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# Effect of polymer additive on the cooling rate of a hot steel plate by using water jet

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## ABSTRACT

The current research focuses on the enhancement of heat transfer of a hot steel plate by introducing polymer additive, polyvinylpyrrolidone (PVP) in jet cooling. The characterization of PVP solution has been done in order to understand the reason for increment in heat transfer. The concentration of PVP has been varied at levels ranging from 50 to 150 ppm along with the variation of flow rate from  $13.3 \times 10^{-5}$  to  $33.33 \times 10^{-5} \text{ m}^3/\text{s}$  (8 to 20 lpm). The results indicate that the addition of PVP in water jet leads to an appreciable increase in cooling rate and surface heat flux compared to that of water which leads to lesser coolant consumption. A PVP concentration of 110 ppm in water is found to provide a maximum cooling rate of  $231 \text{ }^\circ\text{C/s}$  and a maximum critical heat flux of  $3.01 \text{ MW/m}^2$  which are higher than that of water by 111.18% and 19% respectively.

*Keywords:* Jet cooling, ultrafast cooling, run out table, heat flux, cooling rate, polyvinylpyrrolidone

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