

ENHANCED EFFICIENCY STEAM TURBINE BLADING FOR CLEANER COAL PLANT

OBJECTIVES

The aim of this project is to increase the efficiency of the short height stages typically found in high pressure steam turbine cylinders. This will directly lead to a reduction in the amount of coal required to produce electrical power, resulting in lower power station emissions. In order to do this, the following tasks must be undertaken:

- increase the accuracy and execution speed of in-house CFD codes
- develop new Computer Numerically Controlled (CNC) techniques to efficiently produce model turbine blade rows with highly curved 3-D blades
- optimise existing 3-D fixed blade designs to improve performance and gain better understanding of how to deal with very short height blading
- produce a novel design for very short height fixed blades
- perform a model air turbine test on the new design of fixed blade to assess the performance benefit gained from it

SUMMARY

Council for the Central Laboratory for the Research Council (CCLRC) will produce a parallel processor version of the ALSTOM "GENESIS" viscous flow solver and assess the optimum hardware to run the code on a cost per calculation basis.

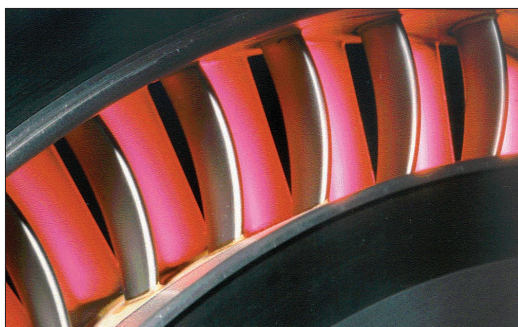
ALSTOM's patented "controlled flow" fixed blades already give a significant performance increase. Further optimisation of controlled flow designs will lead directly to even greater improvements in cylinder efficiency.

The short height blades in the high pressure cylinder of a steam turbine have a lower efficiency than longer blades due to the increased effect of "secondary flow" or endwall losses. A novel 3-D design for early high pressure fixed blades will be developed that will lead to a significant improvement in overall cylinder efficiency.

The final measure of success of the project will be a model turbine test of the novel design of a very short height fixed blade. This will provide a direct measurement of the benefit to be gained from using the new design.

The benefits of the project include:

- reduces power station emissions through more efficient use of fuel
- keeps the UK steam turbine industry at the forefront of technology
- increases the value of retrofit solution offered to customers (typically £700 per kilowatt)
- maintains ALSTOM's competitive advantage in the impulse retrofit steam turbine market. Last year ALSTOM won overseas orders worth over £42 million in this area of the company's business



Modern, Advanced 3-D Blading

COST

The total cost of the project is £578 000 with a contribution of £226 306 from the DTI

DURATION

24 months – October 2001 to September 2003

CONTRACTOR

ALSTOM Power UK Ltd
Newbold Road
Rugby
CV21 2NH

In collaboration with

Council for the Central Laboratory for the Research Council
Cranfield University

Further information on the Cleaner Coal Technology Programme, and copies of publications, can be obtained from:
*Nicholas Aluko, Location 1142, Department of Trade and Industry,
1 Victoria Street, London SW1H 0ET
Tel: +44 (0)20 7215 6261
Fax: +44 (0)20 7215 2674
E-mail: Cleaner.Coal@dti.gsi.gov.uk
Web: www.dti.gov.uk/cct/*

dti

Department of Trade and Industry

DTI/Pub URN 02/636