

Damage and material analysis

Damage analysis

Damages not only cause direct costs by replacing the failed components, but often also very high follow-up costs, for example due to interruption of operation or collateral damage to neighboring system parts. More serious than the material damage, however, are cases where life and limb are endangered, the environment is affected, or when customer confidence is shaken by repeated claims. Losses are often caused by design or production errors or unexpected operating conditions (start-up, shutdown phases, etc.). Due to the complex interaction of chemical, mechanical and thermal influences, an assessment of the damage sequence is often only possible through an in-depth damage analysis. We, a team of 12 specialists from various fields, help you to avoid damage by getting to the bottom of the cause of material problems and damage events.

Causes of damage

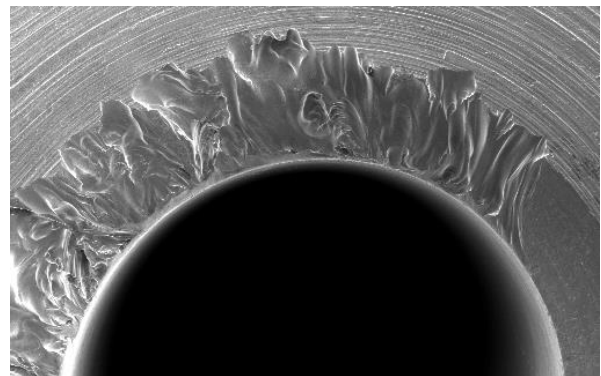
Frequently the cause of potential damage occurs during the design phase, during production due to incorrect assessment of the effective operating loads or the corrosiveness of the input medium, or due to unsuitable or incorrectly executed joining processes, e.g. welding, or surface treatments, such as hardening, grinding and coating. As a result, damage occurs during operation due to corrosion, wear or mechanical overload or a combination of different damage mechanisms.



Vibration fracture in the cylinder block of a gas compressor, caused by a corrosion attack in the cooling water channel (macrophotography)

Methods of loss analysis

Depending on the type and significance of the damage, an adapted investigation programme is defined, usually together with the customer, in order to clarify the cause of the damage. In addition to the visual assessment, the microstructure or fracture surface is often examined more closely by means of microscopy. A comprehensive set of instruments is available to characterize samples with regard to chemical composition and physical and mechanical properties. Often, even the smallest amounts of corrosion products, coatings or foreign substances have to be analysed. For large damaged parts, information can also be obtained on site and non-destructively, e.g. through plastic impressions and microstructure replicas.



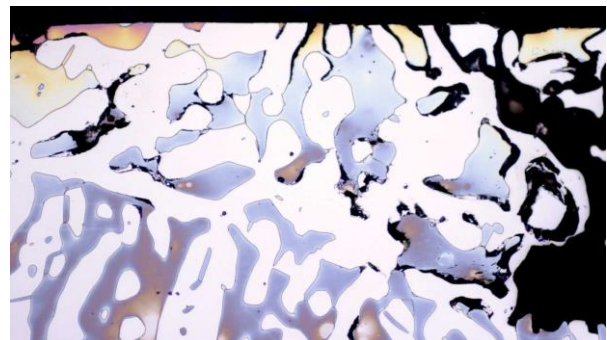
Erosion damage to a fuel valve caused by abrasive particles in the fluid flow (electron microscopy)

Prevention of damage

The aim of any damage analysis is to identify the damage mechanism and to derive measures for the future prevention of damage. Constructional modifications, the choice of another material, a coating or other or optimized manufacturing processes are possible. In some cases, the triggering of damage can also be avoided by adjusting the operating conditions (e.g. lowering the temperature, reducing the flow velocity or removing aggressive components from the medium).

Further training

The Damage and Materials Analysis Group at Qualitech AG offers seminars on damage analysis and prevention, as well as corrosion and corrosion protection.



Selective corrosion on a duplex steel pump housing in a flue gas cleaning system (light microscopy)

