

COMMON RESEARCH & TECHNOLOGY DEVELOPMENT HUB

ON CHEMICAL PROCESSES

DSIR-IITGN-CRTDH
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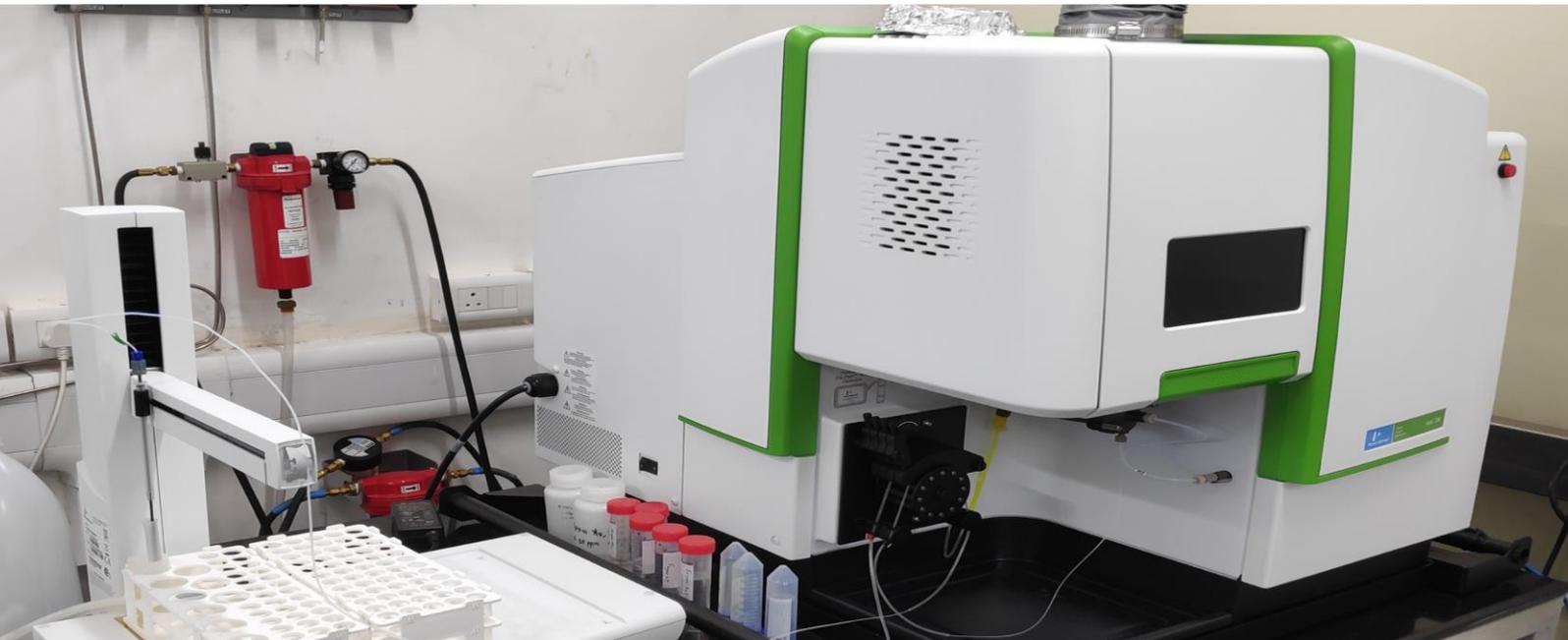


In a major initiative to work with Industries and help them in improving the chemical processes, Department of Scientific and Industrial Research (DSIR) and IIT Gandhinagar (IITGN) together established a **Common Research & Technology Development Hub (DSIR-IITGN-CRTDH)** on **Chemical Processes** at IITGN, Palaj, Gandhinagar. The DSIR-IITGN-CRTDH at IIT Gandhinagar is presently focussing on development and customization of various technologies for the chemical, 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 (intermediate, products/raw materials) etc.** The facilities at DSIR-IITGN-CRTDH (both *Lab* and *Pilot Plant*) 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, Quick COD and Fermenter, Centrifuge Machine etc. 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) and recently applied for NABL accreditation.



In addition, the pilot plant is equipped with several equipments targeted for process scale-up. Some of the equipment available in the facility are 1100 L SS Reactor (teflon coated) with agitator, 50 L jacketed reactor with agitator with heating and cooling arrangement, SS 316 Basket Centrifuge for separating solids from liquid stream, Spray dryer for forticle formation and drying, NI DAQ for controlling various process parameters such as pH, TDS, TSS, Temperature, Pressure and flow etc. 30 L teflon coated two stage SS reactors, standard separator and vacuum separator for water treatment, 1000 L skid mounted STP plant for sewage treatment adaptability, 4L Rotary Evaporators for synthesis, Skid for Membrane Distillation and Forward Osmosis (FO) with hydrophobic membrane system which separates two aqueous solutions, 2 kL MBR Plant for studying the both sewage and industrial effluents (installation pending), Reverse Osmosis set up (~10 LPM flow rate) for TDS reduction, 20 L reactor and distillation unit combination made up of borosilicate glass for separation by distillation process (yet to install), 5 L sequential continuous stirred tank reactor for studying reaction system etc.



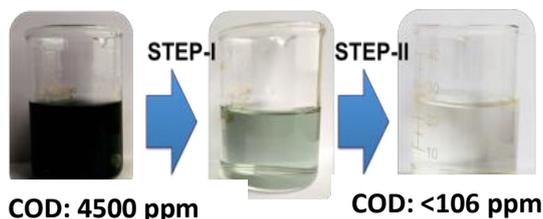
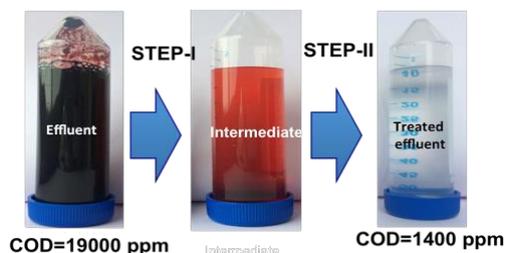
Facilities are open to industry partners for testing and process development against nominal charges depending upon the service. *In addition*, IITGN has several research facilities under Central Instrument Facilities, which are also accessible in the campus. Some of the major facilities are Field Emission 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 (LC-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, Transmission electron microscopes (TEM), Flow Cytometer, MALDI-ToF, Fluorescence Spectrometer, Thermogravimetry (TG) – Differential Scanning Calorimetry (DSC), Particle Size Analyser, FTIR-Spectroscopy, Atomic Absorption Spectroscopy, Optical Microscope, BET Surface Area, Peptide Synthesizer, Fast Protein Liquid Chromatography (FPLC), Inverted Epifluorescence Microscope, Fermenter, Rheometer, Surface Energy Analyser, Contact Angle Analyser etc.



DEVELOPMENT @ DSIR-IITGN-CRTDH

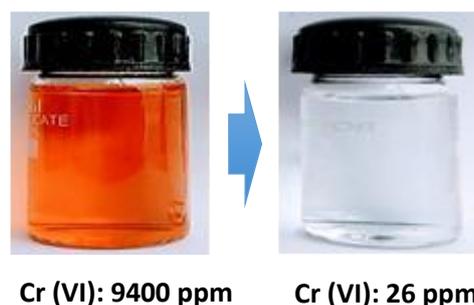
Presently, the CRTDH is working with several MSMEs in and around Gujarat. Also, faculty members from various disciplines such as Chemical Engineering, Chemistry, Biological Engineering, Materials Science Engineering etc. are involved in several multi-disciplinary research projects such as process intensification and optimization, effluent treatment using bio-coagulation, advanced oxidation, membrane separation, phytoremediation, aerobic treatment, design for adsorption process, design for absorption process, decolouration work, COD reduction work, Cr IV reduction, Batch to Continuous 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%. Here are few examples.

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%



CRTDH HELPING STARTUPS

CRTDH is also helping several startups. Entrepreneurs in the 'chemicals' space can bring their ideas and challenges to the CRTDH and benefit by leveraging the innovation / problem-solving capabilities that the CRTDH provides. The advanced laboratory and pilot plant facilities of CRTDH are available for testing their ideas. Also, association with IITGN Innovation and Entrepreneurship Centre (IIEC) ensures the access to space and office infrastructure including mentoring, connecting to investors, and networking.



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



WORKSHOP/TRAINING

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

The CRTDH is **working with several industry members**. For any help, prospective industry partner can directly contact **Prof. 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>