Georgia Tech Research Institute
Agricultural Technology Research Program

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Research Brief
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WHAT KILLED THE PAA?
Topic 1: Characterization of Chiller Media

Problem Statement

Peracetic Acid (PAA) is a strong oxidizer and serves as an antimicrobial agent in poultry processing. PAA stock comes chemically stabilized. Once PAA is diluted with water or dosed into chillers, the chemical begins to decompose into acetic acid and water. PAA decomposition rates are reported as chemical half-life and measured in minutes. The chemical half-life is the time required for a quantity of PAA to reduce to half of its starting value. PAA decays rapidly in the presence of high organic loading common in immersion chillers. Organics in the chiller are found in the form of Total Suspended Solids (TSS), Fats, Oils, Grease (FOG), and Total Dissolved Solids (TDS), such as proteins, lipids, and salts.

This research brief presents results of pre- and main chiller media characterization studies that document typical levels of organic loads in the chiller. This information should help plant operators better manage PAA dosing.

Objectives

- Characterize chiller media from the pre-chiller and main chiller of two major poultry processing plants throughout a typical processing day.
- Collect hourly chiller media samples and then characterize them for levels of: TDS, TSS, FOG, Total Kjeldahl Nitrogen (TKN), and Chemical Oxygen Demand (COD).

Key Takeaways

- Plants processed between 150,000-250,000 WOGS/day per chiller.
- Typical dwell times include: 30 minutes in pre-chiller and 90 minutes in main chiller.
- The pre-chiller had higher organic loads compared to the main chiller at all time points.
- In the pre-chiller, FOG, TKN, and COD typically level off after the first 5 hours of the processing day.
- In the main chiller, TSS, TDS, COD, TKN, and FOG all increase throughout the processing day.
- Phosphorous levels continually increase for both pre- and main chillers throughout the processing day, while sodium levels remain constant or increase slightly.
- Calcium and magnesium levels vary significantly from plant to plant.

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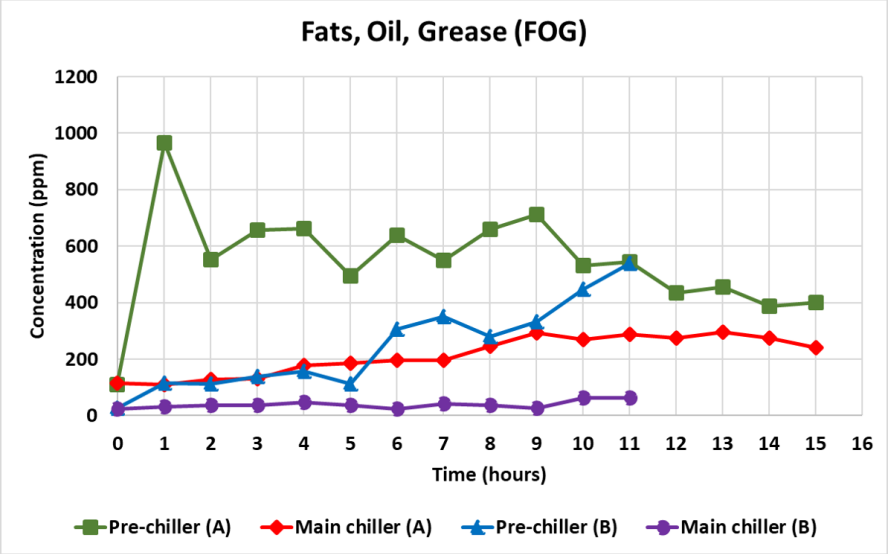
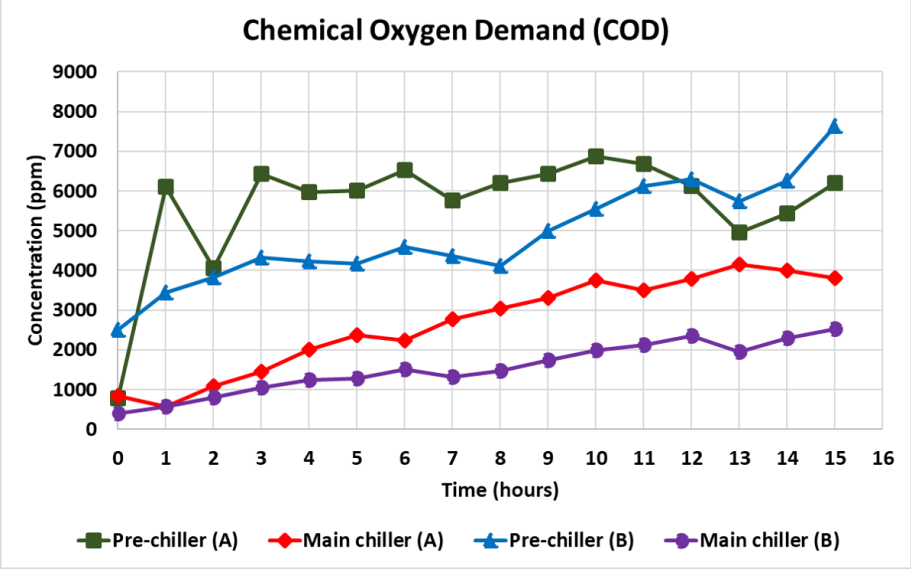
Research Methodology and Results

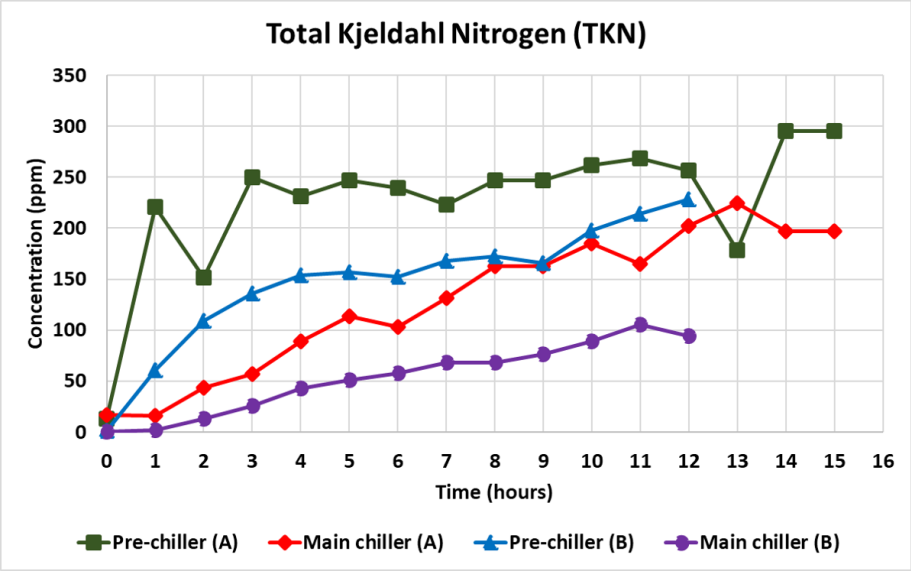
Characterization of Water Samples from Two Poultry Processing Plants

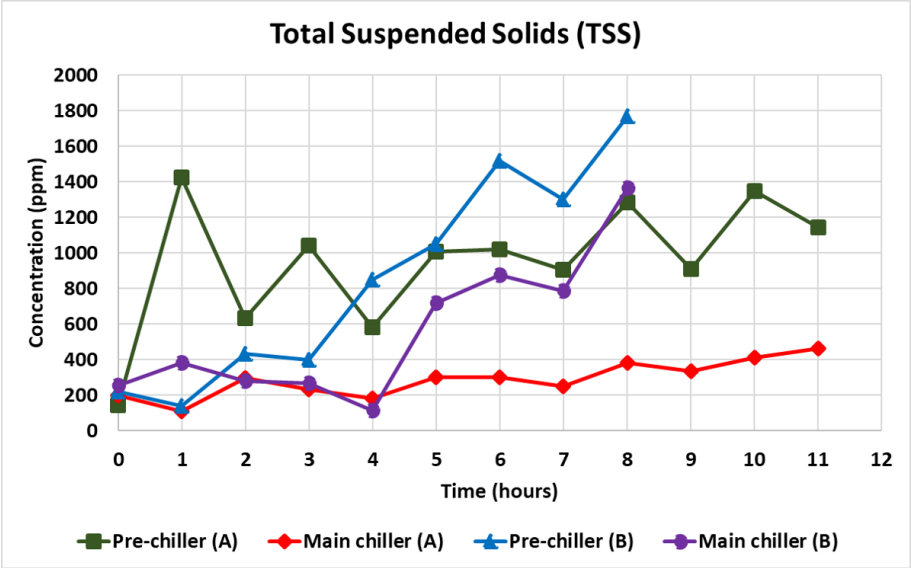
Water samples were collected from two different poultry plants in middle Georgia. Samples were collected on an hourly basis from the start until the end of a typical processing day. Two collections were performed for the pre-chiller, one from the start of the chiller and the second from the exit. Another two collections were performed for the main chiller, again from the entrance and exit. Results from the start and exit of each chiller were averaged and are presented in the following graphs. The characterizations performed included: FOG, COD, TKN, TSS, and TDS. For the FOG, TSS, and TDS analyses, standard gravimetric methods were employed. COD and TKN were measured using standard Hach test kits. In addition, elemental analysis was performed using inductively coupled plasma-optical emission spectrometry (ICP-OES).

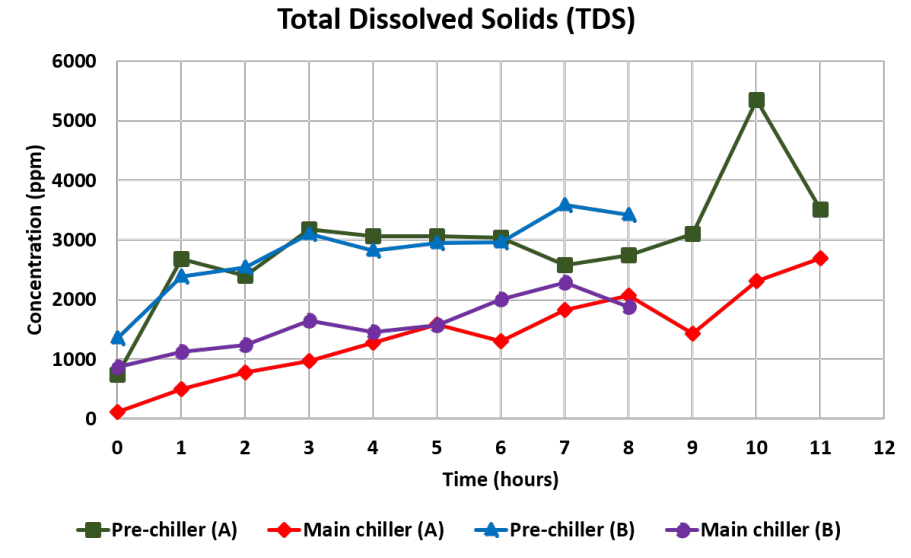
Pre- and Main Chiller Sample Analyses (FOG, COD, TKN, TSS, and TDS) from Processing Plants A and B











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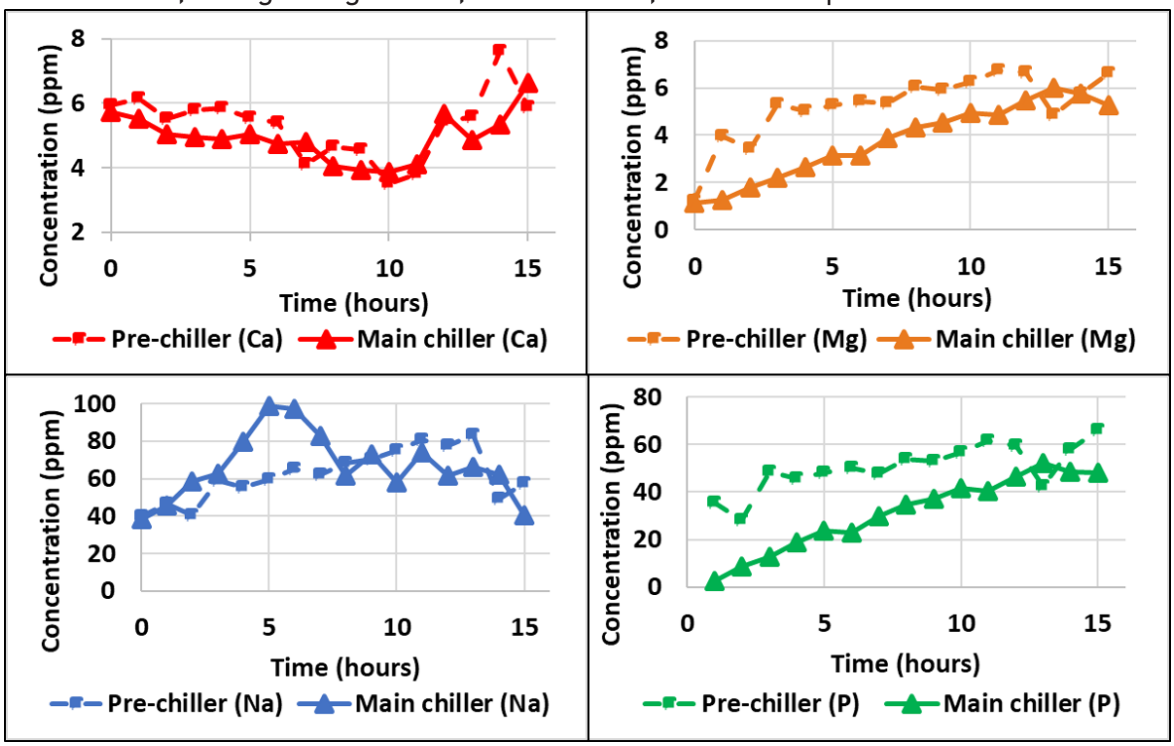
Elemental Analysis

Plant A Results

Red: Calcium; Orange: Magnesium; Blue: Sodium; Green: Phosphorus



Plant B Results

Red: Calcium; Orange: Magnesium; Blue: Sodium; Green: Phosphorus