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Liquid Impingement Erosion

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Liquid Impingement Erosion

AP2-2013

Project Summary/Purpose

Project statement:

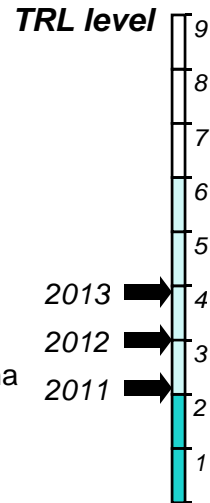
- Understand the Liquid Impingement Erosion phenomenon in gas turbine compressors

Project objectives:

- Build LIE Test Rig
- Deliver a long term solution for ISI technology

Justification:

- The understanding of the water erosion phenomena as applicable to gas turbine compressors is fundamental to successful application of the ISI concept.



Team: V. Badagi, P. Jedrzejowski

Current Budget
GBP 109k

Accomplishments/Progress/Status

- TRL 3 review was held in AP12. The output was satisfactory for the fundamental understanding aspects: erosion analysis, testing methodology and impact modeling. However, proposed mitigation solutions were recommended to be considered within MatCAP program.
- Testing rig is operational at Concordia University. Tests of flat coupons as well as airfoil coupons were conducted.
- MDS Coatings have officially joined the project.

Major/Key Milestones:-

Milestone	Commit. date	Current date	Variance
Effects of microstructure and residual stresses on erosion rates	AP5		
Impact model capturing 500 m/s	AP9		
Evaluation of surface modification methods	AP10		
Evaluation of coatings	AP10		
TRL4 review	AP12		

Comments:

Upcoming Events/Tasks:

- New nozzles (showerhead instead of three jets) will be designed and installed to better simulate engine conditions (distributed erosion).
- RR Canada has joined the EPSRC (Future Conventional Powergen Consortium Research) in UK. One of the research activities of interest is the water erosion of steam turbine blades.
- International collaboration with EPSRC will provide an opportunity for governmental funding (International CRIAQ program)

Major Issues/Risks/Support Needed:



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Current program development

- **Current research program terminates in December 2013. There is no extension being planned. The major deliverables at TRL 4 are following:**
 - **Rig and testing methodology fully representing service conditions**
 - **High speed impact modeling including variable droplet sizes, compressible liquid, elastic solid and time scales beyond the formation of lateral jets during the impact**
 - **Comparison of erosion mechanisms on blades and airfoil coupons**
 - **Evaluation of various erosion mitigation methods (will be continued under MatCAP)**

Future program development

- International collaboration gives an opportunity for governmental funding of the program through International CRIAQ consortium.
- Potential partners include universities involved in EPSRC (Future Conventional Powergen Consortium Research) activity
- Rolls-Royce Canada subjects of interests (not covered in the current program)
 - Erosion prediction
 - Lifing methods for blades exposed to the water droplet erosion
- Detailed plan beyond 2013 is under development
- Funding beyond 2013 strongly depends on the results from current activities