Innovative Membrane Technology **Transforms Wastewater Treatment** in Protein Manufacturing

In the demanding environment of the meat & poultry industry, effective water management is crucial. Traditionally, the industry has relied on mechanical screening followed by dissolved air flotation (DAF) systems for treatment of wastewater. However, new environmental standards and a growing focus on sustainability have prompted a shift toward more advanced and efficient technologies.

To support this growing market demand, ZwitterCo has developed a direct filtration solution featuring superfiltration (SF) membranes that provides the protein industry with a robust and reliable alternative to a DAF. In this case study, we will review how our technology was able to support customer goals by treating total plant wastewater from their poultry harvesting facility with no DAF chemicals, eliminate the need for a secondary DAF, and meet all discharge requirements defined by the local municipality.

Fast Facts

Location:	NE, USA
Application:	Meet discharge from total plant wastewater
Feed Water Type:	Poultry harvest wastewater
Technology:	ZwitterCo Superfiltration system and SF membranes
Duration of Trial:	8 weeks

The Problem

Recently, ZwitterCo completed a successful pilot demonstration with a large protein manufacturer who was undergoing an expansion to double their production capacity. With this growth, the customer was required to significantly upgrade their existing wastewater treatment system to handle the increase in volume. In addition to this, they needed to ensure that their new upgrade would meet required discharge limits to prevent costly surcharges and potential fines. Initially, the customer considered adding a secondary chemical DAF to manage the increase in volume. However, this would involve substantial CAPEX and OPEX investments, including the cost of a new EQ tank, a new building, and the risk of continued operational disruptions and surcharges.

Key Challenges

01.

The harvesting facility needed to **double its wastewater treatment capacity** to support expansion

02.

Expanding DAF systems requires **significant CAPEX** for EQ tanks, buildings, and DAF infrastructure

03.

Tightening discharge limits require a **significantly cleaner effluent** to eliminate surcharges

04.

Chemical-heavy DAF skimmings are becoming **more difficult and expensive to manage** with tighter regulations banning land spreading

The ZwitterCo Solution

Unlike traditional filtration products, ZwitterCo superfiltration (SF) membranes are built with zwitterionic chemistry that attracts water while seamlessly repelling organic compounds (like proteins, fats, grease, and oils) that normally stick to membranes and ruin their filtration capacity. This allows ZwitterCo SF membranes to not only recover quickly and easily but also operate in streams where other membranes would foul or clog within weeks or days, making them an ideal choice for the client's challenging environment.

ZwitterCo proposed a direct filtration solution utilizing their superfiltration (SF) membrane technology (Figure 1). This approach would allow the customer to meet all required discharge limits, eliminate opex related to DAF chemistries, and **produce a chemical-free concentrate** that can safely and easily be land applied, sent to anaerobic digestion, or sent to renderers for value-add potential.

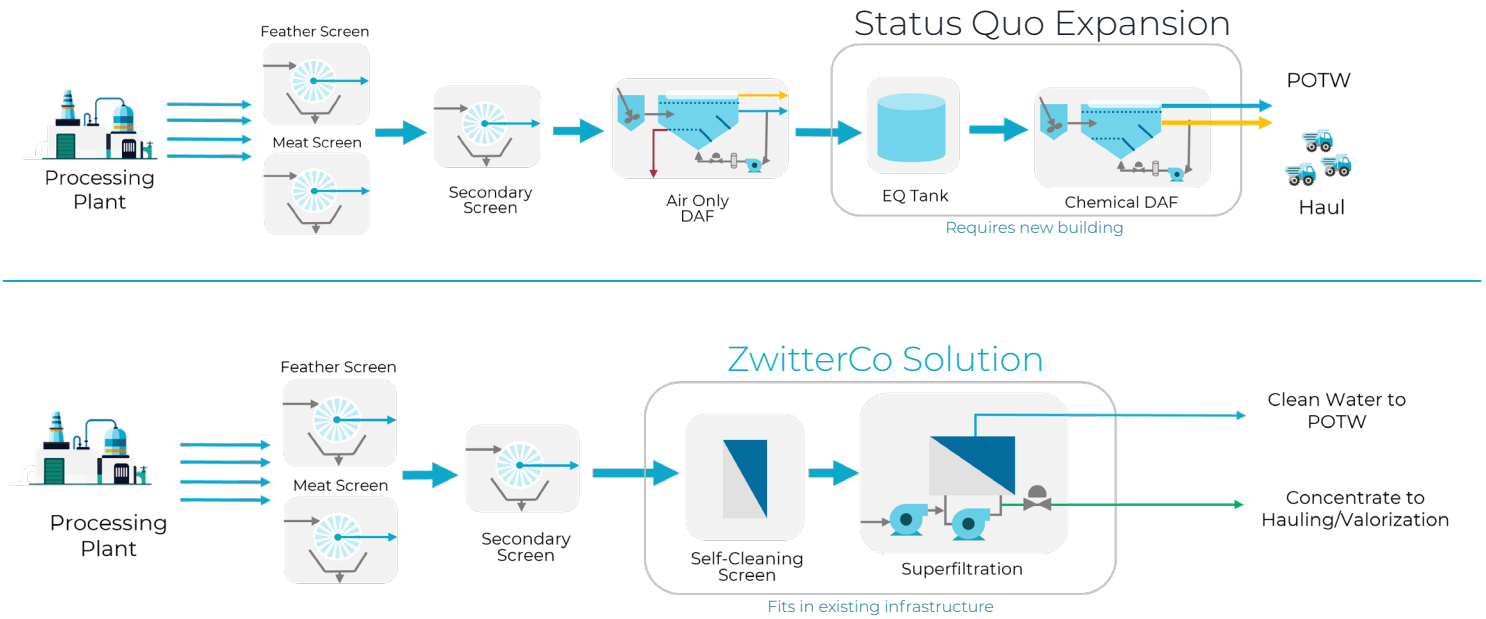

Figure 1: Shown here is just one of many possible expansion scenarios. It is one of the more common for illustration purposes.

The Results

During the piloting demonstration, the superfiltration membranes were evaluated on streams containing up to 6,500 ppm of fats, oils, and grease, and up to 6,500 ppm of total suspended solids. The results were outstanding:

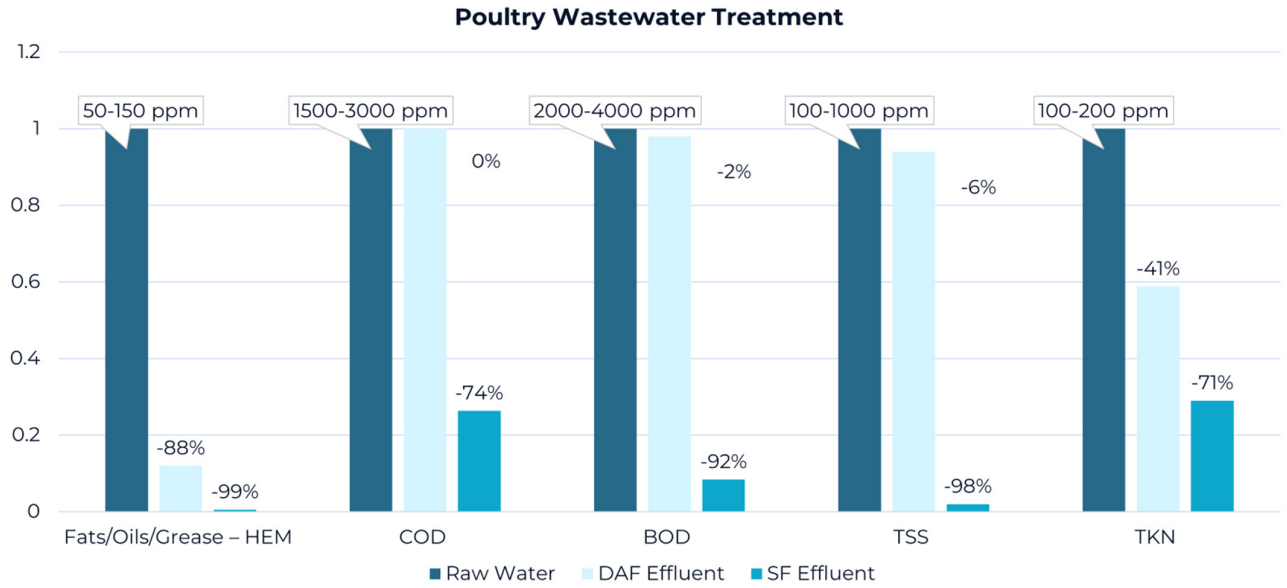

Figure 2: Suspended solids were removed and turbidities of permeate were < 2 NTU.

Key Benefits

Met Discharge Limits

ZwitterCo's advanced membrane technology was shown to be able to effectively reduce FOG and TSS levels below regulatory limits, while meeting BOD standards through the successful reduction of CBOD.

Operational Stability

The ZwitterCo solution is fully automated which reduces the need for manual intervention and significantly reduces the rate of unplanned shutdowns that are typically anticipated with a DAF-based process.

Payback Period

The investment in a full scale ZwitterCo solution is estimated to have a payback period of just 2.5 years, making it a financially sound decision for the company.

Cost Efficiency

The compact design of ZwitterCo SF membranes allowed for a full scale solution to fit within existing infrastructure, significantly reducing capital costs. Additionally, the low energy and coagulant/flocculant free design of SF targeted a significantly lower OPEX, representing meaningful savings and an attractive payback compared to the alternative DAF approach.

Without the option of ZwitterCo membranes, this customer would have no choice but to expand their facility by adding a secondary DAF unit as well as using large amounts of chemicals that would significantly increase OPEX and cause issues with sludge handling. With ZwitterCo, the customer is able to eliminate the need for a secondary DAF and completely eliminate the need for coagulants and flocculants.

The ZwitterCo SF pilot demonstration proved that the protein manufacturer would be able to efficiently double their wastewater treatment capacity while staying within budget and meeting discharge regulations. ZwitterCo has proven the customer can benefit from lower operational costs and a quick return on investment that ensures the customer can continue expansion without the financial and operational burdens associated with traditional DAF system upgrades.

The success of this pilot demonstration highlights the value ZwitterCo technologies and solutions can deliver to the protein industry, transforming the way we think about wastewater treatment in industrial operations. After seeing the value ZwitterCo SF was able to demonstrate at their facility, the customer intends to move forward with integrating ZwitterCo solutions into their operations.

About ZwitterCo

ZwitterCo's membranes solve the most complex separation challenges, providing industries with the tools for advanced wastewater treatment and water reuse. The company leverages zwitterions' remarkable organic fouling-immune technology to build membranes that enable years of operating life in hard-to-treat streams that would ruin conventional membranes in hours. ZwitterCo's products are used in digestates, leachates, and various food & beverage wastewaters. The company has been recognized as Breakthrough Technology Company of the Year at the Global Water Summit and by the Department of Energy and the National Science Foundation as a leader in clean water technologies.

Talk with the ZwitterCo Team

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