

Ivan Mandziak  
V.I.Pererva, research supervisor  
I.P.Nikitina, language adviser  
National Metallurgical Academy of Ukraine, Dnipropetrovsk

## **Analysis of Water-Air Spray Metal Cooling Parameters at Integrated Processes**

The aim of this work is the formulation of the main research directions on the influence of water-air spray cooling parameters on the change of metal temperature and, consequently, on the properties of metal.

As a result of these studies it is planned to receive correlations allowing predict the change of properties of the metal, as well as implement modes of cooling to ensure the required properties of metal, and their distribution over the cross section of the product if these correlations are used in installations for spray cooling control systems.

Number of nozzles, the distance from the nozzle to the cooled surface, the shape of the jet, the specific consumption of water, the specific air flow, the processing time, total consumption of water and air, temperature before cooling, shape of the product influence the change of temperature and properties of metal in the water-air spray cooling.

A greater number of smaller nozzles gives the best results for uniform surface cooling than fewer large ones.

The distance from the nozzle to the cooled surface is associated with the design of the device and the size of the cooled product.

Mostly the form of a jet of water-air mixture, coming out of the nozzle, is determined by the design parameters of the nozzle.

Specific consumption of air in a water-air spray cooling plays three parts: provides cooling of the surface due to the heat transfer, supports water droplet rate and forms a conditional (effective) width of a jet.

Duration of spray exposure on the cooled product determines the depth of heated layer, in case of hardening, as well as tempering temperature at a scheme "quenching-tempering".

Further studies of the water-air spray cooling in integrated technological processes must be developed in the following areas:

- determination of temperature fields in the cooling products with different geometrical characteristics and properties of metal;
- determination of the influence of design parameters and cooling technology on these fields changing;
- refinement methods for calculating the heat transfer coefficient at spray cooling;
- definition of dependency structure, properties, residual stress and form distortion of products depending on the parameters of the integrated process.