



Abradable Lining in Aero-Engine

“Analyse and investigate the wear mechanisms of abradable linings”

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Abradable linings are composite materials used within aero-engines characterised by good abrasability and erosion resistance.

Industrial Need

During engine operation the rotating blades may strike the wall of the surrounding casing. If this occurs without an abradable material present, the blade tips will wear and the overall clearance will increase, producing a loss in efficiency of either the compressor or turbine. This occurs as air leaks over the aerofoil tip, with a consequent energy loss from the flow. Should an abradable be used on the casing wall, this will wear in preference to the blade, resulting in only a local clearance increase. Therefore with an abradable material present, the total efficiency will not be significantly reduced, and damage or wear will not occur to the fast moving blade tips. So it is fundamental investigate and analyse the wear mechanism for improve an abradable material, for improve the aero-engines performances.

Aim of research

The aim of this research is to analyse and investigate the wear mechanisms of abradable linings on a scaled test platform. The rig is capable of reproducing contact behaviour observed in the engine, but due to its simplicity, it can also be heavily instrumented. It is used a high speed imaging techniques, capable of investigating the nature of the blade tip strike on the abradable, as well as the adhesive transfer of material to the blade tip. It is used a dynamometer to analyse the force of contact to understand the behaviour of the wear mechanism.

Figure 1) Test rig platform, 2) Blade after each strike;

3) Sample abradable coating.

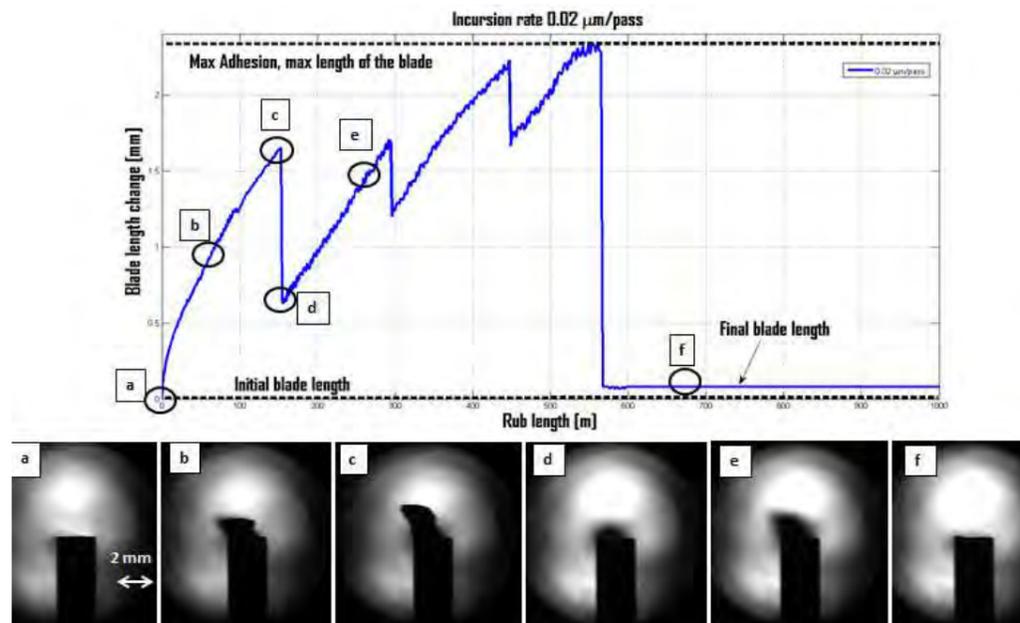
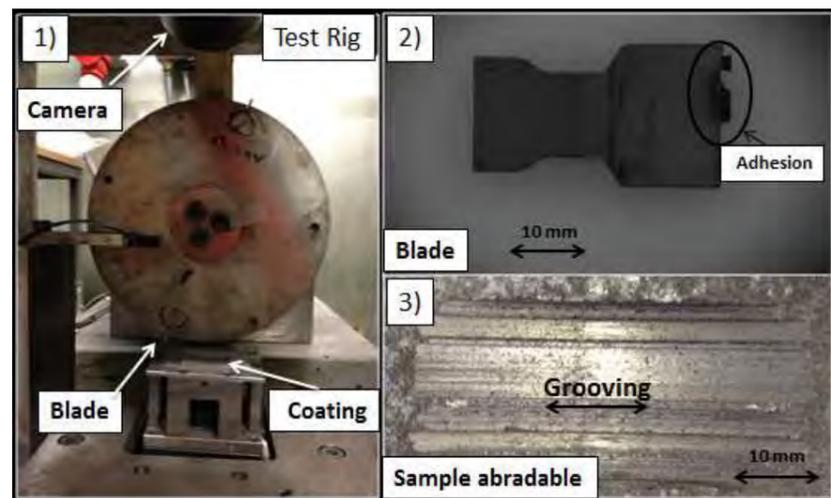


Figure 4) Graphic how change the blade length during the test; 5)The tip of the blade after each strike.

Future Impacts

- With the abradable lining the wear happens in preference on the coating, with a local abrasion, decrease the losses that can be obtain without these materials;
- This materials permit to minimise the blade tip clearances, which improves the efficiency of the aero-engine and increases the stall margins of the compressor,
- With cutting tool wear the blade tip is not damaged, no transfer material, the surface`s coating is smooth, the contact force is low, the size of the debris are small, these are favourable aerodynamic properties.

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