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Session V: Latest methods in waste water treatment

Newer developments and challenges in dye wastewater treatment

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Dr. Vinay M. Bhandari obtained his B. Chem. Engg. from UDCT in 1985 and Ph.D. from IIT Bombay in 1993. He is presently working as a Senior Principal Scientist and Professor-AcSIR, in the Chemical Engineering & Process Development Division of the CSIR-National Chemical Laboratory, Pune, India. He worked as a visiting faculty in the Chemical Engineering Department of Tohoku University, Sendai, Japan in 1998-99 and also as visiting scientist at Korea Institute of Energy Research, Daejeon, South Korea during 2004-05.



Dr. Bhandari has guided several graduate and post-graduate students and has worked as a consultant to many industries. His research interests include chemical/biochemical/environmental engineering, advanced separation processes, catalytic reaction, reactor engineering and industrial wastewater treatment, recycle and reuse. He has more than 140 publications/presentations and has filed 5 patents. He has recently co-authored a book entitled, "Industrial wastewater treatment, recycling and reuse" (Elsevier, 2014).

Abstract:

Dye wastewater treatment is a serious problem in dye manufacturing, plastic and textile industries and is threatening their very existence. Increasing use of refractory dyes that are largely non-biodegradable is adversely affecting the sustainability of the environment and survival of living species. Although a large number of effluent treatment technologies in conventional and advanced form are available worldwide, their assimilation in the domestic sector is limited because of smaller size of plants, poor plant machinery or old set-up, non-availability of skilled manpower, and most importantly, problems with techno-economical viability.

This presentation will address these challenges and discuss newer developments in established technologies such as coagulation, adsorption, and oxidation. It will highlight the utility of using a fresh approach in the form of novel biocoagulants/ coagulant blends for increased efficiency and reduced sludge generation. Newer materials/adsorbents for effective dye removal will be described. Application of hydrodynamic cavitation by employing a new device-vortex diode for degradation of different dyes will be discussed in detail. It is a simple variant of oxidation, requires no catalyst and operates at ambient temperature. It is highly efficient for degrading a variety of dyes, generates no secondary waste, is easy to operate and is believed to be cost effective as compared to other advanced treatment processes. Since the process strongly depends on the nature of dyes an empirical approach is required prior to its implementation. The presentation will discuss case studies involving synthetic dye wastewater as well as actual industrial dye wastewater treatment on laboratory/pilot plant scale using these newer developments. It will highlight the need to integrate these