

Detecting Contaminants in Stormwater Runoff with Hydro International

THE CUSTOMER

Hydro International (HI) is a global company based in the United Kingdom, with a local facility just down the road from Yokogawa Fluid Imaging Technologies in Portland, Maine. HI provides testing, equipment and solutions for the processing and treatment of water in a variety of industrial and municipal applications.

THE CHALLENGE

Contaminants in stormwater runoff that feed into our waterways are a leading cause of environmental pollution. Hydro International analyzes the content of stormwater and wastewater in order to provide solutions that prevent contamination utilizing machinery, cleansers, and filters.

Over ten years ago, HI decided that they needed a better method to quantify and analyze subvisible particulate in the samples they were testing. Previously tested methods, including laser diffraction and Coulter counters, provided size and concentration data, but could

not determine the shape or type of particles being studied. It was time for an improvement.

THE POWER OF IMAGES

The analysis of particles in stormwater runoff presents challenges that traditional detection methods have been incapable of overcoming. When only particle count and size are available, it is impossible to tell the difference between different types of particles of the same size. Manual microscopy can be used to visualize particles, however, this method is slow and laborious, and it is very difficult to analyze a statistically relevant quantity of water.

With a grant from the Maine Technology Institute, Hydro International was able to purchase a FlowCam flow imaging microscope that provides not only count, size, and concentration information, but high-resolution images with more than 40 corresponding morphological measurements.



In multiple method studies performed by Hydro International, FlowCam was successful at providing statistically relevant data alongside images, allowing HI to differentiate between solid particles like clean sand and more amorphous wastewater debris (Figure 1). HI separated these particle types by creating statistical filters based on morphological differences in properties like aspect ratio, roughness, and intensity. Figure 1 shows examples of sand particles which have more angular contours and higher intensity than the more flocculant-like particles.

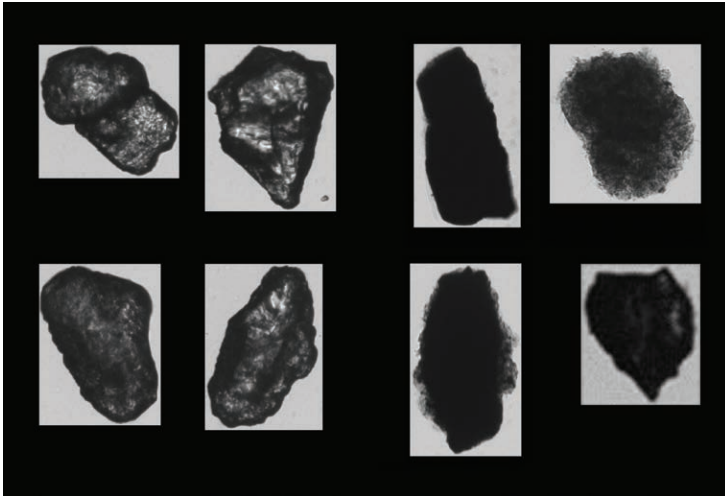


Figure 1. FlowCam images of clean sand (four images on the left) vs. wastewater grit (four images on the right)

With this new tool at their disposal, HI was able to analyze samples brought to them by their clients and determine the size and type of contaminants that needed to be mitigated against. They could then make the proper recommendations on what types of machinery and filters were necessary to improve the clients' water supply.

One such customer, a quarry in a northern region of Spain, enlisted Hydro International to test and make mitigation recommendations to reduce pollution from contaminants in stormwater including limestone, iron ore, cement, and petroleum coke. Industrial sites like theirs are subject to random permit inspections by local regulatory agencies and they need to be ready for inspection at any time.

Samples were shipped to Hydro International's laboratory in Portland, Maine to be analyzed. With FlowCam, HI was able to determine the size and composition of the pollutant particles and make appropriate recommendations for mitigation. FlowCam could then prove that HI's filtration system removed 100% of particles greater than 150 μm and more than 80% of particles 45 μm and larger.

In addition to analyzing stormwater runoff, Hydro International uses FlowCam to study the contents of manufacturing wastewater and process water. They have also committed resources to develop new FlowCam methods to assist a variety of industries with water treatment and purification.