Material challenges of steam turbine blades operated in wet steam region - part 1

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Abstract:

Condensing tails of almost all steam turbines operate in wet steam region. The impacts of water droplets on material of the steam turbine moving blades are causing the erosion of the material. The situation is even worse for steam turbines which already have saturated or just slightly superheated steam at their high pressure inlet. Such turbines are used not only in nuclear power plants, but also in concentrated solar thermal power plants (CSP) and in waste-to-energy power plants (WtE). The process of moisture generation inside of the steam turbine will be described so as the mechanics of impacts of the water droplets on the material of the steam turbine moving blades. As to avoid or at least limit the erosive potential of the droplets impacts on the material of the steam turbine moving blades, various types of active and passive protective measures could be taken. These measures will be presented in detail. As to balance the power output fluctuations of currently build renewable power plants, the fossil power plants are currently often operated with decreased load. Such operation may then induce backward flow in last turbine stage, which may subsequently cause severe dangerous erosion on outlets of last stage blades.

Key words:

Wet steam, blade erosion, protective measures