decreases substantially.

Consequently, heat exchange coefficient between the metal and the liquid medium varies large and uneven, the maximum being in the boiling. An important role plays the