

Evaluation of a Novel and Green Online COD monitoring Technology for Canadian Pulp Mill Effluents

Authors: Brian O'Connor, Serge Genest, FPInnovations, Quebec, Canada
Stephanie Horner, Robert Menegotto, MANTECH, Ontario, Canada;

Email address of presenting author: Brian.oconnor@fpinnovations.ca

A novel and environmentally friendly method to measure soluble Chemical Oxygen Demand (COD), with on-line capability and a smart decision support system, has recently been developed by MANTECH. The photoelectrochemical Chemical Oxygen Demand (peCOD) technology is based on a UV-activated nanoparticle TiO₂ photocatalyst that utilizes a powerful oxidizing potential to ensure that virtually all organics will be fully oxidized giving a true measure of COD. The peCOD offers a unique and green approach that overcomes the use of mercury, dichromate and concentrated acid with the ability to generate results within a 15-minute time-frame.

FPInnovations conducted an evaluation of the bench top (L100) peCOD analyzer for a number of effluents from Canadian kraft and mechanical pulp mill operations. The peCOD method was applied in conjunction with the conventional dichromate COD method for comparison. Since the peCOD analysis is done on filtered samples, it was important to understand the impact of varying effluent solids on total COD. Standard dichromate COD testing demonstrated that the effluent solids represented less than 2% of the total COD and hence were not large contributors. In terms of reproducibility of the peCOD technology, the testing indicated that the analyzer showed excellent reproducibility between triplicate analyses. The correlation of the L100 peCOD and conventional dichromate COD method, for all of the effluent samples (i.e., primary or secondary treated, Kraft, TMP or BCTMP operations), demonstrated very good correlations with r^2 values between 0.92-0.99. Although the peCOD technology typically produced higher overall COD values than the conventional dichromate COD method, the excellent correlation between peCOD and dichromate COD indicated that the analyzer could be used to provide a quick estimate of the actual COD concentration of a particular stream. An evaluation of the online analyzer (P100), measuring COD on a 30-minute cycle in a recirculation tote, is currently under evaluation for a primary TMP and primary Kraft mill effluent. The results from the online peCOD testing will be reported in the presentation.

In a full scale application, a Chilean Mill recently employed a L100 peCOD unit to provide accelerated results to process engineers 8 times faster than the dichromate COD method. This led to a reduction in hypochlorite used for bleaching resulting in lower organics discharge to the wastewater plant and subsequent reductions in chemicals and energy used for treatment. At this site, the total savings over 12 months amounted to \$3 million dollars.