

Cracks in the surface coating of gas turbines provide longer lifespan and better thermal insulation

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Gas turbines are used for the production of electricity and in aircraft engines. To increase the life-span of the turbines, they are sprayed with a surface coating. The coating consists of two layers – one of metal to protect against oxidation and corrosion, and one of ceramic to give thermal insulation. The structure of the coating varies greatly, consisting of pores and cracks of different sizes. It is these cracks and pores that largely determine the efficiency of the thermal insulation and the length of the coating lifespan.

Researchers at University West (Högskolan Väst) have developed methods to improve this [surface coating](#). Using computer simulation, they have investigated the connection between the structure of the coating and its heat-insulating properties. By controlling the shape, number and size of the [cracks](#) in the coating, they have been able to produce a more effective surface coating.

The researchers have also investigated the relation between the surface structure of emerging [oxidation](#) and the stresses that are formed between the two layers as a result of the oxidation. These connections have been used to design a system of layers with a longer life-span.

"We have been able to confirm the results from the computer simulation through experiments too. One important result is that larger pores that are interconnected with cracks can give the surface coating layer much

better [thermal insulation](#) and longer lifespan," says Mohit Gupta who has presented a doctoral thesis on this subject.

He describes the models he has designed for studying the spreading of oxidation. These models can be used to calculate the stresses between the layers that is caused by oxidation. The results show that these advanced models are a powerful tool for designing new types of coating, with properties that are far superior to those used industrially today.

The research has been done in close collaboration with the aircraft manufacturer GKN Aerospace and Siemens Industrial Turbomachinery who make gas turbines. Both companies are interested in using the new coatings.

Provided by University West

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