SULZER

Materials and Failure Analysis

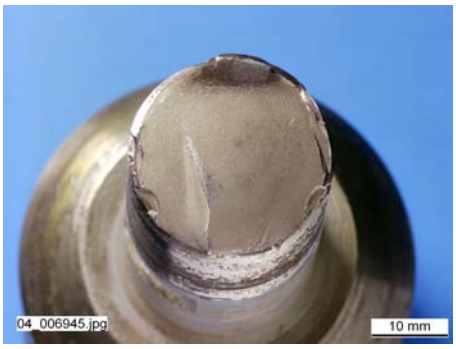
Failure Analyses

Sulzer Innotec

Premature damage and failure not only causes direct costs through the necessity of providing repairs and replacements, but can result in significantly higher secondary costs through plant down-time or contamination, e.g., by polluting substances, oils, etc. Even worse than the direct financial consequences are cases in which repeated failure seriously damages a company's reputation with its customers, or where life, limb or the environment are seriously threatened. Damage frequently occurs as a consequence of either design and processing defects or unexpected perturbations in service conditions, e.g., during start-up or during sudden periods of shut down. Because of the complex nature of the chemical, mechanical and thermal interactions involved, elucidation of the damage process is often only possible after conducting comprehensive failure analysis. Our team of 15 experienced specialists from varying technical disciplines can help you avoid unnecessary and premature damage by identifying and remedying the root cause of your materials problems.

The cause of failure

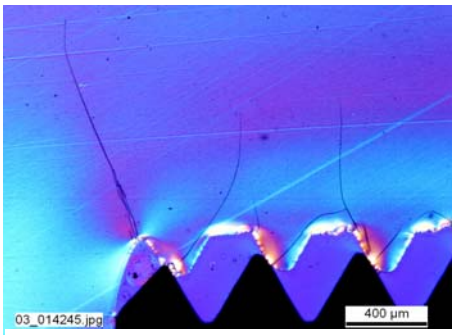
Frequently, potential failure initiation sites are pre-programmed into a component in the design phase or during manufacturing – by inaccurate estimation of service loads, wrongly assessed corrosivity of the service environment, inappropriate or defective joining, or the application of unsuitable surface treatments such as finishing, hardening or coating. As a result damage occurs by mechanical wear, corrosion, breach of maximum loading criteria, or even a combination of all these mechanisms.



Fatigue fracture initiated by corrosion in a threaded bolt made of low alloy steel

Methods of failure analysis

Depending on the type and urgency of the damage situation, a detailed program of analysis is defined together with the customer in order to identify the cause of failure. In addition to visual or microscopic inspection, the microstructure or fracture surfaces are usually studied closely. The equipment required for exact chemical, physical or mechanical characterisation is readily accessible in-house. Frequently, only the tiniest amounts of corrosion product, residues or other contaminants are available for analysis. By using surface replication and ultrasonic crack detection, larger parts can often be non-destructively tested on-site

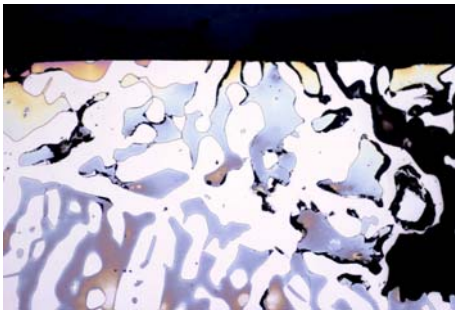


Stress corrosion cracking caused by the action of an organic solvent on an injection moulded polycarbonate component

Failure prevention

The objective of failure analysis is to elucidate the damage mechanism and define measures which allow future failure to be prevented (or avoided). Such measures may include design modification, the selection of alternative materials, the application of a coating or overlayer, or the optimisation of manufacturing procedures. In some cases, damage may be avoided by adjusting service conditions, e.g., reducing the temperature, lowering flow rates or removing a particularly aggressive component from a corrosive medium.

In addition to the above, SWA offers professional training courses and focussed seminars on the subjects of failure analysis, damage prevention and materials selection.



Selective corrosion in a duplex steel pump casing in a flue gas desulfurization plant

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