

Biosensor: An Approach towards Sustainable Environment

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Abstract : Introduction: River Yamuna, in the national capital territory (NCT), and also the primary source of drinking water for the city. Delhi discharges about 3,684 MLD of sewage through its 18 drains in to the Yamuna. Water quality monitoring is an important aspect of water management concerning to the pollution control. Public concern and legislation are now a day's demanding better environmental control. Conventional method for estimating BOD5 has various drawbacks as they are expensive, time-consuming, and require the use of highly trained personnel. Stringent forthcoming regulations on the wastewater have necessitated the urge to develop analytical system, which contribute to greater process efficiency. Biosensors offer the possibility of real time analysis. Methodology: In the present study, a novel rapid method for the determination of biochemical oxygen demand (BOD) has been developed. Using the developed method, the BOD of a sample can be determined within 2 hours as compared to 3-5 days with the standard BOD3-5day assay. Moreover, the test is based on specified consortia instead of undefined seeding material therefore it minimizes the variability among the results. The device is coupled to software which automatically calculates the dilution required, so, the prior dilution of the sample is not required before BOD estimation. The developed BOD-Biosensor makes use of immobilized microorganisms to sense the biochemical oxygen demand of industrial wastewaters having low-moderate-high biodegradability. The method is quick, robust, online and less time consuming. Findings: The results of extensive testing of the developed biosensor on drains demonstrate that the BOD values obtained by the device correlated with conventional BOD values the observed R2 value was 0.995. The reproducibility of the measurements with the BOD biosensor was within a percentage deviation of $\pm 10\%$. Advantages of developed BOD biosensor • Determines the water pollution quickly in 2 hours of time; • Determines the water pollution of all types of waste water; • Has prolonged shelf life of more than 400 days; • Enhanced repeatability and reproducibility values; • Elimination of COD estimation. Distinctiveness of Technology: • Bio-component: can determine BOD load of all types of waste water; • Immobilization: increased shelf life > 400 days, extended stability and viability; • Software: Reduces manual errors, reduction in estimation time. Conclusion: BiosensorBOD can be used to measure the BOD value of the real wastewater samples. The BOD biosensor showed good reproducibility in the results. This technology is useful in deciding treatment strategies well ahead and so facilitating discharge of properly treated water to common water bodies. The developed technology has been transferred to M/s Forbes Marshall Pvt Ltd, Pune.

Keywords : biosensor, biochemical oxygen demand, immobilized, monitoring, Yamuna

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