

MATERIALS AND CORROSION CONSULTING



INNOVATION

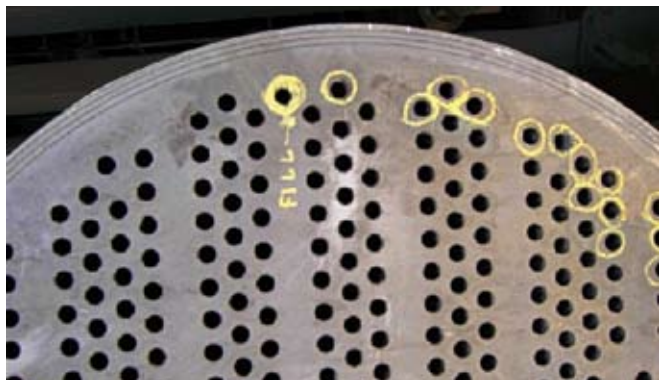
ENGINEERING

OPTIMIZATION

Root Cause Failure Analysis

Failures and the Impact to Plant Availability

The need in the process industry to optimize both plant safety and availability is challenging. Equipment failures can risk human safety, environmental damage, product quality and the high costs of repair, and last, but not least, loss of production. In case a failure occurs it is important to understand the root cause of the failure. The goal is to bring the equipment back to service as soon as possible, but also to derive and implement measures to avoid recurring failures in the future.



Operation of Graphite Heat Exchanger Failed Due to Inconsistent Use of Caps

Failures happen due to mechanical failure, corrosive, and/or thermal overload during service. However, the root cause of an equipment failure may be found in the engineering, design, procurement, fabrication, maintenance, or the service conditions.

Analyzing the Root Cause of Failures

Our root-cause analysis addresses the failure mechanisms of corrosion, high-temperature corrosion and mechanical failures.

We have a long record of case histories in helping our clients to understand different modes of corrosion within processes and the effectiveness of different corrosion control measures. Utilizing state-of-the-art technology and equipment, the Bayer Technology Services Root Cause Failure Analysis takes full advantage of our analytical, metallurgical, and corrosion laboratories, along with the in-depth knowledge of a highly qualified team of metallurgists, materials and chemical engineers with diverse backgrounds in production, engineering, and in laboratory testing. Common types of equipment where Root Cause Failure Analysis can be applied include:

- Agitators, Storage Tanks, Drums, Reactors
- Bearings, Gears
- Flanges, Fastener and Bolts
- Pump, Compressors, Turbines
- Heat Exchangers
- Piping, Valves
- Distillation Columns
- Welded Structures

We analyze damage on materials such as metallic and non-metallic coatings and liners for plant equipment, tanks, pumps, piping systems, including valves, relief and vent systems, devices and controls (including monitoring devices and sensors, alarms, and interlocks).

We engage on demand the following methods for this challenging task:

- Structural light optical methods
- Scanning electron microscopy; high-resolution examination of surfaces and fractures



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- Chemical analysis; composition of materials, deposits, corrosion products, and environments by means of EDX, X-ray diffraction, RFA, ICP, SIMS, and ESCA
- Non-destructive evaluation; failure localization and description by means of standard and advanced NDE technology like phased array, IRIS
- Mechanical-technology testing; measurement and evaluation of all kinds of strength and toughness properties for all technically relevant temperatures
- Field measurements such as strain gauge, inductive displacement transducer for all technically relevant pressures and temperatures for stress level determination and engineering calculation for Fitness-for-Service analysis
- Surface characterization; measurement of roughness and topography including replica techniques, e. g. life time expectancy for creep mechanisms or quality assurance of electro-polished vessels
- Tribological consultancy; characterization of wear performance and lubricated systems



Delamination in PTFE Liner Tube

After the root cause of a failure has been determined we provide economical resolutions in order to avoid reoccurrence of the failure mode. Our hands-on failure repair and avoidance strategies cover other fields beyond materials technology. The Bayer Technology Services approach targets a high benefit to cost ratio, covering all components of a piece of equipment, and relates to a materials technology evaluation of the whole unit or plant.

Benefits

We align our consulting services to your operational needs. You achieve cost, reliability and safety benefits due to:

- Increased plant availability
- Increased on-stream time by avoiding equipment related unscheduled shutdowns
- Cost-oriented repair measures (no over-design and / or over-engineering)

- Practical repair and refurbishment strategies
- Provision of alternative materials reflecting availability in the market as well as surface treatment and surface finishing methods
- Development continuing measures regarding quality control
- Strengthening and related measures in quality inspection of your supplier
- Technical enforcement of warranty claims
- Avoidance of reoccurring failures and the corresponding loss in productivity
- Minimized total cost of ownership by applying specialized technology, methodology and proven materials technology know how as your extended work bench

Bayer Technology Services – The Materials Experts

We are a team of materials engineering experts in an accredited laboratory (DIN EN 17025) and in the field, offering high-level expertise in materials technology and testing with emphasis on, but not limited to, chemical, pharmaceutical, petrochemical, and power engineering. Our multidisciplinary approach in managing corrosion and materials related risks lets us understand your projects in order to satisfy your needs. This increases your profitability through increased plant reliability due to optimized equipment integrity.

We base our service on the extensive experience acquired during years of materials engineering in conjunction with internationally recognized experts with a strong academic background. State-of-the-art technology involving our full range of laboratories, in which we simulate processes and corrosion conditions, complements our expertise. If necessary, we even invent new materials for particular challenges in existing operations or innovative chemical processes.

Our track record illustrates more than 50 years of experience within the daily business operation of a global chemical-pharmaceutical company – the Bayer Group.

The wide experience of Bayer Technology Services is at your disposal. In conjunction with BayOpX® – our Operational Excellence approach – you get access to our full portfolio of services targeting optimum plant reliability and efficiency.

Our value-adding services have been turned into successful business improvements for many of our customers. Our Root Cause Failure Analysis has been used by a wide variety of industry professionals, from equipment fabricators and OEMs to process owners and end-users, in applications as varied as chemical processing and automotive manufacturing.