OPTAN™

CASE STUDY:

# TURNER DESIGNS

## Optan UVC LEDs Enable Fluorometers for Real-Time Water Quality Monitoring

TURNER DESIGNS PROVIDES SENSITIVE, RELIABLE, EASY-TO-USE FLUOROMETERS FOR ENVIRONMENTAL AND INDUSTRIAL WATER QUALITY MONITORING. FOCUSED ON FLUOROMETRY FOR OVER 45 YEARS, THEY ARE THE LEADING SUPPLIER OF FILTER FLUOROMETERS IN THE WORLD.

### CHALLENGE

Fluorometers are used for real-time environmental monitoring because they are specific, require no reagents and can detect extremely low concentrations of compounds. Common examples of environmental monitoring with fluorometers include characterization of waters and identification of changes or trends in water quality over time, identification of existing or emerging water quality problems, responding to emergencies such as spills and floods, and determining compliance with pollution regulations.

Environments can greatly be impacted in circumstances where oils or fuels come into contact with water. Therefore, using simple methods for oil/fuel in water detection quickly provides information to help in mitigating these negative effects. For example, oil tankers can switch between carrying oil cargo and ballast water in their tanks. Quickly scanning ballast water using fluorescence detection for oil/fuel prior to discharge can help determine whether that water was contaminated. Similarly, in industrial facilities, real-time monitoring of oil in water allows operators to detect early leaks in systems, like heat exchangers, that lead to costly repairs if undetected. Crude and most refined oil products contain aromatic hydrocarbons that are highly fluorescent when excited using deep UV wavelengths, therefore fluorescence can be used for detection of oil in water.

In waterways and coastal environments, wastewater contamination is a serious problem. Around the world, 80 percent of wastewater is dumped—largely untreated—back into the environment causing widespread water pollution. During periods of heavy rainfall, the volume of water can overwhelm sewage treatment systems and untreated wastewater gets released back into the environment. We can use fluorescence to track wastewater with the help of specific parameters such as tryptophan fluorescence, using deep UV wavelength excitation and monitor sewage and farm waste contamination in our lakes, rivers and oceans. The ability to gather real-time data easily using simple methods such as in situ tryptophan fluorescence detection is a huge advantage for water quality monitoring.

Traditionally, environmental fluorometers operating in the deep UV wavelengths would use xenon flash or deuterium lamps. These sources have more complex circuitry and a higher cost of ownership in relation to solid-state light sources like LEDs. The use of LEDs also offers the advantages of reducing the footprint, weight and power consumption of the sensors. However, the adoption of UVC LEDs in fluorescence applications has been slow for two reasons: 1) Historically, low light output resulted in poor sensitivity and 2) Short lifetime of early commercial LEDs shortened lifetime of sensors. When developing their high performing Cyclops sensors, Turner Designs looked to Crystal IS for UVC LEDs with high light output and long lifetime.

"CRYSTAL IS OFFERS STABILITY OF SUPPLY FOR OUR FLUOROMETER PRODUCTS. SINCE WE SWITCHED TO THEIR OPTAN LEDS, QUALITY AND RELIABILITY HAVE BEEN A CONSISTENT HALLMARK. THIS HELPS US TO ENSURE CONSISTENCY AND QUALITY IN THE SUPPLY OF SENSORS TO OUR CUSTOMERS. THEY ARE A TRUSTED PARTNER IN OUR PRODUCT DEVELOPMENT."

**Pam Mayerfeld**
**VP of Marketing & Sales**
**Turner Designs**

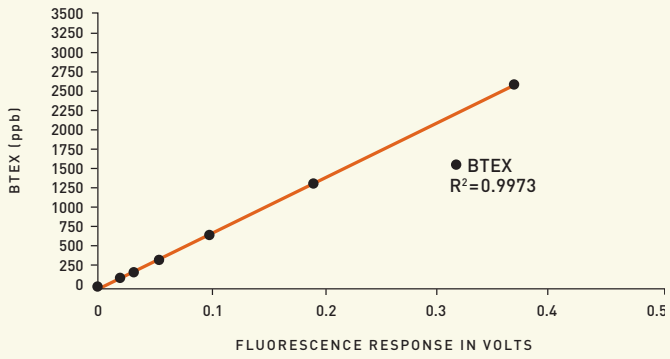

*Cyclops-7F Submersible Sensor*

## SOLUTION

Turner Designs' Cyclops sensor is a highly sensitive fluorometer for detecting oil and tryptophan in water as well as other parameters. The deep UV versions of the Cyclops rely on Optan UVC LEDs by Crystal IS (which emit UVC light in the 255 nm to 280 nm wavelength range) as the fluorescence excitation source and a detector with optical filters to target specific measurement parameters.

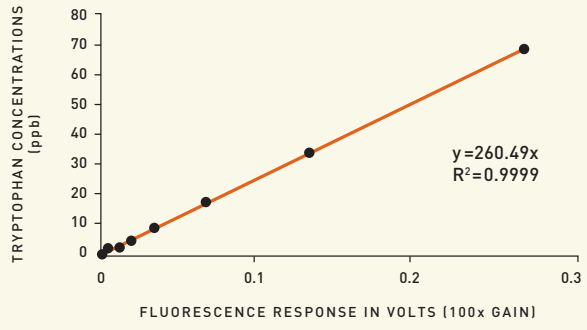
The figure below shows the response curve for the Cyclops fluorometer for refined oils in water. The high light output of Optan UVC LEDs enables a low detection limit of ~ 0.1 ppm. In addition, the spectral quality of the LED contributes to the linearity of measurement over nearly four orders of magnitude—all of which produces highly sensitive oil in water detection.

***Response Curve for a Refined Oil (BTEX) in Water***




Similarly, Cyclops fluorometers are easy to use for detecting tryptophan fluorescence over a range of concentrations. The fluorometers, utilizing three gains, have an overall maximum detection limit of ~20,000 ppb.

***Typical Tryptophan Response Curve***




## Advantage of Optan UVC LEDs by Crystal IS:

LEDS OFFER INSTANTANEOUS RESPONSE, LOW POWER CONSUMPTION AND DESIGN FREEDOM OVER TRADITIONAL LIGHT SOURCES. IN ADDITION, CRYSTAL IS DEEP UV LEDS PROVIDE:

- > HIGH LIGHT OUTPUT FOR TRACE DETECTION
- > LONG LIFETIME THAT EXTENDS MAINTENANCE PERIODS
- > EXCELLENT RELIABILITY THAT PROLONGS SENSOR LIFETIME

OPTAN™

70 Cohoes Avenue
Green Island, NY 12183
U.S.A.

sales@cisuvc.com
(518) 271-7375
www.cisuvc.com