

CHAPTER-2

Industrial R&D Schemes

II Common Research and Technology Development Hubs (CRTDHs)

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COMMON RESEARCH AND TECHNOLOGY DEVELOPMENT HUBS (CRTDHs)

1.0 PREAMBLE

The Department of Scientific and Industrial Research (DSIR) is continuing to operate the 12th Five Year Plan scheme on 'Building Industrial Research & Development and Common Research Facilities' (BIRD-crf) with the sole component on Common Research and Technology Development Hubs (CRTDHs).

Common Research and Technology Development Hubs (CRTDHs) aim to enhance translational research and foster industry institution interaction targeted towards innovative product development.

DSIR extends grants to institutions for setting up of these hubs/centres, which include R&D facilities/ infrastructure, analytical test facilities, design centres, pilot plant production facility, demonstration units, product display centre, information etc. The facilities at CRTDHs are used by the Micro, Small and Medium Enterprises (MSMEs), Innovators and start-ups. The CRTDHs evolve a business model for self-sustainability and operate on a cost plus non-commercial basis.

In the first phase, during 2014-15, Department has approved setting up of following three CRTDHs:

Sl. No.	Location	Sector
1.	CSIR - Centre for Cellular and Molecular Biology (CCMB), Hyderabad	Affordable Healthcare
2.	CSIR - Institute of Himalayan Bioresource Technology (IHBT), Palampur	Affordable Healthcare
3.	CSIR - National Institute for Interdisciplinary Science & Technology (NIIST), Thiruvananthapuram	Environmental Interventions

In the second phase, during 2016-17, Department approved setting up of following four CRTDHs

Sl. No.	Location	Sector
1.	CSIR - Central Mechanical Engineering Research Institute (CMERI), Durgapur	Low Cost Machining
2.	CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani	Electronics / Renewable Energy
3.	Indian Institute of Technology, Roorkee (IIT-R), Roorkee	New Materials
4.	Indian Institute of Technology, Gandhinagar (IIT-Gn), Gandhinagar	Chemical Process



In the third phase, during 2018-19, Department approved setting up of following five CRTDHs

Sl. No.	Location	Sector
1.	CSIR-Central Drug Research Institute (CDRI), Lucknow	Affordable Healthcare
2.	Indian Institute of Technology, Kharagpur	Affordable Healthcare
3.	CSIR-Central Scientific Instruments Organisation (CSIO), Chennai	Electronics / Renewable Energy
4.	CSIR-Indian Institute of Toxicology Research (IITR), Lucknow	Environmental Interventions
5.	CSIR-Institute of Minerals and Materials Technology (IMMT), Bhubaneswar	New Materials / Chemical Process

1.1 Aims and Objectives

The CRTDH programme is aimed at creation of common research facilities equipped with analytical equipment and pilot plant facilities to facilitate and encourage innovators, startups and micro, small and medium enterprises for R&D and technology development. The highlights of objectives of the seven CRTDHs established in phase 1 and 2 are summarized below.

1.2 CRTDHs set up in first phase (2014-15)

Three hubs set up in first phase have identified the needs of the enterprises through seminars and workshops as well as through interaction with the MSME Development Institutes (MSME-DI), Directorate of Industries (DIC), S&T Councils and other state government bodies. Technological development involving MSMEs and host institutions in project mode has begun and several agreements have been signed with enterprises as well as state government agencies for the benefit of the MSMEs and start-ups.

1.2.1 CRTDH at CSIR- Centre for Cellular and Molecular Biology (CCMB), Hyderabad

The focus of CRTDH at CCMB is to support and nurture product development in the field of health care and modern biology covering inter alia, diagnostics, bio-pharma and medical devices. In particular, the products and technologies that are targeted, relate to development of DNA based diagnostic kits for

screening of eye infections, acute encephalitis, septicaemia, antibiotic resistance, and others.

CRTDH is located at the 4th floor of Medical Biotechnology Complex (MBC), CCMB Annex-II building in Habsiguda, Hyderabad. Around 10,000 sq. ft. of fully functional air conditioned facility has been created under CRTDH that can physically accommodate 6-10 incubatee companies. The CRTDH has all the essential facilities including modular lab tables, discussion tables, chairs, cubicles/partitions, modular movable tables with granite top and wheels, staff sitting room, a conference hall with sitting space for 30 people, band width of 8 MBPS and a video conferencing facility.



Fig. 1 CRTDH located at the 4th floor of Medical Biotechnology Complex (MBC), CCMB Annex-II, Habsiguda, Hyderabad



Fig. 2 10,000 Sq Ft. CRTDH Facility at MBC, CCMB Annex-II, Habsiguda, Hyderabad

All the equipment procured under CRTDH are placed for common usage and are fully functional. The hub engages innovators/startups by offering them facilities under CRTDH in addition to giving them practical training on use of major equipment in CRTDH. For the startups occupying space in CRTDH, dedicated space and modular tables have been allotted with virtual partitions. Identity cards have been issued to incubates and their staff. Currently five incubatee companies with 16 staff members are working in CRTDH.

During the year, a brochure on CRTDH was designed and printed by CCMB and the same is being distributed during seminars and meetings to popularize CRTDH. Besides, the institute has continuously strived to create an ecosystem whereby in addition to facility creation, efforts are being made to keep the resident researchers and staff apprised on how to take an innovative idea to the product stage. CRTDH has also conducted lectures, events, training programs, talks for innovators/staff of incubatee companies/researchers on topics related to: building a biotech startup company; prospects of MSMEs in healthcare sector especially in Telangana state; fund raising from venture capitalists etc.

As regards the achievements of CRTDH, a total of 07 companies have been incubated till date in CCMB-CRTDH out of which two companies have bagged BIG grant of ₹ 50 Lakh each while residing in CRTDH. The facilities and equipment under the hub

have been utilized by more than 60 industries till date. Also, more than 500 industries/innovators have been sensitized through over thirty workshops/seminars on equipment usage and entrepreneurship at the hub till date thereby reaching out to the innovators/enterprises to take up technology development and research in the area of affordable health.

Significantly, one of the resident company raised considerable funds from angel investors in the month of March 2018 and successfully graduated out of CRTDH in April, 2018. The CRTDH infrastructure including the cell culture facilities and other high-end laboratory equipment was crucial for the team to convince the funding agencies. Earlier, this multidisciplinary team of cancer research scientists working with a mission to enable personalized cancer therapy in India, wanted to access CRTDH facilities such as confocal microscopy, flow cytometry, next generation sequencing & cell culture facilities to develop a new diagnostic approach called 'Liquid Biopsy' based on 'circulating tumor cells (CTC)' or 'disseminated tumor cells'. Till 2015, they were operating from a partner lab in Hyderabad. They received Big grant and signed the lab lease agreement in August 2016 and wanted to use CRTDH facility as a prototyping lab for microfluidics chip development for a duration of 18 months. While residing in CRTDH, the team completed the milestone objectives of the project. The company is now a resident startup of Atal Incubation Centre-CCMB (AIC-CCMB) and uses the facilities of CRTDH as required.

1.2.2 CRTDH at CSIR - Institute of Himalayan Bioresource Technology (IHBT), Palampur

The CRTDH at IHBT, Palampur has been setup to take advantage of the institute's expertise in development of value added products such as thermo-stable enzymes, zero-calorie sugar substitutes etc. The hub aims to catalyse development of bio-pharmaceutical ingredients such as black carrot anthocyanin, beetroot betaine, mango peel carotenoids etc. by industries located in its vicinity.

The equipment purchased under CRTDH has been housed in a Pilot Plant, set up under

Natural Plant Products (NPP) Division and are functional.

Under the project, extraction of nutraceuticals from pomegranate peel and citrus peel has been done and their pilot scale trials are in progress. Optimization of anthocyanin rich fraction from Brassica Oleracea (wild cabbage plants), red rose and rhododendron has been completed and their pilot scale extraction trials are in progress. The team has also conducted initial trials for producing extruded snacks and wine from black carrot pomace. A schematic of processing of black carrot on pilot scale is given in Fig 4 below.



Fig. 3 Equipment available at CRTDH facility at IHBT, Palampur

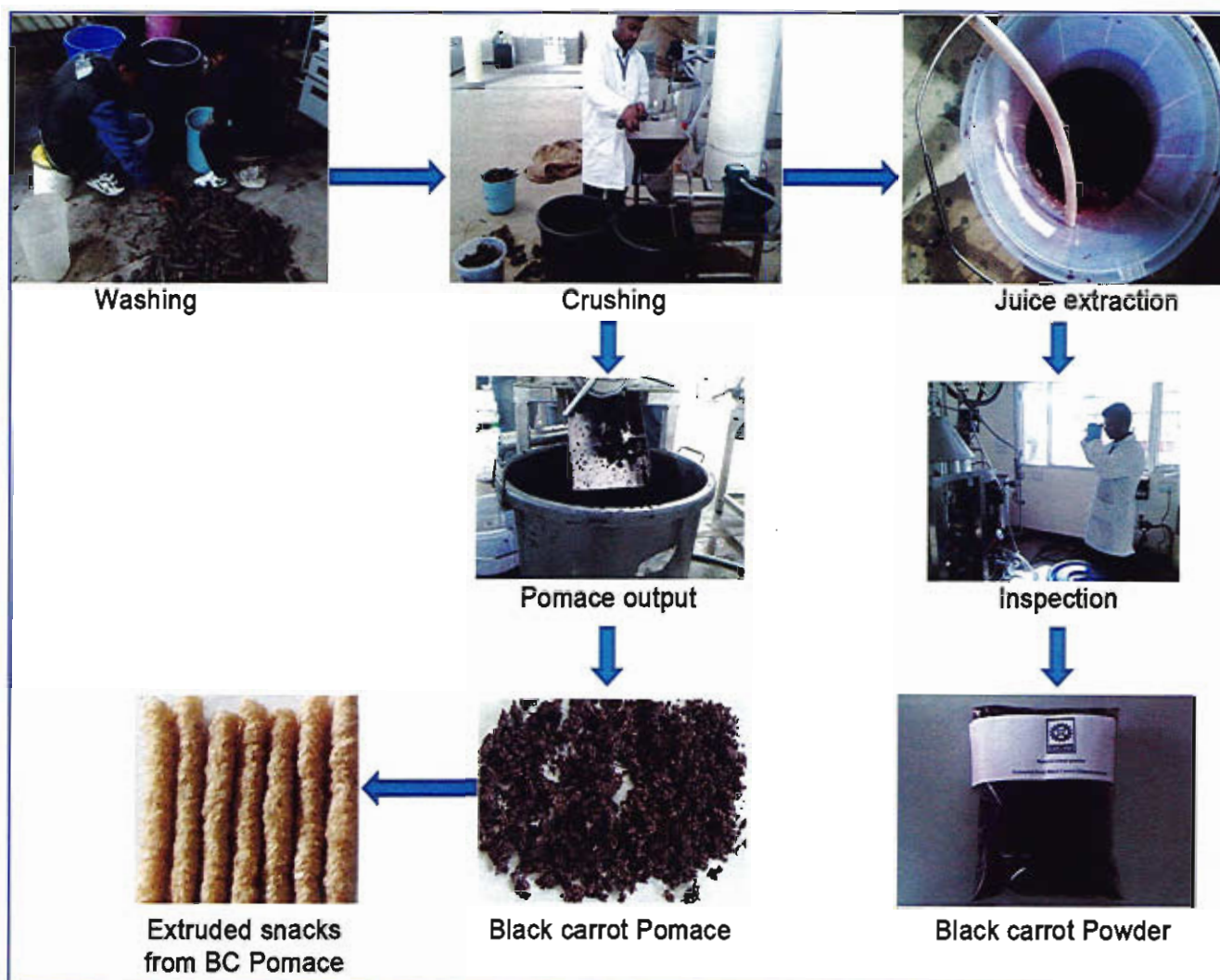


Fig. 4 Processing of Black Carrot on Pilot Scale at CRTDH-IHBT

Incubation of entrepreneurs has been initiated at IHBT, Palampur and a dedicated 'Incubation Centre' is being created where incubates/start-ups can carry out time-bound research projects/activities. CSIR-IHBT, Palampur has been identified as an 'Empanelled Incubator' under the 'Chief Minister's Startup/Innovation Projects/New Industries Scheme of Director of Industries, Shimla, HP to nurture new ideas/innovations and support them till they lead into commercial enterprises. Under the scheme, CSIR-IHBT has signed agreements with 13 incubates/start-ups for providing support for their entrepreneurial enterprise in areas such as crispy fruits, green coffee, processing of stevia leaves and its value added products, ready to serve healthy beverages such as medicated and ice kangra tea etc. As of May 2018,

institute had already received first year recurring fund of ₹ 10 lakh for facilitating 10 incubates in incubation facility. Besides incubates are being given ₹ 25,000/- pm as sustenance allowance for their projects for one year on recommendation by CSIR-IHBT and approval by Empowered Committee in Directorate of Industries, Shimla. These incubates are presently using facilities available under CRTDH. Thus, CRTDH scheme has catalyzed linkages with State's startup scheme and facilitated small industry and innovators to take up research & technology development activities including commercialization in select cases.

Presently, institute is in the process of establishing an incubation centre for food processing as part of CRTDH facility.



Fig. 5 Upcoming Incubation Centre for food processing

1.2.3 CRTDH at CSIR - National Institute for Interdisciplinary Science and Technology (NIIST), Thiruvananthapuram

The objective of CRTDH at NIIST, Thiruvananthapuram is to develop products and technologies addressing environmental issues. The institute's experience in technologies related to odour control, anaerobic treatment, nitrification treatment, water quality analysis and others are being used to provide R&D solutions to MSME's to improve their environmental performance.

Part of the equipment purchased under NIIST-CRTDH has been housed in Engineering hall of Process Engineering and Environmental Technology Division. The CRTDH team is currently working on a comprehensive scheme for municipal waste management in a project funded by Department of Environment and Climate, Government of Kerala. A 50kg prototype biodryer has been installed at the CRTDH facility for the purpose for collection of process data. Currently, report preparation for comprehensive MSW management for Kerala is ongoing.



Fig. 6 CRTDH facilities housed in Engineering hall, Process Engineering and Environmental Technology Division, NIIST, Thiruvananthapuram

Agilent GC Triple Quadruple MS, a major equipment procured under CRTDH has been installed and is fully functional for confirmatory analysis of dioxin and dioxin-like polychlorinated biphenyls (PSBS) which are highly toxic persistent organic pollutants (POPS) many of which have been linked to cancer, endocrine disruption & reproductive disorders. They are created as byproducts of industrial processes, pesticide manufacturing, combustion processes, etc. The Dioxin analysis facility, first of its kind in India is aimed to provide service for environmental management in MSMEs. During the year, GC-MS/MS method of validation was completed and recovery of radioactive-labelled dioxins during

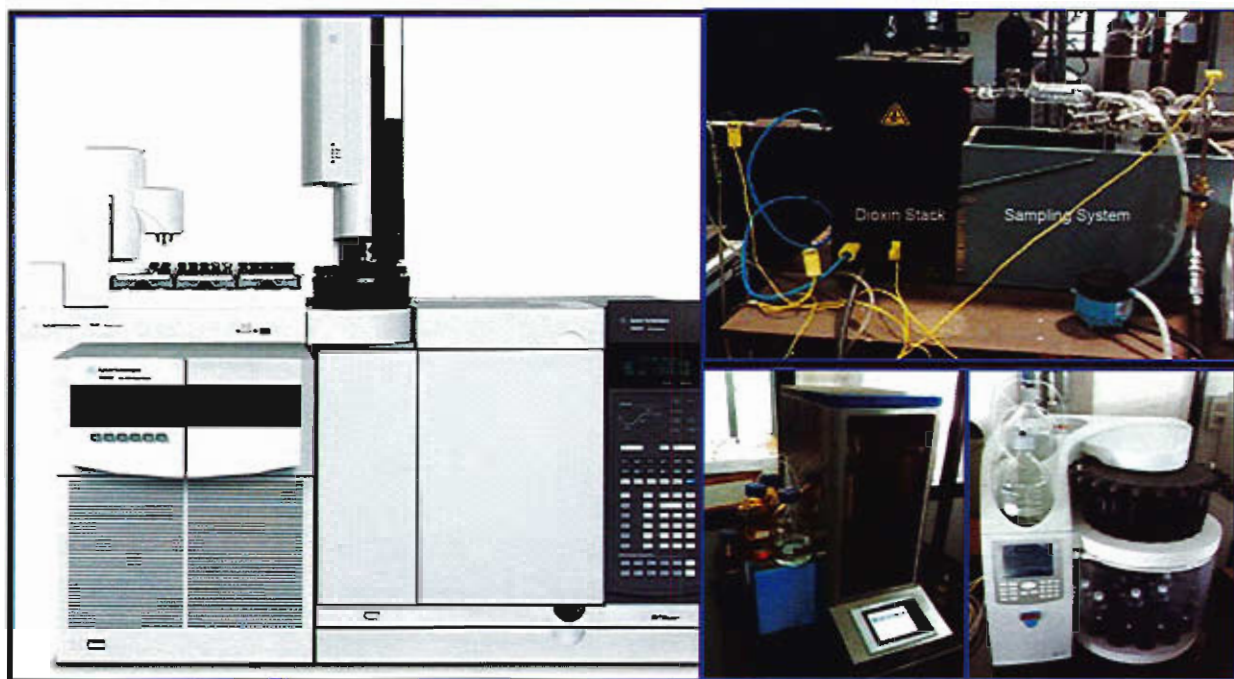


Fig. 7 Agilent GC-Triple quadruple MS for dioxin analysis; Sample preparation system and accelerated solvent extraction system

sample preparation was satisfactorily completed after suitable optimization of protocol. Analysis of ash from open burning sites was carried out. The facility can be used for sampling (air, soil, sludge, ash, food, feed), sample preservation, sample preparation (manual & automated) and confirmatory analysis using GC- MS/MS for dioxins, furans, dl- PCBs & indicator PCBs as well as mandatory reporting and reviewing of data as per the recommended format.

The above Dioxin analysis facility set up under CRTDH is currently being utilized for 'Determination of emission factors of dioxins from open burning of municipal solid wastes in Kerala', a project supported by Kerala State Pollution Control Board (KSPCB). This project was initiated by KSPCB when municipal waste collection was stopped by Corporation of Thiruvananthapuram and houses were forced to carry out waste disposal by them. In order to reduce the quantity of waste, street side dumps were periodically set on fire. The widespread open burning

of city wastes raised question regarding the emissions of dioxins. Under the project, the main objective is to generate authentic data and to create an inventory of dioxin emission from open burning of municipal solid wastes in Kerala. During the year, a simulated waste burning facility (Burn Hut) was constructed at CSIR-NIIST to carry out the waste combustion experiments. The air handling equipment, thermocouples, sampling systems and online data acquisition software have been installed for conducting simulated studies and optimization of analytical workflow. The study report has been submitted to KSPCB in December 2018 and the copies have been provided to MoEFCC, MoHUA and CPCB for necessary policy decision making in scientific solid waste management. The findings of the study were presented at the 38th International Symposium on Persistent Organic Pollutants (DIOXIN 2018) held at Krakow, Poland during 26-31 August 2018. The findings have been also published in Journal of Organohalogen Compounds, 2018 edition.

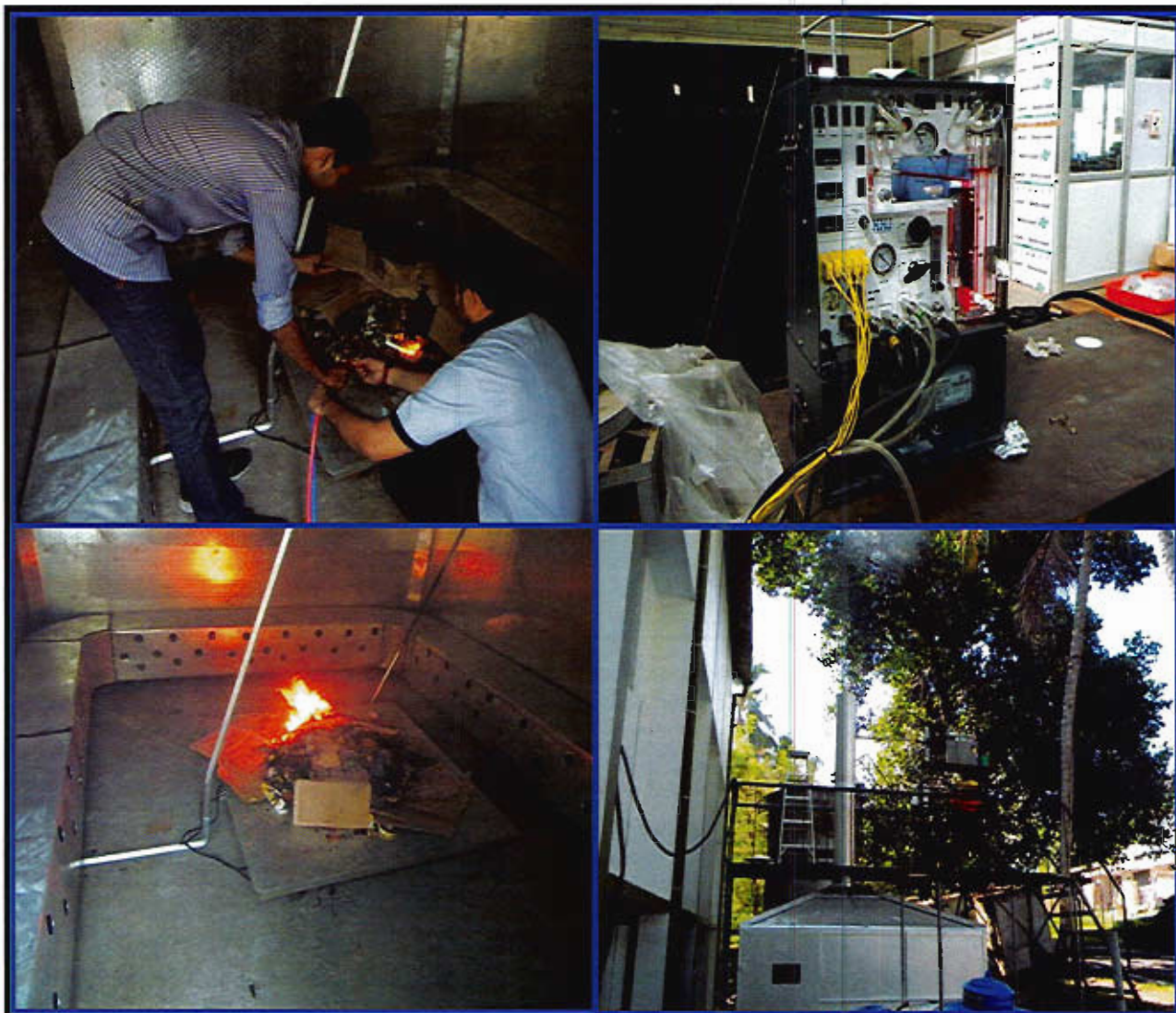


Fig. 8 Open burning simulated burn hut studies and sampling at CRTDH-NIIST

CSIR-NIIST is now the first institute in the country to carry out dioxin analysis. The Ministry of Environment & Forest has recommended CSIR-NIIST as a referral laboratory to carry out Dioxin Analysis for environmental clearances for use in areas such as Ship Breaking Yards, Airports, Common Hazardous Waste Treatment, Storage and Disposal Facilities, Ports and Harbours, CETPs, Common Municipal Solid Waste Management Facility, Building/Construction Projects, Townships and Area Development Projects. The institute had also submitted an application for NABL accreditation of dioxin analysis. CSIR – NIIST has been accredited as per ISO/IEC 17025: 2005 for carrying out dioxin and PCB analysis in environmental

(industrial stack, ambient air, soil, sediment, ash, residues etc.) and food and feed samples (fish and fish products, meat and meat products, milk and milk products, egg).

The team organized a one day workshop in collaboration with Agilent Technologies Inc. on “Advanced Analytical Solutions in Dioxin Analysis” on 5th January 2018 for stakeholders viz., members from Pollution Control Boards, officials of MoEF, companies and analytical laboratories, regulatory bodies like FSSAI etc. to introduce dioxin analysis and to provide insight to latest trends in sampling, sample preparation and quantification of dioxins.



Fig. 9 Workshop on “Advanced Analytical Solutions in Dioxin Analysis” on 5th January 2018 at CSIR-NIIST

Besides, the NIIST-CRTDH is also providing environmental solutions in terms of consultancy and technical services to hospital wastewater treatment plants, prawn feed factories, ice cream factories, fish canning factories etc.

1.3 CRTDHs set up in second phase

In the second phase, during 2016-17, the department approved setting up of four new hubs in the sectors of Low cost machining, New Materials/Chemical Process and Electronics/Renewable Energy. These hubs are currently engaged in activities like procurement of equipment, and setting up infrastructure and essential facilities for R&D. The hubs have started identifying needs of the enterprises through seminars and workshops as well as through interaction with the MSME-DIs, DICs, S&T Councils, industry representatives and associations and other state government agencies.

1.3.1 CRTDH at CSIR - Central Mechanical Engineering Research Institute (CMERI), Durgapur

The objective of the CRTDH at CSIR-CMERI is to meet the R&D requirements of MSMEs regarding improvements in product design & manufacturing involving sizing & shaping, patterns & finishing, special purpose machines, CAM for ensuring product conformity and automation. The centre proposes

to adopt a cluster approach for improving the manufacturing competence of these enterprises.

CRTDH located inside CSIR-CMERI is helping CMERI in striving towards establishing itself as a manufacturing hub. CRTDH has initiated interactions with various target clusters, viz. Bargachia Cluster of Metal Product Manufacturers, Howrah; Surgical Instruments Industry Cluster, Baruipur, 24-Parganas; Shuttlecock Manufacturing Cluster, Uluberia, Howrah; Fan Manufacturers Cluster Foundation of Bansdroni, Kolkata; Metal Casting Foundry Cluster, Howrah; Zari Embroidery Cluster, Sankrail, Howrah; Gems and Jewellery Cluster and Imitation Ornaments Cluster, Domjur, Howrah; Makhana cluster in North Bengal, Brass Cluster of Goghat; Oil expelling cluster of Dinajpur, etc. Under this CRTDH, a machine shop facility and near-net-shape manufacturing facility for Metal Injection Moulding (MIM) will be created. These will be used by the MSMEs for small production batches for market seeding. With the existing expertise and facilities, the copper nozzle for gas cutting/welding torch is being developed mainly targeting Bargachia Cluster of Metal Product Manufacturers. The copper nozzles are being developed through MIM route in a single step, whereby machining time, material wastage and ultimately cost will be saved substantially. This hub has so far organized two major events and around 46 small and micro enterprises have benefited.



Fig. 10 (a) CRTDH Building at CSIR-CMERI



Fig. 10 (b) Injection Moulding Machine



Fig. 10 (c) Copper nozzle (prepared with copper powder and binder)



Fig. 10 (d) Sintered Copper nozzle

1.3.2 CRTDH at CSIR - Central Electronics Engineering Research Institute (CEERI), Pilani

The MSMEs in electronics and renewable energy face several problems such as lack of access to modern technologies, state-of-the-art hardware and software tools to carry out innovative R&D, testing and technology upgradation, and advanced design engineering centres. The objective of the CRTDH at CEERI is to conduct high quality and relevant product oriented research to meet specific industry requirements; disseminate first hand research information to MSMEs/Start-ups for product innovation; create state-of-the-art facilities for engineering design and product evaluation; and ideate for innovative electronic products in collaboration with MSMEs.

DSIR-CRTDH is located at Jaipur in Malviya Industrial Area and is functional. Some of the major facilities that are in place include Grid-tied inverter test equipment system, design engineering facility, conference hall, video conference facility, incubation unit and centre of eminence for skill development. This hub has so far organized 7 major events and around 14 industries have drawn benefits from this Hub apart from generation of associated employment. Besides this, around 30 Member industries of Rajasthan Solar Association and around 25 Member Industries of Federation of Rajasthan Trade & Industry (FORTI) have visited the site and are at different stages of discussion for projects/technical services/consultancy.



Fig. 11 (a) CRTDH Building at CSIR-CMERI



Fig. 11 (b) CRTDH Building at CSIR-CMERI



Fig. 11 (c) Sputtering Facility at CRTDH

1.3.3 CRTDH at Indian Institute of Technology, Roorkee (IIT Roorkee), Roorkee, Uttarakhand

The seamless integration of high speed digital communication systems and the ever increasing usage of the mobile phones demand the shielding of harmful electromagnetic radiation which has an adverse effect on the human body. The objective of the CRTDH at IIT Roorkee is to work towards development of microwave absorbing materials and its characterization for social, stealth and electronics

applications. With the creation of such facilities under CRTDH, the institute is expected to meet growing challenges of enterprises regarding testing of microwave absorbing materials that have potential for various applications in the commercial as well as defence space.

Material testing and characterization involved in this CRTDH requires isolated space for each instrument/set-up. Therefore, IIT Roorkee has allotted separate space for the CRTDH and construction work for the same has been completed during the year. The team is in touch with MSMEs working in the field as well as MSME DI in the State for finalization of equipment related to free space measurement and the Radar Cross Section Reduction (RCS) measurement set up.

For publicity of CRTDH, a workshop on 'National Symposium on Microwave Absorbing Materials' has been conducted by the CRTDH team on 24-25th August, 2018 at IIT Roorkee. Earlier the team had participated in National Vendor Development Program (NVDP) organized by Ministry of Micro, Small and Medium Enterprise (MSME) during 15th-17th Dec, 2017 at ShriPremnagar Ashram, Haridwar where a presentation on CRTDH coming up at IIT Roorkee and facilities likely to be available for MSMEs was presented.



Fig. 12 CRTDH Presentation at National Vendor Development Program (NVDP) during 15th – 17th December, 2017 at Shri Premnagar Ashram, Haridwar

A stall exhibiting the posters on CRTDH was also set up where various MSMEs visited and interacted with the team.



Fig. 13 CRTDH Stall at the National Vendor Development Program (NVDP) during 15th – 17th December, 2017 at Shri Premnagar Ashram, Haridwar

1.3.4 CRTDH at Indian Institute of Technology Gandhinagar, Gandhinagar, Gujarat

Dyes and dye intermediates is one of the core chemical industries in India and mostly located in Gujarat. The waste generated from this sector is highly toxic/hazardous, difficult to treat and very large in quantum. The objective of the CRTDH at IIT Gandhinagar is development and customization of R & D requirements of different dye industries for both waste minimization and waste treatment. With

the creation of such facilities under CRTDH, the institute proposes to engage dye industries in nearby clusters and cater to their technical and R&D needs for management of dye effluent including testing requirements.

During the current year, CRTDH - IIT Gandhinagar has procured equipment and set up the essential facilities such as, chemical storage cabinet, working tables, instrument tables, island bench, hoods, etc. A dye process technology laboratory has been set up in Academic Block 5, Room No. 209.

Industrial R&D Schemes



Fig.14 CRTDH facility at IIT Gandhinagar, Academic Block 5, Room No. 209

Currently, three equipment viz., ICP system, fluorescence spectrophotometer and plate reader have been purchased and installed and process for procurement of other R&D equipment is ongoing.



Fig. 15 ICP-MS equipment at CRTDH - IIT Gandhinagar

For sensitization of the industry and publicity of CRTDH, IIT Gandhinagar has printed brochures of the CRTDH facility and upcoming workshops and also prepared a 3D-video of laboratory, which are being shared at various platforms. A Google webpage has been created (<https://sites.google.com/iitgn.ac.in/dsir-iitgn-crtdh>) that is constantly updated with CRTDH activities.

During the year, CRTDH at IIT Gandhinagar conducted two workshops viz., one-day workshop on "Reducing discharge of hazardous chemicals in dye and textile industries" on 24th October, 2018 in which about 47 industry representatives attended the workshop that focused on various problems of toxic discharge from dye and textile industries. Another one-day workshop was organized by CRTDH team at IIT Gandhinagar on "Use of ICP-MS to determine the toxic heavy metals in industrial effluents" on 31st October, 2018 in which about 14 industry partners participated.

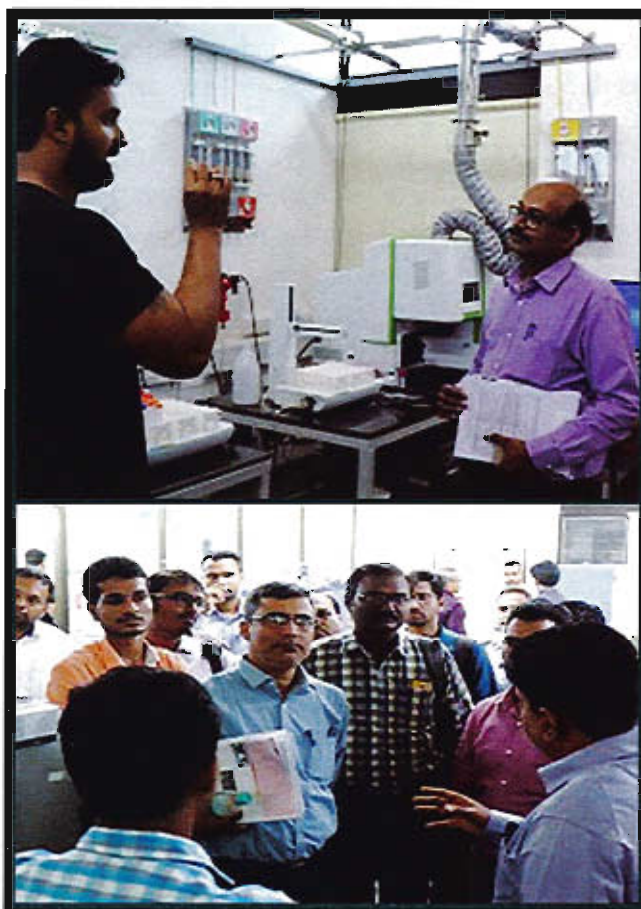


Fig. 16 Industry interaction during workshop(s) at CRTDH at IIT Gandhinagar



The CRTDH team has also visited 8-10 industries in Vadodara, Vatva, Naroda, and enquired about the general problems faced by them in manufacturing of dyes. The main problem areas identified included treatment of the discharged effluent having high COD and TDS, reduction of the usage of water and development of a process for recycling of water. Accordingly, the team is working on different techniques such as, bioremediation, adsorption, photo degradation and electro-coagulation for dye degradation and dye removal from effluents.

1.4 CRTDHs set up in third phase

In the third phase, during 2018-19, the department approved setting up of five new hubs in the sectors of Affordable Health, Environmental Interventions, New Materials/Chemical Process and Electronics/Renewable Energy. These hubs are currently engaged in activities like procurement of equipment, and setting up infrastructure and essential facilities for R&D. The hubs have started identifying needs of the enterprises through seminars and workshops as well as through interaction with the enterprises.

1.4.1 CRTDH at CSIR - Central Drug Research Institute (CDRI), Lucknow

The focus of CRTDH at CDRI is to set up and operate a Pharmaceutical Formulation Development and National Clinical Trial Batch Production Facility that will develop via Quality by Design (QbD) industrially-scalable process-cum-product technology packages for oral, topical and sterile products and manufacture batches of drug products and corresponding placebos for Phase I and Phase II clinical trials under Form 29 license from State Licensing Authority of UP. The hub also aims to establish and operate a Unit for GLP-compliant Pre-clinical and Clinical Bioanalysis (PK, BA, BE) and Drug Testing Laboratory (DTL) that will undertake activities pertaining to generation of chemical and pharmaceutical information on API and formulations; quality assurance, monograph and final/batch release specifications including Stability Studies; in vitro pharmacokinetics and metabolism; preclinical pharmacokinetics, absorption, distribution, metabolism and excretion; and bioanalysis for clinical pharmacokinetics, including bioavailability and bioequivalence.

1.4.2 CRTDH at Indian Institute of Technology Kharagpur

The focus of CRTDH at IIT Kharagpur is to design and develop a research and innovation hub for healthcare system through which rural healthcare KIOSKS, entrepreneurs, startups and MSEs can get support and facilities to carry out their research and development activities. The hub aims to develop novel portable devices that can be deployed at rural healthcare centres, for affordable quick and reliable diagnosis; taking the above products from bench to bedside (rural health kiosks); and provide training and consultancy to the MSE for skill development and augmenting technical knowledge. The CRTDH aims to collaborate with MSE to design and develop new diagnostic device and healthcare service related to point-of-care diagnosis for detection of multiple blood constituents, development of image-based diagnostic device integrated with a tele-control smart chair for diagnosing multiple health conditions, developing telemedicine software and systems etc.

1.4.3 CRTDH at CSIR-Central Scientific Instruments Organisation (CSIO), Chennai

The CRTDH at CSIO, Chennai centre is being set up to provide technical support, infrastructure and sophisticated analytical as well advanced research equipment facility to the local renewable energy and electronic MSMEs for carrying out competitive technological research to translate new ideas into marketable products. The hub aims at identifying and promoting actions that the local industrial community can take to accelerate the pace of innovation in renewable energy by way of testing and certification, skill development and serving as a platform for collaboration among industries, R&D, academia, government, civil society and selected innovation alliances who share a vision for a sustainable future.

1.4.4 CRTDH at CSIR - Indian Institute of Toxicology Research (IITR), Lucknow

The focus of CRTDH at CSIR-IITR is to promote and mentor R&D startups/MSEs as well as develop trained human resource with the objectives to foster cutting edge R&D in the area of water technologies and effluent treatment; drinking water disinfection and water quality assessment

technologies; technologies for treatment of industrial effluent from pulp and paper industries; build predictive models including source apportionment for air quality as well as pollution abatement; as well as develop customized training programmes / workshops for specific cluster to generate trained human resource. The hub shall train human resource through various skill development and workshop programmes. Through this hub, the institute aims to support industries on reducing pollution burden for safeguarding public health and environment.

1.4.5 CRTDH at CSIR-Institute of Minerals and Materials Technology (IMMT), Bhubaneswar

The focus of CRTDH at CSIR-IMMT, Odisha is to meet the emerging market needs for sustenance of a large number of MSEs working on processing

of metal, alloy and materials, chemical processes etc. in the state of Odisha by providing R&D inputs/ interventions. The CRTDH has gathered their unmet R&D needs and aims to develop customized coating and plating processes of metals/materials to suppress chemical corrosion and aberrations, for MSEs in the area of metal and metallurgy; utilize mineral and metallurgical waste for building of rural roads and pre-fab building structured units for rural housing; develop cost efficient polishing technology for gem and conch shell industries; create dedicated testing facility for chemical corrosion, structure, composition, optical properties etc., for MSEs in the area of metal, metallurgy and renewable energy; work on chemical process optimization, cost optimization and energy efficiency in chemical manufacturing; as well as providing services to MSEs for addressing environmental issues.



