

# Optimizing Cooling Water Treatment

## A Leap Towards Efficiency and Sustainability in Power and Industrial Operations

The quest for energy efficiency and environmental sustainability is paramount in today's industrial landscape, particularly in power generation and heavy industries. Cooling water systems, essential for the operational integrity of power plants and industrial facilities, represent a significant focus area for achieving these goals. Traditional cooling water treatments, while effective in maintaining system performance, often come with environmental and economic drawbacks. Innovations in cooling water treatment, such as catalyst technology, present an opportunity to overcome these challenges, offering a pathway to more efficient and sustainable operations.

### The Catalyst of Change: Enhancing Efficiency and Sustainability

Catalyst technology stands at the forefront of innovation in cooling water treatment, marking a paradigm shift toward more sustainable and efficient industrial and power generation practices. By catalyzing chemical reactions essential for mitigating scale, corrosion, and biofouling, this technology facilitates a departure from conventional methods that rely heavily on hazardous chemicals. The intrinsic ability of catalysts to enhance the longevity and efficiency of cooling systems without incurring the environmental and health risks associated with traditional chemical treatments aligns seamlessly with contemporary sustainability objectives.

#### Enhanced Thermal Efficiency Through Catalysis

The integration of catalyst technology into cooling water systems is primarily lauded for its substantial improvement in thermal efficiency. Catalysts play a pivotal role in preventing the formation of scale and biofilm, thereby ensuring unimpeded heat transfer across cooling systems. This optimization of thermal dynamics allows for the achievement of desired cooling outputs with significantly reduced energy inputs. The consequent decrease in fuel consumption and greenhouse gas emissions embodies the critical environmental stewardship ethos, positioning catalyst technology as an indispensable ally

in the quest for sustainable industrial operations.

#### Economic Benefits of Catalyst Technology

The adoption of catalyst technology within cooling water systems heralds profound economic benefits, rooted in the enhanced efficiency it brings to the table. The reduction in energy requirements directly translates into decreased operational costs. Furthermore, the diminished reliance on chemical treatments for water maintenance lowers immediate and long-term financial burdens associated with chemical procurement, handling, and disposal. Additionally, the extension of equipment lifespan and the concomitant reduction in maintenance demands culminate in substantial long-term savings. These economic incentives, coupled with the operational and environmental advantages, render catalyst technology a financially sound investment for the future of industrial cooling water treatment.

#### Energy Optimization: Leveraging Excess Energy

An equally innovative approach to cooling water treatment is the utilization of excess energy on the blow down. This strategy capitalizes on the otherwise wasted energy in cooling systems. This model of energy optimization not only elevates operational efficiency but also significantly curtails energy costs, all while maintaining the efficacy of water treatment protocols.



Fig. 1: Catalystmodule for once through applications with flow rates up to 2,500 m<sup>3</sup>/h



Fig. 2: Installation of catalystmodule at make-up water supply of power plant

### Biocide-Free and Energy-Efficient Operations

The strategic use of suitable catalysts for cooling water treatment paves the way for operations devoid of biocides. This reduction or elimination of chemical biocides minimizes the environmental footprint of facilities and ensures closer adherence to health and safety standards. Moreover, the energy conservation achieved through this innovative approach contributes to a lower carbon footprint, aligning with broader global initiatives aimed at mitigating climate change.

### Case Studies: Demonstrating Impact Across Industries

In the domain of power generation and beyond, the imperative for efficiency and sustainability is increasingly critical. This narrative explores the transformative power of innovative cooling water treatment technologies through the lens of landmark case studies. These instances exemplify not just operational enhancements and environmental stewardship, but also underscore significant economic advantages, particularly in the context of LNG terminals where the balance between ecological responsibility and economic feasibility is paramount.

#### Power Generation

The Schkopau lignite power plant and the Rostock hard coal power plant embody the essence of innovation in the field of cooling water treatment, leveraging their unique environmental conditions to showcase substantial improvements in efficiency, sustainability, and cost-effectiveness.

#### Schkopau Power Plant: A Paradigm of River Water Adaptation

Situated along the Saale River, the Schkopau power plant confronted the challenge of variable water conductivity levels. The introduction of customizable catalyst technologies in 2017 represented a significant stride towards sustainable energy production, enabling the treatment of water without the need for biocides. This technological innovation ensured compliance with stringent environmental standards while bolstering the plant's operational efficacy.

- **Technological Innovation and Adaptability:** The success of Schkopau is anchored in the adaptability of its catalyst modules, specifically engineered to address the fluctuating water quality of the Saale River. This flexibility not only meets regulatory demands but also enhances the plant's operational reliability.
- **Economic and Environmental Impact:** Schkopau's minimized reliance on chemicals has translated into considerable savings, especially in biocide procurement and management. Furthermore, the plant's reduced ecological footprint exemplifies a model for responsible energy production, aligning with broader sustainability objectives.

#### Rostock Power Plant: Mastering Seawater Utilization

In contrast, the Rostock power plant, exploiting the Baltic Sea's seawater for cooling, faces distinct challenges, particularly in mitigating corrosion and managing higher salinity levels. The adoption of a suitable heterogenous catalyst made of a high-performance Mineral-Metal-Foil – the so called MOL®LIK technology, streamlines the treatment process without necessitating additional energy inputs – since 2016.

- **Seawater Treatment Efficiency:** Catalytic technology at Rostock adeptly addresses the challenges posed by seawater's salinity, curtailing scale and corrosion without heavy chemical usage. This method not only boosts the plant's energy efficiency but also substantially diminishes its environmental impact.
- **Savings and Sustainability:** The strategic use of pump energy for water treatment has enabled Rostock to achieve significant reductions in energy consumption and operational expenses. This transition towards a biocide-free cooling methodology is in line with sustainability efforts, establishing a precedent for facilities utilizing seawater.

#### Comparative Analysis and Synergies

Despite differing environmental contexts, the Schkopau and Rostock plants share a commitment to innovative water treatment technologies, underscoring a collective shift towards more sustainable and efficient practices in the power sector. Both cases illustrate the efficacy of customized solutions in tackling unique water treatment challenges, from variable river water conductivity to the corrosive properties of seawater.

#### Leveraging Technological Innovations

The narratives of Schkopau and Rostock highlight the pivotal role of technological innovation in addressing contemporary power generation challenges. By focusing on bespoke solutions — catalyst technologies for river water and seawater — these facilities not only improve operational efficiency but also make significant contributions to environmental preservation.

#### Economic and Environmental Synergies

The economic benefits derived from reduced chemical use, decreased energy requirements, and prolonged equipment lifespan at both plants emphasize the financial soundness of investing in advanced water treatment technologies. Additionally, the environmental benefits of minimizing chemical discharges into aquatic ecosystems underscore the power generation industry's contribution to a sustainable future.

#### Outlook: Advantages for LNG Terminals

The discussed advancements in cooling water treatment technology hold immense promise for LNG terminals. These critical components of the global energy infrastructure stand to gain significantly from the efficiency and sustainability enhancements offered by catalyst technology and excess pump energy



Fig. 3: Power plant of SaaleEnergie in Schkopau/Germany

utilization. The resultant operational cost reductions, coupled with the environmental benefits such as reduced chemical usage and diminished greenhouse gas emissions, position these technologies as pivotal to the sustainable and economically viable operation of LNG terminals.

#### Pioneering Sustainable LNG Operations

As the LNG industry evolves, the imperative for minimizing environmental impact while maintaining operational efficiency becomes increasingly paramount. The adoption of advanced cooling water treatment technologies supports not only the operational imperatives of LNG terminals but also the broader goal of sustainable energy development. The integration of these eco-friendly and efficient treatment methods is set to become a foundational element of sustainable practices within the LNG sector.

#### Conclusion

Innovation in cooling water treatment, exemplified by suitable

catalyst technology, offers transformative benefits across the spectrum of power generation, industrial facilities, food & beverage applications and LNG terminals. This strategy not only enhance system efficiency and reduce operational costs but also significantly lower the environmental impact of these operations. As the global energy sector continues to prioritize sustainability and efficiency, the adoption of these advanced cooling water treatment methods will undoubtedly play a crucial role in shaping a greener, more efficient industrial landscape.

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