



COMMON RESEARCH & TECHNOLOGY DEVELOPMENT HUB

ON CHEMICAL PROCESSES

DSIR-IITGN-CRTDH
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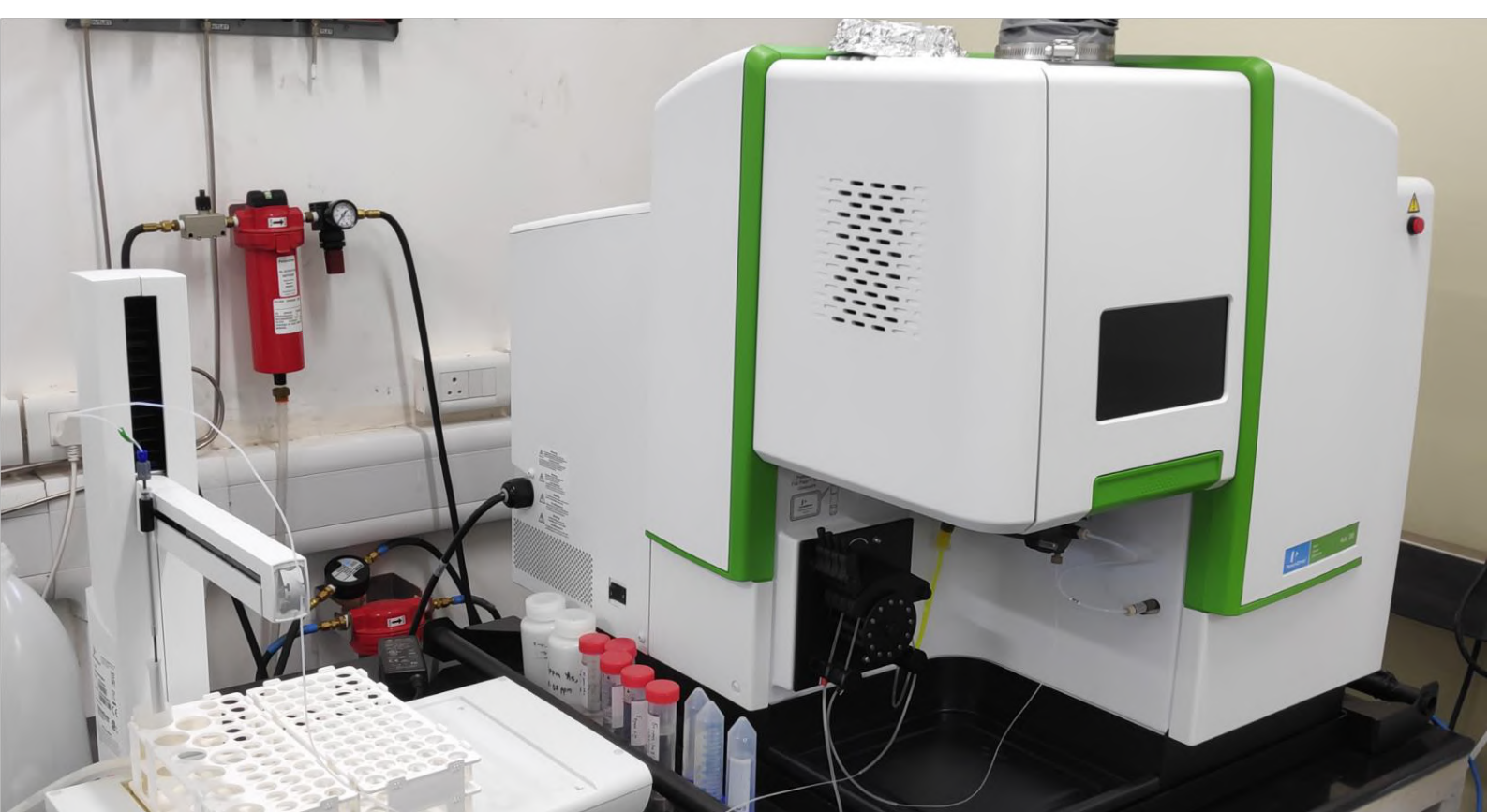
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The dominance of chemical industries in and around Gujarat shows economic prosperity of the region. However, effluents from these industries always remains a concern. The waste generation from the chemical industry and its proper treatment before discharging is a major environmental issue and it is preventing the growth of the industry. The effluent from industry such as pharmaceuticals, pigments, textile, dye and dye intermediates have very high COD, TDS along with the other undesirable contents. The release of this untreated wastewater pose a threat to the environment and causes serious problem to the ground as well as surface water. Moreover, as these industries are water intensive industries and many of the industries are working based on the older technologies which may requires optimization of water usage/recycling, process improvement etc.

In a major initiative to work with Industries and help them in improving their chemical processes, Department of Scientific and Industrial Research (DSIR) and IIT Gandhinagar (IITGN) together established a Common Research & Technology Development Hub (DSIR-IITGN-CRTDH) on Chemical Processes at IITGN, Palaj Campus, Gandhinagar. The DSIR-IITGN-CRTDH at IIT Gandhinagar is presently focussing on development and customization of various technologies for the Pharmaceuticals, pigments, dye and the textile industries. ***The objective of the CRTDH is to engage MSMEs and other chemical industries to enhance their capabilities in technology know-how on effluent treatment, waste reduction, process improvement, research on new products and testing (products/raw materials) etc.*** The facilities at DSIR-IITGN-CRTDH and the knowledge base of IITGN along with the other facilities at IITGN is serving as one-stop solution for chemical industries. The DSIR-IITGN-CRTDH welcomes industry members for collaboration. There are three different working models to sign a MoU between IITGN and industry partner(s).

1. **FLEXIBLE/ VIRTUAL MODEL:** The chemical industries may use DSIR-IITGN-CRTDH to develop their innovations for improving their process or effluent treatment or opt for virtual presence through technical support from the researcher at IITGN.
2. **LICENSING MODEL:** DSIR-IITGN-CRTDH may undertake the development for problems that are common to a sector and carry out prototype/pilot/demonstration plant in collaboration with a lead industry user unit. After the proof of concept demonstration, the technology will be available on license to other user units or to MSMEs for implementation in user units
3. **THE JOINT VENTURE MODEL:** one or more chemical industries can agree to pool their resources for the purpose of development of a new product/process/service. DSIR-IITGN-CRTDH will provide R&D support to the partner industries.



LAB FACILITIES @ DSIR-IITGN-CRTDH

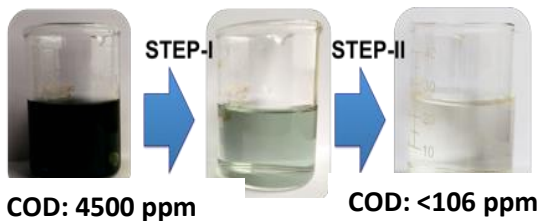
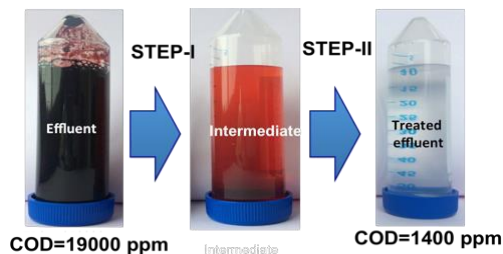
CRTDH is one of the state-of-the-art facility for chemical process and wastewater related research and development. The laboratory is equipped with sophisticated instruments like Inductively Coupled Plasma - Mass Spectrometry (ICP-MS)/ - Optical Emission Spectrometry (ICP-OES) for elemental analysis, Total Organic Carbon (TOC) analyser for carbon content, Multi-mode Plate Reader for microbial studies, Fluorescence Spectrometer and UV-Vis Spectrophotometer for determining optical properties of products and raw materials , High-performance thin-layer chromatography (HPTLC) for compound identification, Gas Chromatography for gas analysis and Spray Dryer for liquid to solid processing in the powder form. The facility also has water quality testing facilities like Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Bound Nitrogen (TNb) and Total Dissolved Solids (TDS).

In addition, facilities like and pilot scale facility are in the process of being installed. The facilities are open to industry partners for testing and process development against nominal charges depending upon the service. *In addition*, IITGN has several research facilities which are also accessible in the campus. Some of the major facilities are Field Emission Scanning Electron Microscopy (FE-SEM) with Energy Dispersive Spectroscopy (EDS), Atomic Force Microscope (AFM), X-ray Diffraction (powder and thin film), Liquid Chromatography – Mass Spectrometry (LS-MS), Nuclear Magnetic Resonance (NMR), Dynamic Light Scattering (DLS) and Zeta potential, Gas Chromatography (GC), Mass Spectrometry (MS), High Pressure Liquid Chromatography (HPLC), NIR Spectrophotometer, Fluorescence Spectrometer, Thermogravimetry (TG) – Differential Scanning Calorimetry (DSC), Particle Size Analyzer, FTIR-Spectroscopy, Atomic Absorption Spectroscopy, Optical Microscope, BET Surface Area, Peptide Synthesizer, Fast Protein Liquid Chromatography (FPLC), Inverted Epifluorescence Microscope, Fermenter, Rheometer, Surface Energy Analyzer, Contact Angle Analyzer etc.

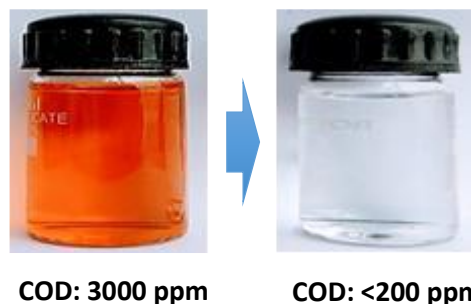
DEVELOPMENT @ DSIR-IITGN-CRTDH

Presently, the CRTDH is working with several MSMEs in and around Gujarat. Also, faculty members from Chemical Engineering, Chemistry, Biological Engineering, Materials Science Engineering, Earth Science, Civil Engineering and Mechanical Engineering are involved in several multi-disciplinary research projects such as process intensification, and water optimization, effluent treatment using bio-coagulation, advanced oxidation, membrane separation, etc. DSIR-IITGN-CRTDH has developed an improved and cost-effective two-step effluent treatment process to reduce the COD level by more than 90 - 95% (absolute COD is well within the permissible limit for CETP/ GPCB/CPCB). Representative results from a dye industry and textile industry is given below.

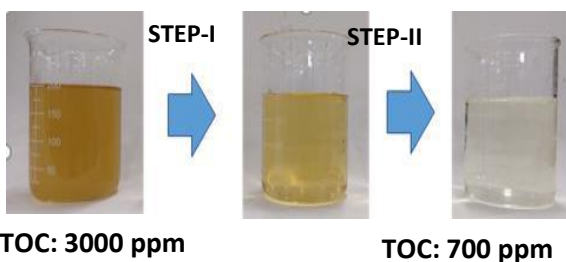
Dye Industry Effluent: Industrial dye effluent treated with bio-coagulant followed by adsorption in the second step resulted in the COD reduction up to 92%. The treated effluent can be sent to CETP or processed further to reuse the water in the process.



Textile Industry Effluent: After flocculation/coagulation, the effluent is treated by catalyst based advanced chemical oxidation which reduces the COD up to > 95%. The pilot testing is under process.



Chrome-Plating Industry Effluent: High concentration of Chromium (VI) treated with chemically reducing method followed by perception. The 99.7% total Chromium removal efficiency is achieved. In addition, COD and TDS reduction are found to be 93% and 43%



Pharma Industry Effluent: The effluent treated by Fenton's followed by Bio-coagulation. 75% TOC reduction is achieved. Pilot testing is under process.



PRODUCT TESTING @ DSIR-IITGN-CRTDH

The DSIR-IITGN-CRTDH helps industry partner to test their products in lab and conduct pilot scale/plant scale demonstration of product performance including solutions for industrial



WORKSHOP/TRAINING

The DSIR-IITGN-CRTDH also conducts free workshop / training program for industry partners free of cost.

The CRTDH is **working with about 45 industry members**. For any help, prospective industry partner can directly contact **Dr Chinmay Ghoroi**, the Principal investigator of the DSIR-IITGN-CRTDH (+91-79-2395-2405) or write to crtdh@iitgn.ac.in. For more details, please visit us at <http://crtdh.iitgn.ac.in>