

ChemScan[®] Process Analyzer

Side by Side Evaluation

ChemScan[®] vs Tytronics and Zellweger

at the

Little Patuxent WRP
Howard County, MD

Published by:
Applied Spectrometry Associates, Inc.
2325 Parklawn Drive Suite I
Waukesha, WI 53186

INTRODUCTION

During late 1999, ChemScan participated in a demonstration project at Little Patuxent WRP, Howard County, MD. Tytronics and Zellweger Analytical were also participants in the demonstration prior to the arrival of the ChemScan system, although Tytronics withdrew their system prior to any data collection by the plant.

A ChemScan UV-4100 process analyzer was used during the demonstration for analysis of nitrate, ammonia and ortho-phosphate. Because the sample point selected by Howard County was in mixed liquor, ChemScan used a cross flow ultrafilter system. ChemScan typically uses either a positive displacement double disc pump or a submersible grinder pump to supply sample flow through the ultrafilter. At Howard County, ChemScan was requested by a manufacturer to evaluate a hose pump that claimed to produce the minimum sample flow and pressure desired by ChemScan.

Despite some issues related to pump and filter maintenance at this site (discussed below), plant personnel concluded that ChemScan is the "sole option for reliable nitrate results", and that ChemScan ammonia and ortho-phosphate data also correlated well with the plant laboratory.

Discussion of Evaluation Parameters

Plant personnel concluded that nitrate was the only parameter that could be controlled with on-line analyzer measurements. The plant recycles a substantial multiple of the daily flow (360%) in order to achieve denitrification in the anoxic basins prior to nitrification. ChemScan believes that direct analysis of ammonia and nitrite in addition to nitrate would prevent the occasional ammonia bleed through experienced at the plant, while avoiding excessive aeration. Excessive aeration carries a high energy cost and can also inhibit denitrification when high D.O. is carried to the anoxic tanks in the recycle. The plant believes that they can achieve the desired process results with analysis of D.O. and nitrate only.

Nitrite is an intermediate form of oxidized nitrogen which, if present after nitrification or denitrification, can indicate that the process is incomplete. The analysis of nitrite was offered by ChemScan but declined by the plant.

The analysis of ortho-phosphate was performed by ChemScan and, following the demonstration, was considered useful by the plant for control of alum addition.

Discussion of Demonstration Results

The use of a hose pump by ChemScan was clearly a mistake for this application. The hose pump suffered frequent mechanical problems and did not deliver a consistent flow of the ChemScan filters at the desired pressure. The key to reduced filter maintenance is to provide a continuous flow through the ultrafilter with sufficient velocity to scour the membrane surfaces. Adequate back pressure must also be maintained across the filter in order to produce enough filtrate volume for flushing and analysis. This was frequently not possible with the hose pump used during this demonstration project.

ChemScan believes that if adequate flow and pressure could have been reliably supplied by the pump, the interruptions in data collection could have been avoided, filter maintenance could have been reduced and filtrate volume would always have been adequate for analysis.

The demonstration project report by the plant indicated that the filters are secured with pipe fittings and that a step ladder is needed for filter maintenance. Quick disconnect fittings are now available for the filters. The step ladder was needed because plant personnel installed the filter using a unistrut structure that was installed for apparatus from a prior project. This resulted in filter being installed much higher off the floor than normally recommended by ChemScan.

The plant was unable to use the calibration adjustment software that was furnished by ChemScan because of differences in the windows operating system on the plant P.C. This ChemScan software is now available for all versions of Windows.

Economic Analysis

The economic analysis conducted by the plant was based on a single parameter (nitrate) and excluded the possibility of one system being used to monitor sample points in both the three existing basins and in a set of new four basins to be located next to the existing basins.

Had multiple parameters been considered or had a single system been allowed for all sample points, the price difference between the Zellweger system and the ChemScan system would have been insignificant.

Regardless of price, the ChemScan system “provided the data that correlated best with laboratory analysis... it is the one analyzer that can provide reliable nitrate data for wastewater.”