

Evaluation of modifications to a physicochemical method for determination of readily biodegradable COD

A Escalas-Cañellas^{1,2*}, MA Ortiz-Balderas² and MG Barajas-López^{1,2}

¹*Centro de Investigación y Estudios de Posgrado, Facultad de Ingeniería, Universidad Autónoma de San Luis Potosí, Av. Dr. Manuel Nava 8, Edificio P, Zona Universitaria, C.P. 78290, San Luis Potosí, SLP, Mexico*

²*Programa Multidisciplinario de Posgrado en Ciencias Ambientales, Universidad Autónoma de San Luis Potosí, Av. Dr. Manuel Nava 201, 2do piso, Zona Universitaria, C.P. 78210, San Luis Potosí, SLP, Mexico*

Abstract

In the Mamais-Jenkins-Pitt method for determination of readily biodegradable COD (S_0), 2 alternatives were proposed for the intermediate determination of soluble inert COD (S_i). When a full-scale treatment plant exists, influent S_i = effluent truly soluble COD. When there is no full-scale plant, then the truly soluble COD of the effluent of a 24 h fill-and-draw batch reactor treating the wastewater is taken as influent S_i .

In this study, both S_i methods were statistically compared on 24 wastewater samples from 2 municipal wastewater treatment plants (WWTPs). While average S_i obtained for the 2 methods was the same, individual samples usually had very different S_i values. In fact, virtually no correlation was found between the 2 methods. Also, the S_s values obtained using both S_i alternatives were statistically compared. A good correlation was observed, in spite of the poor S_i correlation – low, dispersed S_i values did not seriously affect the correlation between both S_s determinations. A method was proposed for determination of the limit of detection and the limit of quantification (LOQ) for both S_s methods. The LOQ resulted in 28.6 mg/l and 32.6 mg/l, respectively, for the full-scale and the laboratory-scale alternatives.

Some assumptions of the original laboratory-scale (LS) method could potentially be sources of error in S_i determination. Two modifications to the laboratory-scale method were implemented in order to avoid these potential problems: Washing biomass with tap water, and correcting S_i in the fill-and-draw reactor by the S_i of the original biomass suspension.

These method modifications were tested on wastewater samples from the mentioned WWTPs. The fundamentals and results of both modifications are discussed in this paper, as well as the imprecision associated with estimating influent S_i from effluent COD_{sol} in all studied methods, and its impact on S_s determination.

Keywords: readily biodegradable COD, physicochemical, wastewater