

Resource-efficient regeneration by generating a digital component image based on different NDT techniques

Sebastian Barton¹, Maximilian K.-B. Weiss¹, Niklas Steinbrecher¹, Hans Jürgen Maier¹

¹Institute of Materials Science, Leibniz University Hannover, Germany

Manufacturing of components that are subjected to high stress levels during operation, such as aircraft engine turbine blades and battery calender rollers, is resource intensive and costly. These components are often designed not as a mono-material, but as a layered system. If operational stresses initiate defects, cracks or changes in the microstructure in the coating and/or base material, this can lead to premature component failure. To prevent this, the component's condition is assessed during maintenance by means of inspections. Based on the data obtained, a decision is made whether the component can remain in operation, must be replaced or needs to be repaired. This decision is based on safety, economic and environmental considerations. In order to repair or regenerate such capital goods in a targeted and resource-efficient manner, a differentiated assessment of surface defects and material changes in the coating as well as in the base material is required. This can be achieved by an intelligent combination of different non-destructive testing techniques. In this paper, the differentiated assessment of the condition of the individual layers and the base material is presented using the example of a high-pressure turbine blade. The test results of the non-destructive testing techniques used are combined in a digital image of the component from which suitable repair measures can be derived. The transfer of the findings from the turbine blade to the layered system of a calender roller is also discussed.