

Asset Life Cycle Management by Bayer Technology Services

Optimize Your Availability, Boost Your Performance, Reduce Your Costs



INNOVATION

ENGINEERING

OPTIMIZATION

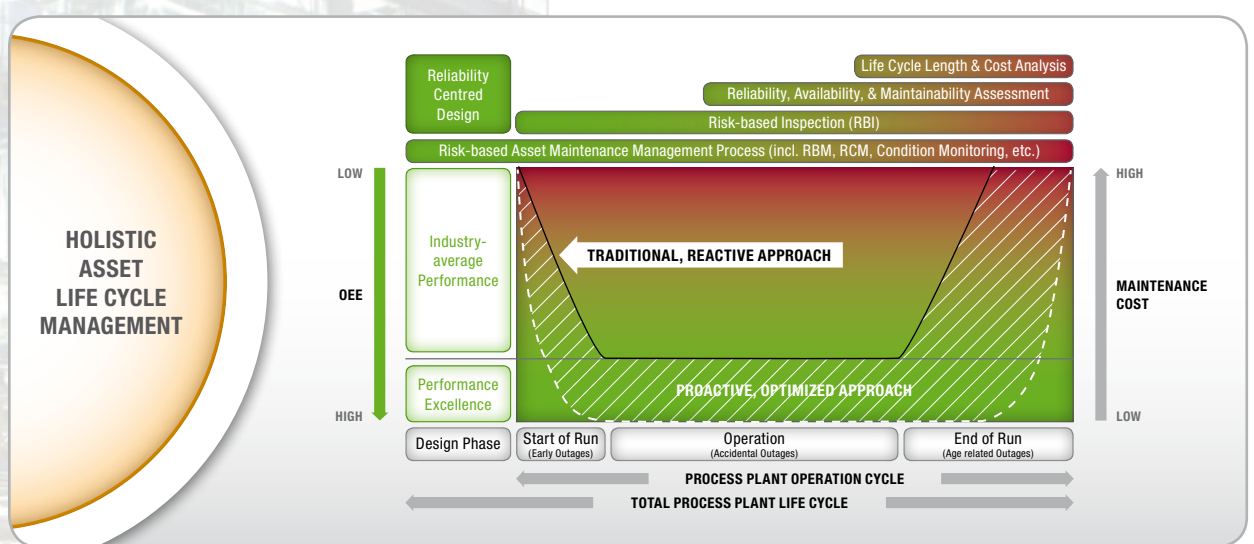


Bayer Technology Services

Powering Your Performance

TRUST THE EXPERT: Experience & Excellence to Protect Your Assets

Bayer Technology Services has been a globally active engineering expert for decades. As a subsidiary of the Bayer Group we have been collecting detailed experience in the chemical, petrochemical, and pharmaceutical industries worldwide. Our experts use their hands-on know-how and experience to develop individually tailored, plant-specific solutions for our customers. We support you in enhancing your plant performance and securing your asset availability along the entire life cycle of your production plants. Bayer Technology Services provides you with consulting and engineering solutions, which keep your facilities permanently fit for the changing market.



Competitive market pressure forces you to supply your customers with products at the lowest price possible. You need to satisfy this demand accommodating three contradicting requirements, which have a direct influence on your plant maintenance.

You need to:

- Fulfill market requirements regarding product availability and price
- Observe regulations/laws in operations and plants, e.g., HSEQ, OSHA, FDA
- Keep maintenance costs at the lowest level possible

Bayer Technology Services is your experienced partner, designing holistic and robust approaches for your individual asset situation. These encompass changes in laws, demand, and asset fitness over the entire life cycle span. Our expert teams have developed an intelligent and industry-tried Asset Life Cycle Management (ALCM) concept, which enables you to operate your existing and future facilities economically in the long term.

VISUALIZE YOUR FUTURE:

Professional Risk-based Management

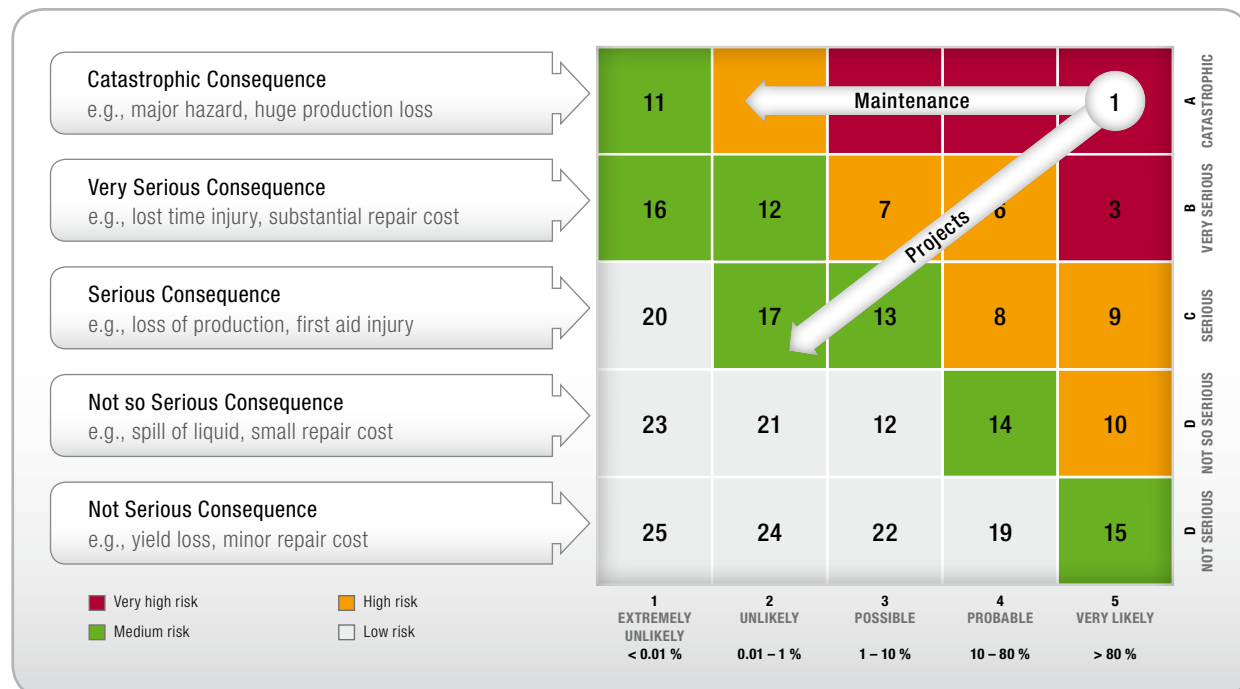
Risks associated with your operation are numerous and are becoming increasingly difficult to evaluate and oversee. Bayer Technology Services assists you with a uniform risk management approach. Our experts provide you with standardized evaluation criteria to minimize your production and availability hazards.

A large variety of industries worldwide already apply professional risk management. The implementation of a holistic risk management process assures:

- Management of your overall business risk at a defined and accepted level
- A standardized risk-based approach, which applies the same criteria for strategic decisions as well as the management of day-to-day business
- Systematic and consistent development of Reliability & Maintenance (R&M) plans for your assets
- Requested performance in terms of service level, maintenance cost, and HSEQ compliance

Ideally, you define your requirements for sustainable production already during the design phase of your plants and assets, such as achieving a specific product quality and plant availability at the lowest cost possible. Overcoming reliability and maintenance issues due to design and equipment inherent mal-functions in an already operating facility results in substantially higher costs. Changing your plant design leads to higher total investment and additionally to a loss of production output during the respective construction work.

Bayer Technology Services has developed a systematic approach for intelligent Reliability Centered Design (RCD) regarding plants and assets of the processing industry. Thus, you can be sure to meet pre-defined availability requirements at the lowest life cycle cost. Based on our long-term owner/operator knowledge and practical experience in the industry, our experts are able to supply you with best-in-class solutions for your individual business situation.



Consolidated risk documentation and risk mitigation approaches





UTILIZE YOUR POTENTIAL: Custom-fit Maintenance Management

Do you want to achieve a high availability of your plants and equipment? Do you want to be sure to manage all kinds of production risks? Reach your targets with Bayer Technology Services Risk-based Asset Maintenance Management. Our modular approach provides tailor-made solutions for your units or production sites.

The main features of this process are:

- The development of a site-/plant-specific Reliability & Maintenance (R&M) strategy, the definition of your long-term goals and targets, as well as the implementation of defined and scheduled measures.

OUR EXPERTS ARE COMMITTED TO ASSURING YOUR:

EFFECTIVENESS: Select the required and appropriate R&M interventions, measures, and maintenance operations.

EFFICIENCY: Implement specified R&M interventions and measures at the lowest possible cost.

SUSTAINABILITY: Constantly deliver a reproducible R&M performance regarding OEE, HSEQ, and cost.

- The establishment of Asset Reliability Centered Maintenance (RCM) Strategies for each asset, defining the risk-based maintenance scope, the resources for the respective execution, and the specific spare-parts requirement.
- The implementation of a KPI-based Asset Performance Management process for monitoring all set strategies.
- The assessment and ranking of all improvement projects and investments based on uniform and reproducible criteria.

Bayer Technology Services helps you to assess the business requirements of all major production elements in your plants. We investigate the risk associated with your operation and define measures assuring the fulfillment of your business requirements. For the performance of equipment-specific investigations, Bayer Technology Services can draw on internal expert resources. The result defines your responsibilities concerning plant maintenance, e.g., the stipulation of spare-part requirements or maintenance intervals.

BOOST YOUR PERFORMANCE:

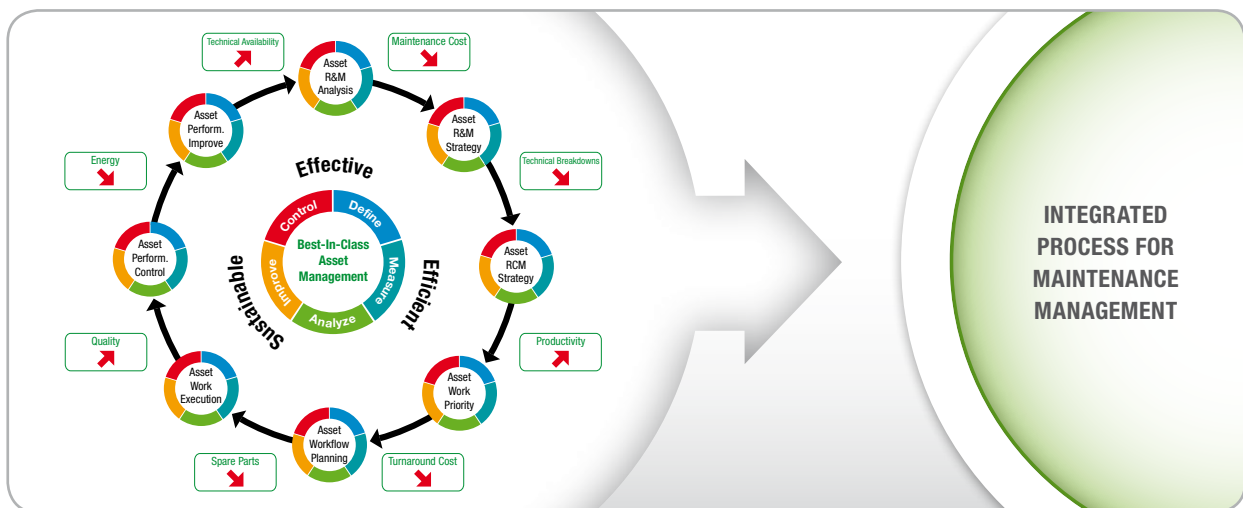
Risk-based Inspection and Condition Monitoring

Ageing and corroding plants cause varying asset conditions over time. For static equipment, this can mean the loss of mechanical integrity, resulting in potentially major production losses and HSEQ incidents. You need profound knowledge about the condition of your facilities to keep your plant integrity and availability constantly high. Our Risk-based Inspection approach (RBI) assures the selection of the most cost-effective inspection routine. You can avoid equipment failures and unnecessary downtimes in production due to maintenance activities, for example, by extending inspection intervals, replacing internal inspection with advanced external inspection methods. If you focus on critical equipment (20%), you consequently minimize inspections. Thus, you can harvest savings from maintenance preparation work and shortened shut-down periods.

Bayer Technology Services commands a long record of accomplishment in the performance of RBI assessments. With more than 60 implemented RBI projects around the world, on various continents and in various industries, our corrosion specialists reliably assist you in foreseeing and reducing corrosion failures of plants and equipment. Our experts help you to extend inspection intervals and to meet legal regulations in agreement with governmental authorities. We are a licensed reseller of industry-tried RBI software solutions for your asset-specific needs.

Furthermore, Bayer Technology Services employs state-of-the-art technology supporting real-time corrosion monitoring systems. These technology solutions can alarm your operational personnel in the control room of the occurrence of increased corrosion activity with a traffic light indicator. Thus, you can readjust operating parameters before major corrosion damage occurs, or monitor and control the success of implemented countermeasures.

Bayer Technology Services also utilizes several condition-monitoring techniques for rotating equipment. Our experts command broad experience regarding vibration or lubrication monitoring systems within the Bayer family, and other process industries worldwide. This strengthens our practical knowledge and expertise for the professional evaluation of measurement results within your plants at all times.

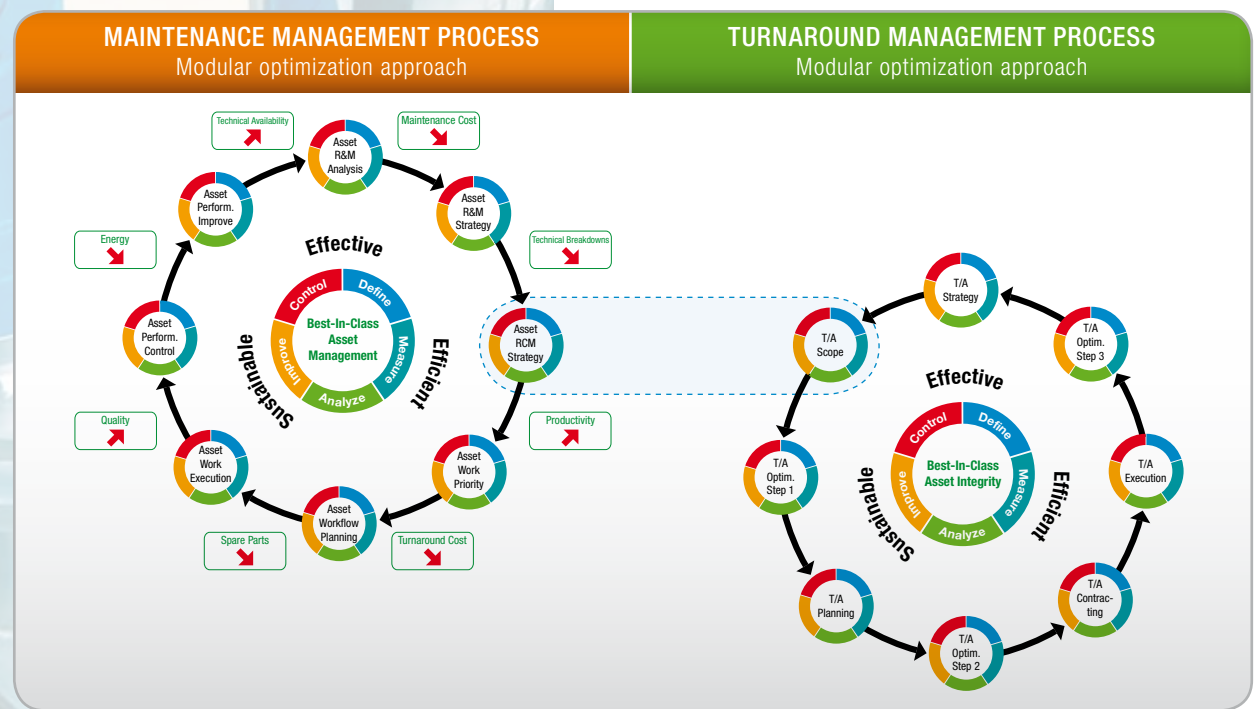


Modular optimisation approach

SELECT YOUR INVESTMENTS: Reliable Life Cycle Length and Cost (LLC) Studies

Do slowdowns interfere with your production targets? Do you struggle with availability issues due to market demands slightly above your current production capabilities? Our Reliability Availability, and Maintainability (RAM) study supports you in unleashing hidden values by identifying your critical equipment and availability bottlenecks. Moreover, it helps you to outline improvement approaches to achieve the required plant availability.

Is your plant at the end of its designed lifetime? A robust Life Cycle Length and Cost (LLC) study will help you to decide on your next steps. The study will provide you with substantial infor-



mation based upon a holistic assessment. Based on the comprehensive data, you can choose to invest either into physical improvements and/or an improved maintenance process for your existing facilities or into an entirely new plant.

Turnarounds are an essential part of plant maintenance. Shortening your production downtimes without taking risk for unplanned outages is crucial for a successful turnaround optimization. With our Risk-based Turnaround Management you can optimize your turnaround scope, minimize the critical path, and identify the most appropriate contracting strategy. The Bayer Technology Services team of experienced turnaround planners and schedulers prepares detailed shutdown plans for a streamlined turn-around process. Our experts achieve maximum effects by combining Risk-based Maintenance Management and Turnaround Management.

MEASURE YOUR EFFICIENCY:

Smart Asset Performance Management

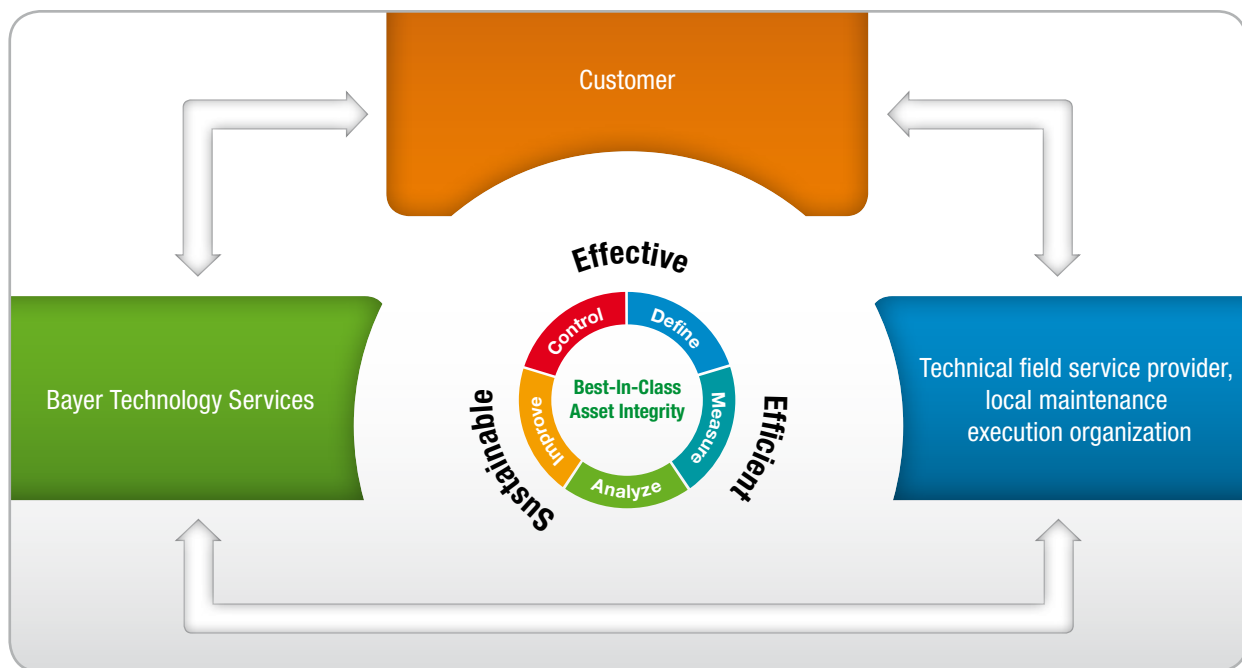
What you cannot control you cannot measure. For monitoring the effectiveness, efficiency, and sustainability of your Asset Life Cycle Management system, Bayer Technology Services develops site- and plant-specific consistent KPI systems with leading and lagging KPIs.

Is your investment budget limited and do you have various investment projects? Our risk-based approach enables you to compare all competing projects applying consistent risk management criteria. Our experts start at plant level and move to a site-specific, regional, up to a global list of projects, ranking all possible investments depending on their potential to achieve your overall company targets.

Bayer Technology Services provides you with innovative software systems that easily integrate into an existing IT environment. Thus, you enjoy less disruptive day-to-day asset management

as your operating personnel will not have to adapt to an entirely new system and program. Moreover, a tailor-made, state-of-the-art Asset Performance Management concept exactly suits the requirements of your business situation.

You may reduce fixed operating costs by minimizing your own maintenance organization. Technical field service providers typically provide experienced hands-on service capabilities, but limited competences in the area of reliability management. Bayer Technology Services bridges this gap. We offer you the possibility to enter into a robust three-party agreement: you as plant operator, a maintenance service provider, and us as reliability management organizer, providing all strategic reliability- and availability-related expertise. Thus, you can reduce your maintenance effort drastically, profit from our experts' reliability, availability, and maintainability know-how, and utilize cost-effective external resources.





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