



## Corrosion and Options for Reducing it in Energy Efficient Stainless Steel Pasteurizers



**FleetwoodGoldcoWyard**

A BARRY-WEHMILLER COMPANY

# Industrial Water and Waste Water Reuse and Reduction

- Water consumption globally has increased water and waste costs
- 24% reduction in industrial water since 1985
- **2000-Present:** Beverage industry has increased water re-use with closed loop water systems

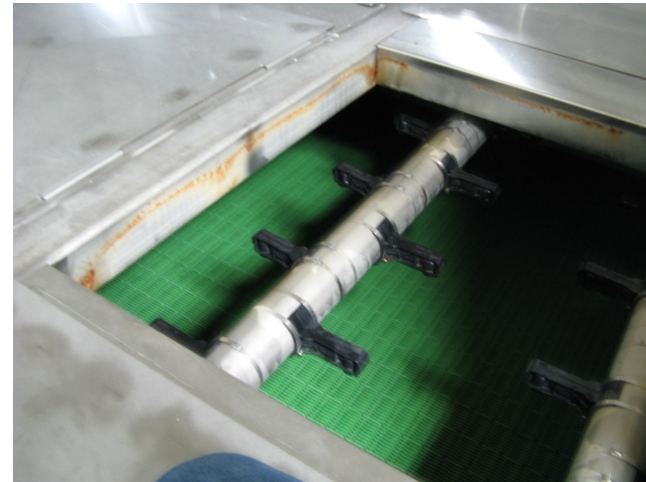
# Brewery Tunnel Pasteurizer Corrosion

- **2007-2008:** Pasteurizer manufacturers began to experience corrosion issues on energy efficient passivated stainless steel pasteurizers
- Corrosion source was unknown
- Pasteurizer stainless steel was tested and certified to ensure proper grade
- **Conclusion:** Corrosion was from Halide Vapors Could be Minimized by Cleaning Surfaces



# 2013 Corrosion Explosion

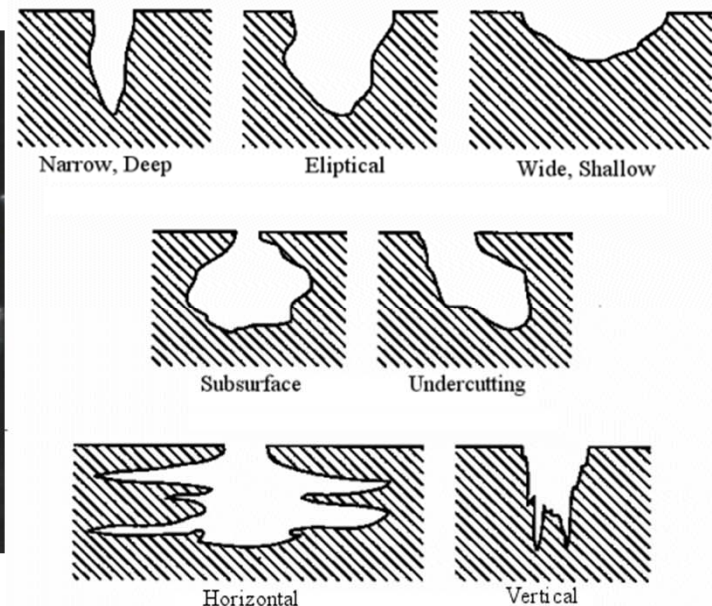
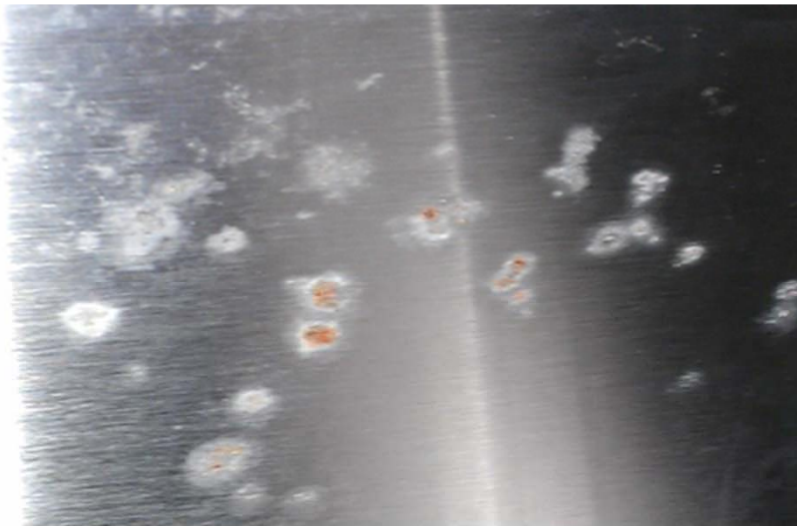
- Energy efficient pasteurizer with less than 5 gallons per minute water consumption began to corrode
- Unit was being treated and monitored with 2-3 ppm of chlorine in regenerative zones
- Unit was passivated before start up





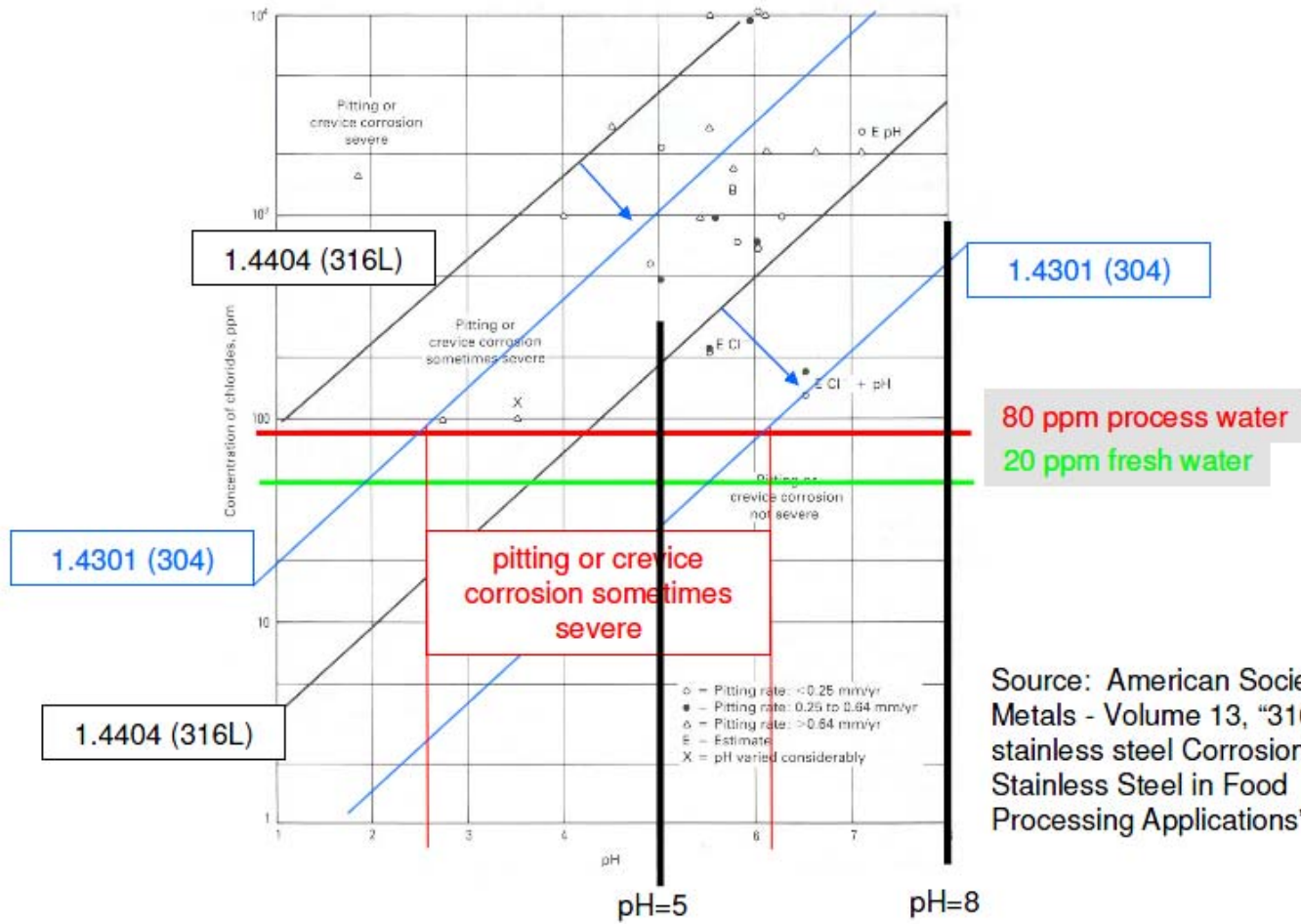
# Stainless Steel Passivation

- Passivation removes the excess iron, leaving a chrome-rich surface which then oxidizes
- If the chrome is depleted, corrosion pitting will occur
- Passivation layer is 1/1500 the width of a human hair



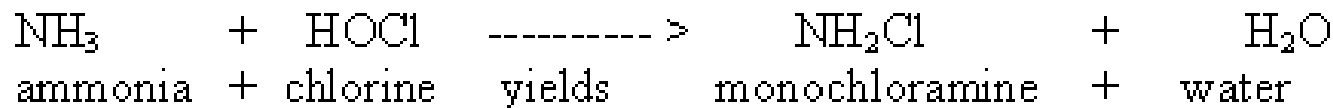
# Interdependency of Various Parameters

CONCENTRATION OF CHLORINE

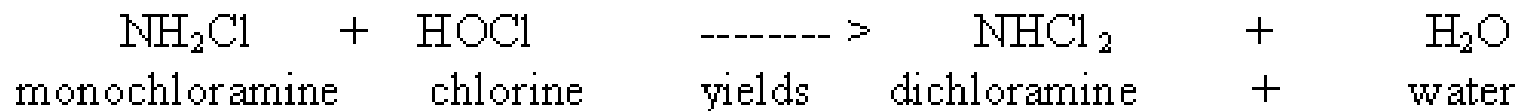


Source: American Society for Metals - Volume 13, "316L stainless steel Corrosion of Stainless Steel in Food Processing Applications"

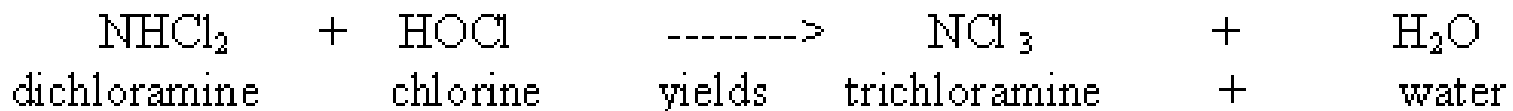
# Chloramines



add more chlorine to the water we are treating, and hold the quantity of ammonia:



add even more chlorine to the water we are treating, and hold the quantity of ammonia:

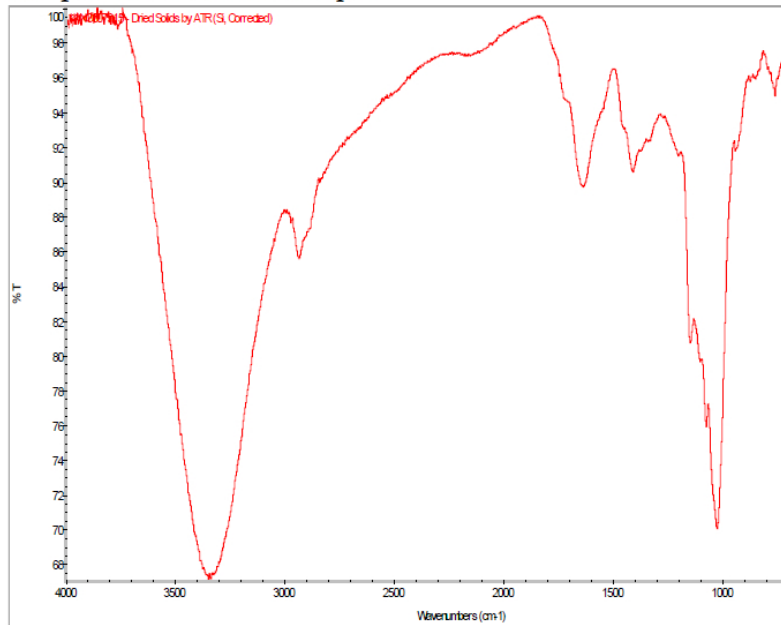


# TOTAL ORGANIC CARBON

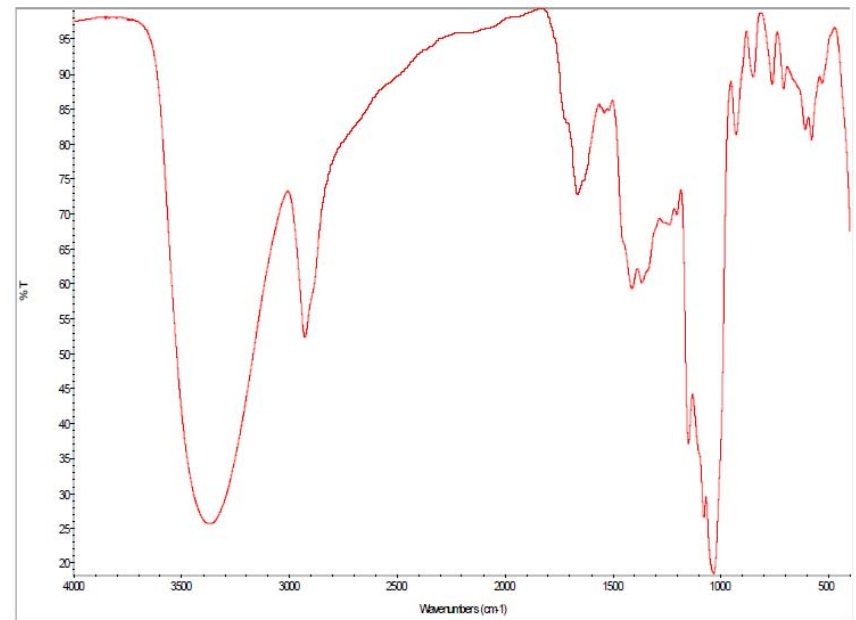
- TOC-

## Analytical Report

of the pasteurizer water sample.



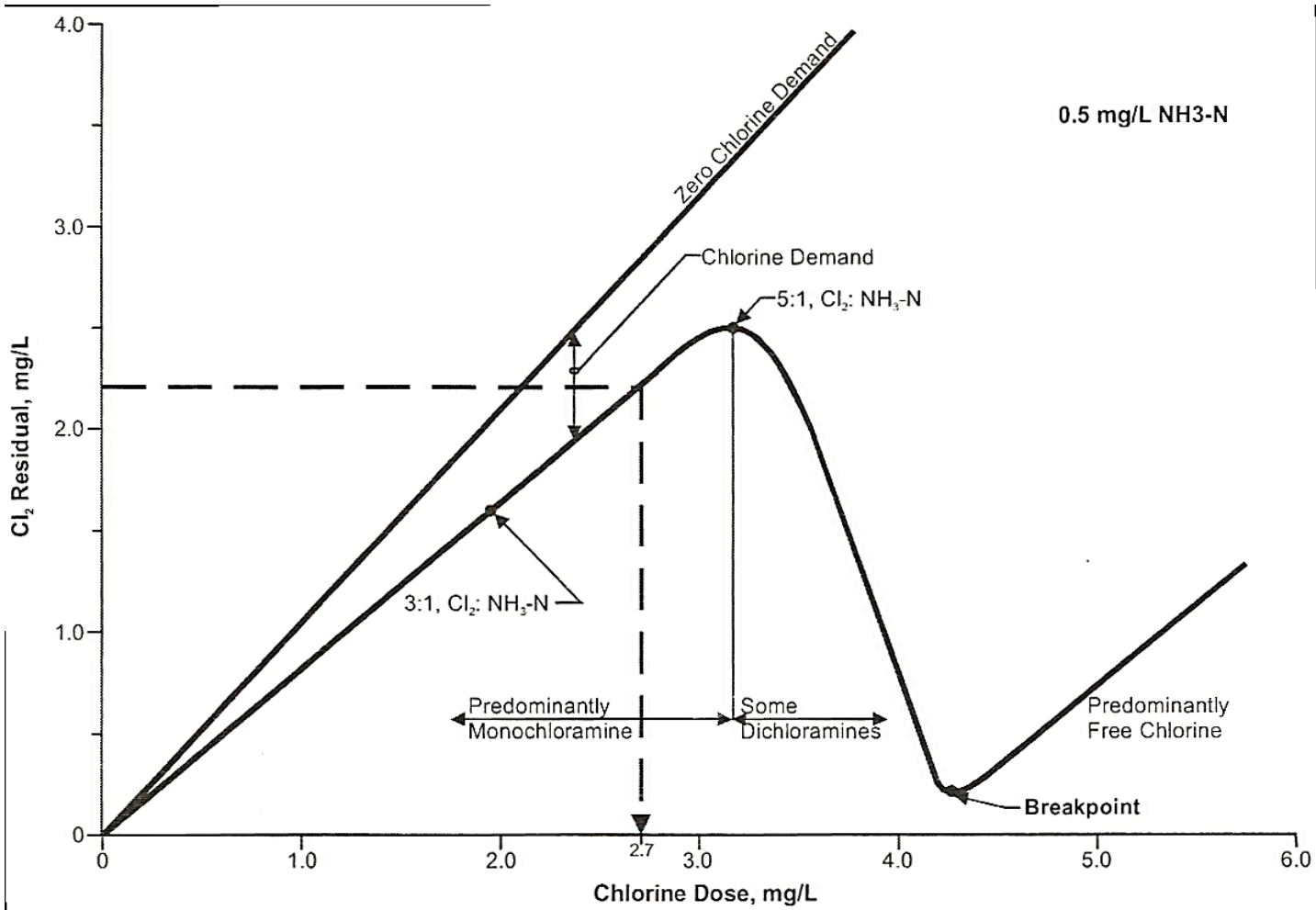
IR Spectrum of Dried Solids Portion of Water



IR Spectrum of Dried Solids Portion of Lager Beer

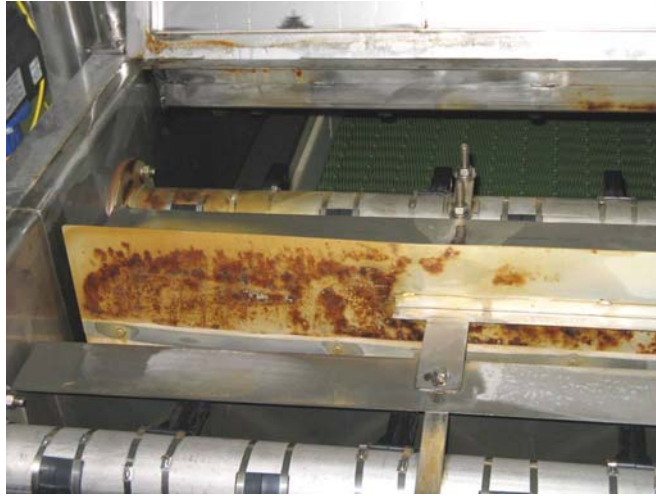


# Chlorine Demand Break Point

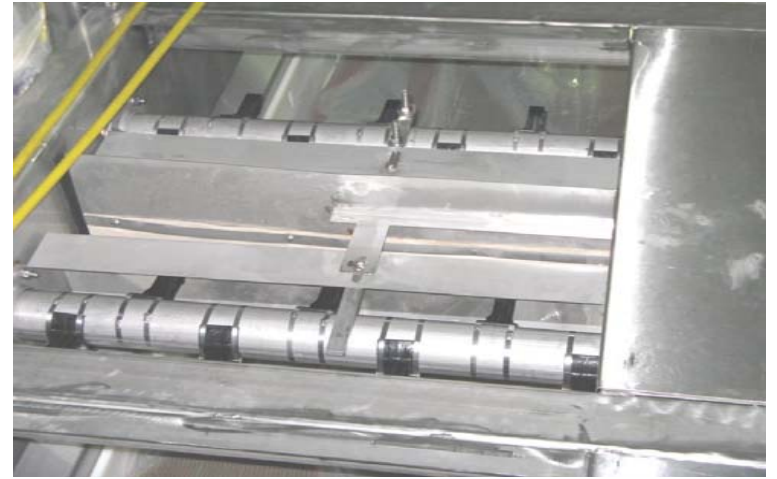


# Best Practice:

## Stainless Steel Cleaning and Re-Passivation



Before



After



# Maintaining Rust Free Stainless Steel Pasteurizer

- Cleaning
- Increase Water Use
  - Pre-Rinse
  - Monitor Total Organic Carbon and Turbidity
- Biocide Alternatives
  - Peracetic Acid
  - Ion (Cu-Ag)
- Water Filtration System

# Thanks To

- Dan Holmes-DG Yuengling and Sons Brewery
- Matt Casher –Nalco Chemical
- Anne Baic-Annick Engineering

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