



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

ACCREDITED WITH GRADE "A++" BY NAAC
CATEGORY - 1 UNIVERSITY BY UGC



**CENTRE FOR WASTE MANAGEMENT
INTERNATIONAL RESEARCH CENTRE**

BROCHURE

"DRIVING INNOVATION WITH
STATE-OF-THE-ART FACILITIES
TOWARDS WASTE VALORISATION"



www.sathyabama.ac.in
www.centreforwastemanagement.com



ABOUT SATHYABAMA

Sathyabama Institute of Science and Technology is one of South India's premier Academic and Research Institutions that offers multi-disciplinary academic programmes in various fields of Engineering, Science, Technology, Management, Dentistry, Law and Nursing. It has been Accredited with 'A++' Grade by the National Accreditation and Assessment Council. Sathyabama's standing in rankings and ratings are excellent at National and International level. For the year 2024, Sathyabama Institute of Science and Technology has been ranked in 51st position among the Universities in India by the National Institutional Ranking Framework (NIRF), Government of India. NIRF has consistently ranked Sathyabama in the top positions and this is the seventh consecutive year the Institution is receiving this recognition.



ABOUT CENTRE



To encourage and motivate researchers across the globe, several research centres have been initiated in the institution and are progressively working towards innovation in the field of Science and technology. **Sathyabama Institute of Science and Technology with the joint initiative of the National Solid Waste Association of India (NSWAI) has established the Centre for Waste Management in 2011.** Centre was devoted to develop innovative products, patent liable novel ideas in Waste Management, publish experimental outcomes in Q1 journals, train graduate students, offer consultancy services and pursue outreach activities so as to translate the research findings to the society for environmental and economic benefits.

The centre has contributed majorly towards Bioenergy and has been instrumental in acquiring **Centre of Excellence for Energy Research bestowed by Ministry of Human Resource Development under the FAST Scheme in October 2014.** Since then, the centre has flourished in biofuel related research focusing on Biodiesel from edible and non edible sources, Bioethanol, Biogas and Biohydrogen.

VISION

The Centre aims to create a sustainable future by turning waste into valuable resources and promoting a circular economy by implementing innovative solution twinned with mass awareness for a cleaner greener environment.



MISSION

- To promote advanced research on waste valorisation for clean fuel, green chemicals and value added materials for a wide range of applications.
- To implement the research outcomes at institutional, local and regional levels and earnestly contribute to meet sustainable development goals and attain carbon credits by following climate change abating protocols.



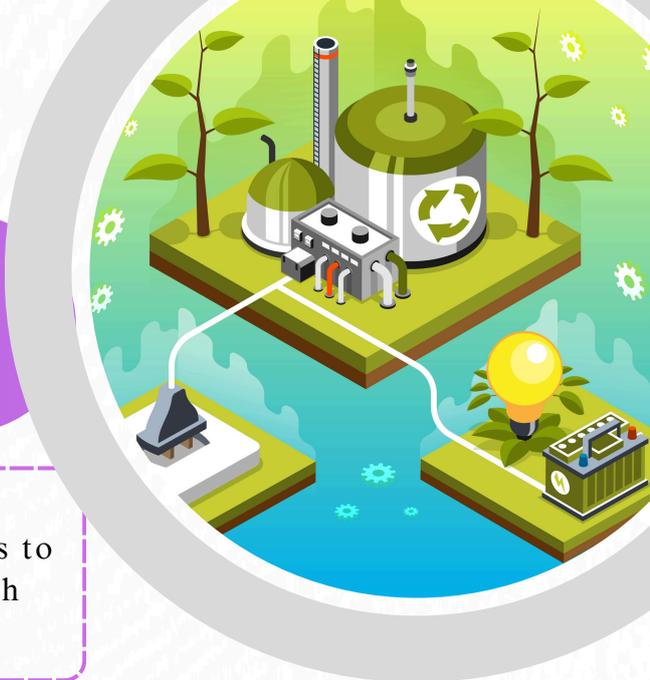
- To attract masses into clean and green initiatives by convening awareness and outreach programmes.
- To indicate the need skills and knowledge to the student community and enhance their interest towards the waste management and clean environment.
- To encourage social entrepreneurship by being a mentoring centre for environment friendly enterprises and start ups.

COLLABORATE AND INSPIRE

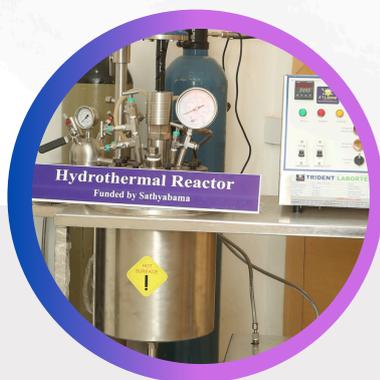
We offer a dynamic range of services designed towards industrial enthusiasts, entrepreneurs, students, academicians and agribusiness with the knowledge and strategies needed for sustainable development.

Think outside the box

Break the mold and explore new sustainable ways to lead yourself. Be courageous to experiment with different processes and styles !



GET OUR SERVICES



HYDROTHERMAL REACTOR

Hydrothermal (HTL) reactions mimic the natural geothermal processes that take place deep beneath the earth by happening under extreme pressure and temperature conditions. This technique is critical to many applications, including synthesis of materials, the production of bioenergy, and environmental remediation.



ATOMIC ABSORPTION SPECTROMETER

Atomic absorption spectrometer (AAS) was used to determine the concentration of metal more specifically to water environment. It ensures accurate and sensitive detection of trace elements in both PPM and PPB level, which is crucial for applications in food safety, medicines, and environmental remediation.



CHNS - O ANALYSER

The carbon, hydrogen, nitrogen, sulphur, and oxygen contents of different materials can be accurately determined with the CHNS/O Analyzer. It provides excellent precision and dependability. The analyser finds significant applications in biomass biofuels, materials research, medicines, and environmental remediation.



Specialized
Expertise



Adaptive
Solutions



Holistic
Ideas

"TO SUCCEED IN YOUR MISSION, YOU MUST HAVE SINGLE-MINDED DEVOTION TO YOUR GOAL"

DR. APJ ABDUL KALAM

Tell us your need...

Share us your unique need, perspective, problem and experiences in the field. Together, we can achieve greatness !

‘ Sustainable development is the ability to meet the needs of the present without compromising the ability of future generations to meet their own needs ‘





Pilot Scale Biodiesel Esterification and Transesterification Unit

The pilot scale Biodiesel production unit housed in the Centre since 2015 is catering to the conversion of waste cooking oil into Biodiesel, an alternate green fuel. The unit has successfully produced more than 10,000 litres of biodiesel since its establishment. The biodiesel produced has been tested for its quality and meets ASTM standards. The reduced emissions, improved oxidation stability, higher calorific value, enhanced flow and combustion properties make the biodiesel supreme and competitive. The biodiesel has been tested in the institution buses, a few of which operate with biodiesel blends. We have been regularly supplying biodiesel to agricultural pump sets and gensets and have received commendable feedback from the customers. Apart from the pilot scale unit, the Centre has facilities in lab and bench scale for the production of biodiesel from wide range of raw materials including waste cooking oil, algal oil, beef tallow, goat fat, rice bran oil and many other edible and non-edible oils.

Facility Outcomes

200+ Training Programmes conducted

1000+ Students and Scholars Trained

50+ Industry Experts/Entrepreneurs Trained

750+ Consultancy Services completed

50+ Publications and 2 Patents

Regular training programmes are being conducted for graduate students, research scholars, researchers, academicians and industry experts. Consultancy services are also provided in design/fabrication of Biodiesel production units, Biodiesel production and quality analysis from edible and non-edible oil sources. We work towards achieving sustainable development goals 7 (Affordable and Clean Energy) and 13 (Climate Action) and focus on Carbon footprint reduction in campus.

Digital Bomb Calorimeter



The instrument is used to determine the calorific value of hydrocarbon fuels (ASTM D 4809-13), coal and biomass (ASTM D 5865). It can be used for a wide range of fuels, biofuels and blends.

Kinematic Viscosity

The viscosity of fuels is important for the estimation of optimum storage, handling, and operational conditions. The equipment is used to measure kinematic viscosity as per ASTM D445.



Closed cup tester



The flash point of biodiesel, blends and other petroleum products in response to heat and an ignition source under controlled laboratory conditions in the temperature range from 40 °C to 300 °C can be determined using the Pensky-Martens closed-cup apparatus as per ASTM D93.

Copper Strip Corrosion (ASTM D130)

This test method covers the determination of the corrosiveness to copper of wide range of fuels, biofuels and blends including aviation gasoline, aviation turbine fuel, automotive gasoline, cleaners (Stoddard) solvent, kerosine, diesel fuel, distillate fuel oil, lubricating oil, and natural gasoline or other hydrocarbons having a vapor pressure no greater than 124 kPa (18 psi) at 37.8 °C.



Cloud and Pour point (ASTM D2500)



This test method covers only petroleum products and biodiesel fuels. This cloud and pour point is a condition which is detrimental for any engine as solidified wax makes the fuel thick and it clogs the fuel filters and injectors.

BIOETHANOL PRODUCTION FACILITY

Bioethanol research focuses on the process optimization, production, and application of bioethanol, a renewable and sustainable form of ethanol (C_2H_5OH) primarily derived from biomass. Bioethanol is widely studied as a biofuel and a potential substitute for fossil fuels, helping reduce greenhouse gas emissions and dependence on non-renewable resources.



FOCUS RESEARCH AREAS

- Valorization of agricultural waste for sustainable bioethanol production: A circular economy approach
- Metabolic engineering of microbial consortia for enhanced lignocellulosic bioethanol yield
- Advancing bioethanol recovery using superhydrophobic membranes for azeotropic separation
- Hybrid feedstock utilization: Combining algae and lignocellulosic for third-generation bioethanol
- Carbon-neutral bioethanol production: Coupling fermentation with carbon capture technologies
- Enhancing bioethanol sustainability through green pretreatment technologies
- Bioethanol-based high-octane fuel blends for aviation and marine applications
- Decentralized bioethanol production systems: A rural energy perspective
- Life cycle assessment of emerging feedstocks for sustainable bioethanol production
- Transforming food waste into bioethanol: Opportunities in urban waste management
- Advanced membrane distillation for energy-efficient bioethanol purification

Consultancy and training services offered in highlighted areas of research

Applications of Bioethanol

1. Renewable Energy and Transportation
2. Industrial and Chemical Sector
3. Pharmaceutical and Personal Care
4. Food and Beverage Industry
5. Agricultural Applications

Industrial connects

1. Rex Bioscience Technology, Chennai
2. Cosy Industries, Guindy, Chennai
3. Sri Aachaneyaa Industries, Chennai

Relevant Services Offered

1. Biomass Characterization for Bioethanol Production
2. Bioethanol and blend properties testing as per ASTM standards
3. Carbohydrates estimation using UV spectroscopy

1 NO POVERTY



7 AFFORDABLE AND CLEAN ENERGY



8 DECENT WORK AND ECONOMIC GROWTH



13 CLIMATE ACTION



SDGs involved 1, 7, 8, 13



1 TONNE BIOGAS PLANT



The digester converts 1 Tonne food waste into 80-100 cubic meters of biogas per day. This initiative was taken towards addressing the Global Climatic Change issues. This aligns with Sustainable Development Goals (SDG) 12 (Responsible Consumption) and 13 (Climate Action), promoting sustainable waste management and energy recovery while minimizing environmental impact.

Processing 1 tonne of food waste through anaerobic digestion can prevent approximately 0.5 to 1 tonne of carbon dioxide equivalent (CO₂e) from being released into the atmosphere.

- We provide consultancy support for installation of lab, pilot and large scale biogas plants.
- Training on optimization & validation of Digester conditions and biogas plant operations.



MICROALGAL FACILITY

Algae cultivation in a photobioreactor (PBR) involves growing algae in a controlled environment using light as the primary energy source. PBRs provide optimal conditions for algae growth by regulating factors like light intensity, carbon dioxide, temperature, and nutrient supply. They prevent contamination and ensure higher productivity compared to open pond systems. This technology is sustainable and contributes to carbon capture and wastewater treatment

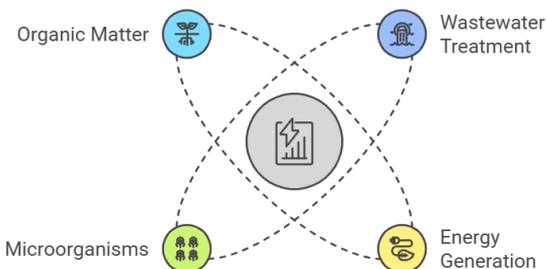


Applications : Biofuel Production
Biopolymer
Bioremediation

Food and feed supplements
Medical and nutraceuticals
Waste water treatment

Our main focus is to cultivate microalgal for sustainable application in biofuel and biopolymer technology. In addition we strike to work on carbon sequestration using *Nanochloropsis*

MICROBIAL FUEL CELL



Microbial fuel cells (MFCs) harness electroactive microorganisms to oxidize organic matter in wastewater, facilitating simultaneous treatment and power generation. By converting biochemical substrates into bioelectricity, MFCs contribute to Sustainable Development Goals (SDG) 6 (Clean Water), 7 (Affordable and Clean Energy), and 12 (Responsible Consumption).

- Fabrication of customized lab and pilot scale MFCs
- Training in operations of MFC
- We provide consultancy support.



GAS CHROMATOGRAPHY



Gas chromatography (GC) with Flame Ionization Detector (FID) and Thermal Conductivity Detector (TCD) is a versatile analytical technique used to separate and analyze compounds in a mixture. The FID is sensitive to hydrocarbons and detects compounds based on ionization in a flame, offering high sensitivity for organic substances. The TCD detects compounds by measuring changes in the thermal conductivity of the carrier gas due to analytes, making it suitable for detecting both organic and inorganic compounds. This method is widely used in environmental, pharmaceutical, and petrochemical industries.



Funded by Ministry of Human Resource Development, Govt. of India

**Samples Tested : Petrochemical
Gas Samples**

**Biofuels
Extractives**

BIOPOLYMER TECHNOLOGY

Biopolymer synthesis from lignocellulosic biomass involves converting plant-derived materials like cellulose, hemicellulose, and lignin into biodegradable polymers. The process includes pretreatment, enzymatic hydrolysis, and microbial fermentation to break down the biomass and synthesize biopolymers such as polyhydroxyalkanoates (PHAs) or polylactic acid (PLA). This approach utilizes renewable feedstocks, reducing reliance on fossil fuels and lowering environmental impact. The resulting biopolymers are used in packaging, medical applications, and sustainable materials. Advances in biotechnology aim to enhance yields and economic viability for large-scale production.



Applications :

- ★ Biomedical
- ★ Bioremediation
- ★ Packaging
- ★ Cosmetics
- ★ Agriculture
- ★ Textile

"Greener Materials for a Cleaner Tomorrow"

To know more, please visit our website

We provide :

- Training Program
- Consultancy
- Workshop
- Internship

Our Achievements

- 100+ Consultancy samples
- 50+ Trainings Programs
- 25+ Student Projects and Internships
- 20+ Papers and book chapters



Our research focuses mainly on developing and optimizing geopolymer binder for various applications like thermal resistant binder for construction, heavy metal encapsulation, CO₂ capture and thermal energy storage applications.

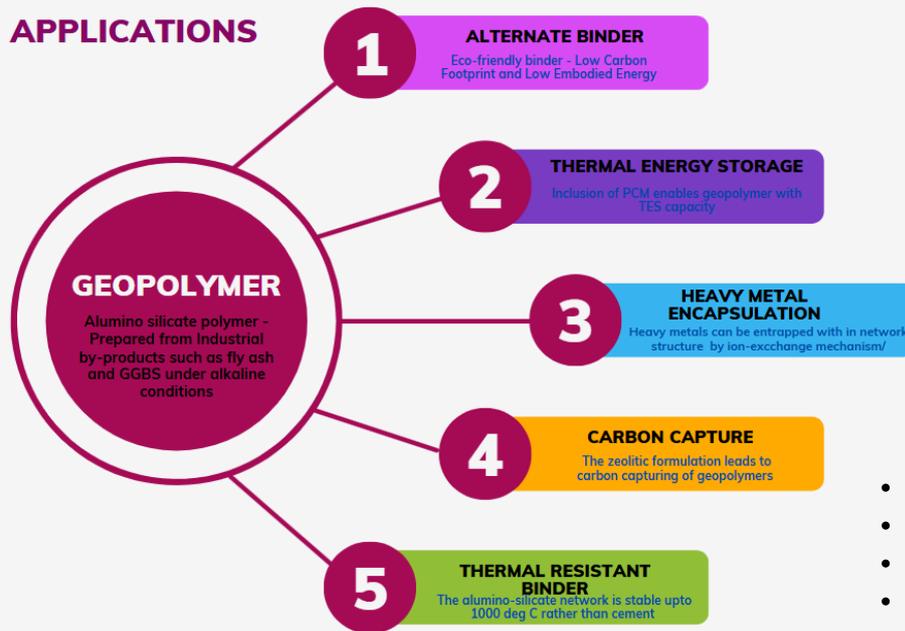


SDG involved, 7, 9, 11

Active geopolymer research areas

- Development of thermal resistant geopolymer binder from the industrial by-products such as fly ash and GGBS.
- Optimization and lifecycle assessment of the one-part alkali activator solution for geopolymer production
- Formulation of geopolymers for thermal energy storage applications using bio-glycerol modified alkali activator solution
- Microstructure evaluation of different geopolymer using advanced characterization techniques, Durability assessment of the developed geopolymer composites such as acid, sulfate resistance, RCPT and carbonation resistance etc.,
- Heavy metal encapsulation

APPLICATIONS



Related Facilities

- JASCO 6600 ATR FT-IR Spectrometer, Japan
- Equitron Hot Air Oven -Stream Series/2023
- AIMIL Digi Mortar Mixer (4.75 litre) capacity
- AIMIL Automatic Compression and Flexure Testing machine for 250kN & 25kN capacity, Dual mode (AIM-308E-FA-1-D)
- AIMIL Vicat Apparatus

Major Facilities - JASCO 6600 ATR FTIR Spectrometer

The JASCO 6600 ATR FTIR Spectrometer is an advanced instrument designed for precise and versatile infrared spectroscopic analysis. Equipped with an Attenuated Total Reflectance (ATR) accessory, it allows direct sample analysis without extensive preparation, making it suitable for solids, liquids, and powders.

Its key features include:

- **Broad Spectral Range:** Provides detailed analysis across the mid-infrared region, ideal for identifying functional groups and studying chemical bonding.
- **High Sensitivity and Resolution:** Ensures accurate peak detection, making it suitable for complex materials and subtle changes in molecular structure.
- **Rapid Data Acquisition:** Capable of capturing spectra in seconds, improving workflow efficiency for multiple sample analyses.
- **User-Friendly Software:** Offers advanced tools for baseline correction, peak deconvolution, and quantitative analysis.



WATER TESTING LABORATORY NABL ACCREDITATION IN PROCESS

(APPLICATION NUMBER: NABL040 671)

Water is a critical resource for life, and its quality plays a vital role in health and environmental sustainability. Water testing ensures that water meets safety and quality standards by identifying physical, chemical, and biological parameters. Our advanced water analysis lab is equipped to perform comprehensive testing, providing reliable results to support safe water usage and environmental conservation.

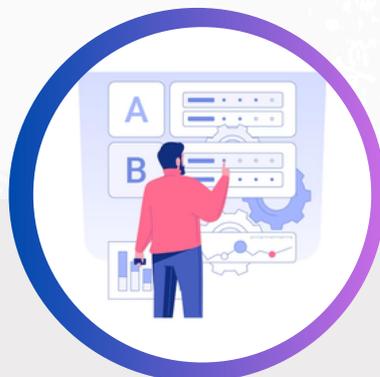


GET OUR SERVICES



TYPE OF WATER WE TEST

We offer testing services for various types of water, including drinking water, groundwater, surface water (such as lakes, rivers, and streams), wastewater, industrial process water, irrigation water, seawater, and bottled water.



TESTING PARAMETER

Calcium
Chloride
Magnesium
Total hardness (as CaCO₃)
Total alkalinity (as CaCO₃)
pH
Turbidity
Colour
Total Dissolved Solids (TDS)
Odour
Taste



EQUIPMENTS

Our lab is equipped with a Multiparameter Analyser (pH, Dissolve Oxygen, conductivity, Temperature), UV spectrophotometer, and a titration setup. It also includes a Type III water unit, Kjeldahl Distillated unit, Vaccum Oven, Muffle furnace, Magentic stirrer, digital weighing balance, and a filtration unit. Additionally, there is a variety of glassware, such as beakers, flasks, and pipettes, along with incubators for controlled environmental conditions.



Specialized
Expertise



Adaptive
Solutions



Holistic
Ideas

“Quality is never an accident; it is always the result of high intention, sincere effort, intelligent direction and skillful execution; it represents the wise choice of many alternatives.”

- William A. Foster

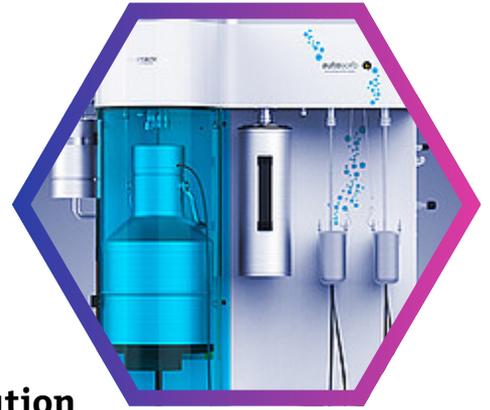
"Water is life, and quality water is the foundation of a healthy environment."

"Committed to Excellence in Environmental Testing"



BET SURFACE AREA ANALYSER

Surface Area Analyzer is a sophisticated instrument designed to measure the surface area and pore size distribution of materials with high accuracy and precision. It provides valuable insights into the material properties, enabling researchers and end-users in various fields such as material science, catalysis, adsorption, pharmaceuticals, energy storage and environmental applications.



- **T-Plot**
- **Average Pore Diameter**
- **Langmuir Surface Area**
- **Adsorption Kinetics**
- **Surface Area**
- **Pore Size Distribution**
- **Total Pore Volume**

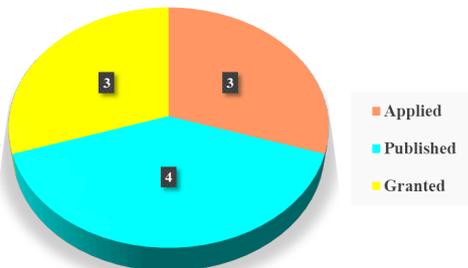
PATENTS

Granted: 3

- Solar Powered Water Desalination Apparatus
- An Automatic System for Treatment and Recycling of Water for Train Compartment Wash Basins
- Automatic Smart Segregator

Applied: 3

Published: 4



PROJECTS

Total No of Projects Acquired: 8

Overall fund received : Rs. 3,81,05,289/-

Funding Agency:

- **Ministry of Human Resource and Development**
- **Department of Science and Technology**
- **Unnat Bharat Abhiyan - MHRD**
- **Vikram Sarabhai Space Centre- ISRO**



VIKRAM SARABHAI SPACE CENTRE

STARTUP

Biglyso Private Limited



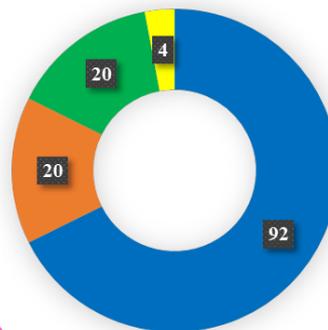
Supported by



Products developed

- **Biodiesel**
- **Biocompost**
- **Biochar**
- **Bioplastics**
- **Detergent Soap**
- **Incense Sticks**
- **Bioethanol**
- **Geopolymer**

PUBLICATIONS



- **Journal Publication**
- **Conferene Publication**
- **Book Chapters**
- **Books Edited**



EVENTS @ CWM

- Training Programs
- Workshops
- Internships
- Outreach Programs
- Conferences
- Tech talks
- Awareness Programs
- Student projects

REACH US

Youtube :

<https://www.youtube.com/channel/UCxBcv3nd9oXoNqJfBVRu9wg>

LinkedIn :

<https://www.linkedin.com/in/cwm-era-58a068323>

Website :

<https://www.centreforwastemanagement.com>

Email ID : centreworkcwm@gmail.com

INDUSTRY CONNECTS OF CWM

The CWM has signed MoUs with



AUDIT

Institutional Waste, Energy and Environment audits has been organized since 2020 covering:

Solid waste
Water usage
Green coverage
Carbon footprint
Energy consumption



CONTACT US

SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY

WWW.SATHYABAMA.AC.IN



**CHENNAI (OMR)
&
SRIPERUMBUDUR**

CENTRE FOR WASTE MANAGEMENT – INTERNATIONAL RESEARCH CENTRE

CHENNAI CAMPUS

JEPPIAAR NAGAR (OMR), CHENNAI – 600 119.



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