Baker Hughes

BioKlenz biofilm control services

Just right for hydrocarbon processors

BioKlenz biofilm control services

Are your current microbiological growth-control programs as effective and efficient as they should be?

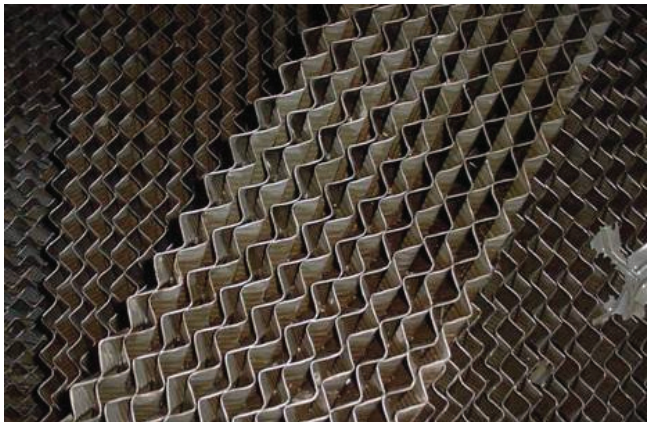
Consider the following cooling water system scenario:

- System measurements indicate good oxidant residuals
- Bulk water bacterial counts are low
- Corrosion inhibitor residuals are within the desired range

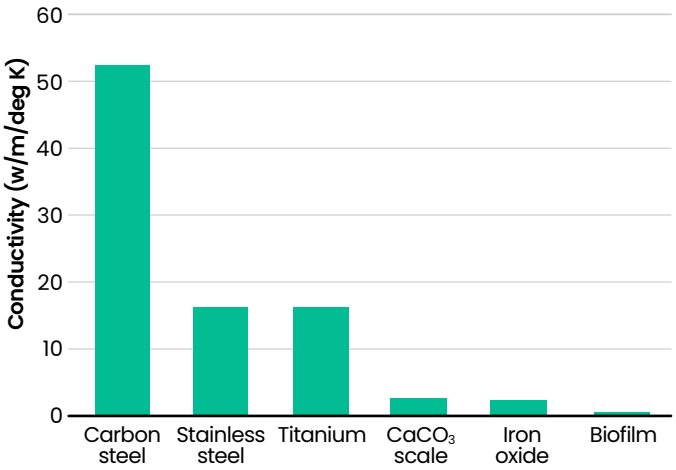
Yet, your system still experiences high corrosion rates. How can this be?

Quite possibly, "sessile" bacteria have developed significant biofilms, or surface growth, in heat-exchanger tubes and pipelines, influencing the development of potential and costly corrosion scenarios, such as underdeposit corrosion and oxygen concentration cells.

High-efficiency film before BioKlenz service treatment



High-efficiency film after BioKlenz service treatment



W.G. Chiracklis, Microbial biofouling control, in: Biofilms, W.G. Chiracklis and K.C. Marshal (eds.), Wiley Interscience, Toronto, 1990; pp. 585-633.

Biofilms dramatically reduce heat-exchange capacity.

Other negative impacts on operational and business objectives associated with biofilms include the following:

- Reduced operating profits
- Impaired process throughput and lower revenue from reduced heat-transfer efficiencies
- Increased chemical-feed costs associated with increased biocide demand
- Shortened equipment life and greater equipment costs from increased corrosion failures
- Frequent shutdowns and reduced throughput from growing corrosion
- Rising labor costs for equipment cleaning and repair
- More health, safety, and environment (HSE) risk from expanded chemical handling

Choose the right biocide program

Hydrocarbon processing environments can actually contribute to biofilm proliferation in cooling water systems through the introduction of growth-enhancing hydrocarbon or ammonia contaminants via leaking heat exchangers. If microbial growth is not closely monitored and controlled, treatment regimes can suddenly change from routine to a full-blown emergency, such as biofilm growth impacting heat transfer severely enough to significantly reduce production rates.

Biocide treatments can be applied using oxidizing biocides, non-oxidizing biocides, surfactants, or combinations of those, and dosed intermittently or continuously to attempt to control microbial populations.

The key to success is choosing the right program for the application.

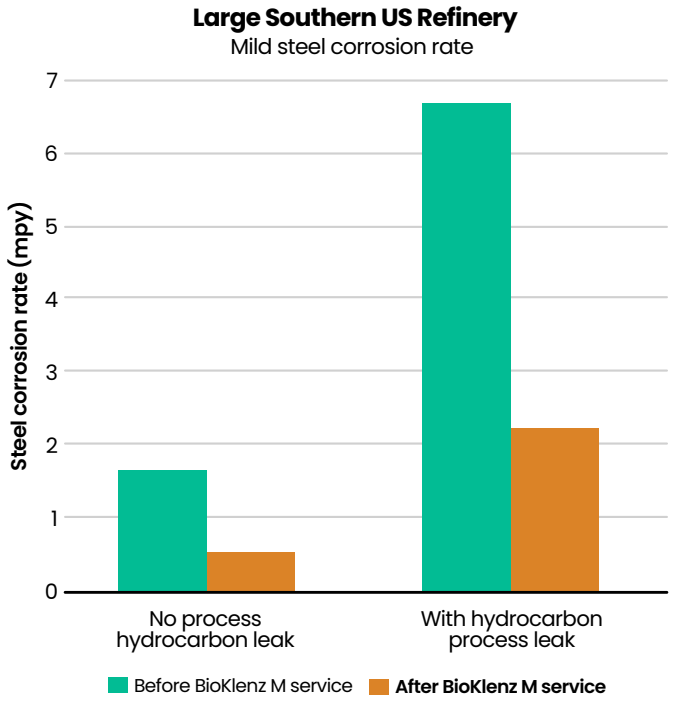
Use an effective treatment

BioKlenz™ biofilm control services from Baker Hughes provides for the safe and effective generation and delivery of chlorine dioxide biocide. Our BioKlenz service programs provide turnkey applications for cooling water microbiological control.

Baker Hughes water treatment experts have been successfully treating biofouling problems in industrial water treatment systems with chlorine dioxide for more than 10 years. Using a proprietary generator design, Baker Hughes integrates advanced instrumentation to monitor and control chemical injection.

The BioKlenz biofilm control services effectively treat systems in jeopardy from biofilm growth that often results from significant hydrocarbon or ammonia contamination. BioKlenz emergency service is one option we feature with the **LeakGuard™ hydrocarbon leak detection and mitigation program**. Our expert **PREPARED TO RESPOND™ (P2R™) services** teams arrive at customer sites to quickly mitigate the microbial impacts of hydrocarbon leaks in cooling water systems, to restore heat-transfer efficiency, and to reduce corrosion and environmental risks.

The BioKlenz M biofilm control service is our turnkey offering for permanent installations of chlorine dioxide biocide treatment. Often, customers use the BioKlenz and P2R services to treat an out-of-control system and then migrate to a long-term treatment program using a permanently installed system. The BioKlenz M program provides excellent biofilm control with the benefits of reduced corrosion rates, as detailed in the chart below.



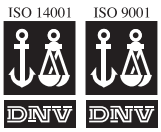
Get the benefits of chlorine dioxide

- Superior biofilm penetration and destruction compared to other oxidizing and non-oxidizing biocides
  - Heat transfer is optimized
  - Corrosion rates are reduced by reducing differential cell corrosion, lowering pitting corrosion from anaerobic acid-producing bacteria, and cleaning metal surfaces for more effective corrosion passivation
- Decreases chemical feed and improves control when there is a hydrocarbon or ammonia leak
  - Weaker oxidizer than ozone, hydrogen peroxide, chlorine, or bromine
  - Reacts with bacteria and biofilms but not hydrocarbons or ammonia
- Reduces HSE risk
  - Will not form organohalogenated compounds, like trihalomethane (THM), unlike chlorine gas, sodium hypochlorite (bleach), or bromine
  - Will not form bromates, a health hazard
- Provides higher efficiency and lower use cost
  - Kills microbes in a wide pH range (6 to 10)
  - Works effectively at lower dosages than other oxidants, even with intermittent feed
  - Eliminates the requirement for other biocides
  - Reduces chemical handling and associated labor costs
  - Is compatible with other water treatment programs–no concern for cross-reactions or halogenation of copper corrosion inhibitors

When you need your microbiological growth-control programs to be as effective as possible, contact your Baker Hughes representative to find out how BioKlenz biofilm control services can help.

	Condenser 1		Condenser 2	
	Inlet	Outlet	Inlet	Outlet
CL2	450 mV	-60 mV	430 mV	320 mV
CLO2	630 mV	620 mV	630 mV	620 mV

Oxygen-reduction potential (ORP) measurements from an ammonia plant's leaking heat exchangers show chlorine dioxide does not react with the ammonia contaminant, like chlorine gas treatment.



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