



Basins must be drained to properly measure chain tension and inspect the scrapers.

PHOTOS COURTESY OF EVOQUA

# Getting Clarity on Clarification

By Allen Lepak

History, overview and maintenance tips for chain & scraper systems

**T**he goal of a clarifier is to maximize the capture of solids so as to minimize the quantity of suspended solids, which escape the process in the effluent flow.

### What Is Water Clarification?

Primary and secondary clarification technologies provide a clarified liquid effluent for

downstream treatment processes. There are many types of clarification options on the market — including circular clarifiers and ballasted clarification systems — but this article will focus on rectangular clarifiers, or what many industry professionals refer to as chain and scraper systems.

A chain and scraper sludge collection system typically removes debris by scraping the



Installation and aftermarket services are available to plant operators and managers to help protect equipment and the investment in utility assets.

settled solids along the tank floor into sludge hoppers. The system simultaneously skims the surface of the water, sending floatables to a scum removal device.

### Chain & Scraper System History

The first chain system applied to a wastewater plant was the REX system from the Chain Belt Co., which now is owned by Rexnord Industries, and was a precursor to Evoqua Water Technologies Envirex system. It was installed in 1910. With the support of experts and aftermarket services, the system operated for approximately 70 years.

Evoqua pioneered the non-metallic chain and scraper components, which are now



Rectangular clarification units are well suited to facilities that have a limited footprint.

considered the standard in the industry. Non-metallic components include fiber-reinforced plastic flights, polymeric sprockets, sleeve bearings and of course the chain. The non-metallic loop chain has nearly the strength of stainless-steel chain but at a fraction of the weight, simplifying installation and maintenance.

### Who Benefits from Chain & Scraper Systems?

Chain and scraper systems are used at water treatment plants for pre-sedimentation and chemical enhanced sludge removal; at wastewater treatment plants for primary and secondary clarification, DAF thickening; and for industrial treatment for oil/water separation and clarification.

Chain and scraper systems are one of the most popular types of clarification systems on the market today. They are best suited for:

- Plants with large flows that want to take advantage of common wall construction to reduce civil construction costs;
- Plants with existing rectangular tanks that can be converted to chain and

scraper clarifiers, such as traveling bridge retrofits; and

- Covered and stacked clarifiers where available land area is limited.

### Maintenance Tips for Chain & Scraper Systems

While chain and scraper systems are a solid investment for removing solids, even the best clarification systems do not last forever. To prevent chain and scraper system from failing, follow these helpful tips.

- Maintain proper chain tension and alignment at all times.
- Inspect flight wear shoes for excessive wear and replace as necessary.
- Inspect flight wear strips for excessive wear and warpage that could catch and derail flights.
- Check sprockets for wear and tooth "hooking" that could lead to chain jumping and skewed flights.
- Change oil in reducers at recommended intervals to maximize gear box life.
- Grease cast iron shear pin hubs regularly to prevent hub seizure.

## Applications In Action: Clarification

Treatment plant operators should also look for signs of impending failure and take action before a system crash occurs. Warning signs include:

- When the skimmer flight is skewed or intermittently stops or stalls;
- If the chain pops or jumps as it leaves the sprocket tooth; and
- If the chain skips a sprocket tooth as it comes over the head-shaft.

The best way to prevent these problems is to perform predictive maintenance. The tank needs to be drained to effectively measure chain tension. In a plant with multiple basins, it is best to rotate basins when checking equipment to maintaining operation. It is also important to check for wear on sprockets, in addition to cleaning and greasing the cast-iron shear-pin sprocket in the drive equipment. Replace components as needed.



Chain and scraper system components, drive systems, and scum pipes replaced in the Grass Valley, California wastewater treatment plant.

### Professional Maintenance

While some treatment plant operators try to maintain clarification systems themselves, it is often easier (and more cost-effective) to

hire a professional for the job. When choosing to partner with a trusted solution provider, utilities can be confident the treatment plant is in good hands.

Original equipment manufacturers and service companies have technical expertise in inspecting and retrofitting systems, as well as replacing components. When researching options, look for companies that offer:

- Customized maintenance training;
- System evaluations;
- Diagnostic inspection reports;
- Proactive recommendations;
- Engineering support;
- Budget information for planning purposes; and
- An extensive inventory list of replacement parts.

Professional maintenance services can help bring attention to factors that may not have been considered, such as shear pin alignment or the importance of checking chain tension during the coolest part of the day. Thermal expansion is prevalent in non-metallic applications, and in the hot sun on a summer day, the chain will naturally become slack when the tank is drained.

Commonly overlooked maintenance items include wear shoes and wear strips. These equipment components inevitably need to be replaced and the replacing of wear strips is critical to chain and scraper system performance. Before attempting to field drill and install the anchors, all polymeric wear strips should be positioned and spaced per the drawings and unique specifications.

## SHREDDING THE COMPETITION

**AGPR** Single Seal Grinder    **AGP800/500/750** Dual Seal Grinder    **AGP-HC200** Dual Seal Grinder

Your solution for: • Wipes • Swiffer Pads • Hygiene Products • Dental Floss • Rags

# Ashland

P U M P

*Honest. Professional. Dependable*

1899 Cottage St. • Ashland, OH 44805 • 855.281.6830 • ashlandpump.com

There should be a gap between the strips, but gap measurement depends on the type of wear strip. This allows for maximum expansion of the strip and prevents curling or overlapping if the tank is drained and thermal expansion takes place.

There are a lot of variables to consider, but a professional can assist with all of these.

### Chain & Scraper System Upgrade Success Stories

When demand increases, regulations change or plant equipment reaches the end of its useful life, it becomes necessary to upgrade, retrofit or rehabilitate existing clarifier systems. When systems fail, retrofitting clarifiers must be quick to keep operations online so as to minimize service disruptions.

One of the largest wastewater treatment plants in the U.S., Great Lakes Water Authority in Detroit, Michigan, relies on chain and scraper technology to meet heavy load requirements. The wastewater treatment plant (WWTP) treats approximately 650 million gallons per day and experienced overloading and downtime because of the age of its clarifier equipment.

By replacing molded non-metallic collector chains with Envirex HS730 high-strength loop chain, the Detroit WWTP functions as it should. The system now handles heavy load requirements with less wear and lower maintenance.

The WWTP in Grass Valley, California, which discharges approximately 2.1 million gallons of treated wastewater effluent per day, is another example of a WWTP that counts on chain and scraper systems. When their chain and scraper system reached the end of its service life, it was replaced with an Envirex chain and scraper sludge collection system from Evoqua. Despite a high-risk, compressed schedule, Evoqua moved quickly in providing new equipment. Now, downtime and maintenance issues have been minimized and solids removal has increased. The new equipment is expected to extend the operating life of the system for another 15 to 20 years. **WWD**

Allen Lepak is product manager of clarification systems for Evoqua Water Technologies. Lepak can be reached at [allen.lepak@evoqua.com](mailto:allen.lepak@evoqua.com).



# YOUR PARTNER FOR WATER SYSTEMS

## PERFORMANCE BEYOND THE PUMP

Franklin Electric is your single source for engineering, manufacturing, packaging, and technical support for water pumping applications in municipal, industrial, and commercial markets. Maximize performance beyond the pump and choose Franklin as your partner for water systems. [franklinengineered.com](http://franklinengineered.com) | [pioneerpump.com](http://pioneerpump.com)

Visit us at CONEXPO•CON/AGG  
**BOOTH C32929**

