Proforma for submission of proposal under the

RESEARCH PROMOTION SCHEME

Research Promotion Scheme is aimed to create research ambience in the institutes by promoting research in engineering sciences and innovations in established and newer technologies; and to generate Masters and Doctoral degree candidates to augment the supply of research experience faculty and research personnel in the country.

Research and development activities are considered as an essential component of higher education because of their role in creating new knowledge and insight and imparting excitement and dynamism to the educational process, as well as make them need based in view of the national requirements. The objective of this scheme is to create and update the general research capabilities of the faculty members of the various Technical Institutes. The proposal should include a specific project theme with a clear statement of the objectives, details of equipments and other research facilities proposed to be acquired and the expected deliverables from the project.

Name of the Institute	Malla Reddy Engineering College (Autonomous)		
Address			
Contact details	Email	FAX	Telephone
Permanent Id of the Institute	This Id is available on AICTE web portal		
Application Id	Unique application Id as assigned to your application on web portal. See important note on the last page of this proforma.		
Department	Civil Engineering		
Strength & Weakness of the Institute	Give brief information regarding strength and weakness		

Technical Field of proposal

Waste Management, Effluent Treatment and Recycling

Add rows as required

Title of proposal

Design and development of Electrocoagulation unit for the processing of Electroplating wastewater

Add rows as required

Abstract

The rapidly growing world population with increasing level of pollution and continuous need for energy and food is forcing the exploration of the wastewater recycling and resource recovery. Due to the fact that water is a limited and vital resource, it should not be wasted after having been used in industrial processes. Thus, the reuse of wastewater has become an absolute necessity and, henceforth, an urgent need to develop innovative, more effective and inexpensive techniques for treatment of wastewater. Conventional techniques such as adsorption, air stripping, ion exchange, chemical oxidation etc., have limitations such as the addition of chemicals etc. A host of very promising techniques based on electrochemical technology are being developed, of which, Electrocoagulation (EC) has the potential to extensively eliminate the disadvantages of the classical treatment techniques.

Electrocoagulation is an electrochemical method of treating polluted water whereby sacrificial anodes release active coagulant precursors (usually aluminium or iron ions) into the solution. Electrocoagulation is effective in treating waste-waters containing several organic & inorganic compounds which include phenol, dyes, metal ions, cyanide, etc.

Hence in the preset study, an attempt will be made to design an Electrocoagulation unit for the treatment of Electroplating wastewater.

Add rows as required

Objective - Project Significance / Relevance with ongoing academic activities

One of the major challenges facing mankind today is to provide clean water to a vast majority of the population around the world. The need for clean water is particularly critical in Third-World Countries. Rivers, canals, estuaries and other water-bodies are being constantly polluted due to indiscriminate discharge of industrial effluents as well as other anthropogenic activities and natural processes. The reuse of wastewater has become an absolute necessity. Thus, there is an urgent need to develop innovative, more effective and inexpensive techniques for treatment of wastewater.

A host of very promising techniques based on electrochemical technology are being developed of which Electrocoagulation (EC) has the potential to extensively eliminate the disadvantages of the classical treatment techniques. The EC technology offers an alternative to the use of metal salts or polymers and poly-electrolyte addition for breaking stable emulsions and suspensions. The technology removes metals, colloidal solids and particles, and soluble inorganic pollutants from aqueous media by introducing highly charged polymeric metal hydroxide species. These species neutralize the electrostatic charges on suspended solids and oil droplets to facilitate agglomeration or coagulation and resultant separation from the aqueous phase.

Electroplating industry consumes and discharge large volumes of wastewater. Use of various chemicals and metal salt creates pollution problems. Major pollution caused by rinse water, spray losses and solution dumping and leakages. Valuable metals and cyanide along with different chemicals used are lost in wastewater. Hence, the main objective of the present study is to design and develop Electrocoagulation system for the treatment of electroplating wastewater.

Add rows as required

Project Impact -Expected outcome

- Designing of pilot scale & semi-commercial reactors
- Reuse of the water can be more than 80%

Add rows as required

Literature survey on National & International scenario

EC is one of the simple and efficient electrochemical methods for the purification of many types of water and wastewaters [Un et al., 2006]. This technique is characterized by its simple equipment, easy operation, and decreased amount of sludge. The coagulant in this technique is generated by electrolytic oxidation of an anode material which, at appropriate pH forms insoluble metal hydroxide capable of removing a large variety of pollutants [Adhoum *et al*., 2004]. These metal hydroxide species neutralize the electrostatic charges on the pollutants/contaminants to facilitate agglomeration or coagulation and resultant separation from the aqueous phase [Feng et al., 2003]. It was found to be effective to treat dyes wastewater (Kim *et al*., Kobya *et al*., 2006a), arsenic containing wastewater (Kumar *et al*., 2004), phosphate containing wastewater (Bektas *et al*., 2004), electroplating wastewater (Adhoum *et al*., 2004), metal finishing effluents (Khelifa *et al*., 2005), poultry slaughterhouse wastewater (Kobya *et al*., 2006b) and textile wastewater (Kobya *et al*., 2003). Konstantinos et al., (2011) studied the performance of electrocoagulation with aluminum electrodes for simultaneous removal of nickel, copper, zinc and chromium from synthetic aqueous solution and actual electroplating wastewater. Zhang et al. (2009) determined that 97% color removal was obtained after 10 minutes electrolysis time, with an electrical potential of 20 V, current of 0.4 A, electrode distance of 2.5 cm, concentration of 500 mg/L, KCl concentration of 0.5 g/L , and a pH of 3.0 for the purpose of treating methyl orange simulate dye wastewater by electrocoagulation. Ghosh et al. (2008) observed a 99.75% crystal violet removal by electrocoagulation when initial treatment concentration was 100 mg/L, current density 1,112.5 A/m2, solution conductivity of 1.61 S/m, pH of 8.5, and 1 hour of electrolysis time. It was also noticed that the cost for optimum treatment was 0.2141 US$/$m^3$. El-Naas et al. (2009) concluded that through batch experiments it was proven that the most effective treatment for petroleum refinery wastewater was using aluminum electrodes. Factors that were discussed included current density and initial concentration of the wastewater, where the temperature was 25 degrees Celsius and pH of 8. Chatzisyneon et al. (2009) concluded that by using electrochemical oxidation of olive mill wastewater (OMW) with a TiO_2 anode, it was noticed that the oxidation of OMW at 43 Ah/L, 80 degrees Celsius, and 5 mM NaCl can completely remove color, phenols, ecotoxicity, and low 30% COD removal with a 50 A/cm^2 current density. Katal and Pahlavanzadeh (2011) determined that by using aluminum and iron electrodes for electrocoagulation, optimum pH between 5 and 7, current density of 70 mA/cm^2 was capable of efficiently treating the wastewater at a low cost. In addition, temperature relationship also poorly affects the performance. Heidmann and Calmano (2008) was capable of treating galvanized wastewater by successfully reducing heavy metals of Cr and Cu by over 99% and 90% of Ni, as long as optimum conditions of a PH were greater than 5, 0.2 A for Fe electrodes, 1.5 A for Al electrodes, and a power consumption of 9.0 kWh/m^3. Qui et al.(2009) concluded that having a pH of 4, voltage 2.5 V, hydraulic retention time of 15 minutes, current density of 25 A/m^2, removal rate could be achieved at 99.5%, when treating electroplating wastewater by pulse electrocoagulation.

Add rows as required

Techno-Commercial status / Outcome / IPR / Social benefit /other

- The treatment technique can be used for remediation of complex industrial wastewaters

Add rows as required

Technical Consultancy / Revenue generation

- Designing of pilot scale & semi-commercial reactors for various industries can be done.

Add rows as required

Time & activity chart

Activities	1 Year			2 Year			3 Year		
	I	II	III	I	II	III	I	II	III
Collection & Characterization of the effluent									
Optimization of experimental conditions for the treatment of effluent using Electrocoagulation									
Evaluation of the performance of the treatment method in terms of COD, turbidity and heavy metals									
Evaluation of energy consumption along with cost estimates for the treatment method									
Designing of pilot & semi-commercial reactors based on lab scale results									
Data compilation									
Publication of results	3-4 International papers with high impact factor								

This is sample activity chart. Modify as needed.
Add activities/rows as required

Facilities / equipment available in the area of research proposed

Name of equipment	Make and model	Cost in Rs.	Year purchased
pH meter			
Electrical Conductivity meter			
COD digestor			
BOD incubator			
UV Visible Spectrophotometer			

Add rows as required

Budget Estimates – Non Recurring **Total Rs.** 15,00,000-00

Proposed equipment/s	Specifications	Cost in Rs.	No of units	Justification
Electrocoagulation Reactor Cell	100l tank capacity 30A-40V (1200 W power) & 43 x 36 x 13 dimensions (cm) 500l tank capacity 100A- 40V (4000 W power) & 43 x 50 x 27 dimensions (cm)	15,00,000-00	1	• Reactor tank • Power supply-pulsed DC regulated system • Floc generation tank • Clarifier • Ozone pretreatment • Equalization tank

Add rows as required

Budget Estimates –Recurring **Total Rs.** 10,00,000-00

	Estimate for Year 1	Estimate for Year 2	Estimate for Year 3
AMC/Service charges	Nil (warranty period)	50,000-00	50,000-00
Consumables & Contingencies	2,50,000-00	2,50,000-00	2,50,000-00
Other	50,000-00	50,000-00	50,000-00

Add rows as required

Profile of collaborating/participating Industry/s or other orginisation/s, if any.

Name	Address	Website	Contact person , designation, email	Role[$] in collaborating/participating	Financial commitment[#] towards project in Rs.
				Total Rs. (C)	

[$]Mention role of Industry/orgnisation.
Provide resume of participating personnel from Industry/orgnisation with their strength and role in the research project.
Add rows as required. Attach additional pages if required.
[#]Attach copy of letters received from participating industry showing intent / financial commitment etc.

Details of Project Coordinator

Name	Dr.P.Saritha		
Exact designation	Associate Professor	Date of joining	23-06-2014

Appointment Type	Regular	Scale of Appointment	
Department	Civil Engineering		
Qualifications	UG- Microbiology	PG- Environmental Science & Technology	PhD- Environmental Science & Technology
Experience in years	Teaching-6yrs	Industry-0	Research-9yrs
Students guided	UG-14	PG-3	PhD-0

Publications	National-3	International-17	Books-0
Relevant experience	Attach separately as needed		
Other information	1. DST WOS-A from May 2009-2012 2. CSIR RA From April 2012-May 2014 3. UGC-Minor Project completed March 2020		
Cell number	9849332474		
Email	poodarisaritha@gmail.com		
Signature			

Details of earlier grants awarded to the Institute (Give details of grants received in last three years)

Scheme	Name of the coordinator	Amt sanctioned		Sanctioned letter details	Funds Utilisation position as on today	UtilisationCertificate details/ Reason for non- submission of UtilisationCertificate
		NR	R			

Add rows as required

By signing this certificate, I/We undertake to

- ☑ Abide by all the rules / regulations regarding utilization of amount that may be granted to the Institute.
- ☑ Submit timely progress reportsabout grant utilization.
- ☑ Submit utilization certificate duly authenticated by CA on/before project period is over.
- ☑ Return full/partial unutilized grant amount to the Council.

Project forwarded to AICTE Signature of Head of the Institution

Date : Institute Seal

Important : You need to apply on web portal using your Institute login and password. Select tab "RID application". Press "New" to create new application. Your application is assigned **unique application Id**. Fill all the details over there. **Prepare application in this proforma also**. Attach PDF of it to the application on web portal. Now press "submit" on web portal to submit application. Pay processing fees on web portal using appropriate payment option.

office use only :

	NR	R	R	R	R	R	R

	Equip purchase	AMC	Consumables	Salary	Fellowship	Travel, Stay & DA	Ptg& Stationery / office Exp
RPS	Y	Y	Y	-	-	-	-