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# Material inspection of hot gas path components

Advice on material degradation and reconditioning

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## RECONDITION OR REPLACE?

The components in the hot gas path of a gas turbine require special attention, as they are exposed to high temperatures in excess of 1000°C and subjected to high stresses during service. In addition, the life expectancy of these components is limited, since the exposure of the components at high temperature will gradually degrade their mechanical properties and give rise to material degradation by for instance creep, fatigue, corrosion or oxidation. After completion of their service cycle, the user is typically faced with a difficult choice. Are the components fit for reconditioning or should they be replaced? Obviously, reconditioning would be the cheapest solution, but how can you tell if the reconditioning will be successful?

## MATERIAL INSPECTION GUARANTEES THE RIGHT DECISION

Certainly, the manufacturers of gas turbines have an interest in recommending the replacement of old components for new ones. On the other hand, independent reconditioning companies, may have the tendency to go further than recommended in the scope of the repair because they have an interest in selling repairs. Therefore a neutral and expert material inspection is advised to determine whether the components can be successfully reconditioned. An inspection of this type should ideally be combined with non-destructive testing and if possible also destructive tests.

This will enable a thorough investigation of the ageing of the coating and base material of the gas turbine components. Laborelec experts have developed an extensive knowledge in this type of inspections.

## MONITORING THE RECONDITIONING PROCESS

If you decide to go ahead with a reconditioning of your gas turbine components, it is highly recommended to have the reconditioning process monitored by an independent expert. This will guarantee the repair process goes as planned and assures that only the components that actually need to be scrapped will be scrapped.

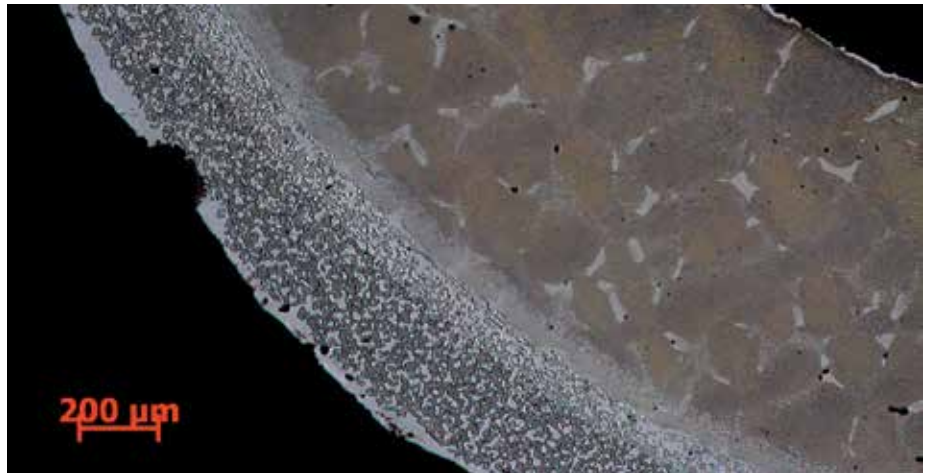


## RECONDITION OR REPLACE: A MATERIAL INSPECTION

A material inspection on a set of Hot Gas Path components, involves the following steps:

- A thorough visual inspection of the components (visual, fiberscope),
- A non-destructive testing of a selection of the components (Penetrant testing, ultrasound, Eddy Currents, etc.),
- A destructive material inspection on one component.  
This component is sacrificed to check the condition of the superalloy material by means of light optical microscopy, Scanning electron Microscopy (SEM), creep testing and/or stress relaxation testing.

All the results are analyzed in detail to come to clear recommendations on the feasibility of reconditioning, as well as a residual life assessment, if required.



## RECONDITIONING ADVICE

As soon as you decide to go ahead with reconditioning, we can assist you in the following way:

- We recommend which steps to take in the refurbishment process,
- We formulate witness and hold points throughout the reconditioning process to ensure that everything is going as planned,

- We carry out a detailed quality control at the end of the process to answer the following: is the quality of the parts sufficient? Were the correct procedures followed? Is the result as planned?

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