

COMPENDIUM
On
**COMMON RESEARCH AND TECHNOLOGY
DEVELOPMENT HUB
(CRTDH)**
November 2022

**Electronic/
Renewable Energy**



**Low cost
machining**



**Affordable
Health**



**Environmental
interventions**



**New Materials/
Chemical Process**



Common Research and Technology Development Hub (CRTDH)
Department of Scientific and Industrial Research (DSIR)
Ministry of Science and Technology
Government of India

डॉ० जितेन्द्र सिंह

राज्य मंत्री (स्वतंत्र प्रभार)
विज्ञान एवं प्रौद्योगिकी मंत्रालय;
राज्य मंत्री (स्वतंत्र प्रभार) पृथ्वी विज्ञान मंत्रालय;
राज्य मंत्री, प्रधान मंत्री कार्यालय;
राज्य मंत्री कार्मिक, लोक शिकायत एवं पेंशन मंत्रालय;
राज्य मंत्री परमाणु ऊर्जा विभाग तथा
राज्य मंत्री अंतरिक्ष विभाग
भारत सरकार



Dr. JITENDRA SINGH
Minister of State (Independent Charge)
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Government of India

MESSAGE

With the vision of creating an enabling environment for nurturing Industrial Research and developing innovative products and processes among Micro, Small and Medium Enterprises (MSMEs), the Department of Scientific and Industrial Research (DSIR) has been implementing the scheme of 'Building Industrial Research & Development and Common Research Facilities (BIRD-crf)' that supports creation of Common Research and Technology Development Hubs (CRTDHs). The CRTDHs are dedicated for use by MSMEs

Since the inception of the scheme i.e. 2014-15, 18 CRTDHs have been established by DSIR across the country, with special focus on five sectors, namely, Electronics/Renewable Energy, Affordable Health, Environmental interventions, Low cost machining and New materials / Chemical Processes. During the last 8 years, there has been notable achievements made by these CRTDHs and MSMEs/Start-ups associated with the CRTDHs. The CRTDHs promote and lead towards indigenous development of products and services that strengthen the momentum for "Vocal for Local". We aim to take forward Prime Minister Shri Narendra Modi's vision of "Atmanirbhar Bharat" through the DSIR-CRTDHs.

I am happy to know that DSIR has come out with a compendium highlighting the achievements of each Common Research and Technology Development Hub (CRTDH) along with success stories of some of the MSMEs/start-ups associated with the CRTDHs. I am sure that this compendium will not only give opportunity to the all CRTDHs to showcase their achievements but also motivate new CRTDHs and MSMEs/start-ups to get associated with the DSIR-CRTDHs.

I wish DSIR all the best in this endeavor!

(Dr. Jitendra Singh)
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FOREWORD

The Department of Scientific and Industrial Research (DSIR) undertakes programmes to promote R&D by the industries and supports the industrial units develop state-of-the-art, globally competitive technologies of high commercial value. The programmes play a catalytic role for faster commercialization of laboratory-scale R&D, augment technology transfer capabilities, enhance the share of technology intensive exports in overall exports, strengthen industrial consultancy and establish a user friendly information network to facilitate scientific and industrial research in the country.

As we know, the Micro, Small and Medium Enterprises (MSMEs) play a very important role in the overall economy of India by promoting equitable development across the nation. They, therefore, need to be sensitized towards translation of public funded R&D into products and processes. Aligning with this goal, DSIR establishes Common Research and Technology Development Hubs (CRTDHs) in public-funded institutions having linkages with and proximity to MSME clusters.

These DSIR-CRTDHs provide a platform for demonstration of innovative R&D and technologies by the host institutions and encourage MSMEs to become a part of the innovation ecosystem. Thus, the primary objective of DSIR-CRTDHs is to encourage more and more MSMEs to take up R&D and innovation. 18 DSIR-CRTDHs established across the country provide state of the art R&D facilities to MSMEs and Research Institutes for translation of scientific knowledge and ideas into new products and processes. The facilities are being availed by the Micro, Small and Medium Enterprises, innovators and start-ups.

The compendium prepared by DSIR is a sincere effort for capturing glimpses of the activities of the DSIR-CRTDHs and the remarkable achievements of the DSIR-CRTDHs, MSMEs and other stakeholders. I am confident that this compendium will help in creating synergy between various DSIR-CRTDHs and complement each other in their R&D endeavours.

My best wishes to DSIR for this much needed effort!


(N. Kalaiselvi)

New Delhi
November 01, 2022



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GOVERNMENT OF INDIA
MINISTRY OF SCIENCE AND TECHNOLOGY
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From the Desk of Head, CRTDH

Over the past few decades, the Micro, Small and Medium enterprises (MSMEs) sector has evolved as a highly dynamic and vibrant sector which significantly contributes to the economic and social development of the nation. The innovation capacity of this sector largely depends on the access to financial and infrastructural resources to come up with the innovative technologies and products. Although MSMEs are endowed with the talented individuals, they often find it challenging to invest in R&D and technology development due to lack of access to suitable equipment, instruments, skill-sets, and other such resources. With the vision to ensure best possible support to MSMEs through various developmental measures, Department of Scientific and Industrial Research (DSIR) under Ministry of Science and Technology has initiated a program aimed at Building Industrial Research and Development-Common Research Facilities (BIRD-Crf) for creation of Common Research and Technology Development Hubs (CRTDHs). The CRTDHs not only provide research and technology development infrastructure to MSMEs but also encourages R & D activities in MSMEs by facilitating them to undertake new/improved product/process development, hands-on training & skill enhancement activities, research information facilities, business mentoring, networking and intellectual support, a holistic ecosystem which is essential for MSMEs to grow stronger in their R & D endeavor. As a result of this, MSMEs may make a difference by developing innovative products of world class standards having high commercial value, which can be exported to global destinations. This is expected to boost the economy as well as societal development by nurturing entrepreneurial mindset and creating large pool of employment at comparatively lower capital cost.

Through BIRD-Crf, DSIR has extended funding support to 18 CRTDHs nationwide, with special focus on sectors such as Electronics/Renewable Energy, Affordable Health, Environmental Interventions, Low Cost Machining and New Materials/Chemical Processes. Each of these CRTDHs are supported at Indian Institute of Technologies, Research institutions and Universities based on geographical location and evaluating their expertise and capability to create conducive ecosystem for MSME clusters around them to support their R & D efforts. Over the years, the 18 CRTDHs supported by DSIR have created an excellent impact by developing an infrastructural ecosystem for R & D, sensitizing and engaging large number of MSMEs for R & D activities, developing/transferring technologies, generating intellectual property, fulfilling last mile societal needs etc. and it will continue to impact the MSME sector to bring positive outcomes in the years to come.

This compendium presents brief information about the CRTDHs that have been supported by DSIR, achievements of MSMEs/start-ups who have successfully utilized the facilities at CRTDHs and the impact they have been able to make at regional and national level. The infrastructure and expertise available at each CRTDH will be extremely beneficial to create an optimal environment for MSMEs, start-ups and innovators to grow exponentially.

(Dr. Sujata Chaklanobis)

COMMON RESEARCH & TECHNOLOGY DEVELOPMENT HUB (CRTDH)

Introduction:

DSIR undertakes programmes to promote R&D by the industries and to support the industrial units develop state-of-the-art globally competitive technologies of high commercial value, catalyzing faster commercialization of laboratory-scale R&D, augment technology transfer capabilities, enhance the share of technology intensive exports in overall exports, strengthen industrial consultancy and establish a user-friendly information network to facilitate scientific and industrial research in the country.

MSMEs in India contribute about 29 per cent to the country's GDP. MSME sector is therefore, often referred as the backbone of Indian economy. To remain competitive, MSMEs need to adopt new technologies and make efforts to do meaningful Research & Development. However, MSMEs often find it difficult to invest in R&D and technology development activities due to lack of access to suitable equipment and infrastructure. In view of this requirement of MSMEs, DSIR has initiated a program aimed at creation of Common Research & Technology Development Hubs or CRTDHs, to encourage research and technology development activities by MSMEs.

The CRTDH program was launched during FY 2014-15. 18 CRTDHs are being established in sectors such as Electronics and Renewable Energy, Affordable Health, Environmental Interventions, Low Cost Machining and New Materials and Chemical Process. The DSIR-CRTDHs have presence in 14 states of the country. These hubs facilitate MSMEs to undertake new and improved product and process development and skill enhancement activities.

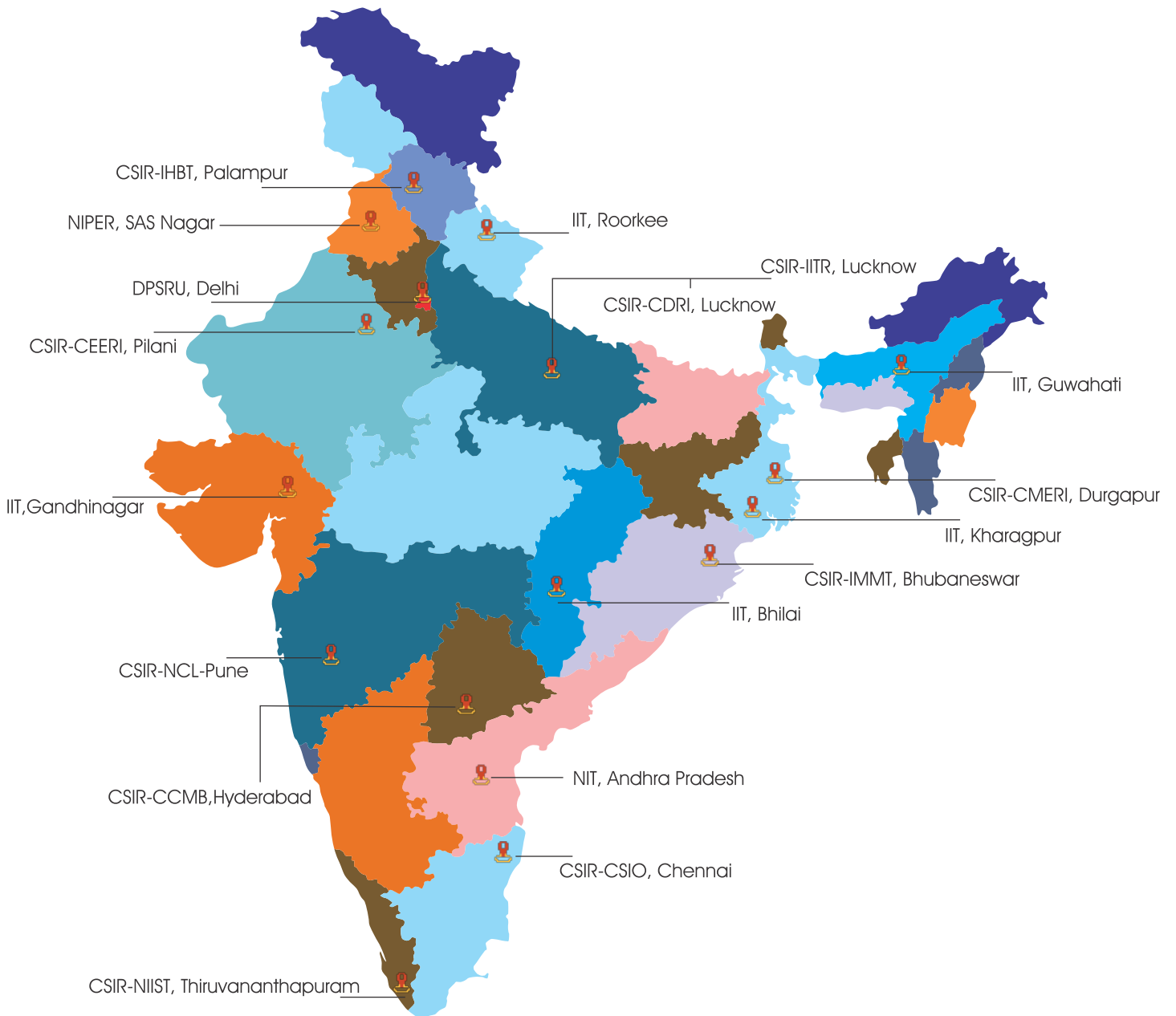
The collaborating institutions extend hands-on training, skill development and research facilities to the MSMEs. Creation of these CRTDHs will enhance productivity, increase the innovative skills of the MSMEs and help them become globally competitive, and also generate more employment.

During the time of COVID-19 pandemic, our CRTDH's repurposed their activities and focused on developing novel technologies for the treatment and diagnosis of COVID-19. All our CRTDH's are encouraging MSMEs to engage in R & D activities and helping them by providing necessary infrastructure and also intellectual inputs. We aim to expand the network of CRTDHs across India to achieve our vision to enable India to emerge as global Industrial and innovation hub.

AIMS & OBJECTIVES:

- i. To enhance productivity and competitiveness of MSMEs by providing assistance in technological problem-solving and capacity building.
- ii. To provide partial financial support as Grant-in aid to establish CRTDHs for industrial R&D innovation dedicated for Micro and Small Industries.
- iii. To facilitate MSMEs to conduct their research and development activities, including testing of innovative products and new technologies, with special focus on sectors namely Electronics/Renewable Energy, Affordable Health, Environmental interventions, Low cost machining and New materials / Chemical Processes through infrastructure and equipment established at CRTDHs.

Pan India Presence of DSIR-CRTDHs



**CRTDHs Supported in
Phase I (FY 2014-15)**

Brief Introduction

Department of Scientific and Industrial Research (DSIR) has set up a Common Research and Technology Development Hub (CRTDH) at CSIR – Centre for Cellular & Molecular Biology, Hyderabad in the sector affordable healthcare, with priority areas of diagnostics, and biopharmaceutics. The intent of this hub was to provide sophisticated analytical services and advanced research equipment facilities to the MSMEs. With the right facilities, ecosystem, and investment, MSMEs can conduct competitive technological research to produce value-added, marketable products and services. Since its inception, CRTDH – CCMB has facilitated industry-institution interactions through various engagement programs and events. One of the mandates of this center is to encourage MSMEs to translate leads from CSIR labs as well as translate their own early-stage innovations into products/enterprises.

- **Total area of CRTDH:** 10,000 sq. feet
- **Focus area and objectives: Affordable Healthcare**
 - i. Establish a dedicated CRTDH in CCMB for affordable health for benefit of MSEs.
 - ii. Carry out quality R&D in the frontier areas of healthcare for diagnostics and biopharmaceutics for cancer, infectious diseases etc.
 - iii. Encourage SMEs to participate in R&D to convert innovative ideas to proof of concept.
 - iv. Establish collaborations with MSEs for joint projects and funding in healthcare.
 - v. Disseminate R&D knowledge to convert innovations into valuable products/processes.
- **Specialization of work at CRTDH:**
 - i. Diagnostics: Currently projects are underway for cancer, infectious diseases like SARS –Cov-2, tuberculosis
 - ii. Bio-Pharmaceutics: Drug repurposing, biosimilar, novel therapies for the treatment of SARS –Cov 2
 - iii. Medical Devices: Ultra-pure water device and others
 - iv. Technology-led interventions in healthcare for genomics
- **Technological solutions developed, support for industry:**
 - i. Oncosimis Pvt Limited: AcceTT® and BacSec® for large-scale manufacturing of a wide range of biological drugs
 - ii. Althion Tech Innovations Pvt Ltd - Water purifier for dialysis applications & Tabletop water filter for type-1 &2 water supply
 - iii. Sarvotham Care Ltd: Anti-oxidant, anti-inflammatory, immunomodulatory activities of selected medicinal/herbal extracts using in vitro & ex-in vivo systems.
 - iv. Pulse Pharmaceuticals Pvt Ltd: CAR-T & CAR-NK Products for Human Malignancies
 - v. Virupaksha Lifesciences Pvt Ltd: Technology Development for Generic Biosimilar Peptides/Proteins
 - vi. Theranosis Life Sciences Pvt Ltd.: Comprehensive Liquid Biopsy for Finding Suitable Therapeutic Interventions
 - vii. SirfbioPvt Ltd.: Design and Development of automated Nucleic acid extraction system integrated with Real-time PCR
 - viii. BioArtis Lifesciences Pvt Ltd.: BioArtis WSSV PCR Detection kit, BioArtis EHP PCR Detection kit, BioArtis IHNV Detection kit



- **State of the art facility and R & D support and services to MSME:**

- 10,000 sq. ft air-conditioned space for MSEs to present physically or virtually
- Open lab facilities with access to industrial biological equipment
- Customizable plug-and-play wet lab space with access to high-speed internet, basic utilities, parking space, security etc.
- Modular movable tables with granite tops and wheels, desk tables/ carols with lock and key
- Round tables for discussions with up to 20 people
- Sophisticated instruments like Microarray, Proteomics Facility, Automatic DNA Sequencing, Advanced Microscopy and Imaging, Cryo-transmission Electron Microscopy and Scanning Electron Microscopy, X-Ray Crystallography Facility, High Throughput (HT) Crystallization Facility, Bioinformatics and NMR facility
- 30 seater conference room
- Subsidized canteen facility for staff
- Access to affiliated labs and industries

- **Skill development workshops:** Quarterly training sessions, skilling workshops, networking events

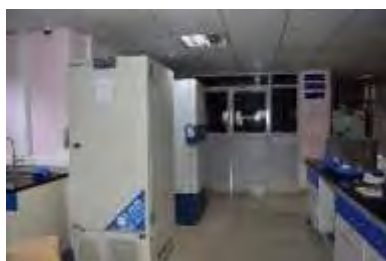
- **Total MSME/Industry served:** Over 100

- **Impact created for societal problems:**

- Oncosimis Pvt Limited: Rapid and high-throughput screening of 2019-nCoV.
- BioArtis Life Sciences Pvt Ltd: One-step nucleic acid amplification for the detection of Covid-19 using LAMP (Loop mediated isothermal amplification) as a simpler and affordable molecular test alternative to RT-PCR.
- Kommareddi BioPharma Pvt Ltd: Identifying Protein-Small Molecule Interactions of FDA approved drugs to SARS-CoV-2 Proteins by deploying high throughput screening for rapid drug repurposing.
- Althion Tech Innovations Pvt. Ltd: Emergency pandemic ventilator (Collaboration with T-works, Govt. of Telangana).
- SirfBio Pvt. Ltd: Automated nucleic acid extraction device for isolating RNA from Covid-19 test samples.

- **Services offered to MSMEs:**

- R&D Infrastructure
- Product validation
- Prototyping
- Business mentoring
- IP guidance from domain experts
- Connect with acceleration programs and funding avenues



Contact Details:

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CRTDH

CSIR–Institute of Himalayan Bioresource Technology, Palampur

Sector: Affordable Health



DSIR
DEPARTMENT OF SCIENTIFIC
AND INDUSTRIAL RESEARCH

Brief Introduction

CRTDH set up at CSIR-Institute of Himalayan Bioresource Technology, Palampur in the area of Affordable Health helps to carry out quality R&D in frontier areas of health care and nutraceutical development. Technical competency and facilities exist within the institute to guide the start-ups for networking, infrastructure development, awareness and up-scaling in the area of food processing, nutraceuticals, enzymes, aromatic and medicinal plants. Facilities for the distillation of essential oil, extraction of steviol glycosides, cell and tissue culture units are also made available for the benefit of the individuals, start-ups and entrepreneurs during their incubation period. Earmark incubation facility in separate building has been fully developed in CSIR- IHBT. Complete installation of commercially ready to eat canning unit and Freeze drying unit has been installed.

- **Total area of CRTDH:** 2000 sq. feet
- **Focus area and objectives: Affordable Healthcare**
 - i. Designing and development of nutraceutical and natural colorant extraction and purification at pilot scale level.
 - ii. Quality, stability and functionality assessment of purified ingredients with respect to health and wellness.
 - iii. Training and demonstration of pilot scale processing of colorant and nutraceutical ingredients for MSE's cluster development in the selected region.
- **Specialization of work at CRTDH:**
 - i. **Natural colorant:** Non-hygroscopic, crystalline in nature, Readily soluble in water and alcohol, Improved stability and shelf life of product, Green and cost-effective process & Safe for human consumption.
 - ii. **Nutraceutical:** Utilization of waste material from mango, citrus and Pomegranate, Nutraceutical with different health benefits.
 - iii. **Functional foods:** Chemicals and Preservatives free, Preservation of aroma and taste of the packaged food for 12 months, Healthy benefits with prebiotic attribute, Ready-to-Eat as open and serve, Source of protein & fiber, Empowering local communities through outsourcing of ingredients.
- **Technological solutions developed, support for industry:**
 - i. An eco-friendly green process has been developed for the extraction of natural colors from plant and vegetable sources.
 - ii. Standardized processing technology for the development of Nutraceutical and their application.
 - iii. Indigenous technology for commercial production of ready-to-eat food and
 - iv. Production of crispy fruits/vegetables to reduce post harvest losses.



- **State of the art facility and R & D support and services to MSME:**

- 2,000 sq. ft space for MSMEs
- Earmarked incubation facility, available under CRTDH, has been fully developed in a separate building in CSIR- IHBT campus.
- Complete extraction and drying processing unit of anthocyanin and natural colorant has been established.
- Complete installation of canning unit for ready-to-eat foods
- A complete freeze-drying processing unit for fruits and vegetables has been created.
- Packaging and storage facility for raw material and final products established.

- **Skill development workshops: 21**

- **Total MSME/Industry served: 07**



- **Impact created for societal problems:**

- Major processing facilities at CSIR-IHBT campus are made available for usage by the MSMEs such as: Canning unit for ready-to-eat food products, Crispy fruit making pilot scale unit and Extraction of steviosides from stevia etc.
- Complete extraction and drying processing unit of anthocyanin and natural colorant has been established.
- Complete installation of canning unit for ready to eat foods
- Complete freeze-drying processing unit for fruits and vegetables has been created.
- Packaging and storage facility for raw material and final products established.
- Strong linkage forged with MSMEs and individual entrepreneurs (start-ups/ stand-ups) to encourage them to utilize the facilities of the incubation centre.

- **Services offered to MSMEs:**

- Advisory services
- Proof of concept program
- Incubation program
- Customized program
- Training and demonstration hub
- Equipment usage



Contact Details:

Director

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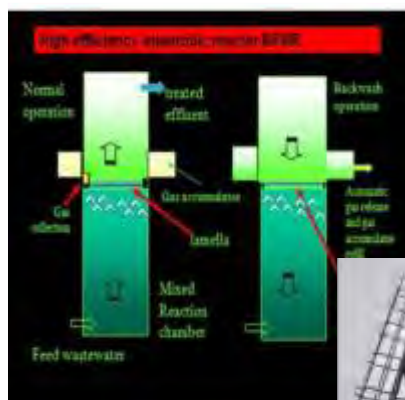
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Brief Introduction

The DSIR-NIIST-CRTDH addressed the water/air/ solid waste related pollution issues faced by MSMEs and provided affordable technological solutions and services.

- **Total area of CRTDH:** 5382 sq. feet
- **Focus area and objectives: NMCP**
 - i. Process development and plant design for control of wastewater, solid waste and air pollution from SMEs
 - ii. Developing and designing process interventions to reduce water, power and resources consumption for improved environmental performance
 - iii. Determination of data such as air pollutant emission factors from various process industries for design of pollution control systems
 - iv. Developing treatment systems and devices in standard modules for economic installation in SME
 - v. Developing testing facilities for environmental analysis.
- **Specialization of work at CRTDH:**
 - i. Anaerobic wastewater/solid waste treatment.
 - ii. Odour control Biofilters
 - iii. Dioxin Research & Monitoring
- **Technological solutions developed, support for industry:**
 - i. Buoyant Filter Bioreactor (BFBR): Commercialized (Licensed to two companies: M/s. Galaxy Environ Pvt Ltd, Kalady, Ernakulam & M/s. Victoria Pvt Ltd) - Technology Installed at Rice Mills (6 Nos), Ice cream Factories (4 Nos), Fish meal Processing units (1 Nos), Hospital Sewage Treatment unit (1 Nos), Wastewater treatment at Temple (1 Nos), Common Effluent Treatment Plant (CETP).
 - ii. Odour control bio-filters: Commercialized (Licensed to two companies: M/s. Elixir Environ Pvt Ltd, Kozhikode, Kerala & M/s. A. P. Engineers Pvt Ltd, Erode, Tamil Nadu)
Technology Installed at Fish Meal Industries (10 Nos), Shrimp Feed Industries (2 Nos), Bone meal Processing units (1 Nos), Gelatin industries (2 Nos), Fish processing unit (2 Nos), Chicken waste rendering plant (1 Nos), Municipal solid waste composting plant (1 No), Sewage Treatment Plant (1 No)
 - iii. NIIST Onsite Wastewater Treatment (NOWA): suitable for small restaurants, food processing units, bakeries etc

Facility creation



• **State of the art Facility and R & D support and services to MSME:**

- ICP-MS
- Continuous Flow Analyzer
- Dynamic Olfactometer
- Total Organic Carbon Analyzer

• **Skill development workshops:**

- i. Conducted DIOXIN INDIA Training Workshops in 2018 (1 day) & 2019 (3 days).
- ii. Conducted skill development programs on dioxin analysis in fish & fish products and milk and dairy products to two testing laboratories (5 days).
- iii. Certification course on Design, Operation & Troubleshooting of Anaerobic Bioreactors (4 days).
- iv. Remote sensing & GIS applications in Environmental Impact Assessment and Management (5 days).

• **Total MSME/Industry served: 571**

• **Impact created for societal problems:**

- i. The dioxin research facility has been extensively utilized by various national and regional R&D/regulatory/export/ academic and legal bodies and generated revenue to the institute.
- ii. Provided expertise and service for various important organisations such as BARC, Mumbai, CPCB, KSPCB, MPEDA, CSIR-NEERI, ICAR-CIFT etc. and issue of great importance at war footing such as accidental fire breakout at municipal solid & biomedical waste treatment plants.

• **Services offered to MSMEs:**

- i. NABL accredited Dioxins and PCBs analysis in food, feed and environmental matrices.
- ii. Odour testing, water and waste water analysis.
- iii. Establishment of technological and monitoring solutions for the management of waste water, solid waste and air pollution in national context.
- iv. Every year on an average 25-30 candidates are given training in the state of the art analytical and engineering facility established under CRTDH.



NIIST onsite wastewater treatment cum resource recovery unit (NOWA)



Major highlights of NOWA

- Novel design with resource recovery potential
- Can treat organic wastewater (COD ~500-3000* mg/L)
- Modular and compact with low foot print (0.02 sq ft/L)
- Low O&M cost (0.26 Kw/kg-COD)
- Free from sludge disposal problem
- Completely biological treatment system
- The design can be customized for retrofitting

*treated maximum water flow (L/Min)

The design and process patent filed
TECHNOLOGY TRANSFERRED TO TWO COMPANIES



NOWA installation at Jahari food products, Adoor

NOWA installed at a large bakery unit recovering reuse quality water and Biogas (~3 cub meter/D) from ~ 3000 L wastewater daily.



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**CRTDHs Supported in
Phase II (FY 2016-17)**



CRTDH

Indian Institute of Technology, Gandhinagar

Sector: New Materials/Chemical Process (NMCP)



Brief Introduction

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 etc.

- **Total area of DSIR-IITGN-CRTDH:**
 - i. Lab area 1165 sq. feet
 - ii. Pilot plant area 1000 sq. feet
- **Focus area and objectives: NMCP**
 - i. 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.
 - ii. Reaching out to ~200 MSME industry members and helping them to adapt environment-friendly technologies and competitive in domestic/international market through technology improvement, training and testing.
- **Specialization of work at CRTDH:**
 - i. Wastewater treatment & waste reduction
 - ii. Process design & Intensification
 - iii. Water & Wastewater testing according to ISO 17025 accredited (NABL)
 - iv. Toxicity analysis of Industrial products
 - v. Pilot plant facility for taking process runs
- **State of the art Facility and R & D support and services to MSME:**
 - i. ICP-MS/OES- Trace elements
 - ii. Fluorescence Spectrometer- Concentration of dye
 - iii. Plate Reader- Micro-organism growth study
 - iv. Spray Dryer- Drying
 - v. TOC- Total Carbon Content
 - vi. BOD- Water quality
 - vii. GC- Analysis of gases
 - viii. Fermentor- Microorganism growth
 - ix. HPTLC- Dye separation
 - x. Incubator- Micro-organism growth
 - xi. Spectrophotometer- Quantification of chemical compounds
 - xii. TNb, COD, TDS, TSS and pH measuring units
- **Pilot plant Facilities:**
 - i. Distillation column
 - ii. Rotary disc contractor
 - iii. 5L Borosilicate glass 3.3 CSTR in Series
 - iv. 50L SS316 CSTR in parallel
 - v. 1000L ETP system
 - vi. 1000L STP
 - vii. Membrane test modules (RO, FO and MD)
 - viii. Walk in fume hood
 - ix. 10 L SS316 autoclave etc



• **Technological solutions developed, support for industry**

- i. Two stage effluent treatment process by using indigenously developed catalyst
- ii. Designed absorption column for the separation of acid gas
- iii. Controlled color removal for partial recovery of the products
- iv. Separation of salt by fractional crystallization
- v. Treatment of hospital wastewater by using ozonation
- vi. Product optimization for Aluminum Hydroxide Chloride
- vii. Adsorber design for VOC separation
- viii. Methane reduction from MSW solid waste
- ix. Carbon nanotube based anode material development for Li-ion batteries
- x. Recycling and recovery of valuable metals from Li-ion batteries
- xi. Development of Nanobiocomposite for control release of cancer drug
- xii. Development of bio-polymeric film for wound healing
- xiii. Pilot run of reaction to produce food dye
- xiv. Industrial water treatment using biocoagulation
- xv. Method development for biotoxicity test for industrial products
- xvi. Helped to develop 12 LPM oxygen concentrator
- xvii. Helped MSME to test their products

• **Skill development workshops: 11**

- **Total MSME/Industry served:** Reached out to 237. About 15 industries served through testing and projects. Also, 5 Startups got help from CRTDH Lab.



Impact created for societal problems :

- i. CRTDH Lab facility is now a NABL Accredited Lab serving as a certified testing facility for MSMEs.
- ii. Easy access to expert opinion, high-end analytical instruments and scale up facilities (pilot plant)
- iii. Pilot plant facility at DSIR – IITGN CRTDH helping MSME to take trial runs/process scaling up
- iv. Creating awareness/knowledge sharing sessions among MSME on water treatment, safety, product and raw material analysis
- v. Development of catalyst for effluent treatment through advanced oxidation
- vi. Process technology/method development for MSME
- vii. Helped industry to develop 12 LPM oxygen concentrator etc.

Services offered to MSMEs:

- i. Wastewater treatment by using the coagulant and developed catalyst
- ii. Process design of dye and washing of project
- iii. Process design of separation of salt and gases
- iv. Recovery Metal from waste Li-ion batteries
- v. Testing of water, wastewater, gas and solids
- vi. Pilot plant facility for taking process trials by MSME
- vii. Bio-toxicity tests for industrial products
- viii. Training on ICP-MS for product analysis
- ix. Training on HPTLC for product analysis
- x. Various knowledge sharing sessions on safety, water treatment etc.



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CRTDH

CSIR-CMERI, Durgapur

Sector: Low Cost Machining (LCM)



Brief Introduction

With the right facilities, ecosystem and investment, an innovative idea can be translated into marketable products and services. With this objective, a CRTDH facility at CSIR-CMERI has been created where Startups & MSMEs in Design, Casting & Machining utilize low cost manufacturing & testing facilities along with equipment & infrastructure, intellectual support necessary to test and validate their Product Manufacturing process. Besides providing training on skill development, CRTDH also facilitates industry-institution interactions and assists MSMEs & Startups get access to already developed technologies available in the CSIR laboratories for taking their ideas to market.

- **Total area of CRTDH:**

- i. Approx. 2160 sq. feet ground area for machines and
Approx. 2017 sq. feet first floor area for CAD training.

- **Focus area and objectives: LCM**

- i. To foster industry-institution interaction and address the above problems faced in translational research by the MSEs
- ii. Thereby providing an eco-system for research and innovation in the country.
- iii. The hubs would provide technical support, infrastructure and sophisticated analytical as well as advanced research equipment facility to the MSEs
- iv. To carry out competitive technological research to translate new ideas into marketable products as well as utilize the already developed technologies available in the institutes/laboratories for taking them to market.

- **Specialization of work at CRTDH:**

- i. Metal Injection Moulding.
- ii. Sintering and heat treatment of alloys.
- iii. Conventional low cost machining of components.
- iv. Casting of ferrous and non-ferrous components.
- v. Vacuum sintering.
- vi. Composite development.
- vii. CAD and CAM.

- **State of the art Facility and R & D support and services to MSME:**

- i. Debinding furnace
- ii. Drying Oven
- iii. Sand Testing Equipment
- iv. Sigma Blade mixer
- v. Brinell hardness Tester
- vi. Vicker's hardness Tester
- vii. Compressor, Vacuum sintering furnace
- viii. Double Column
- ix. All Geared Radial Drilling Machine
- x. Manual Surface Grinder
- xi. Universal Tool & Cutter Grinding Machine
- xii. Micro Feed Hydraulic Surface Grinder
- xiii. Measuring Instruments
- xiv. Hydraulic Press Brake with NC System
- xv. Injection moulding machine
- xvi. Universal cylindrical grinder
- xvii. Dewaxer
- xviii. Heat treatment furnace



- **Technological solutions developed, support for industry**

- Technological intervention to improve the existing manufacturing techniques for anchor bolt and copper nozzle to enhance productivity.
- Technological intervention to replace the age old manual manufacturing techniques for surgical tools to enhance product quality.
- Technological intervention to replace the age old manual processing techniques for semi-automated slotting of makhana seeds to enhance productivity.
- Technological intervention to replace the age-old manual manufacturing techniques for slitting operation to enhance product quality.
- Technological intervention for different designs of moulds for ornaments manufacturing and machines for productivity improvement.
- Technological intervention to mechanize sorting process and different designs of moulds for ornaments.
- Casting design using solidification simulation, sand quality assessment, quality consistency of cast product and training on foundry practice.



Anchor Bolt



Copper nozzle

- **Skill development workshops: 10**

- **Total MSME/Industry served: 07**

- **Impact created for societal problems:**

- Skill development
- Copper Nozzle development through MIM Process for Bargachia Spare Parts Manufacturing Cluster (BCMPM)
- Reduction of production cycle time for anchor bolts - Bargachia Spare Parts Manufacturing Cluster (BCMPM)

- **Services offered to MSMEs:**

- CRTDH can help innovator/MSMEs by providing all kind of supports at initial stages of product development.
- Entrepreneur trainings and workshops, skill development programs, leadership programs, R&D facilities, etc.
- Enable the entrepreneur to be ready with an 'innovative technology' in the form of marketable product.
- New start-ups can avail the organization and activity structures of CRTDH.
- Competitive facility utilization charges and fast approval procedure.



Slitting Machine

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CRTDH

Indian Institute of Technology, Roorkee

Sector: New Materials/Chemical Process (NMCP)



Brief Introduction

The Common Research and Technology Development Hubs (CRTDH) have been established by the Department of Scientific and Industrial Research (DSIR) with an objective to foster industry-institution interaction and address the above problems faced in translational research by the MSMEs thereby providing an eco-system for research and innovation in the country

- **Total area of CRTDH:** 2873 sq. feet (aprox)
- **Focus area and objectives: NMCP**
 - i. The adverse health effects of electromagnetic waves on human body turned the attention of researchers towards a possible solution through the coating of microwave absorbing shield.
 - ii. To develop and characterize cost effective advanced materials and techniques that can be used for shielding the microwave radiation and for stealth applications.
 - iii. To generate skilled manpower in the area of material testing, RCS measurement and EM radiation measurements.
 - iv. To encourage the enterprises to participate in R&D for bringing innovative ideas into marketable product or processing.
 - v. Set up experimental facility for the measurement of electromagnetic parameters through free space, Radar Cross Section Reduction (RCS) measurement, EM radiation level from different communication devices, Specific Absorption Rate (SAR), thermal absorption of camouflage network and Radar Imaging.
- **Specialization of work at CRTDH:**
 - i. Microwave absorbing materials and products for Stealth and EM Shielding
 - ii. New Materials/Chemical Processing and Microwave Characterization
- **State of the art Facility and R & D support and services to MSME:**
 - i. Material Synthesis
 - ii. Compact range RCS measurement
 - iii. Antenna Testing, Stealth Testing
- **Technological solutions developed, support for industry**
 - i. Camouflage Nets
 - ii. RADOME
 - iii. Microwave Absorbing Paints
 - iv. SAR reduction for mobile phones
- **Skill development workshops**
 - i. Series of VAMMAM conferences
 - ii. 1-Day CRTDH Awareness Program
- **Total MSME/Industry served: 12**
- **Impact created for societal problems**
 - i. Radiation reduction methodologies
- **Services offered to MSMEs:**
 - i. Material Synthesis
 - ii. Material Characterization in Microwave
 - iii. Powder and Liquid
 - iv. Product Development (Stealth and Shielding)
 - v. Product Testing (Stealth and Shielding)



Anechoic Chamber for Measurements



Compact Range Radar Cross Section/Antenna Testing



Microwave, Absorbing Material Coated on Different Structures



Novel designs of various stealth related products

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CRTDH

CSIR-Central Electronics Engineering Research Institute, Jaipur Centre Sector: Electronics/Renewable Energy (ERE)



Brief Introduction

The focus of the DSIR-CRTDH hub is to provide the state of the art modern technologies to MSME's, startups and industries in the field of Electronics and Renewable Energy.

•**Total area of CRTDH:** 2500 sq. m

•**Focus area and objectives:** ERE

- i. To conduct high quality and relevant product-oriented research to meet specific industry requirements
- ii. Disseminate first hand research information to MSME's/ Start-up's for product innovation
- iii. State-of-the art facilities and support for engineering design and product evaluation
- iv. Ideation for innovative electronic products in collaboration with MSME's

•**Specialization of work at CRTDH:**

- i. Real time embedded system product development
- ii. Analytical instrumentation development in the field of dairy, honey & edible oils

• **State of the art Facility and R & D support and services to MSME:**

- i. SMT PCB assembly line
 - 27K+ CPH Capacity
 - Comp Size: 0402 (metric) - 120x90 mm
- ii. NABL Accredited grid tied inverter upto 20 kWh
- iii. Spectroscopic platform(UV-Vis – FTIR/FTNIR) for sample characterization

•**Technological solutions developed, support for industry:**

- i. Rapid Milk Scanalyzer
- ii. Milk Analyzer
- iii. Honey adulteration detection system
- iv. Edible Oil Analyzer
- v. Smart pH Meter
- vi. Formaldehyde detection system
- vii. Ksheer Tester (Domestic use)
- viii. Smart Solar Tree
- ix. Mercury Free Plasma Device

•**Skill development workshops:**

- i. Skill development for students, professionals & mentors
- ii. Grid Tied Solar inverter for MSME's and industrialists

•**Total MSME/Industry served:**

- i. Sensitized: 150 MSME's
- ii. MSME Served: 40

•**Impact created for societal problems:**

- i. Stone dust precipitator systems for stone carving artisans

•**Services offered to MSMEs:**

- i. PCB assembly services
- ii. Electrical calibration & testing services.



Milk Scanalyzer



Honey Adult. Detection System



Pick and Place Line



Grid Tied Inverter Test Facility

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**CRTDHs Supported in
Phase III (FY 2018-19)**



CRTDH

Indian Institute of Technology, Kharagpur

Sector: Affordable Health



Brief Introduction

Access to health is one of the fundamental human rights. However, almost 50% of the world's 7.5 billion people is forced to live at underserved locations without access to basic healthcare. This results in the accumulation of diseases among the most vulnerable segment, delayed presentation and intervention, and consequent need for specialty treatment at high secondary and tertiary cost and health-related poverty shocks. By envisioning disruptive interventions in technologies for affordable healthcare to break this vicious cycle, the CRTDH at IIT Kharagpur was established in 2019, as flagship Center of Excellence.

- **Total area of CRTDH:** 4,000 sq. feet
- **Focus area and objectives: Affordable Healthcare**
 - i. To strengthen the collaborative research between academia and industries
 - ii. To facilitate the MSMEs/Startups with newer technologies, infrastructure support, knowledge transfer
 - iii. To 'democratize' disease management by bringing high-end procedures to the ambit of the bottom of the community pyramid in the green field with no differential treatment of the rich and the poor.
 - iv. To generate local small scale enterprises, stimulating localized economy of small scale jobs across spectrum of skills.
- **Specialization of work at CRTDH:**
 - i. Laser Cutting
 - ii. 3D Printing
 - iii. Lyophilization
 - iv. Vacuum Packaging
 - v. Patch Clamp Amplifying
 - vi. Cryogenic Refrigeration
 - vii. Lateral flow strip cutting
 - viii. Computational Servers
 - ix. Electronic Dispensing
 - x. PCB printing
- **Technological solutions developed, support for industry:**
 - i. Paper-based diagnostic device for detecting multiple blood parameters (glucose, haemoglobin, creatinine concentration)
 - ii. Primary healthcare clinical decision support system software and algorithm
 - iii. Electronic Health Record system based telemedicine software
 - iv. Portable spinning disc for complete blood count and other haematological examination
 - v. Nucleic Acid Based Rapid Diagnostic Device platform technology for infectious disease detection.
 - vi. Portable hand-held device for early screening of oral cancer and pre-cancer
 - vii. Paper-based device for antibiotic drug resistance evaluation
 - viii. Tumour on a chip for cancer cell analysis
 - ix. COVICUBE – a all in one solution for temperature and pulse oximetry based screening
 - x. Lateral Flow device technology – design and fabrication
 - xi. Electricity generation technology from wet textile



- **State of the art facility and R & D support and services to MSME:**

- 4,000 sq. ft space for MSMEs
- Pilot plant for manufacturing of paper-based diagnostic kits
- Molecular diagnostic device manufacturing unit
- Data Science R&D unit
- Blood test readout device prototype fabrication unit
- Lateral flow strip manufacturing unit
- Bio-Safety labs (L2)
- Rapid prototyping unit
- Microfluidic cell culture and analysis unit
- PCB printing and assembly work bench

- **Skill development workshops:**

- Several offline and hands-on sessions with MSMEs and frontline health workers were conducted to provide training and consultancy for skill development and augmenting technical knowledge.
- Numbers of economically and socially-challenged rural entrepreneurs have also been trained with the knowhow of manufacturing frugal-medical devices and kits developed by the research team.
- The human resource development programs are targeted towards innovating and infusing affordable diagnostic technologies for underserved community healthcare, having inherent integrability with the digital healthcare mission of the Government.

- **Total MSME/Industry served:** 18 MSMEs and more than 140 rural entrepreneurs

- **Impact created for societal problems:**

- Awareness programmes, diagnostic camps, employment generation workshops and knowledge dissemination sessions, door to door surveys in different villages were conducted.
- Rural e-health centres and mobile healthcare units including river launches.
- During COVID-19 pandemic, extensive training and know-how for manufacturing quality-assured PPE kits and sanitizer was imparted to marginal rural entrepreneurs.
- Engaged women power as frontline health workers in a sustainable ecosystem and bringing them in the ambit of rural employment generation.
- The CRTDH has established gender equality in the underserved community by promoting healthy and economically-supportive livelihood for all.

- **Services offered to MSMEs:**

- Infrastructure facilitation and laboratory space support
- Technical advisory for product development-centric R&D
- Training and consultancy
- Co-development of products and processes with domain experts
- Industry-Academia partnership support
- Field Trials and Clinical Validation
- Joint IP creation, technology transfer, Regulatory compliance activities
- Educational and Social Outreach and Community Health Support



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Brief Introduction

CRTDH created at CDRI, Lucknow will help MSMEs in industrially-scalable process-cum-product technology development for oral, topical and sterile products and to 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. This facility is a one-stop destination for pharmaceutical product development from formulation concept to GMP batches for clinical testing.

- **Total area of CRTDH:** 94,959 sq. feet
- **Focus area and objectives: Affordable Healthcare**
 - i. To operate a Pharmaceutical Formulation Development and National Clinical Trial Batch Production Facility
 - ii. To operate a Unit for GLP-compliant Pre-clinical and Clinical Bioanalysis (PK, BA, BE) and Drug Testing (DTL).
- **Specialization of work at CRTDH:**
 - i. **FORMULATION:** Oral, topical and sterile products (in next phase). GMP R&D scale enables cost saving.
 - ii. **PILOT-SCALE PROCESS:** Optimization, QbD, validation and scale-up. Raw Material Characterization, In-Process Quality Check (IPQC) protocol
 - iii. **PRODUCT CHARACTERIZATION:** High-end spectroscopy (IR, NMR, mass), microscopy (scanning/ transmission, atomic force, confocal, fluorescence, optical), chromatography (LC-MS/MS, GC-FID/MS, HPLC) calorimetry, and laser scattering to all pharmacopoeial tests. Excipient compatibility, stability, photostability, CQA, CPP, STP, BRS, MSDS development
 - iv. **PHARMACOKINETICS (PK):** In vitro and pre-clinical in rodent and non-rodent species. Compartment and non-compartment PK modeling. Bioavailability and bioequivalence testing of clinical samples
 - v. **ON-SITE TROUBLESHOOTING**
 - vi. **CONSULTING AND TRAINING:** skills necessary for regulatory approval as Manufacturing or Analytical HR
 - vii. **REGULATORY FILING:** support in the preparation of application dossiers for submission to CDSCO and overseas regulatory authorities
- **Technological solutions developed, support for industry:**
 - i. Tablets and syrup formulations of umifenovir (Medizest, Goa), dry powder inhalation of favipiravir (Windlas, Dehradun) for COVID-19.
 - ii. Dry powder inhalation for anti-tuberculosis medicines (Camus, Jaipur)
 - iii. Tablets of CDRI's anti-platelet New Chemical Entity S007-867 (Marc, Lucknow)
 - iv. Valorization of poultry industry waste for use as excipient in drug products (Helixion, Hyderabad)
 - v. Technology Feasibility Assessment, Detailed Project Reports, Regulatory Filings in India and Europe– Consultancy Services



- **State of the art facility and R & D support and services to MSME:**
 - 94,959 sq. ft space for MSMEs
 - Form 37 Licensed Drug Testing Lab for batch release testing per Official/product monograph, including stability.
 - Pharmaceutical Analysis and Bio-Analysis for PK, BA/BE.
 - Pilot-scale GMP manufacturing
- **Skill development workshops:** GMP manufacturing of tablets and capsules - two workshops
- **Total MSME/Industry served: 27**

- **Impact created for societal problems:**
 - Glycerin IP is required as inactive ingredient in several formulations. Also, retail-packaged by many MSME as OTC skin-care product.
 - MSME client (Neurochem, Lucknow) was offered bulk quantity of Glycerin IP at competitive price.
 - Raw Material Characterization on request.
 - Per-monograph testing (titration) indicated borderline compliance with IP standard.
 - FT-IR and GC analysis showed impurities of ethylene glycol and diethylene glycol.
 - Client, Vendor, Industry Association and Regulatory Authorities alerted by word-of-mouth.

- **Services offered to MSMEs:**

- Formulation Development,
- Quality Control
- Bioanalysis



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Brief Introduction

For more than 5 decades, the CSIR-Indian Institute of Toxicology Research (CSIR-IITR), a pioneer in translational research, has provided S&T interventions for environmental sustainability. The institute established “The Environmental Monitoring and Intervention Hub” supported by DSIR-Common Research and Technology Development Hubs (CRTDHs) in 2019. The hub is aimed to promote and mentor R&D startups/MSEs in the area of environmental pollution abatement as well as develop trained human resource. The objective of the hub is to provide service to industries for assessment of emission levels and reducing pollution burden on environment by action plan development, technology development & deployment, services, thereby, providing clean and green technological solutions to industries for environmental sustainability.

- **Total area of CRTDH:** 7,000 sq. feet
- **Focus area and objectives:** **Environmental Interventions**

The CRTDH-CSIR-IITR focuses on providing clean/green and sustainable technological solutions & service to industry as well as develop trained human resource with the following objectives:

- i. Drinking water disinfection and water quality assessment technologies.
- ii. Develop customized training programmes/workshops for specific cluster to generate trained human resource.
- iii. Technologies for treatment of industrial effluent from Pulp & Paper industries.
- iv. Build predictive models including source apportionment for air quality as well as pollution abatement.

- **Specialization of work at CRTDH:**

- i. **Textile effluent treatment:**
 - Biochar based treatment technology
 - Green Process (microbial Immobilization technology)
- ii. **Modular sensor design for different environmental setup:** Device for air quality monitoring & management.
- iii. **Toxic metal ion removal from water resources:** Biopolymer Based hydrogel, Biochar, Nanocomposites etc.
- iv. **Skill Development:** Develop customized training programmes / workshops for specific cluster to generate trained human resource.

- **Technological solutions developed, support for industry:**

- i. Installation of Pilot-scale (2000L) Bioreactor at Yash Paper Mill.
- ii. Oneer “An electronic device for the disinfection of drinking water”.
- iii. Lab scale Reactor for Effluent Treatment.
- iv. Treatment of dyeing effluent collected from Handloom Bhandar and Jeet dyeing using sewage sludge biochar.



- **State of the art facility and R & D support and services to MSME:**

- 7,000 sq. ft space for MSMEs
- Water treatments and monitoring Effluent treatment and
- Air pollution abatement. Hub include, infrastructure for MSEs, state of the art analytical facility and well equipped laboratories
- IT and High end computational infrastructure, prototyping lab, Meeting room and training facility.

- **Sophisticated Analytical Instrumentation Facility:**

- LC MS/MS: Quadrupole based ultra-performance liquid chromatography- mass spectrometer
- Gas Chromatography- MS/MS
- High Performance Liquid Chromatography
- Atomic Absorption Spectrophotometer
- Atomic Florescence Spectrophotometer
- FTIR Spectrometer

- **Dedicated Hub Instrumentation Facility:**

- Incubation Shaker-Stackable Multiple Model
- Third Generation Sequencer
- COD analyzer
- BOD sensor system
- Ultrafine particle (PM1) sampler
- Flue gas analyzer
- Real time SO₂, CO₂, CO, ozone
- 3-D printing facility
- Pilot plant (2000-L capacity)

- **Skill development workshops:**

- 24 and five conferences in Environment, Pollution and Safety sector. More than 370 manpower trained through customized training programmes & workshops

- **Total MSME/Industry served:** more than 33

- **Impact created for societal problems:**

- Lucknow air quality survey (pre-monsoon and post-monsoon)
- Diwali air quality survey

- **Services offered to MSMEs:**

- R&D Support
- Testing of models such as industrial air pollution control devices for efficacy evolutions.
- Studies for testing of ambient air purification devices and pollution monitoring devices.
- Drinking water disinfection and water quality assessment technologies.
- One-to-one engagement to offer more efficient solutions to individual needs.



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CRTDH CSIR- Institute of Minerals and Material Technology, Bhubaneswar Sector: New Materials and Chemical Processes (NMCP)



Brief Introduction

It's primary objective is to nurture and promote innovations in MSMEs and Start-Ups through R&D or knowledge-based support in the area of new materials and chemical processes and to mentor, nurture, collaborate, or hand-hold MSMEs to develop innovations and provide enabling services such as IPR support, Laboratory facilities, testing and analysis support for quality assurance etc.

- **Total area of CRTDH:** 9000 Sq. feet
- **Focus area and objectives: NMCP**

Primary objective is to nurture and promote innovations in MSMEs through R&D or knowledge-based support in the focus area of "**new materials and chemical processes**". The aim is three-fold:

 - i. R&D & Knowledge based Support to MSMEs & Start-ups
 - ii. Mentor, nurture, collaborate, or hand-hold MSMEs to develop innovations
 - iii. Provide enabling services such as IPR support, Laboratory facilities, testing and analysis support for quality assurance, auditing of existing production processes etc.
- **Specialization of work at CRTDH:** Focus is to facilitate the scientific and technological intervention particularly in the area of :
 - i. Mineral Processing
 - ii. New Chemical Processes
 - iii. Industrial Waste Utilization
 - iv. Metallurgical Processes
 - v. Coatings & Surface Engineering
 - vi. New Materials
 - vii. Materials Testing
- **Technological solutions developed, support for industry:**
 - i. Nutrient enriched biochar for organic based fertilizer
 - ii. Automated chemical dosing system
 - iii. Wireless temperature sensing and recording
 - iv. Design of disposable infant tooth cleaning device.
 - v. Utilization of PCB wastes in manufacture of Bricks.
 - vi. Utilization of waste related to agricultural, plastic, biomass etc
 - vii. Process development for treatment of metal pickling solutions to achieve Zero Liquid Discharge (ZLD) through integrated online approach
 - viii. Pull cord addressing system: An embedded system with wireless connectivity is being developed for the industry.
 - ix. Powder preparation of fused mullite, silicon carbide for indigenous production
 - x. Wireless Thermocouple (lab level demonstration)
 - xi. Two channel Wireless thermocouple for process testing research (system prototype given to them for their trial in industry)
 - xii. Moisture sensing in iron and coal
 - xiii. Bell metal and Brass casting (temple articles, idols etc.), sheet metal work(utensils), Al alloy based hollow products, Sheet metal engraving and embossing
 - xiv. Dokra casting, Bell metal and Brass casting, Lost wax process
 - xv. Conducting coatings on phosphor bronze pins.
 - xvi. WC-Co coated samples for continuous casting parts



• **State of the art Facility and R & D support and services to MSME:**

- i. Corrosion testing facility established to evaluate the corrosion, aberration, erosion etc of the materials/coating being developed.
- ii. Metal craft processing- polishing, energy efficient brass melting furnace and cutting tools facility
- iii. Metallurgical processing including controlled atmospheres heating furnaces etc.
- iv. Mechanical properties testing facility to examine the fatigue, stress etc properties.

The major equipment :

- i. Universal Testing Machine (UTM 8801)
- ii. Tribometer (Nanovea, T-2000)
- iii. TGA-DTA
- iv. Furnaces
- v. RF power supply
- vi. Semi automatic variable speed polishing machine
- vii. Precision Cutting Machine

• **Skill development workshops: 10**

• **Total MSME/Industry served:** 37 number of MSMEs/Start-ups working in the chemical process/materials or related areas and more than 70 Artisans, 30 farmers.

• **Impact created for societal problems with examples and photos**

- i. Automated Chemical Dosing System for Iron Ore Industry
- ii. Revitalization of Brass-bell metal handicraft sector
- iii. Value added materials from waste lithium batteries
- iv. Silicon carbide from rice husk
- v. Chemical additive and dosing system for high concentration slurry transportation of iron ore
- vi. 10 know-hows on sanitizer, disinfecting device, hospital assistive device, personnel protective device have been transferred to 14 MSMEs.

• **Services offered to MSMEs:**

- i. R&D & Knowledge based Support to MSMEs & Start-ups
- ii. Mentor, nurture, collaborate, or hand-hold MSMEs to develop innovations
- iii. Providing enabling services such as IPR support, Laboratory facilities, testing and analysis support for quality assurance, auditing of existing production processes etc.



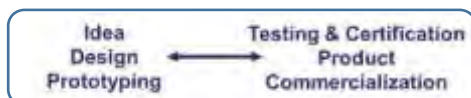
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Brief Introduction

DSIR and CSIO is establishing CRTDH center to provide technical R&D, infrastructure, and testing facilities to the MSMEs in the sectors of Renewable Energy and Electronics, for carrying out competitive research for translating innovative ideas into marketable products. The Centre will support cutting-edge investigations into some of the most important questions facing the Renewable Energy Sector today.

- **Total area of CRTDH:** 2152 sq. feet
- **Focus Area & Objectives: ERE**
 - i. Leveraging Research & Development expertise and resources to create regional cluster of innovation
 - ii. Create facility for testing and certification of products in the Renewable Energy sector
 - iii. Bridging the gap between industry, academia and research institutions
 - iv. Provide skills development at all levels
- **Specialization of work at CRTDH**
 - i. Testing & Certification, R&D Support and Consultancy in the area of Renewable Energy/Electronics
- **State of the art Facility and R & D support and services to MSME:**
 - i. 30 kVA Solar Inverter Test Facility (Installed)
 - ii. Solar Photovoltaics (SPV) Test Facility (Under Progress)
 - iii. Electronic Design & Development Facilities (Installed)
 - iv. Engineering Design and Idea Incubation Centre
- **Skill development workshops: 70**
 - i. CRTDH conducted a series of Technologist – Industrialist “Meet & Expos” which sensitized around 70 industrial participants from different parts of India in the areas of Energy, Calibration and related Instrumentation. This also facilitated the opportunity for industries & users to know about the technologies & facilities of DSIR, CSIR and CRTDH.
- **Total MSME/Industry served:** Over 100
- **Technological solutions for industry**
 - i. **Covid 19 Contribution:** CRTDH had implemented optical sensor setup and darkroom facility for measuring the irradiance, dose, temporal stability, and leakage of the UVGI (Ultraviolet germicidal irradiation) systems used in COVID Pandemic Mitigation.
 - i. It also developed SOPs for testing & validating all kinds of UVGI systems.
 - ii. The UVGI testing facility has served around 50 MSMEs across the country.
- **Impact created for societal need**
 - ii. Improve Productivity
 - iii. Inclusive Cluster Innovation –Govt., Entrepreneurs etc.
 - iv. Common Not-for-Profit Resource Hub & Testing /Certifications Facility
- **Services offered to MSMEs:**
 - ii. Testing & Certification, R&D Support, Skill Development and Consultancy



Contact Details:

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**CRTDH Supported in
Phase IV (FY 2021-22)**



CRTDH

National Institute of Technology Andhra Pradesh, Tadepalligudem Sector: Electronics/Renewable energy (ERE)



Brief Introduction

The objectives of the hub are to undertake research of both fundamental and applied nature and enhance the capabilities of MSMEs in the sector of electronics and renewable energy so as to meet the industrial requirements for efficient power converter technologies, cost-effective power generation, improving reliability in the renewable energy system by applying advanced technologies like IoT, machine learning, and edge computing. and to disseminate first-hand research information to MSE's for product innovation.

- **Total area allocated for CRTDH:** 6000 sq. feet
- **Focus area and objectives: ERE**
 - i. Designing and development of intelligent micro-grid using renewable energy systems and battery management systems
 - ii. Testing, Analyzing and charactering the renewable energy system/components
 - iii. Design for reliability in meeting industry demands and development of power converter topologies for renewable applications.
 - iv. Development and deployment of intelligent smart control systems in meeting demands of respective interest of renewable based MSE's.
- **Specialization of work at CRTDH:** Electronic and Renewable energy
- **State of the art Facility and R & D support and services to MSME:**
 - i. Micro Grid Setup consisting of solar, wind and energy storage technologies.
 - ii. FPGA based hardware in loop real time controllers for rapid prototyping
 - iii. Solar and Wind energy emulators
 - iv. Programmable high precision AC/DC power sources
 - v. Programmable AC/DC electronic loads
 - vi. Three phase power quality analyzer and insulation testing equipment
- **Targeted MSME clusters:**
 - i. Solar power based cluster
 - ii. Energy Efficiency cluster
 - iii. Electric machines & Equipments cluster
 - iv. Electrical & Electronic Products / Control Panels cluster
- **Services to be offered to MSMEs:**
 - i. Delivery of first hand R & D technological solutions to the MSEs' in Renewable Energy sector including testing services.
 - ii. Development of data driven simulation and design tools for assessment of renewable resource potential, cost estimation, operation & maintenance planning and asset management through testing and characterizing of renewable resources.
 - iii. Design and development of solutions to the decentralized power generation and to increase the penetration of renewable energies to the grid.
 - iv. Development of optimal sizing and power control strategies for hybrid renewable systems consisting of photovoltaic, wind, hydro, fuel cells including battery management.
 - v. Analyzing the power converters efficiency and reliability by developing loss models and mission profile parameters taken at MSE's location towards selection of suitable power converters in renewable systems.
 - vi. Support to MSEs in technological solutions towards Power quality enhancement in offgrid and on-grid renewable energy systems.
 - vii. Skill development of manpower of MSEs through training and capacity building programs.
 - viii. Incubation of Startups/MSEs in the sector.



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Brief Introduction

DSIR has set up CRTDH at Delhi Pharmaceutical Science and Research University (DPSRU), Delhi where pharmaceutical, nutraceutical and cosmeceutical startups & MSMEs can utilize low cost manufacturing & testing facilities along with intellectual support to test and validate their products.

- **Total area of CRTDH:** 4500 sq. feet
- **Focus area and objectives: Affordable Healthcare**
 - i. To accelerate research and development of advance and innovative healthcare solutions through integration of nanotechnology, molecular, preclinical and clinical testing, thus making interventions more affordable, safe and effective.
 - ii. To set up core translational facilities and infrastructure for advanced product development (IPR, market research, pre-formulation, formulation optimization, dosage form development, characterization, testing, analysis, preclinical and clinical research) accessible for MSME clusture, startups, research institutes/ universities and individuals.
 - iii. To support and cater the research, development and testing needs of Healthcare MSME clusture, startups, research institutes/ universities and individual and to provide them unique platform to validate their proof of concepts to scale-ups and ultimately commercially viable sustainable solutions.
 - iv. To develop state-of-art preclinical animal imaging facility which will assist in understanding in vivo molecular interaction and fate of advanced formulations.
 - v. To develop one-stop solution for translation (bench to bed side) of advance healthcare formulation and products.
 - vi. To train people in the advanced formulation development technology to serve the needs of development in these areas and to develop affordable healthcare products through novel processes and technologies.
- **Specialization of work at CRTDH:**
 - i. Development of advanced, novel and nanotechnology based formulations.
 - ii. Sophisticated evaluation of the formulations
- **State of the art Facility and R & D support and services to MSME:**
 - i. Pilot scale manufacturing facility
 - ii. Preclinical Imaging facility
 - iii. Product characterization & evaluation
 - iv. R&D support for advanced formulation development
- **Targeted MSME clusters:**
 - i. Pharmaceutical, Nutraceutical & Cosmeceutical MSMEs
- **Services to be offered to MSMEs:**
 - i. R&D, formulation development and validation
 - ii. In vitro evaluation and characterization
 - iii. In vivo animal studies



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Brief Introduction

The CRTDH established at CSIR-NCL is to facilitate (i) taking Go/NoGo decisions related to change in the technology platform for the SMEs in the specific areas of dye manufacturing, (ii) help the SMEs in polymer processing and anionic polymerization

- **Total area allocated for CRTDH:**

- i. 1 Stand alone facility for anionic polymerization (25 ft x 15 ft) + peripheral facilities (compressor, gas cylinders, etc. 15 ft x 10 ft)
- ii. 1 Fully operational synthesis lab for laboratory scale process development of dyes (20ft x 15 ft)
- iii. Proposed facility for installing a Container Based pilot plant (30 ft x 20 ft)
- iv. Polymer processing laboratory (15 ft x 20 ft)

- **Focus area and objectives: NMCP**

- i. To undertake research to meet the industrial requirements for polymerization, its processing and for synthesis of azo dyes.
- ii. Continuous process for anionic, insertion polymerization, azo dyes and intermediates.
- iii. Undertake the complete characterization of the polymers and dyes in order to understand the structure-property-performance relationship required for various applications.
- iv. Organizing training sessions for MSE's in the area of polymer synthesis, polymer processing and dye manufacturing
- v. Hold annual conclave of industries.

- **Specialization of work at CRTDH:**

- i. Continuous flow synthesis of dyes, colourants and polymer processing



- **State of the art Facility and R & D support and services to MSME:**

- i. Anionic polymerization facility being installed.
- ii. A laboratory for continuous flow synthesis of azo dyes has been set for industry utilization
- iii. Characterization of the dyes
- iv. Polymer processing centre for processing of polymer films and their characterization

- **Targeted MSME clusters:**

- i. Polymer processing
- ii. Dyestuff and colourant manufacturing
- iii. Demographical locations: Kurkumbh, Vapi, Ankaleshwar, Vatva, Mahad etc.

- **Services to be offered to MSMEs:**

- i. Training programs
- ii. Access to synthesis and polymer processing facilities at discounted rates
- iii. Access to NCL scientists for process development



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CRTDH

Indian Institute of Technology(IIT) Guwahati

Sector: New Materials /Chemical Process (NMCP)



Brief Introduction

CRTDH at IIT Guwahati is dedicated to Disseminate Biodegradable Plastics Research and related Technologies to MSMEs for Industrial Commercialization of Sustainable Packaging & Healthcare Products & to create required infrastructure / Incubate innovative entrepreneurs and collaborate to build ecosystem, Create impact to Promote Sustainable Materials and Eco-friendly processes.

- **Total area allocated for CRTDH:** 10,000 sq. feet
- **State of the art Facility and R & D support and services to MSME:**
 - i. Pilot Plants for Bioplastics and down stream technologies for packaging and Healthcare
- **Focus area and objectives: NMCP**
 - i. To promote Biodegradable
 - ii. Plastic and its technologies to
 - iii. MSMEs
- **Targeted MSME clusters:**
 - i. Plastic, Packaging Industries
- **Specialization of work at CRTDH:**
 - i. Provide Bioplastic Technologies
 - ii. Sustainable Packaging solutions
- **Services to be offered to MSMEs:**
 - i. Biodegradable Plastic resin production and products to the Industries
 - ii. Skill Development to Industries
 - iii. Packaging
 - iv. Healthcare support
 - v. Consultancy.



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CRTDH

National Institute of Pharmaceutical Education and Research (NIPER) S.A.S. Nagar, Punjab Sector: New Materials /Chemical Process (NMCP)



Brief Introduction

NIPER SAS Nagar, Punjab is creating a new current Good Manufacturing Practice (cGMP) pilot plant facility within Technology Development Center complex along with Kilogram, research & development and analytical laboratories. This newly created advanced GMP certified CRTDH facility is useful for pharmaceutical/chemical/Herbal MSMEs for research, analysis, scale-up and validation of processes

- **Total area allocated for CRTDH:** A dedicated building area of approx. 1000 sq. mtr is allocated for CRTDH facility at NIPER SAS Nagar for new GMP plant, kilogram and R&D laboratory
- **Focus area and objectives: NMCP**
 - i. Chemicals/Key Starting Materials (KSMs)/ Drug Intermediates (DIs) and Active Pharmaceutical Ingredients (APIs).
 - ii. Build in facilities for pilot trials (GMP), Kilogram scale and research & development
 - iii. Development of sustainable, cost effective, industry feasible processes and extraction & isolation process of high value herbals.
 - iv. Creation of Natural Product Standards
 - v. Development of new bioactive materials
 - vi. Validation and Contract Research Services
 - vii. Technology transfer to industry
 - viii. Trainings for MSMEs/Chemical startups
- **Specialization of work at CRTDH:**
 - i. The regulatory compliant facility, R&D lab, analytical laboratory with technology expert will accelerate the research in Chemical processes especially for KSMs)/ DIs and APIs. Institute will work with MSME's to facilitate for the development of cost effective synthesis of chemicals for import substitution and export promotion taking nation towards the path of self-sufficiency in APIs
- **State of the art Facility and R & D support and services to MSME:**
 - i. Pilot plant scale up facility (GMP): (50L-1KL)
 - ii. Kilogram Laboratory with flow reactor/Chemical reactor, 20L rotary evaporator etc
 - iii. Research and Development Laboratory with hoods
 - iv. Analytical Labs with HPLC, GC, Moisture analyzer etc
 - v. Facility/Labs are equipped with modern instruments which will be offered to industry
- **Targeted MSME clusters:**
 - i. Una (GoI –Bulk Drug Park)
 - ii. Baddi-Brotiwala-Nalagarh
 - iii. Derabassi-Lalru
 - iv. Chandigarh-Mohali-Panchkula
 - v. Ludhiana-Amritsar
 - vi. Parwanoo
 - vii. Kalaamb-Paonta Sahib
 - viii. Delhi-Noida-Gurugram-Rewari
- **Services to be offered to MSMEs:**
 - i. Scale up and Pilot Scale Studies/services
 - ii. Sustainable cost effective process development of APIs
 - iii. Validation of Synthetic procedures at Gram/Kilogram scale
 - iv. Extraction and processing of Herbals
 - v. Reference herbal Standards
 - vi. MSMEs/Chemical Startups and Industry Training



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CRTDH

Indian Institute of Technology Bhilai (IIT), Chhattisgarh

Sector: New Materials/Chemical Process (NMCP)



Brief Introduction

The dominance of industrial regions in and around Chhattisgarh shows economic prosperity of the region. However, absence of a state-of-the-art material characterization facility always remains a concern and it is preventing the growth of the industry. The raw materials used in the industry such as pharmaceuticals, pigments, textile, dye and dye intermediates, metal and mineral require to be characterized well to determine their key physico-chemical and mechanical properties before using them in large scale production. In a major initiative to work with MSMEs and to help them in improving their processes through efficient material characterization, IIT Bhilai has established a Common Research & Technology Development Hub, supported by Department of Scientific and Industrial Research (DSIR) on New Materials/Chemical Process sector.

- **Total area allocated for CRTDH:** 2000 sq. feet. readily available and the rest 3000 sq. feet. to be made available
- **Focus area and objectives: NMCP**

The focus is on the development of a state-of-the-art material characterization facility for the minerals and metals, pharmaceuticals, pigments, dye and textile industries. The objective of the CRTDH is to engage MSMEs and other industries to enhance their capabilities in technology know-how on process improvement, research on new products and testing (products/raw materials) etc.
- **Specialization of work at CRTDH:**
 - i. New Material/ Chemical process development for MSMEs involved in the production of polymers, pharmaceuticals,
 - ii. pigments, textiles,
 - iii. dye and dye intermediates,
 - iv. metals, and minerals.
- **State of the art Facility and R & D support and services to MSME:**
 - i. Mass Spectrometer for characterization of molecules/compounds used in pharmaceuticals, pigments and textile industries;
 - ii. Optical emission spectrometer for characterization materials used in metal/mineral industries;
 - iii. Inert gas workstation for processing/sample preparation of air sensitive materials
- **Targeted MSME clusters:**
 - i. Pharmaceuticals,
 - ii. Pigments, textile,
 - iii. Dye and dye intermediates,
 - iv. Metal and mineral sectors
- **Services to be offered to MSMEs:**

The facilities at DSIR-IIT Bhilai-CRTDH and the knowledge base of IIT Bhilai along with the other facilities at IIT Bhilai shall serve as one-stop solution for MSMEs and industries in the state of Chhattisgarh.

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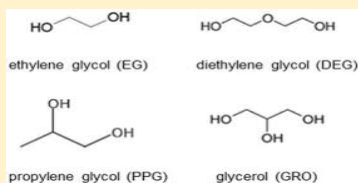


**Success stories of
CRTDH/MSMEs/
Start-ups**

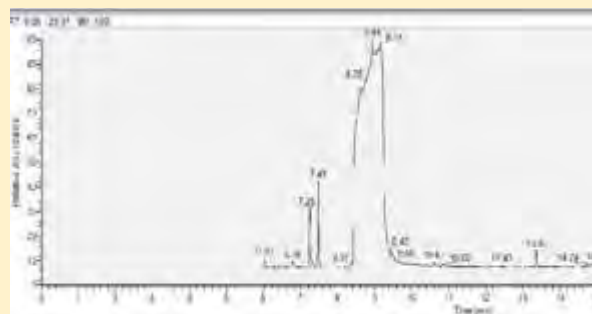
Common Research and Technology Development Hub at CSIR-CDRI, Lucknow helps MSME avert a potentially dangerous outcome. In line with the Institute’s mandate, the CRTDH offers R&D services, consultation, troubleshooting and hand-holding to pharmaceutical MSMEs for new product and technology development, as well as for regulatory compliance. We are proud to share a success story.

M/s. Neurochem Laboratories Pvt. Ltd., Lucknow, are ethical manufacturers of pharmaceutical and veterinary products. Glycerol or glycerin is Official in the Indian Pharmacopoeia (IP), meaning that anyone who can make the material with specifications spelled out in the IP monograph can sell it for use as raw material in making pharmaceutical products. It is used in several pharmaceutical and cosmetic preparations, and even repacked by MSME in small volume packaging for domestic use to manage dryness of skin during winter months. There are ~40 manufacturers of glycerine IP in India, but its availability in the retail market has been compromised, at least since November 2018. The annual sales (including export) of glycerine IP are approximately ₹ 500 crores.

In view of domestic shortages, manufacturers and especially MSME are actively engaged in vendor development for their requirements. Industrially, glycerol IP is usually produced by saponification of vegetable oils, followed by purification by charcoal adsorption and chromatography. However, it can also be synthesized from propene, propylene etc. using feedstock from the hydrocarbon industry. Further, glycerol is a waste product from processes used to manufacture biodiesel from fats. The nature of impurities arising from these kinds of processes is different. Some processes generate impurities like ethylene glycol and diethylene glycol.



M/s. Neurochem carried out a precautionary test on a sample of the material that was offered as glycerin IP. Something seemed wrong with the sample, even though it was passing the Official test as a borderline case. They approached the CRTDH at CSIR-CDRI. The vendor’s sample and Analytical Grade material were tested at the CRTDH. The sample just passed the test for purity, but showed unexpected signals in the infra-red (IR) spectrum. We analysed it by gas Chromatography followed by Mass Spectroscopy (GC/MS) and found significant amounts of ethylene glycol and diethylene glycol present in the sample (*see chromatogram below*).



Considering the potential harm that these entities are capable of doing to the liver, kidneys, etc., it was laudable that the MSME, operating on a very tight budget, thought it fit to fulfill its ethical commitments beyond the letter of the law in testing raw materials. The results of tests were shared among MSME by word-of-mouth, and potential tragedies like the cough syrup tragedy in Africa were avoided. The CRTDH salutes the high professional standards of the client and the spirit of business-to-business collaboration in the pharmaceutical MSME in the region.

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M/s Althion Tech Innovations Pvt. Ltd., Hyderabad

Althion is a 2017 born, Hyderabad based med-tech (medical technology) company developing affordable and innovative medical equipment. Althion is a winner of National Award 2020 (Technology Development Board), DST-ISBA Startup Award 2019 and STEM Impact Award 2019.

Althion has developed a line of ultra-pure water products based on a licensing agreement with CSIR IICT in November 2017. R&D was funded and supported by BIRAC, Department of Biotechnology, Department of Science and Technology, and Ministry of Electronics and IT and the startup was **incubated at CRTDH CCMB from October 2018 to October 2020**. Althion has ISO 13485 (medical device manufacture) certification from TUV Nord, the premier certifying body in the world.

CRTDH CCMB role in Althion's journey

Althion had a fruitful 2 years incubation at CRTDH CCMB from October 2018 to October 2020, before moving to a larger space. CRTDH CCMB was very helpful in connecting Althion to sister CSIR laboratories across India to help with validating the table top laboratory product. CRTDH CCMB helped Althion set up a demo unit in CSIR CCMB which was very useful. Further, we used several equipments in CRTDH CCMB such as HPLC, ultra-pure water unit for comparative studies, Ultimaker 3D printer for prototyping, etc. CRTDH CCMB also organised regular networking and training events which were quite useful.

Products:

All the below products represent import substitution opportunities from developed countries and are apt for Make in India.

- i. Medical RO plant for kidney dialysis centres, installed at several hospitals including Nandyal Government hospital AP, Rush multi-speciality hospital Kamareddy, Karkala Government Hospital Karnataka, Poornima Sethi Government Hospital Delhi, Municipal Corporation of Delhi Hospital Tilaknagar, etc.
- ii. Portable home and ICU dialysis medical RO unit, installed at several hospitals including CMC Vellore, PRS Hospital Trivandrum, Elite Mission Hospital Thrissur, Government Hospital Shillong, Narayana Hrudayalaya Bangalore, etc. Currently in the market.
- iii. Type-1/type-2 ultra-pure water table-top units for biotech/pharma companies and research institutions. To be launched shortly

Future plans:

Althion has developed the following products:

- i. Hemodialysis centre automation products
- ii. Biomedical equipment monitoring solutions for public hospitals.

These are under development:

- i. Patient motoring systems for kidney dialysis patients and automation aids for fistula creation and cannulation (the site in the body where blood is taken out during dialysis for purification). Patent filed.



Kidney Dialysis Medical RO Plant (large scale and portable)



Type-1 and Type-2 device water for sensitive and critical R&D work

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M/s Oncosimis Biotech Pvt. Ltd., Hyderabad

The Oncosimis Biotech Pvt Ltd, a startup Biotech company, presently located in Hyderabad, is in the business of making therapeutic biosimilars antibodies for cancer and diabetes and proteins for other diagnostic and industrial applications at affordable costs. Oncosimis Biotech Pvt Ltd was incorporated in December 2016 in the incubator facility of the CRTDH-CCMB, Hyderabad. The company has filed/received 30 patents. Oncosimis Biotech Pvt Ltd is recognized by DSIR, DPIIT and MSME and is also an ISO 9000:2015 certified company. They were also exempted from Tax Payment to a tune of 100 Crores.

The main mission of the Company remains production of biological drugs for cancer and diabetes and peptides for treatment of other diseases as well. Though their technology is extendable for applications in Vaccine, Nutraceuticals, Veterinary products and proteins for Diagnostics and other Industrial applications, they had confined themselves to production of novel biologics and Biosimilars proteins. They have also taken a lead role in establishing vaccine production facility for a big pharma company in Hyderabad. They are also supporting pharma industries in developing bio-catalysts (Green Chemistry initiative) intended to reduce manufacturing costs. On advanced stage of commercial - pipeline are two products, namely, Nuclease for Vaccine industry and a recombinant protein-based cream for wound healing.

The company is privileged to be one of the very first incumbents at the DSIR-CRTDH incubator facility of the Centre for Cellular and Molecular Biology, Hyderabad. As a Biotech Start up, they had to use several equipment, which were cost intensive and beyond the reach of procurement. The DSIR-CRTDH incubator facilitated availability of such equipment that helped them in establishing proof of principle studies and setting up of work protocols.

The CRTDH management of the CCMB were quite supportive and friendly in their approach. They organized several in-house training programs which facilitated the safe use and proper maintenance of equipment. Instrumentation Department of the CCMB provided immediate rectification of instrumental errors. This enhanced productivity of the start-ups at the CRTDH incubator. In addition, several deliberations and discussions with expert faculty from CCMB and other organizations, helped in updating latest trends in biotechnology.

Additionally, the recognition accorded by the DSIR has greatly helped in the import of equipment and consumables critically required (at reduced GST) for the Oncosimis, facilitating smooth progress of the proposed works. With the support from CRTDH-CCMB and DSIR, we could successfully complete BIG Grant (DBT) and NBM grant (DBT-World Bank) and progressing well in putting Oncosimis in the right track. The Company sincerely express their gratitude for CRTDH and DSIR for their continuous encouragement and support.



BIOASIA 2020 Award

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M/s InnoDX Solutions Pvt. Ltd., Gurgaon

Molecular testing based on nucleic acid (eg. RT-PCR) is considered to be the gold-standard for infectious disease detection. The COVID-19 pandemic has proven the usefulness and need for such powerful technology. However, such high-end facilities are still mostly concentrated in the centralized laboratories due to the requirement of expensive infrastructure and highly trained technicians. As a consequence, Rapid antigen/antibody detection-based tests remain the only option available for community-level adaptation (decentralized and out of the laboratory settings). These tests are rapid and cost-effective, but are highly unreliable in detecting mild infections that may be associated with the risk of community-spreading and create life-threatening implications for the immuno-compromised. While these tests may serve as screening tools, they may not be much effective in controlling and managing disease outbreaks at their early stages. Consequently, there is a huge gap between these two diagnostic formats and there is dire need of a test which has benefit of both accuracy as well as cost-effectiveness, with decentralized and out-of-laboratory application.

To bridge this gap, CRTDH at IIT Kharagpur has developed a new platform technology for Nucleic Acid based infectious disease detection. This platform is simple to use (in decentralized, remote and resource limited settings), portable, cost-effective solution with the same accuracy as that of a gold standard RT-PCR test performed at centralized laboratories. This platform requires minimal training and service support. One outstanding aspect of this technology is that it is an all-in-one portable diagnostic device that may be custom-programmed to detect a large number of infectious diseases, be it viral, bacterial or parasitic, by testing the nucleic acid (DNA/ RNA) and it is completely 'Make-in-India' solution.

InnoDx® Solutions, a rapidly emerging player in molecular diagnostics, has been privileged to be considered by -

CRTDH-IIT, Kharagpur as their technology licensee for commercializing this US-patented platform technology, COVIRAP, with no such parallel having comparable cost cum value proposition existing globally. InnoDx is working closely with the global licensees of this Technology for wide dissemination across various geographical locations. It is believed that this platform technology will be the way forward to manage all infectious and vector-borne diseases in resource-limited settings, as the post-pandemic period unfolds.

InnoDx has been further hand-held on this platform technology by the CRTDH on Affordable Healthcare at IIT Kharagpur. Post its incubation at the CRTDH, InnoDx has partnered with Surbhi Satcom Private Limited, to bring in this next-gen device technology for COVID-19 diagnostics to the realm of on-field deployment, including organizing extensive screening tests.

With the mentorship of CRTDH, InnoDx has already obtained the commercial test license of this new iso-PCR platform. Currently, these commercial kits are with ICMR for validation, and ready for market adaptation post this regulatory compliance. The final product will be indigenized as a unique cost-effective solution that will help healthcare, especially diagnosis to be taken out of the laboratory and be performed at the remotest areas, including community level adaptation (Institutions and schools, shopping centres, eateries, local pharmacy shops, community centres, bus and train stations, airports, etc.). InnoDx feels that this test will help the healthcare providers an option that can be performed at even primary healthcare level, and in the process democratize diagnostics by addressing the barriers that hinder the reach of appropriate technologies to a larger underprivileged population.



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M/s Huwel Lifesciences Pvt. Ltd., Hyderabad

Standard diagnostic method for Hgb level detection involves converting the Hgb to cyanmethemoglobin using the Drabkin's solution and then analyzed using spectrophotometry in a hematology analyzer. However, a major part of the rural Indian population is still deprived of even the most essential primary healthcare amenities owing to the unaffordable and inaccessible centralized healthcare facilities and their standardized diagnostic protocols. Such challenges culminate in the form of mortality, secondary and tertiary disease burden and medically-enforced poverty. As a result of all these factors, early diagnosis of anemia and frequent monitoring of Hgb levels still remain a challenge in most parts of rural India.

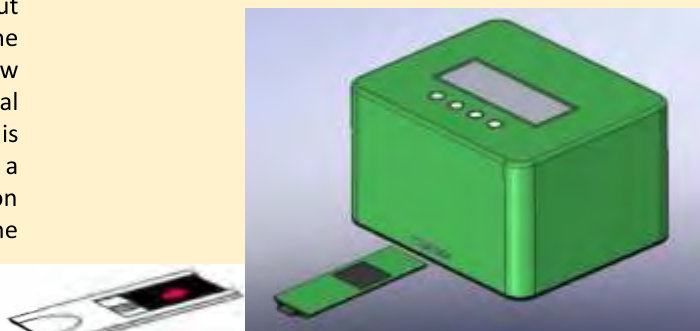
To supplement these efforts towards affordable diagnostic solutions, Indian Institute of Technology, Kharagpur (IIT-KGP) has collaborated with Huwel Lifesciences Pvt. Ltd. to develop an easy-to-use Point Of Care (PoC) solution for detecting and quantifying Hgb and reduce the need for sophisticated instruments for Hgb monitoring, along with the evaluation of other routine blood markers with minimal alteration in the test protocol. A simple, affordable, rapid and highly accurate quantitative paper-based sensor, integrated with smartphone application, for on-spot detection of hemoglobin and plasma glucose concentration using approximately only a drop of finger-pricked blood has been developed. Quantitative analytical colorimetry could be achieved via a user-friendly smartphone App; integrating the key operational steps of image acquisition, real-time analysis and result dissemination via a portable custom-made readout unit.

Huwel Lifesciences Pvt. Ltd, already having manufacturing licenses from DCGI and an established leader in RT-PCR kits, came across with this technology disruption by interfacing with the R&D team of CRTDH at IIT Kharagpur. The whole act of extremely simplified blood testing with minimally invasive procedure, fabrication-free microfluidic technology, in-situ blood-plasma separation without any device complexity or additional operative embodiment and AI-driven data analytics for fully-automated detection and interpretation without manual intervention; all instrumented by smartphone integration, leading to gold-standard test accuracy at ultra-low cost, appeared to be a decisive game-changer for rural healthcare and community adaptation. Huwel licensed this technology from IIT Kharagpur and is currently working in a mission mode to bring this product to the market for common use, under the mentorship of the scientific team from the CRTDH at IIT Kharagpur.

The technology team at Huwel is working on adapting a universal version of this technology, wherein all the functionalities will be integrated into one device, which includes eliminating the need for a smartphone. Paper strips will have a unique ID that can be associated and linked to each patient. The secondary focus is also to develop a universal portable device that may be customized to perform large numbers of blood tests based on similar detection principles without changing the essential hardware. This new product from Huwel, in partnership with the CRTDH of IIT Kharagpur, is envisioned to foster a silent socio-economic revolution by empowering minimally-trained personnel to deliver healthcare-support to last-mile and providing financially-sustainable livelihood for rural-women and MSMEs in establishing a new supply chain of medical kits.

Huwel has a dedicated and qualified human resource team exclusively working on this technology, to deliver a high-quality low-cost product for routine blood tests centered around the invention. In addition to the implementation of good manufacturing practices (GMP), following the latest MDR and ISO 13485/9001 guidelines and adapting stringent QC/QA coupled with high quality documentation that ensures the processes that meet the Global requirements, the product and business development team of Huwel is in continuous endeavor to infuse innovative design-for-manufacturing perspectives to this diagnostic product. This includes up-scaled manufacturing of a simple modular readout device akin to common card-readers, and developing a large-scale field deployment network (urban slums, low-cost test models in urban hospitals, municipality health clinics, primary healthcare centres in the rural sector, skeletal pathology labs at decentralized locations, community centres and local pharmacies, green-field applications).

Huwel would like to extend thanks to CRTDH at IIT, Kharagpur for such a wonderful innovation and timely support in our R & D endeavor.



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M/s Spatial Karma Resources Private Limited (SKRPL), Hyderabad

Spatial Karma Resources Private Limited (SKRPL), a Company originally spun-off to deploy digital transformation in the agricultural technology space, has been privileged to incubate its extended arm on rural technologies at the CRTDH-IIT, Kharagpur on Affordable Healthcare at. This has been a follow-up of the consortium partnership led by Institute of Insurance and Risk Management (IIRM) to use the flagship handheld device-technology on rapid and early screening of oral pre-cancer and cancer, developed by Dr Suman Chakraborty, Professor, IIT Kharagpur and his team, for on-field adaptation at underserved locations beyond the ambit of resourced clinics. The device has a thermal camera and temperature/humidity sensors and the data is analysed using AI/ML on the cloud.

The proposal of this consortium to conduct a district wide multi-phasic survey using the device was accepted and the project was initiated in June 2022. SKRPL has also signed a technology transfer agreement with IIT Kharagpur, and is currently being mentored by the CRTDH for commercializing this product. The product development team of CRTDH is facilitating this lab-to-market translation, and simplify the device for mass manufacturing, ensuring good user experience, and enabling it to access any part of the oral cavity in a non-invasive manner as well as making it easy to use for the frontline health workers. The design team of SKRPL transformed the electronics in the point-of-care system into a single integrated unit and created a form-fit design similar to a toothbrush. They considered additional design parameters which includes an integrated design without screws, in-built pattern to facilitate holding in the hand rather than using a different material, among others, to result in a unique product that infuses deep scientific realm of blood perfusion image-analytics to the realm of public health in a manner that remained elusive thus far. The final product includes a multi-colour indicator for various stages of operation. It is designed for IP67 compliance, and the first of its kind handheld portable thermal imaging system to be commercially disseminated, premised on the landmark publication of the IIT Kharagpur team in the Proceedings of the National Academy of Sciences, USA.

The above premium product on oral cancer screening offers a substantial advancement from the existing thermal-imaging tools, which alone, by themselves, remained somewhat inadequate in distinguishing between some ambiguous manifestations of pre-cancer and cancerous lesions inside the mouth or skin or any other sub-surface location, resulting in compromise in the selectivity of the disease detection. This, along with the lack of availability of a user-friendly and inexpensive portable device for thermal-image acquisition and data integration thus far acted as a deterrent against the emergence of an inexpensive, contact-free and accurate in situ screening and diagnostic approach for cancer detection and management. The device, in its successful Phase-1 clinical trial, could remarkably detect cancerous traits in suspected oral lesions of human patients with an extremely high precision without requiring any laboratory-standard resources, by characterizing the localized alterations in microcirculation in the tissue. This may indeed create a revolution in early detection of cancer in underserved rural settings in a primary healthcare format and save several lives in the way.

The exclusive features of this technology evidenced capability of differential diagnosis of oral pre-cancer reasonably early, when the visual features remain indistinguishable from normal scenarios. This aspect is extremely critical for public health management at under-resourced locations, since further complexities in the disease progression may lead to irreversible damage as well as transformation to malignancy. The potential lifestyle disruption, if allowed to progress indefinitely, may lead to an inability of the patient to open the mouth at a later stage of oral sub-mucosal fibrosis. However, if the disease is detected early, lifestyle alterations alone may be adequate means of disease management without further complications. Since early detection of this remained unfeasible in healthcare practice in resource-limited settings in the current state of affairs, patients with oral pre-cancer typically continue to present with advanced disease progression, with inevitable irreversible damage. This product has clearly established a unique value proposition in this regard, by offering a community level measure towards managing critical oral diseases at underserved locations. The product is set to be used in Sundargarh District, Odisha for a survey of all at risk population with an oral cancer risk. It has also been proposed to be used in Meghalaya by Indian Institute of Public Health.



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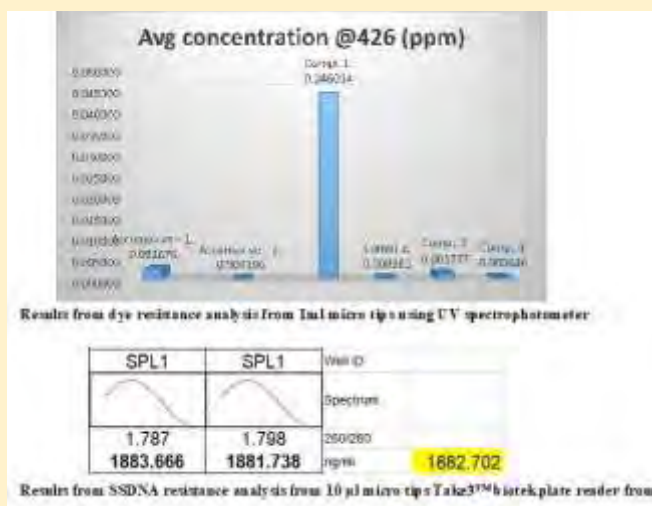
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M/s Accumax Lab Devices Pvt. Ltd., Gandhinagar

Accumax has become one of the largest producers of liquid handling products for the past decade and driven by a culture of change and innovation. It constantly strives to improvise on its technology, process and product quality to provide exceptional precision and ease in usage. It is constantly exploring different horizons, currently our exclusive product basket includes Pipettes and controllers, bottle top, dispensers, tips, tubes and PCR consumables. Since inception, quality was one of the key for our success stories and when Accumax decided to expand our business horizon beyond the country, it reached out to DSIR-IITGN-CRTDH facility at IIT Gandhinagar for product quality testing. It started with heavy metal content analysis for our products like centrifuge tubes, HDPE and PP bottles. DSIR-IITGN-CRTDH team optimized the microwave digestion method and carried out the rest of the analysis using ICP MS/OES.

Accumax got its low retention tips rolling out as a new product line and wanted to check its substance resistance using commercial dye and DNA/RNA as testing materials. 1ml micro tips was tested for dye resistance test and later compared with other commercially available products. Along with DSIR-IITGN-CRTDH team the methodology for carrying out the experiments was formulated and the samples were tested using UV spectrometer in the CRTDH facility. Similarly, 1.10 μ l short tips from Accumax were tested and the final analysis done with Take3™ biotek plate reader at the CRTDH facility and further compared with the competitors. Since there are no standard tests available for such exploratory tests, the methodology was developed with lot of literature review and trial error experiments. To compete with international market and improve the standards with the national suppliers, Accumax decided to do leachable assay to its 1 ml micro tips. With the help from CRTDH team, the extraction technique and parameters like type of solvents, time, effect of temperature and many more were optimized.

The best possible analytical technique to analyse the expected compound was HPTLC and GC/MS. But due to the requirement from the end of Accumax, it was decided to go along with HPLC, which was outsourced for analysis. Since the expected the compounds are plasticizers, the analytical HPLC required a separate method development for the quantification. After a detailed literature review and white paper reviews, Accumax decided with analytical methods and the analysis was carried out in HPLC with a newly developed method by CRTDH Team. The work is still in progress and yet to be completed. A HPLC facility at CRTDH facility would have accelerated the work. Nevertheless, Accumax appreciates team's support for helping to improve its products quality. Apart from these, Accumax also have participated in a workshop organised by CRTDH and looking for much venues to learn about the analytical techniques. Accumax is also looking forward to collaborate many R&D work in the future.



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M/s Arun Industrial Products, Ahmedabad

Arun Industrial Product is a leading Manufacture & Exporter of AHC (Aluminium Hydroxide Chloride) & Paper Sizing Chemicals, Water treatment chemicals and food chemicals. The introduction of AHC product in the market was stuck due to the lack of proper method validation and product optimization for various types of STP water. Arun Industry wanted to do a feasibility study of our AHC products for sewage treatment. To develop R&D trials and scale-up studies, the company approached the DSIR-IITGn-CRTDH facility. The CRTDH Team started validating their product from a few ml in the Lab. On successful demonstration, the team developed optimized doses in liter scale (200 L and 400 L) for various STP effluents. Based on the experience, the final demonstration was arranged in IIT Gandhinagar's STP plant on 1 m³ scale, followed by a trial in a running STP plant in Nadiad after getting permission from GPCB. The extensive studies at DSIR-IITGn-CRTDH generated detailed data and a full-fledged report. After submission of the data and report to GPCB, Arun Industry got permission to sell their AHC products as a coagulant for sewage treatment. The company is happy with CRTDH's contribution for validating our product which is now available in the market and giving good business. They were pleased to gift a 1000 L STP skid-mounted wastewater treatment plant to CRTDH, which can be used for other MEME members. Arun Industry is also discussing a proposal with the CRTDH team for their upcoming business.



Testing of AHC in STP plant at Nadiad



Testing of AHC in 200-400 L scale at CRTDH

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Disclaimer: The contents/data presented in this compendium is based on the factual information as claimed by the CRTDHs & MSMEs and CRTDHs & MSMEs are responsible for the authenticity of the information.

CRTDH



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