

Icing mitigation strategies using surface coatings

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Anti-icing and de-icing are the conventional active (i.e. energy consuming) techniques for reducing or avoiding ice accretion of surfaces below water freezing temperature. A passive (i.e. zero-energy consuming) technique for mitigating icing is proposed. It makes use of hydrophobic coatings to reduce water drops adhesion to the surface and enhance water re-entrance in the external flow field before allowing the drop to freeze.

Results of an experimental study in a small icing wing tunnel are presented. The airfoils were exposed to a water drop cloud at -17°C (air static temperature), to simulate an icing event. The airfoils were either untreated aluminum or coated by a hydrophobic layer. An electrical heater was present in the leading edge, to simulate an anti-icing system.

Results show that energy consumption for combating icing can be reduced up to 80% for the case of a coated airfoil, compared to the uncoated one. Also, runback is significantly reduced as a result of application of coating. The results are encouraging for application in wind turbines.