

Abstract Submission

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Title

PeCOD[®] Inline COD Monitoring for Real Time Results

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PeCOD[®]

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Chemical Oxygen Demand (COD)

Biological Oxygen Demand (BOD)

Wastewater Treatment Plant (WWTP)

Remote Access

MANTECH specializes in simplifying process analysis for the water and wastewater sector. MANTECH is the proud manufacturer of the PeCOD[®], which is capable of measuring soluble Chemical Oxygen Demand (COD) in 15 minutes. The PeCOD[®] is a patented nanotechnology based approach for COD analysis that overcomes the limitations of current COD analysis methods for municipal wastewater applications. The quick analysis time allows process facilities to have access to COD data 24/7. The real time data is beneficial for plant operation and optimization.

The PeCOD[®] directly measures photocurrent charge originating from the oxidation of the organic contamination in a sample. The core technology that hosts the oxidation process is the PeCOD[®] sensor, which consists of a UV-activated nanoparticle TiO₂ photo catalyst

coupled to an external circuit. The oxidizing potential of UV-illuminated TiO₂ ensures that virtually all species will be fully oxidized giving a true measure of soluble COD. The high electrochemical potential of the TiO₂ gives the PeCOD a substantial advantage over the modest chemical potential generated by the dichromate method commonly used for COD analysis.

The PeCOD[®] is proven to be an excellent Biological Oxygen Demand (BOD) screening tool, providing accurate BOD estimates in just minutes versus the standard 5-day BOD test (BOD₅). Exceptional correlation can be observed between PeCOD[®] COD results and BOD, stronger in fact than seen between similar dichromate approach comparisons, due to the fact that PeCOD[®] does not require pre-digestion of the sample.

In 2015 MANTECH launched a commercialization effort to integrate the PeCOD[®] to the municipal and industrial wastewater markets to provide real-time soluble COD data. In this time MANTECH has installed an At-Line L100 PeCOD[®] COD Analyzer at one of Ontario's Clean Water Agency (OCWA) wastewater treatment plants in Mississauga, the Clarkson Wastewater Treatment Plant (WWTP). The PeCOD[®] system is located at the final effluent of the WWTP beside the BOD auto sampler. The At-Line L100 PeCOD[®] COD Analyzer samples and analyzes hourly where the BOD auto sampler collects a 24-hour composite sample that is sent to the lab for Carbonaceous BOD (CBOD). The system has been operating online consistently since November 2015.

A portion of the data can be seen in the below figure. Figure 1 displays hourly COD from the PeCOD[®] on the left axis and daily composite BOD on the right in mg/L. The data was collected from June to August 2016 with BOD values plotted when the sample was collected. The PeCOD[®] was successfully able to measure known events in real time that were occurring at the WWTP. One event was observed on July 25th 2016 when an aeration and final tank were taken offline for preventative maintenance creating a large load of organics. The PeCOD[®] immediately spiked above 150 mg/L on July 25th whereas the BOD result of 20 mg/L was not known until the beginning of August.

Hourly COD from PeCOD® and 24-Hour Composite BOD at Clarkson WWTP Final Effluent (mg/L)

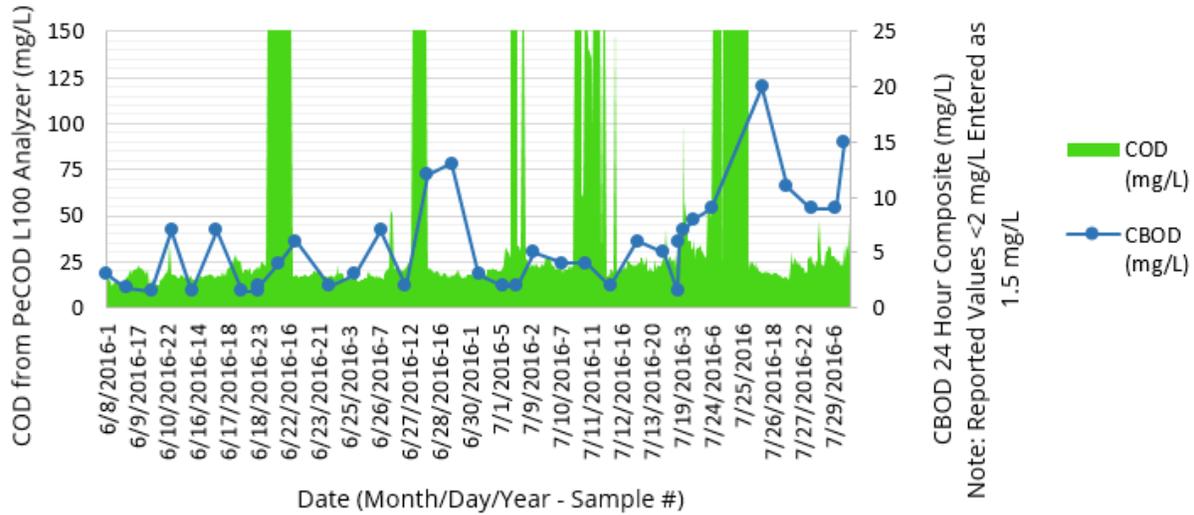


Figure 1: Graphical comparison of PeCOD® data to CBOD data from the final effluent of Clarkson Wastewater Treatment Plant in Mississauga Ontario. The PeCOD® data was collected hourly over the sampling period of June to August 2016. The PeCOD® passed quality control checks within 10% every 8 samples. The CBOD is a 24-hour composite collected daily in the mornings at the final effluent.

The At-Line L100 PeCOD® COD Analyzer at Clarkson WWTP's final effluent can not currently output data remotely and must be manually downloaded. MANTECH is currently in the prototype stages of providing a secure method of remote access for end users and operators to have ease of access to the data and receive notifications when required. However, MANTECH does offer a more industrial version of the At-Line L100 PeCOD® COD Analyzer, called the P100 PeCOD® COD Analyzer. The P100 PeCOD® COD Analyzer utilizes all the same components while offering a 4-20 mA output that can be sent to a control room to receive the COD values. The P100 PeCOD® COD Analyzer is currently installed in industrial settings all over the world but was not implemented at the Clarkson WWTP since there was inadequate sample flow for proper operation.

The PeCOD® can provide real-time regulatory screening for compliance and optimization of wastewater treatment processes. The green chemistry PeCOD® COD system can be integrated anywhere along the wastewater treatment process for fast analysis, ease of use, safe operation, and accurate results to aid in financial and environmental sustainability.