

Kirin Beer Uses Liqui-Cel® Membrane Contactors For CO₂ and O₂ Removal to Prevent Pipe Corrosion at Three of Their Japanese Breweries

It is becoming more common that systems operate with less chemical usage for food and beverage applications. People are very aware of environmental considerations when using chemicals and companies are looking for alternatives to chemical usage.

Kirin Beer has been successfully using Liqui-Cel® Membrane Contactors for CO₂ and O₂ removal in their Okayama, Hokuriku, and Kobe Japan facilities. The contactors successfully prevent corrosion of pipes that feed the boiler without using high volumes of neutralizing amine chemicals that negatively impact the environment.



another known corrosive element in water used to feed the boilers.

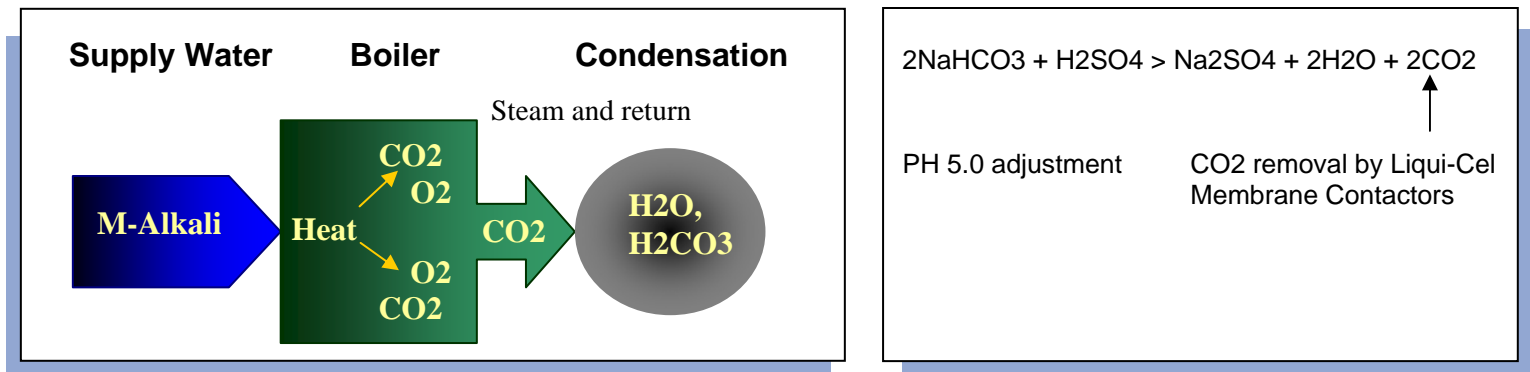
Kurita Water Industries Ltd. incorporates Liqui-Cel® Membrane Contactors in their Oxyace® System which they installed to remove the CO₂ and O₂ in front of the boiler at Kirin Beer to prevent pipe corrosion.

Method of Carbon Dioxide Removal

In order to prevent the formation of carbon dioxide in the steam, sulfuric acid can be added to the feed water. The sulfuric acid reacts with the sodium bicarbonate and forms sodium sulfate, carbon dioxide and water. This is illustrated in the chemical equation below. Membrane contactors are unique devices that are

Carbon dioxide is formed when water containing dissolved salts like sodium bicarbonate is heated in a boiler. This is illustrated in the diagram below. The carbon dioxide dissolves into condensed water in the pipes; this creates an acidic environment that will attack the inner surface of the pipe. O₂ is

The Process



designed to remove dissolved gasses from water. In this system they remove dissolved carbon dioxide and oxygen that are present in the water.

The Oxyace® system includes: a Softener, Filtration, pH control (M-Alkali control), Liqui-Cel® Membrane Contactors and a vacuum pump. With system automation and a feed back signal, the soft water is controlled to a pH of 5.0 with sulfuric acid. Caustic soda is added daily to inhibit bacteria growth. Very minimal chemical usage is required to control the pH.

To date there are 14 Oxyace® systems operating in Japan. All of these systems utilize Liqui-Cel Membrane Contactors for degassing.

For additional information, please contact your Membrana representative or visit us on line at www.liqui-cel.com

System Summary

End user:	Kirin Brewery
Water Flow:	70m ³ /h (308 gpm)
Number of Contactors:	Four configured 4 in parallel with 1 in series
Purpose of system:	Primarily CO ₂ removal with bonus of O ₂ removal
Inlet gas:	30-32 ppm CO ₂
Outlet gas:	8-10 ppm CO ₂
Operating mode:	N ₂ sweep with vacuum combo
Boiler:	Small Steam pressure boiler of 16.6kg/cm ² (236 psi)

Outlet Summary:

The contactors reduce the CO₂ concentration from 30ppm down to 10ppm. This reduces the corrosion rate from 50mdd (mg/square decimeters/day) down to 22mdd. This chemical free alternative is equivalent to the reduction in corrosion rate that can be observed with neutralizing amines.

Note: Corrosion rate = (Weight of test sample before immersion in mg) – (Weight of test after immersion in mg) / Surface area (100 cm²) / Test days.

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