Temporary Registration No. : TPN / 71444

सत्यमेव जयते
Ministry of Science & Technology
Government of India

Project Proposal On

"TREATMENT OF BIOREFRACTORY WASTEWATER THROUGH MEMBRANE ASSISTED CHEMICAL OXIDATION"

Submitted to

Division : Technology Missions Division

Programme or Scheme : WTI Call 2021 on Desalination Technologies

Submitted by

Project Investigator:

Dr. P SARITHA

MALLA REDDY ENGINEERING COLLEGE(AUTONOMOUS)-Hyderabad

Part 1 : General Information

General Information:

1.Name of the Institute/University/Organisation submitting the Project Proposal :

MALLA REDDY ENGINEERING COLLEGE(AUTONOMOUS)

2. State	Telangana
3. Principal Investigrator Name:	Dr. P SARITHA
4. Category:	General
5. Type of the Institue :	Registered Societies (NGOs)
6. Project Title :	TREATMENT OF BIOREFRACTORY WASTEWATER THROUGH MEMBRANE ASSISTED CHEMICAL OXIDATION
7. Division :	Technology Missions Division
8. Programme Or Scheme :	WTI Call 2021 on Desalination Technologies
9. Academic Area :	Civil Engineering,
10. Application Area :	Water,
11. Goverment National Initiative :	Not Applicable,
12. Type of Proposal :	Proposal Against Call
13. Project Duration :	3 Years and 0 Months
14. Proposal Submit Date :	27/09/2021
15. Project Keywords :	Advanced oxidation process, Biorefractory, Membrane filteration, Degradation, Desalination

16. Project Summary :

Outline of the problem

Water pollution has become a serious problem throughout the world. According to the UN's latest figures, approximately 40 of the world's population of more than two billion people face water shortage. By 2025, this figure is expected to increase to 5.5 billion or more than 2.5 times the present population. Chemical industry is at the forefront of the water management challenge, due to increasing government pressure on effluent discharge, raw water usage, increasing process water costs and in many locations, general lack of available water. The total amount of different chemicals produced is vast and continuously increasing. About 100000 different chemicals can be found in the market Charpentier 2003. Despite their different properties and uses, their production processes are very similar. The need and use of water in chemical and pharmaceutical processes is defined by the required unit operations, raw materials and process equipment. As much as 20 of total wastewater flow from chemical and pharmaceutical industries contains 80 of the pollutant load EU Water Saving Potential - Part 1, 2007. Increased knowledge about the consequences of water pollution and the public desire for better quality water has promoted the implementation of stringent regulations by expanding the scope of regulated contaminants and lowering their maximum contaminant levels MCLs. An ideal waste treatment process would be cost-effective and at the same time completely mineralize all the toxic species present in the waste stream without leaving behind any hazardous residues. At the current state of development, none of the treatment technologies approach this ideal situation. The presence of compounds like the phenolics Gonzalez 1993, which cannot be treated by conventional techniques, require non-biological processes for effective elimination and Advanced Oxidation Processes AOP have such a capability. In addition, legislations governing the effluent discharge standards laid by pollution control boards stress on freshwater conservation through water reuse and recycling. By recycling and reusing treated wastewater, industries can save on the costs of clean water, ensure adequate supplies and help to preserve a diminishing natural resource. The increase in water reuse has been driven largely by innovative treatment technologies like Membrane filteration that are both cost effective and reliable in removing harmful bacteria and pathogens.

Significance of the project

The suitability of Advanced Oxidation Processes AOPs for aqueous pollutant degradation was recognized in the early 1970's and much research and development work has been undertaken to commercialize some of these processes. Advanced Oxidation Processes AOP has emerged as potentially powerful methods, which are capable of transforming the pollutants into harmless substances. They offer a high degree of process flexibility and the ability to degrade pollutants and concentration levels that can be challenging to the treatment processes listed above. Among all the oxidation processes, Fenton, Photofenton and Photocatalysis using titanium dioxide TiO_2 appears to be the most promising techniques in the treatment of the above listed refractory molecules.

Membrane treatment is capable of providing a highly efficient treatment, requires minimal energy, and does not introduce any additives to the waste stream. Membrane systems successfully remove the large amount of suspended solids SS in wastewater. There are many membrane process applications on water and wastewater treatment that has proven to be efficient. The aim of introducing membrane filtration is not only to reduce water consumption and wastewater effluents, but also to reduce the consumption of energy, as the warm water can be recovered. Membrane technology covers a large spectrum of separation techniques, ranging from reverse osmosis to nanofiltration. The main force of membrane technology is the fact that it works without the addition of chemicals, with a relatively low energy use and easy and well-arranged process conductions.

A combination of membrane and AOPs could have many advantages - high-quality effluent over a wide range of raw water sources, no chemical addition except when organic removal is practiced and a small amount of solids requiring disposal with reduced operation and maintenance requirements. Use of a membrane reactor generally permits the reuse of the catalyst, the control of contact time of organic substrates in the oxidant environment, and confining of the pollutants and their intermediates in the reaction ambient thus carrying out, in a single step, both reaction and separation. The membrane separation process allows the photocatalyst Molinari, R, 2006 to be easily separated, recovered and reused. More significantly, the membrane is efficient to maintain high flux as the photocatalyst can reduce the membrane fouling problem which is a hindrance in the development of membrane process. The long retention time required by oxidation process can be overcome with use of membrane technique. Inadditon, the toxic oxidation products formed during oxidation process can be effectively removed by membrane filteration Anthony Brown, 2000. Thus, membrane processes are suitable for removing a wide range of contaminants in water and wastewater treatment because of the wide range of pore sizes available H. Zhou et al., 2002.

Novelty

Recent investigations on effluents generated from chemical industries focused on many recalcitrant molecules present in effluents at trace and ultra-trace concentrations. Till date most industries treat such effluents in their effluent treatment plants ETPs and alternatively treating effluents in a common effluent treatment facility. These treatment facilities are not sophisticated to manage recalcitrant molecules and many of these molecules are toxic to life.

Several problems arise with AOPs in treating the organically polluted effluents. Complete mineralisation by AOP's results in excessive costs since the highly oxidized end products i.e. carboxylic acids such as acetic, oxalic, etc. formed tend to be refractory to further oxidation by chemical means. Moreover the catalyst homogenous/heterogenous used in the process continuously leave the oxidation reactor in the form of environmentally hazardous sludge, posing serious environmental problems. Continuous injection of catalyst due to its loss in the reactor effluent is thus needed, which increases treatment costs. Membrane processes by themselves are unable to decompose organics as they only transport them from one phase to another. However, they are useful in those applications where subsequent solute separation is required. Under such circumstances, membrane technology can serve as an efficient tool for decreasing or even avoiding AOPs inconveniences and thus enhance the efficiency of the treatment of biorefractory wastewater. Hence, the present research proposal aims and emphasizes to treat such molecules using the combination technique of advanced oxidation process and membrane technology.

Objectives of the proposed project
The main objective of this project is to improve the efficiency of AOPs in treating a range of organic contaminants by coupling with membrane technologies.
1.To evaluate the feasibility of Advanced oxidation process to partially treat the pollutant synthetic effluents by
aAssessing the effect of peroxide dose, iron concentration and TiO2 dosage on the efficiency of Fenton, Photofenton and Photocatalytic process.
bEvaluating the efficiencies of the above mentioned processes in degrading the listed model pollutants in terms of COD and compound reduction.
cCost evaluation studies

2.To determine the feasibility of membrane processes as efficient technologies in enhancing the degradation of organic contaminants by AOPs by
aExamining the feasibility of coupling ultrafilteration and nanofiltration UF/NF to AOPs in terms of retention of organic intermediates, nonoxidized pollutants, iron and TiO2 from partially treated effluents.
bTesting the UF and NF for recovering iron and TiO2 from aqueous solutions.
cCost evaluation studies

3.To efficiently apply these optimum parameters of combined treatment using AOPs and membrane technology together and successfully treat the real wastewaters from effluent treatment plants.

Methodology
The present study is aimed at evaluating the treatment methodologies for effluents contaminated with phenolics using sequential Advanced Oxidation Processes and Membrane Techniques. For successful implementation of the proposed research the detailed methodology is projected below.

Step 1 Sample preparation
The biorefractory compounds selected for the study will be initially checked for the solubility to prepare the stock solution. Further dilutions will be made from stock solution. All the stock solutions, standards and pure compounds will be stored in dark below room temperature. The samples will then be brought to room temperature before experimentation. Control samples would be run for every experiment to validate the degradation and also check for any loss on volatalization. All the experiments will be carried out in batch mode. 0.1 N /1.0N solution of H2SO4 or 0.1N/1.0N NaOH will be used for the adjustment of pH. Samples would be drawn at regular intervals and centrifuged, followed by filtration through syringe filters. The filtrate is to be stored at 4176c and further analyzed for compound reduction and chemical oxygen demand COD removal.

Step 2 Treatment of model pollutants using Advanced Oxidation processes
The synthetic samples will be prepared keeping in view the characteristics of real effluents. These samples will be subjected to Fenton oxidation in a batch reactor while photofenton and photocatalysis with TiO2 in a photoreactor. Various operational parameters such as effect of pH, effect of initial peroxide concentration, effect of iron, effect of TiO2 dosage, effect of temperature and effect of ions will be studied to find the efficacy of the treatment system. The performance of the treatment system will be studied in terms of COD reduction and compound reduction Spectrophotometrical analysis and confirmation by HPLC. Analyses include target compound concentration, TOC, COD, total iron and UV-VIS spectra. HPLC, LC-MS analysis will be carried out for the identification of intermediates and a mechanistic degradative pathway will be proposed. Finally kinetic constants will be evaluated.

Step 3 Treatment of partially/nonoxidized wastewater from AOPs using Membrane filteration
Pressure-driven membrane processes decrease the concentration of refractory organic intermediates to a biodegradability level enough for allowing the efficient degradation of the pre-treated effluent by a conventional biological treatment. Therefore, the installation of the membrane process as a step after advanced oxidation process would guarantee the correct operation of all the process units. They also perform as iron/TiO2 recovery step after advanced oxidation process. Moreover, the coupling of AOPs with membrane filteration would decrease the need of continuous oxidant/catalyst feed. UF or NF could be used for this purpose because of their expected capability of separating target compounds from wastewaters.

Three types of experiments will be performed to test the membrane efficiency. One experiment will be designed to test the of efficiency UF and NF membranes in completely oxidizing the synthetic effluent. Second experiment will be to test the feasibility of the above-mentioned membranes to recover iron and other metals from aqueous synthetic effluents. The third experiment will deal with the application of membrane filteration to real oxidized effluents.

To test the efficiency of membrane filteration, various process parameters such as permeate flux decline, fouling and cleaning efficiency are to be monitored. The separation of certain ions or compounds is often the main objective when considering a membrane technology in wastewater treatment applications. The retention percentage, R, can refer to an individual ion, molecule or to a global parameter. Therefore, the retention of iron ions, phenol or TOC can be of interest for a certain membrane application. The concentration of the species/parameter of interest in the feed solution Cf and in the permeate CP are needed to calculate the associated R. Thus, analyses determining the species/parameters of interest in aqueous samples are needed.

Outcomes
1. The methodology developed using advanced oxidation processes and membrane techniques will be useful in designing a ‘Clean and Green Technology’ for reuse of complex industrial wastewaters.

2. This newly developed method can be applied for wide range of effluents, which are contaminated with recalcitrant molecules.
3. The method can serve as an excellent pretreatment alternative before biological treatment process.
4. The methodology can be disseminated to the industry for full-scale implementation of these results.
5. Finally, this study will result in a couple of peer reviewed journal publication along with a review article. Further this output will help bridge gaps between the research institutes and academic interests working with wastewater abatement technologies.

Deliverables
1. Methodology of the treatment technique
2. Designing of pilot reactors for treating the above effluent

Part 2: Particulars of Investigators

Principal Investigator:

1. Name:	Dr. P SARITHA
Gender:	Female
Date of Birth:	23/06/1976
Designation :	ASSOCIATE PROFESSOR
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Institute/University:	MALLA REDDY ENGINEERING COLLEGE(AUTONOMOUS)
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Category:	General

Co-Investigator: NA

Part 3: Suggested Refrees

Suggested Refrees:

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Application Area:	Waste Processing, Water,
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Application Area:	Water,
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4. Name:	S. VENKATA MOHAN
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Institute/University:	INDIAN INSTITUTE OF CHEMICAL TECHNOLOGY

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Application Area:	Water,
State:	Telangana
District:	Hyderabad
City:	Hyderabad
Address:	Bio Engineering And Environmental Sciences, CSIR-IICT, Hyderabad-500007
Pin Code:	500007

Part 4: Financial Details

Financial Details:

A. Non - Recurring

Equipment

S.	Equipments	Qty.	Justification	1 Year	Total
1 .	Accessories- Pressure pump, peristaltic pumps, Magnetic stirrers	1	Accessories for MF	350000	350000
2 .	Membrane filteration equipment	1	Treatment technique	1500000	1500000
3 .	Membranes	5	Membranes for filteration	1000000	1000000
			Total	**2850000**	**2850000**

B. Recurring

Project Staff

S.	Project Staff	No.	Justification	1 Year	2 Year	3 Year	Total
1 .	JRF	2	PG with Gate score	833280	833280	833280	2499840
			Total	**833280**	**833280**	**833280**	**2499840**

Consumables

S.	Items	Qty.	Justification	1 Year	2 Year	3 Year	Total
1 .	Chemicals & Glassware	1	Membrane filteration Experiments	0	200000	0	200000
2 .	Chemicals & Glassware	1	Oxidation Experiments	200000	0	0	200000
3 .	Chemicals & glassware	1	Real water Experiments	0	0	100000	100000
			Total	**200000**	**200000**	**100000**	**500000**

Contingency

S.	Description	Justification	1 Year	2 Year	3 Year	Total
1 .	Photocatalytic reactor	Maintenance of lamps	50000	0	0	50000
2 .	membrane fouling	Membrane maintenance	0	50000	0	50000
3 .	Printing, Paper bundles, other stationary	Publications, Printing documents	0	0	50000	50000

Total	**50000**	**50000**	**50000**	**150000**

Travel

S.	Description	Justification	1 Year	2 Year	3 Year	Total
1 .	Travel	Attending National & International conferences & Seminars	0	50000	0	50000
2 .	Travel	Attending National & International Conferences 7 seminars	0	0	50000	50000
3 .	Sample collection kit, sample collection, Filed analysis kit, Field visit	Sample collection and field analysis of samples	100000	0	0	100000
		Total	**100000**	**50000**	**50000**	**200000**

Overhead

S.	Description	Justification	1 Year	2 Year	3 Year	Total
1 .	Overheads	lab support	250000	250000	200000	700000
		Total	**250000**	**250000**	**200000**	**700000**

Any Other Recurring

S.	Description	Justification	1 Year	2 Year	3 Year	Total
1 .	Outsourcing and Testing	Consultant charges and HPLC analysis	40000	40000	0	80000
2 .	Patenting	Patenting the technology	0	0	10000	10000
		Total	**40000**	**40000**	**10000**	**90000**

Budget Head Summary in (INR)

Budget Head	Year-1	Year-2	Year-3	Total
1- Non-Recurring				
Equipment	2850000	0	0	**2850000**
Subtotal (Capital)	2850000	0	0	**2850000**
2- Recurring				
Project Staff	833280	833280	833280	**2499840**
Consumables	200000	200000	100000	**500000**
Contingency	50000	50000	50000	**150000**
Travel	100000	50000	50000	**200000**
Overhead	250000	250000	200000	**700000**
Any Other Recurring	40000	40000	10000	**90000**
Subtotal (General Items)	1473280	1423280	1243280	**4139840**
Total Project Cost (Capital + General)	**4323280**	**1423280**	**1243280**	**6989840**

Part 6: PFMS Details

PFMS Unique Code Available: Yes

PFMS Unique Code : TLML 00000156

Part 5: Current Ongoing Project

Current Ongoing Project: NA

NGO Details fetched from NGO Portal:

(1) Registration Details:

NGO Unique ID :	TS/2017/0154621
Name:	CMR EDUCATIONAL SOCIETY
Registration With :	Registrar of Societies
Type of NGO :	Society
Registration No :	5613/2001
Registration Date :	2001-08-21
Contact Name :	Sudhakar Muvvala
Designation :	
Act Name :	Register under the Andhra Pradesh (Telangan Area) public societies ACT 1 of 1350
Reg Multiple :	
FCRA Registered :	No
FCRA Registration No :	
FCRA Registration Date :	NA
Valid upto :	NA
State :	TELANGANA
District :	Medchal–Malkajgiri
Address :	Maisammaguda, Dhulpally, Secunderabad
Pincode :	500100
State of Registration :	TELANGANA
City of Registration :	Secunderbad
Off Phone :	

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Email : muvvala1963@yahoo.co.in

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Pan No : A********P

Pan Status : Verified

Work Issues : Education & Literacy

(2) Members Details:

1. Name: Sudhakar Muvvala

Designation: Principal

Aadhaar Status : Verified

Pan Status : Verified

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Last Updated : 15-06-2017

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Aadhaar Status : Verified

Pan Status : Verified

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Last Updated : 15-06-2017

3. Name: satyabrata bhanja

Designation: Professor

Aadhaar Status : Verified

Pan Status : Verified

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Last Updated : 15-06-2017

4. **Name:** Sudhakara Reddy Saripalli

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Pan Status : Verified

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Last Updated : 27-04-2019

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Pan Status : Verified

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Last Updated : 27-04-2019

6. **Name:** Palaparthi Ananthababu

Designation: Assistant Professor

Aadhaar Status : Verified

Pan Status : Verified

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Last Updated : 27-04-2019

7. **Name:** Megavath Vijay Kumar

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Aadhaar Status : Verified

Pan Status : Verified

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Last Updated : 30-04-2019

List of Uploaded Documents:-

1. Complete Project proposal
2. Biodata
3. Certificate from PI
4. Conflict of interest
5. Endorsement from head of Institute
6. Quotation for Equipments

WTI Call 2021 on Desalination Technologies

COMPONENT/STREAM APPLIED FOR:

(Tick the most appropriate one)

Applied Research stream	√
Technology Assessment	
Convergent Solution Stream	
Centre of Excellence	

SUBMISSION OF PROPOSAL
FOR SUPPORT

CONTENTS

I. ProposalSummary

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<tr><td>III</td><td>PI Details</td><td>Name</td><td>DateofBirth</td><td>Category(General/SC/ ST/Othersetc)</td></tr>
<tr><td></td><td></td><td>Dr.P.SARITHA</td><td>23/06/1976</td><td>General</td></tr>
<tr><td></td><td></td><td colspan="3"></td></tr>
<tr><td>IV</td><td>Co-PI Details</td><td>Name</td><td>DateofBirth</td><td>Category(General/SC/ ST/Othersetc)</td></tr>
<tr><td></td><td></td><td>-</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>V</td><td>Lead Organization</td><td colspan="3">MALLA REDDY ENGINEERING COLLEGE</td></tr>
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Note: Restrict the above information to a single A4 page size

File No.	*DST/TMD/EWO/WTI/DM/2K21/* **(TOBEFILLEDBYDST)**

II. Financial requirements:

(Break-up of cost)

Slno.	ITEM	Description		Individual sub-head cost	Total Amount (All figure in lakhs)
1	**MANPOWER** *(mention Posts with gross emoluments)*	Junior Research Fellow-2		31,000+HRA (12%) /3years	24,99,840-00
2	**PERMANENT EQUIPMENT LIST** *(mention cost of the individual item)*	Indigenous	√	Membrane Filteration equipment, Membranes Pressure pump, peristaltic pump, magnetic stirrers	28,50,000-00
		Foreign			
3	**OTHER COST** (Consultant charges, Analysis charges, Patenting)				90,000-00
4	**CONSUMABLES** (Chemicals & Glassware)				5,00,000-00
5	**TRAVEL** (Sample Collection Kit, Sample collection, Field visit, Attending National & international conferences & Seminars)				2,00,000-00
6	**CONTINGENCIES**				1,50,000-00
7	**OVER HEADS CHARGES**				7,00,000-00
GRAND TOTAL					**69,89,840-00**

Grand Total : **Rs. 69,89,840-00 (Rupees Sixty Nine Lakhs Eighty Nine Thousand Eight Hundred and Forty only)**

III. CORE PROPOSAL FORMAT

(Applied Research)

1. Project Title: TREATMENT OF BIOREFRACTORY WASTEWATER THROUGH MEMBRANE ASSISTED CHEMICAL OXIDATION

2. Principal Investigator (PI)

Name:	**Dr.P.Saritha**
Designation:	Associate Professor
CompleteAddress:	Civil Engineering Department, MREC, Sec'Bad-500100
Telephone&Mobile No.:	9849332474
E-mail:	drpsaritha@mrec.ac.in

3. Co-Principal Investigator (Co-PI): -

Name:
Designation:
CompleteAddress *(withcitypincode)*:
Telephone&Mobile No.:
E-mail:

4. Name:-

Designation:
Completeaddress*(withcitypin code)*:
Telephone&mobileNo.:
E-mail**:**

5. **Collaborating Agencies/Industries** *(Ifany):***-**

6. Target Beneficiaries: Industries generating biorefractory wastewaters.

7. **Objectives of the Proposal** *:*

- To evaluate the feasibility of Advanced oxidation process to partially treat the pollutant synthetic effluents by

(a) Assessing the effect of peroxide dose, iron concentration and TiO_2 dosage on the efficiency of Fenton, Photofenton and Photocatalytic process.
(b) Evaluating the efficiencies of the above mentioned processes in degrading the listed model pollutants in terms of COD and compound reduction.
(c) Cost evaluation studies

- To determine the feasibility of membrane processes as efficient technologies in enhancing the degradation of organic contaminants by AOPs by

(a) Examining the feasibility of coupling (ultrafilteration and nanofiltration) UF/NF to AOPs in terms of retention of organic intermediates, nonoxidized pollutants, iron and TiO_2 from partially treated effluents.
(b) Testing the UF and NF for recovering iron and TiO_2 from aqueous solutions.
(c) Cost evaluation studies

- To efficiently apply these optimum parameters of combined treatment using AOPs and membranetechnology together and successfully treat the real wastewaters from effluent treatment plants

8. Critical Review of Status Identifying Gaps

i) National Status Review

In times of scarcity of water here's some encouraging news. Indian scientists have developed a simple method to recover usable water from industrial waste.The technique, using a nanofiltration membrane, ensures the separation of harmful chlorides and cyanide from the contaminated waters in certain chemical industries.The membrane is economical and the process low pressure, which can substitute the regularly used reverse osmosis for specific applications. Developed by the Hyderabad-based CSIR-IICT (Indian Institute of Chemical Technology), it was demonstrated in Tata Steel's Jamshedpur plant in 2016. Explaining the process, the IICT scientists led by S. Sridhar said during one of the critical steps of its manufacture, steel from the blast furnace is quenched in a tower, which results in the release of excessive chloride and cyanide into the aqueous stream. Chloride levels above 800 mg/L cause corrosion in the blast furnace.

ii) International Status Review

Advanced Oxidation Processes (AOPs) are processes involving generation and use of powerful transitory species, principally the hydroxyl radical (•OH) (Glaze et al., 1987). This species can be generated from water using energy such as solar energy, electrical energy, sound energy etc. or simply by chemicals like H_2O_2, ozone etc. with or without the use of an appropriate catalyst; the difference being the way in which the hydroxyl radicals are produced. Other active oxygen species are the superoxide ion radical, $O_2^{\bullet -}$, and its conjugate acid form, the hydroperoxyl radical, $HO_2^{\bullet}$ that are also produced in many AOPs but they are far less active than •OH. Now a days, in addition to hydroxyl radicals, experiments using other radicals like sulphate radicals as the transitory species have yielded excellent results and are classified as AOPs.
The hydroxyl (•OH) radical with oxidation potential of 2.8 V (vs. normal hydrogen electrode) is a powerful, non-selective chemical oxidant that acts rapidly with most organic compounds and hence is often the oxidant of choice for chemical oxidations (Kurian et al., 2006) and (Kurian et al., 2015a). The heterogeneous systems have obvious advantages over the homogeneous ones such as easy separation of the catalyst for reuse from the treated water, lack of secondary treatment to remove dissolved metals from treated water and tolerance towards extreme operating conditions (Nair et al., 2017a). Membrane technology has grown significantly in the last couple of decades due to the benefits it offers in water and wastewater treatment. With significant reduction in the size of equipment, energy requirement and low capital cost, membrane technology offers many prospects in wastewater treatment (Quist-Jensen, 2015) According to Singh and Hankins [Singh, R, 2016], membrane technology has the potential of bridging the economical and sustainability gap, amid possibilities of low or no chemical usage, environmental friendliness and easy accessibility to many. That is, membrane technology has proven to be a more favorable option in wastewater treatment processes in recent times.

9. Outline of the Project (withschematics,wherepossible)(*Definetheproblemsandgivetechnicaldetails)*

Water pollution has become a serious problem throughout the world. According to the UN's latest figures, approximately 40% of the world's population of more than two billion people face water shortage. By 2025, this figure is expected to increase to 5.5 billion or more than 2.5 times the present population. Chemical industry is at the forefront of the water management challenge, due to increasing

government pressure on effluent discharge, raw water usage, increasing process water costs and in many locations, general lack of available water. The total amount of different chemicals produced is vast and continuously increasing. About 100000 different chemicals can be found in the market (Charpentier 2003). Despite their different properties and uses, their production processes are very similar. The need and use of water in chemical and pharmaceutical processes is defined by the required unit operations, raw materials and process equipment. As much as 20% of total wastewater flow from chemical and pharmaceutical industries contains 80% of the pollutant load (EU Water Saving Potential - Part 1, 2007). Increased knowledge about the consequences of water pollution and the public desire for better quality water has promoted the implementation of stringent regulations by expanding the scope of regulated contaminants and lowering their maximum contaminant levels (MCLs).

Industrial Wastewater and Model Pollutants

Phenols, drugs, pesticides, herbicides, aromatic hydrocarbons, surfactants are some of the recalcitrant compounds typically found in industrial effluents (Dojilido and Best 1993). These substances are not only toxic but also non-biodegradable and persistent in the environment for decades together; further, the symptoms of contamination may not manifest themselves until several generations after initial contact with the chemical of concern (Stirling 2001). Thus, it becomes crucial to treat such wastewaters containing non-biodegradable pollutants to avoid associated environmental pollution.

Large amounts of phenolic wastewater along with pharmaceutical drugs produced by many industrial processes pose severe threat to environment. Phenol and substituted phenols are moderate to highly toxic depending on the number, position and nature of substitution while pharmaceuticals have potential impact on human health and environment even at trace levels (µg/l). All these compounds are refractory and come to the natural water resources from the effluents of a variety of chemical industries such as pharmaceuticals, phenol manufacturing, and industries of resin paint, dying, textile wood petrochemical, pulp mill, etc. Consequently, aquatic organisms including fish are subjected to these pollutants. The interest in phenolic compounds is their selection by the US Environmental Protection Agency (USEPA) as persistent, bioaccumulative, and toxic (PBT) chemicals. Some of the USEPA listed priority pollutants selected for the study are 2,4- dinitrophenol; 2,4-dimethylphenol, 4-chloro-3-methylphenol, 4,6-dinitro-2-methylphenol, and pentachlorophenol. Pharmaceuticals include antibiotics like Ciprofloxacin, Clofibric acid and Diclofenac.

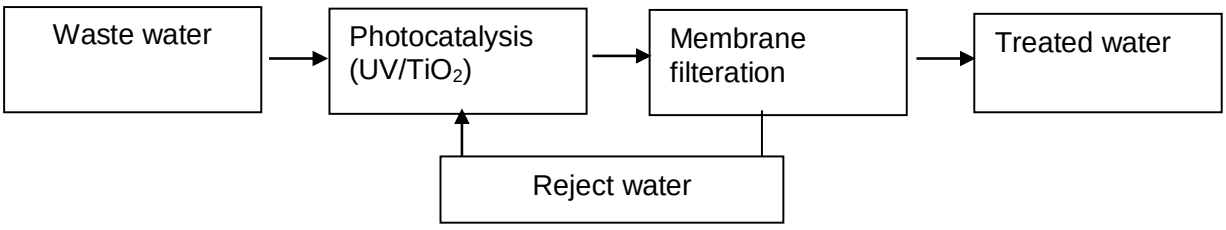
Industrial Wastewater Treatment

An ideal waste treatment process would be cost-effective and at the same time completely mineralize all the toxic species present in the waste stream without leaving behind any hazardous residues. At the current state of development, none of the treatment technologies approach this ideal situation. Air stripping, which is commonly employed for the removal of volatile organic contaminants in wastewater, just transfers the pollutants from water phase to air phase rather than destroying them. Thus, most air-stripping processes currently require subsequent treatment of the off-gas. Granular activated carbon (GAC) adsorption is the other commercialized process for water purification. However, the spent carbon, on which pollutants are adsorbed, is a new waste that needs to be disposed off. Biological degradation of municipal wastes has been practiced, but similar bio-treatments of industrial wastes are still not common because some toxic organics may kill the active microorganisms. The presence of such compounds like the phenolics (Gonzalez 1993), which cannot be treated by conventional techniques, require non-biological processes for effective elimination and Advanced Oxidation Processes (AOP) have such a capability.

In addition, legislations governing the effluent discharge standards laid by pollution control boards stress on freshwater conservation through water reuse and recycling. By recycling and reusing treated

wastewater, industries can save on the costs of clean water, ensure adequate supplies and help to preserve a diminishing natural resource. The increase in water reuse has been driven largely by innovative treatment technologies like Membrane filteration that are both cost effective and reliable in removing harmful bacteria and pathogens.

Recent investigations on effluents generated from chemical industries focused on many recalcitrant molecules present in effluents at trace and ultra-trace concentrations. Till date most industries treat such effluents in their effluent treatment plants (ETPs) and alternatively treating effluents in a common effluent treatment facility. These treatment facilities are not sophisticated to manage recalcitrant molecules and many of these molecules are toxic to life. Several problems arise with AOPs in treating the organically polluted effluents. Complete mineralisation by AOP's results in excessive costs since the highly oxidized end products (i.e. carboxylic acids such as acetic, oxalic, etc.) formed tend to be refractory to further oxidation by chemical means. Moreover the catalyst (homogenous/heterogenous) used in the process continuously leave the oxidation reactor in the form of environmentally hazardous sludge, posing serious environmental problems. Continuous injection of catalyst (due to its loss in the reactor effluent) is thus needed, which increases treatment costs. Membrane processes by themselves are unable to decompose organics as they only transport them from one phase to another. However, they are useful in those applications where subsequent solute separation is required. Under such circumstances, membrane technology can serve as an efficient tool for decreasing or even avoiding AOPs inconveniences and thus enhance the efficiency of the treatment of biorefractory wastewater. **Hence, the present research proposal aims and emphasizes to treat such molecules using the combination technique of advanced oxidation process and membrane technology.**



10. Deliverables of the project (brief description)

- The methodology developed using advanced oxidation processes and membrane techniques will be useful in designing a 'Clean and Green Technology' for reuse of complex industrial wastewaters.
- This newly developed method can be applied for wide range of effluents, which are contaminated with recalcitrant molecules.
- The method can serve as an excellent pretreatment alternative before biological treatment process.
- The methodology can be disseminated to the industry for full-scale implementation of these results.
- Finally, this study will result in a couple of peer reviewed journal publication along with a review article. Further this output will help bridge gaps between the research institutes and academic interests working with wastewater abatement technologies.

11. Methodology

The present study is aimed at evaluating the treatment methodologies for effluents contaminated with phenolics using sequential Advanced Oxidation Processes and Membrane Techniques. For successful implementation of the proposed research the detailed methodology is projected below.

Step 1 Sample preparation

The biorefractory compounds selected for the study will be initially checked for the solubility to prepare the stock solution. Further dilutions will be made from stock solution. All the stock solutions, standards and pure compounds will be stored in dark below room temperature. The samples will then be brought to room temperature before experimentation. Control samples would be run for every experiment to validate the degradation and also check for any loss on volatalization. All the experiments will be carried out in batch mode. 0.1 N /1.0N solution of H_2SO_4 or 0.1N/1.0N NaOH will be used for the adjustment of pH. Samples would be drawn at regular intervals and centrifuged, followed by filtration through syringe filters. The filtrate is to be stored at 4°c and further analyzed for compound reduction and chemical oxygen demand (COD) removal.

Step 2 Treatment of model pollutants using Advanced Oxidation processes

The synthetic samples will be prepared keeping in view the characteristics of real effluents. These samples will be subjected to Fenton oxidation in a batch reactor while photofenton and photocatalysis with TiO2 in a photoreactor. Various operational parameters such as effect of pH, effect of initial peroxide concentration, effect of iron, effect of TiO2 dosage, effect of temperature and effect of ions will be studied to find the efficacy of the treatment system. The performance of the treatment system will be studied in terms of COD reduction and compound reduction (Spectrophotometrical analysis and confirmation by HPLC). Analyses include target compound concentration, TOC, COD, total iron and UV-VIS spectra. HPLC, LC-MS analysis will be carried out for the identification of intermediatesand a mechanistic degradative pathway will be proposed. Finally kinetic constants will be evaluated.

Step 3 Treatment of partially/nonoxidized wastewater from AOPs using Membrane filteration

Pressure-driven membrane processes decrease the concentration of refractory organic intermediates to a biodegradability level enough for allowing the efficient degradation of the pre-treated effluent by a conventional biological treatment. Therefore, the installation of the membrane process as a step after advanced oxidation process would guarantee the correct operation of all the process units. They also perform as iron/TiO2 recovery step after advanced oxidation process. Moreover, the coupling of AOPs with membrane filteration would decrease the need of continuous oxidant/catalyst feed. UF or NF could be used for this purpose because of their expected capability of separating target compounds from wastewaters.

Three types of experiments will be performed to test the membrane efficiency. One experiment will be designed to test the of efficiency UF and NF membranes in completely oxidizing the synthetic effluent. Second experiment will be to test the feasibility of the above-mentioned membranes to recover iron and other metals from aqueous synthetic effluents. The third experiment will deal with the application of membrane filteration to real oxidized effluents.

To test the efficiency of membrane filteration, various process parameters such as permeate flux decline, fouling and cleaning efficiency are to be monitored. The separation of certain ions or compounds is often the main objective when considering a membrane technology in wastewater treatment applications. The retention percentage, R(%), can refer to an individual ion, molecule or to a global parameter. Therefore, the retention of iron ions, phenol or TOC can be of interest for a certain membrane application. The concentration of the species/parameter of interest in the feed solution (Cf) and in the permeate (CP) are needed to calculate the associated R(%). Thus, analyses determining the species/parameters of interest in aqueous samples are needed.

12. Milestones with Months, Work Elements & Responsible Organization for each Work Element

S.No.	Milestone	Target Month	Work Elements	Responsible Organization
1	Tentative Degradativemechanism &Pathway		1.Optimization of parameters in AOPs 2.identification of intermediate compunds	Malla Reddy Engineering College
2.	Performance efficiency, with journal publication & presentation in conferences		1. Optimization of parameters in Membrane filteration 2.Synergistic treatment 3.Cost analysis	Malla Reddy Engineering College
3	Knowledge sharing to industries		Technology application to real waters	Malla Reddy Engineering College

13. Work Plan

Activities	12 months			12 months			12 months		
	I	II	III	I	II	III	I	II	III
Procurement of material/equipment									
Sample preparation & characterization Studies									
Degradation of selected compounds Advanced Oxidation processes by optimizing the experimental conditions.									
Degradation mechanism and pathways of selected compounds									
Treatment using membrane filteration by optimizing the process parameters.									
Evaluation of intermediates using HPLC, LC-MS									
Application of optimized conditions to real wastewaters									
Review meeting									
Conference and final report									
Publication of results	3-4 International papers in SCI Journals								

14. Names of Experts/Agencies/Institution working in the similar area

(Please give complete Name, Designation, Address with pin code, telephone numbers & e-mail addresses)

Dr.V.Himabindu
Professor
Center for Environment, IST
JNTUH, Hyderabad-500085
9849692838
drvhimabindu@gmail.com

Dr.S.Sridhar
Senior Principal Scientist
Indian Institute of Chemical Technology (IICT), Hyderabad
8790748674
ssridhar@gov.in

Dr.S.Karthikeyan
Associate Professor
Anna University Chennai
9884612135
skarthi@annauniv.com

Dr.S.Venkata Mohan
Senior Principal Scientist
Indian Institute of Chemical Technology (IICT), Hyderabad
9849306934
vmohan_s@hayoo.com

IV. Proforma for Bio-Data of Principal Investigator (PI)

1. **Name: Dr.P.Saritha**
2. **Gender : Female**
3. **E-mail ID: drpsaritha@mrec.ac.in**
4. **Qualifications**

S.No.	Degree	Institution	Year	Division/Class
1	CSIR-RA	JNTUH	2012	-
2	Ph D	JNTUH	2011	-
3	MSc	JNTUH	2001	I

4. Employment Experience

S.No.	Position & Organisation	Nature of Job	Period
1	Associate Professor, Malla Reddy Engineering College	Permanent	2014-till date

5. **List of Publications**

5.1 Journal Publications: 10

- Yamuna rani. M, Bhagawan. D, Himabindu.V, VenkateswaraReddy.V,**Saritha. P,**Preparation And Characterization Of Environmental Friendly Bricks From Pharmaceutical Industrial Wastes Environ SciPollut Res. ISSN: 1614-7499.
- D. Bhagawan, **SarithaPoodari**, Gujarathi Ravi kumar, ShankaraiahGolla, Ch. Anand, Kumara Swamy Banda, VurimindiHimabindu, et al. Reactivation and recycling of spent carbon using solvent desorption followed by thermal treatment (TR), Journal of Material Cycles and Waste Management (2015) 17:185–193.
- G. Shankaraiah, **SarithaPoodari**, D. Bhagawan, VurimindiHimabindu,S. Vidyavathic, Degradation of antibiotic norfloxacin in aqueous solution using advanced oxidation processes (AOPs)—A comparative study Desalination and Water Treatment (2016) 1–12.
- Yamuna Rani M, Bhagawan D, Himabindu V, Venkateswara Reddy V, **Saritha P** (2017) Utilization of Polluted Dredged Sediment for Making of Bricks. JSM Chem 5(2): 1043.
- DheeravathBhagawan, **SarithaPoodari**, NaralaChaitanya, Surya Ravi, Yamuna M. Rani, VurimindiHimabindu, S. Vidyavathi, Industrial solid waste landfill leachate treatment using electrocoagulation and biological methods, Desalination and Water Treatment, 68 (2017) 137–142.
- G. Shankaraiah, **P. Saritha**, D. Bhagawan, V. Himabindu, S. Vidyavathi, Photochemical oxidation of antibiotic gemifloxacin in aqueous solutions:A comparative study South African Journal of Chemical Engineering 24 (2017) 8-16.
- Yamuna R M, Bhagawan D, **Poodari S**, Himabindu V, Venkateswara R V (2017) Recovery of SiO2 from Pharma Waste and its Application for Environmental Remediation. ChemEng Process Tech 3(2): 1040.

- Yamuna Rani M, Bhagawan D, **Saritha P**, V. Himabindu, V. Venkateswara Reddy, Treatment of Hazardous Solid Waste Using Solidification and Stabilization Technique American Journal of Environmental Protection 2017; 6(4): 94-100.
- D. Bhagawan, **P. Saritha**, G. Shankaraiah, and V. Himabindu, Fluoride Removal from Groundwater Using Hybrid Cylindrical Electrocoagulation Reactor ISSN 1063_455X, Journal of Water Chemistry and Technology, 2019, Vol. 41, No. 3, pp. 164–169.
- Treatment Of Methylated Chloro Phenols Using Uv Mediated Oxidation Processes **S Poodari**, CMV Vardhan, D Bhagawan, ANS Baba - Solid State Technology, 2020
- Pharmaceutical Wastewater Treatment Using Natural And Chemical Coagulants CMV Vardhan, **P Saritha**, ANS Baba - Solid State Technology, 2020

6. Patents Granted: 2

- System to collect air pollutant from exhaust of a vehicle and further generates oxygen
- An efficient device and methodology to identify the quality of construction materials

7. Books Published/Chapters contributed: -

8. Sponsored Research Projects

S.No	Title	Sponsoring Agency and OfficerConcerned	Period	Amount	Achievements
1	Degradation of some of the USEPA listed recalcitrants using nanosize semiconductors	UGC-Minor Project	2015-2016	2,50,000-00	• Paper publications • Conference presentations
2	Treatment of Industrial wastewaters using Advanced oxidation Processes	DST (WOS-A)	2009-2012	12,50,000-00	• Ph.D • Paper publications • Conference presentations

9. Consultancy Projects

S.No	Title	Sponsoring Agency	Period	Amount

10. Sponsored Research/Consultancy Projects submitted for approval

S.No.	Title	Agencytowhom submitted	Duration	Amount

V. BUDGET ESTIMATES

1. Break-up of Total Budget

(All Amount in Lakhs)

S.No	Item	1st Year	2nd Year	3rd Year	Total
1.	Manpower JRF (2) (31,000+HRA 12%=34,720-00)	8,33,280-00	8,33,280-00	8,33,280-00	24,99,840-00
2.	Permanent Equipment Indigenous	28,50,000-00	-	-	28,50,000-00
3.	Other Costs	40,000-00	40,000-00	10,000-00	90,000-00
4.	Consumables	2,00,000-00	2,00,000-00	1,00,000-00	5,00,000-00
5.	Domestic Travel	1,00,000-00	50,000-00	50,000-00	2,00,000-00
6	Contingencies	50,000-00	50,000-00	50,000-00	1,50,000-00
7	Overhead Charges	2,50,000-00	2,50,000-00	2,00,000-00	7,00,000-00
	TOTAL	43,23,280-00	14,23,280-00	12,43,280-00	69,89,840-00

GrandTotal: **Rs.69,89,840-00** (**Rupees Sixty Nine Lakhs Eighty Nine Thousand Eight Hundred and Forty only)**

2. Itemised Budget

2.1. Manpower

Budget for Salaries(To be borne by DST)

Designation	Qualification	Salary per month	No. of Persons	Amount Rupees in Lakh	Justification
Junior research Fellow	PG with GATE score	31,000+3720(12%HRA) =34,720-00	2	**24,99,840-00**	JRF (1)- AOPs JRF (2)- MF

2.2Equipment*

Budget for Permanent Equipment (To be borne by DST**)**

Description of Equipment	Foreign/Indigenous	Unit Landed Price (CIF+CustomDuty+others)	Nos. of Equipment	Total Rupees	Justification in relation to project requirement
Membrane filteration equipment (Pressure Pump)	Indigenous	-	1	15,00,000-00	Treatment technique
Membranes	Indigenous	-	5	10,00,000-00	Membranes for filteration
Peristaltic pumps, magnetic stirrers	Indigenous	-	1	3,50,000-00	Acessories for MF
			TOTAL	**28,50,000-00**	

2.3. Other Costs (Outsourcing, Fabrication, Testing and Patenting etc.**)**

Budget for Other Costs (To be borne by DST**)**

Item	1st Year	2nd Year	3rd Year	Total	Justification including basis of cost estimates/quotations
Outsourcing	25,000-00	25,000-00	-	50,000-00	Consultant for designing for large scale
Fabrication	-	-	-	-	
Testing	15,000-00	15,000-00	-	30,000-00	HPLC analysis for intermediate products
Patenting	-	-	10,000-00	10,000-00	Patenting the Technology
Total	40,000-00	40,000-00	10,000-00	**90,000-00**	-

2.4 Consumables

Budget for Consumable Materials (To be borne by DST**)**

1st Year	2nd Year	3rd Year	Total	Justificationincludingbasisofcostestimates/quotations
2,00,000-00	2,00,000-00	1,00,000-00	**5,00,000-00**	Glassware & Chemicals

2.5. DomesticTravel*

Budget for Domestic Travel (To be borne by DST**)**

1st Year	2nd Year	3rd Year	Total Rupees	Justification
50,000-00	50,000-00	50,000-00	1,50,000-00	Attending National & International Conferences & Seminars
50,000-00	-	-	50,000-00	Sample collection, field visit
		TOTAL	**2,00,000-00**	

2.6 Contingencies

Budget for Contingencies (To be borne by DST**)**

1st Year	**2nd Year**	**3rd Year**	**Total**	**Justification including basis of cost estimates/quotations**
50,000-00	50,000-00	50,000-00	**1,50,000-00**	Membrane fouling, maintenance of lamps, publications, Printing documents, other stationary…

2.7 Designation of the officer in the organization who is vested with financial power: Proposal if approved, Payment shall be made in favour of **Principal, Malla Reddy Engineering College**

i. Bank Account No.: 769401000078
ii. IFSC Code.: ICIC0007694
iii. MICR Code.: 500229130
iv. Bank Branch Address: MREC Campus, Maisammaguda

2.8 Mention HRA% applicable to Research fellow in your institute and the classification category of your city/town **12%**

CURRICULUM VITAE

Dr. SARITHA POODARI

Mobile: 9849332474
E-mail: poodarisaritha@gmail.com
drpsaritha@mrec.ac.in

EDUCATIONAL PROFILE

2006-2011
Ph.D (Environmental Science & Technology)
Jawaharlal Nehru Technological University Hyderabad

1998-2001
Master of Science (Environmental Science & Technology) with **Distinction**
Jawaharlal Nehru Technological University Hyderabad

1993-1996
Bachelor of Science (Microbiology, Botany & Chemistry) with **Distinction**
Osmania University, Hyderabad

PROFESSIONAL EXPERIENCE

Associate Professor: June 2014-Till date
Malla Reddy Engineering College (MREC), Secunderabad

Responsibilities include teaching course work for B.Tech students, Supervising Students for their dissertation writing technical reports, research proposals and research publications for peer reviewed journals.

My Mode of teaching includes:

- Supervise graduate or postgraduate teaching, internship, and research work
- Initiate, facilitate, and moderate classroom discussions
- Prepare course materials such as syllabi, homework assignments, and handouts
- Keep abreast of developments in the field by reading current literature, talking with colleagues, and participating in professional conferences
- Supervise student's laboratory and field work
- Evaluate and grade students class work, laboratory work, assignments, and papers
- Plan, evaluate, and revise curricula, course content, and course materials and methods of instruction
- Compile, administer, and grade examinations, or assign this work to others
- Maintain regularly scheduled office hours to advise and assist students
- Conduct research in the particular field of knowledge and publish findings in professional journals, books, or electronic media.

Research Associate-CSIR: April 2012-May 2014
Center for Environment, Institute of Science & Technology, Jawaharlal Nehru Technological University, Hyderabad.

Responsibilities include: Working with environmental projects related to lake water quality analysis along with remediational measures. Supervising Masters Students for their dissertation, teaching course work for M.Tech & Masters students, writing technical reports and research publications for peer reviewed journals. Drafting research proposals for Government funding agencies such as Department of Science and Technology, Ministry of Environment and Forest, Department of Biotechnology, Department of Ocean Development of Government of India.

Women Scientist–DST: May 2009–March 2012
Center for Environment, Institute of Science & Technology, Jawaharlal Nehru Technological University, Hyderabad.

Studied treatment of non-biodegradable pollutants commonly found in wastewaters using advanced techniques with special reference to drug impurities found in pharmaceutical effluents. Advanced techniques include studying oxidation techniques like Sonication and UV mediated reactions.

Project Scientist: July 2006-April 2009
Center for Environment, Institute of Science & Technology, Jawaharlal Nehru Technological University, Hyderabad.

Working on doctoral thesis, studied the degradation of various multisubstituted recalcitrant in synthetic and environmental samples by Advanced Oxidation Processes (AOPs). Writing research publications, technical reports, supervising junior researchers, attending and organizing conferences were other challenges.

Research Assistant: March 2005 – June 2006
Center for Environment, Institute of Science & Technology, Jawaharlal Nehru Technological University, Hyderabad.

Executed studies on the sampling, analysis, data interpretation and documentation of various environmental projects funded by different agencies like CPCB, APPCB, etc.

Academic Assistant: March 2002 – April 2003
Center for Environment, Institute of Science & Technology, Jawaharlal Nehru Technological University, Hyderabad.
Teaching in the field of Environmental studies with emphasis on ecology, environmental management and Zero Pollution studies. Also tutored wastewater analysis / treatment laboratory classes graduate students.

ACADEMIC ACCOMPLISHMENTS

- B.Sc. (Microbiology, Botany & Chemistry) with Distinction, Osmania University, Hyderabad
- M.Sc. (Environmental Science & Technology) with Distinction, Center for Environment, IPGSR, JNTU, Hyderabad
- Women Scientist – Department of Science & Technology, New Delhi, Government of India
- Research Associate – Council of Scientific & Industrial Research, New Delhi, Government of India

INSTRUMENTAL PROFICIENCY

- Working experience on HPLC, GC, GC-MS and Ion Analyzer
- Developed methods for the identification of chloro, nitro and methyl substituted phenols in environmental samples
- GC-MS analysis carried for commercial samples from PCB (Pollution Control Board) and various Pharmaceutical industries.
- Heavy metal analysis in environmental samples using Atomic Absorption Spectra (AAS)

RESEARCH INTEREST AND SKILLS

- Ten years of research experience in **'Environmental Research'** with special reference to the treatment of industrial effluents using advanced oxidation process
- Monitoring and optimizing process parameters for evaluating best treatment methodology for industrial effluents contaminated with chloro, nitro and methyl substituted phenolics.
- Identification and elucidation of degradative mechanistic pathways for the recalcitrants present in effluents.
- Developed sample preparation methods for the quantification of substituted phenols using HPLC.
- Synthesized Nano TiO_2 and zerovalent iron using sol-gel and flame synthesis method.
- Expertise on water, sediment and soil quality analysis along with their remediation using various physico-chemical methods.
- Conduct membrane pilot plant experiments on process waters from industry to clearly demonstrate the added value of adapting cleaner production solutions, both economically and environmentally.
- Bioremediation and biodegradation of recalcitrant compounds using composting and aerobic shake flask culture.
- Dissemination of results along with development of reports and presentations.
- Contributed research articles in peer reviwed journals and also presented in international conferences.
- Supervised many masters students for their dissertation

1	***Projects Completed*** ➢ **CSIR - Research Associate** - Treatment of biorefractory wastewaters using advanced oxidation process ➢ **DST-Women Scientist** - Treatment of non-biodegradable pollutants commonly found in industrial wastewaters using advanced techniques ➢ **UGC – Minor project -** Degradation of USEPA listed recalcitrant compounds using Nano- sized semi conductors
2	***Project proposals Applied*** ➢ Conversion Of Solid Hazardous Waste To Eco-Economic Products applied to **DST, GoI-TSCOST-PRG** (February 2020)

FDP's ATTENDED

S.No	Title of FDP	Organized by	Duration dates	Year
1	Research Funding & IPR	K. C. College of Engineering & Management studies and Research, Thane (East)	May7 -10	2020
2	Shrutam - Unfolding Bharateeya vichar	Bharatiya Shikshan Mandal, Nagpur	May 20-25	2020
3	Recent advances in concrete technology and sustainable infrastructure	GRIET, Hyderabad	May 21-23	2020
4	Recent Advances in Civil Engineering	CMR Institute of Technology, Hyderabad	May 20-22	2020
4	IPR awareness	Keyway research, Hyderabad	May 13-17	2020
5	Outcome based education and NBA accreditation	Shri Chhatrapati Shivajiraje College of Engineering, Thane	May 12-17, 2020	2020
6	NAAC Awareness Programme for Faculty	MMIT, Pune	May 08-14, 2020	2020
7	Remote Sensing & GIS	NPTEL	Aug 26-Oct 03	2019
8	Contemporary Research & IPR	JNTUH	Jan 28-Feb 01	2019
9	Plastic Waste	NPTEL	Feb 25-April 28	2019

	Management			
10	Environment, Health and Safety	JNTUH	April 30-May 02	2018

AWARDS

- DST - **Women Scientist (2009-12)**

- Presented paper in International conference on Environment and Energy and has been awarded for the **'Best paper presentation' (2014).**

- **Chaired a Technical Session in** International conference on Environment and Energy, JNTUH (2014)

- Invited as a speaker for **DBT sponsored Teacher/Researcher short-term training course (STTC)** on **Pharma Innovations for Better Perspective in Healthcare organized by Malla Reddy College of Pharmacy, Maisammaguda, Secunderabad** on **June 18, 2019** morning session from 9.30 to 10.20 am on the topic **"Pharmaceutical waste effluents testing by different analytical methods".**

OTHER ACTIVITIES

- Member of women grievance cell at Malla Reddy Engineering College (MREC)
- Coordinator for Staff & Student Welfare committee
- Actively involved in NBA, NAAC, UGC inspection activites
- Supervising the students for their dissertation
- Judge in one of the presentation sessions of students during Akshara Fest
- Actively involved in examination duties such as:
  - *Question paper setting*
  - *Paper evaluation*
  - *Invigilation*

LIST OF INTERNATIONAL PUBLICATIONS

1. **P. Saritha**, C. Aparna, V. Himabindu, Y. Anjaneyulu, Comparison of various advanced oxidation processes for the degradation of 4-chloro-2 nitrophenol, Journal of Hazardous Materials, Volume 149, Issue 3, 19 November 2007, Pages 609-614.
2. C. Aparna, **P. Saritha**, V. Himabindu, Y. Anjaneyulu, Techniques for the evaluation of maturity for composts of industrially contaminated lake sediments, Waste Management, Volume 28, Issue 10, 2008, Pages 1773-1784.
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PERSONAL PROFILE

Date of Birth	:	23-06-1976
Sex	:	Female
Nationality	:	Indian
Marital status	:	Married
Personal Attributes	:	Reliable, Adaptive, Co-Operative, and Assertive.
Permanent Address	:	Plot No 539, H.M.T Hills Opp. JNTU, Kukatpally Hyderabad 500 072, Andhra Pradesh, India

(Dr.P.Saritha)

Annexure-I

UNDERTAKING FROM THE INVESTIGATOR(S)

Project Title: TREATMENT OF BIOREFRACTORY WASTEWATER THROUGH MEMBRANE ASSISSTED CHEMICAL OXIDATION

1. I/We have carefully read the terms and conditions of the Water Technology Initiative Programme and I/We agree to abide by them.
2. I/We have not submitted this or a similar Project proposal elsewhere for financial support.
3. I/We have explored and ensured that the equipment and the basic facilities described in the Research Proposal, will actually be available as and when required for the purpose of the Project. I/We shall not request financial support under this project, for procurement of these items.
4. I/We undertake that spare or idle capacity of the permanent equipment procured under the Project will be made available to other legitimate users from parent and other organizations.
5. I/We have enclosed the following:

   a. Endorsement from the Head of the Institution (on letter head)

   b. Undertaking from the Collaborator (s)

Name and signature of the Investigators

(Dr. P. Savitha

Date 16/9/2021

Place Hyderabad

Annexure –VI

DEPARTMENT OF SCIENCE AND TECHNOLOGY

POLICY ON CONFLICT OF INTEREST FOR APPLICANT

Issues of Conflicts of Interest and ethics in scientific research and research management have assumed greater prominence, given the larger share of Government funding in the country's R & D scenario. The following policy pertaining to general aspects of Conflicts of Interest and code of ethics are objective measures that are intended to protect the integrity of the decision making processes and minimize biases. The policy aims to sustain transparency, increase accountability in funding mechanisms and provide assurance to the general public that processes followed in the award of grants are fair and non-discriminatory. The Policy aims to avoid all forms of bias by following a system that is fair, transparent and free from all influence / unprejudiced dealings, before, during and after the currency of the programme to be entered into with a view to enabling the public to abstain from bribing or any corrupt practice in order to secure the award by providing assurance to them that their competitors will also refrain from bribing and other corrupt practice and the decision-makers will commit to preventing corruption, in any form, by their officials by following transparent procedures. This will also ensure a global acceptance of the decision-making process adopted by DST.

Definition of Conflict of Interest:

Conflict of Interest means "any interest which could significantly prejudice an individual's objectivity in the decision-making process, thereby creating an unfair competitive advantage for the individual or to the organization which he/she represents". The Conflict of Interest also encompasses situations where an individual, in contravention to the accepted norms and ethics, could exploit his/her obligatory duties for personal benefits.

1. **Coverage of the Policy:**

a) The provisions of the policy shall be followed by persons applying for and receiving funding from DST, Reviewers of the proposal and Members of Expert Committees and Programme Advisory Committees. The provisions of the policy will also be applicable to all individuals including Officers of DST connected directly or indirectly or through intermediaries and Committees involved in the evaluation of proposals and subsequent decision-making process.

b) Thispolicyaimstominimizeaspectsthatmayconstituteactual Conflictof Interest,apparentConflictof Interests and potential Conflict of Interests in the funding mechanisms that are presently beingoperatedbyDST.Thepolicyalsoaimstocover,althoughnotlimitedto,Conflictofinterestsathatare Financial (gains from the outcomes of the proposal or award), Personal (association of relative /Family members) and Institutional (Colleagues, Collaborators, Employer, persons associated in a professional career of an individual such as PhD supervisor etc.)

2. **Specifications as to what constitutes Conflict of Interest:**

Any of the following specifications (non-exhaustive list) imply Conflict of Interest if,

(i) Due to any reason by which the Reviewer/Committee Member cannot deliver a fair and objective assessment of the proposal.

(ii) The applicant is a direct relative or family member (including but not limited to a spouse, child, sibling, and parent) or personal friend of the individual involved in the decision making process or alternatively if any relative of an Officer directly involved in any decision-making process / has influenced interest/stake in the applicant's form etc.

(iii) The applicant for the grant /award is an employee or employer of an individual involved in the process as a Reviewer or Committee Member; or if the applicant to the grant/award has had an employer-employee relationship in the past three years with that individual.

(iv) The applicant to the grant/award belongs to the same Department as that of the Reviewer/Committee Member.

(v) The Reviewer / Committee Member is a Head of an Organization from where the applicant is employed.

(vi) The Reviewer/Committee Member is or was, associated with the professional career of the applicant (such as PhD supervisor, Mentor, present Collaborator etc.)

(vii) The Reviewer/Committee Member is involved in the preparation of the research proposal submitted by the applicant.

(viii) The applicant has joint research publications with the Reviewer/Committee Member in the last three years.

(ix) The applicant/Reviewer/Committee Member, in contravention to the accepted norms and ethics followed in scientific research has a direct/indirect financial interest in the outcomes of the proposal.

(x) The Reviewer/Committee Member stands to gain personally should the submitted proposal be accepted or rejected.

#The Term "Relative" for this purpose would be referred to insection 6 of Companies Act, 1956.

3. Regulation:

The DST shall strive to avoid conflict of interest in its funding mechanisms to the maximum extent possible. A self-regulatory model is however recommended for stakeholders involved in scientific research and research management, on issues pertaining to Conflict of Interest and scientific ethics. Any disclosure pertaining to the same must be made voluntarily by the applicant/Reviewer /Committee Member.

4. Confidentiality:

The Reviewers and the Members of the Committee shall safe guard the confidentiality of all discussions and decisions taken during the process and shall refrain from discussing the same with any applicant or a third party unless the Committee recommends otherwise and records for doing so.

5. Code of Conduct

(a) The applicant must refrain from suggesting referees with potential Conflicts of Interest that may arise due to the factors mentioned in the specifications described above in Point No.2.

(b) The applicant may mention the names of individuals to whom the submitted proposal should not be sent for refereeing, clearly indicating the reasons for the same.

6. Final Appellate authority:

Secretary, DST shall be the appellate authority in issues pertaining to conflict of interest and issues concerning the decision making process. The decision of Secretary, DST in these issues shall be final and binding.

7. Declaration

I have read the above "Policy on Conflict of Interest" of the DST applicable to Applicant and agree to abide by provisions thereof.

I hereby declare that I have no conflict of interest of any form pertaining to the proposed grant

(Dr. P. Saville)

(Name/Signature with date)

Annexure-II

ENDORSEMENT FROM THE HEAD OF THE LEAD/PARTNER ORGANISATION

Project Title: TREATMENT OF BIOREFRACTORY WASTEWATER THROUGH MEMBRANE ASSISSTED CHEMICAL OXIDATION

1. Certified that the organization welcomes the participation of **Dr.P.Saritha** as the PI and Dr/Mr/Mrs as the Co-PI for the project and that in the unforeseen and legitimate event of discontinuation by the PI, the Co-PI will assume full responsibility for completion of the project. Information to this effect, endorsed by me, will be promptly sent to the DST.

2. Certified that the equipment, other basic facilities and other administrative facilities as per the terms and conditions of the award of the Project, will be extended to the investigator(s) throughout the duration of the project

3. The Organization shall ensure that financial and purchase procedures are followed as per the prevailing norms of the organization, with in the allocated budget.

4. The Organization shall provide timely the Statement of Expenditure and the Utilization Certificate of the grant as required by the DST in the prescribed format.

5. The grant for the proposal, if approved may be made in favour of Payment shall be made in favour of **Principal**

   i. Organization Name as per Bank records: Malla Reddy Engineering College

   ii. Bank Account No.: 769401000078

   ii. IFSC Code: ICIC0007694

   iii. MICR Code: 500229130

   iv. Bank Name: ICICI

   v. Bank Branch Address: MREC Campus, Maisammaguda

(Head of the Institute) Seal/Stamp

Date: 15/09/2021
Place: Hyderabad

PRINCIPAL
Malla Reddy Engineering College
(Autonomous)
Maisammaguda, Dhulapally,
(Post Via Kompally), Sec'bad-500 100

Mobile: 9704134781

S.G.ENTERPRISES

H.NO. 1-10-1/265/58/1, Sri Sai Nagar Colony, Kushaiguda,
ECIL POST, HYDERABAD – 500 062

QUOTATION

Date: 10-09-2021

To,
Malla Reddy College of Engineering,
Main campus, MaisammaGuda
Kompally secunderabad – 500 100.

Kind Attn: Dr.P. SARITHA

Dear Sir/ madam,

Please refer to our telephonic discussion regarding your Membrane Filtration Equipment

Sr.	Production Description	Unit	Unit Price	Amount (Rs)
01	Accessories (Pressure pump, peristaltic pumps, magnetic stirrers)	01	3,50,000-00	3,50,000-00

Terms & conditions

1. Sales Tax: Sales Tax Extra @ 5%.
2. Payment: 100% advance along with purchase order.
3. Delivery: within 15 days from our godown.

We believe the above offer will find most competitive, awaiting for your order.

Thanks and Regards,

For **S.G. Enterprises**
P.Narsimha