Advanced Materials Modelling and Lifing Technologies for Gas Turbine Components Operating in Coal Gasification Plant

OBJECTIVES

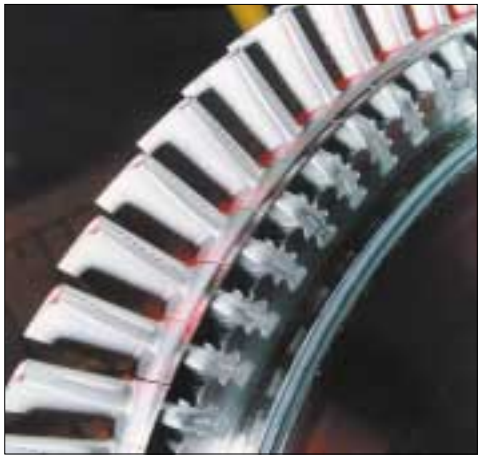
Over the next decade all major gas turbine manufacturers will be aiming to achieve higher efficiencies and lower emissions from turbine technology regardless of the fuel type used. For coal-fired plant the challenges are not only to match the performance of natural gas fired turbines, but also to meet the technical challenge brought about by the use of aggressive fuel gas. By conducting a programme of work in three key technological areas – advanced materials, materials modelling and lifing methodologies – this programme aims:

- to improve quantifiably the performance of industrial gas turbines operating in coal-fired power plant
- to provide spin off benefits to gas turbines operating with a wide range of other fuels including biomass, waste and natural gas

SUMMARY

Efficiency and emission improvements will only be achieved by raising the pressure ratios and turbine inlet temperatures, leading to more arduous service conditions on the critical turbine components in the hot gas path. For this reason this programme will concentrate on improving the performance, reliability, availability and maintainability of three of the most critical components, the turbine blades, vanes and combustors.

In order to achieve quantifiable benefits the programme will look into the possibility of developing new coating systems for turbine blades and vanes to improve temperature capability and corrosion resistance as well as developing new lifing and modelling methods for coated single crystal blades to optimise blade design and improve accuracy of life prediction. It will also evaluate the potential use of novel materials for combustors and transition ducts with improved high temperature performance.



(Image courtesy of ALSTOM Power)

A set of thermal barrier coated turbine blades installed in an industrial gas turbine

COST

The total cost of the project is £2 616 000 with a contribution of £789 000 from the DTI

DURATION

5 years commencing September 1999

CONTRACTOR

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Defence Evaluation Research Agency
Howmet UK Ltd
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Project Profile 287