



ST. ANNE'S COLLEGE OF ENGINEERING AND TECHNOLOGY

(Approved by AICTE, New Delhi. Affiliated to Anna University, Chennai)

ANGUCHETTPALAYAM, PANRUTI – 607 106.

3.1.1 Grants received from Government and non-governmental agencies for research projects, endowments in the institution during the last five years (INR in Lakhs)

Academic Year 2021-2022

Name of the research project/ endowment	Name of the Principal Investigator/Co-investigator	Department of Principal Investigator	Year of Award	Amount Sanctioned	Duration of the project	Name of the Funding Agency	Type (Government/ non-Government)
Saline Water level Monitoring using Lora Technology	Dr. S. Anita	ECE	2022	0.075	6 months	Tamilnadu State Council for Science and Technology (TNSCST)	Government
Electrical discharge coating of aluminium alloy using WS ₂ /Cu green compact electrode(EM E-063)	Mr. K. Shanmuga Elango	ME	2022	0.075	6 months	Tamilnadu State Council for Science and Technology (TNSCST)	Government

Dr. R. AROKIADASS, M.E., Ph.D.,
Principal,
St. Anne's College of Engineering & Technology.
ANGUCHETTPALAYAM,
Siruvathur-(Post), Panruti-(T.k),
Cuddalore-(Dist), Pin: 607 110.



தமிழ்நாடு அறிவியல் தொழில்நுட்ப மாநில மன்றம்

TAMIL NADU STATE COUNCIL FOR SCIENCE AND TECHNOLOGY

(Established by Government of Tamilnadu)

Directorate of Technical Education Campus, Chennai – 600 025

Ph : 044-22301428, Telefax : 044-22301552 www.tanscst.nic.in

20.3.2022
11.03.2022

Dr. R. Srinivasan, M.Sc., Ph.D., F.I.C.S., M.A.C.S.(USA),
Member Secretary

Ref.No.TNSCST/SPS/2021-2022/

11.03.2022

To
The Principal
St.Anne's College of Engineering and Technology
Cuddalore-607 106

Sir/Madam,

Sub: TNSCST – Student Project Scheme (2021-2022) – approval intimation–grant release- reg.

With respect to the above scheme, the list of projects approved by the State Council is enclosed along with terms and conditions. You are requested to adhere to terms and conditions such as submission of UC and seminar paper in time.

No	Guide Name and Institutional Address	Title of the Project	Students Name	Project Code	Amount
1	Dr.S.Anita Associate Professor, Department of ECE St.Anne's College of Engineering and Technology Cuddalore-607 106	Saline level monitoring system using LoRa technology	R.Sineka, R.Preethi, G.Parameswari, S.Krishna Dharshini	EEE-1418	7500/-
2	Mr.K.Shanmuga Elango Associate Professor, Dept. of Mechanical Engineering St.Anne's College of Engineering and Technology Cuddalore-607 106	Electrical Discharge Coating Of Aluminium Alloy Using WS2/Cu Green Compact Electrode	R.Arun Prakash J.Arokia Tony Play	EME-063	7500/-

Herewith enclosed the cheque for the approved grant and disburse the grant to the concerned students through the guides at the earliest.

Kindly send the utilisation certificate (format enclosed) and seminar paper (Ref.T&C-No.5&6) on completion of the project.

Thanking you,

Yours faithfully,

Member Secretary.

- Encl: a) Terms & Conditions (T&C)
b) Format of Utilisation Certificate (UC)
c) Cheque for Rs. 15,000/- No:409456 dt:11.03.2022

Copy to: The individual guides



தமிழ்நாடு அறிவியல் தொழில்நுட்ப மாநில மன்றம்

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No.	Guide Name and Institutional Address	Title of the Project	Students Name	Project Code	Amount
1	Dr.S.Anita Associate Professor, Department of ECE St.Anne's College of Engineering and Technology Cuddalore-607 106	Saline level monitoring system using LoRa technology	R.Sinaka, R.Preethi, G.Parameswari, S.Krishna Dharshini	EEE-1418	7500/-
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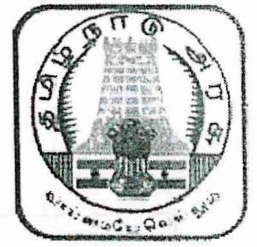
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Yours faithfully,

Member Secretary.

- Encl. a) Terms & Conditions (T&C)
b) Format of Utilisation Certificate (UC)
c) Cheque for Rs. 15,000/- No:409456 dt:11.03.2022

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PROPOSAL FOR THE GRANT

of

STUDENT PROJECT SCHEME (TNSCST)

on

“Saline Level Monitoring System using LoRa Technology”

Submitted to

TAMILNADU STATE COUNCIL FOR SCIENCE AND TECHNOLOGY

DOTE CAMPUS,

CHENNAI – 600 025.

Submitted by

SINEKA R

PREETHI R

PARAMESWARI G

KRISHNA DHARSHINI S

Department of Electronics & Communication Engineering

ST. ANNE'S

College of Engineering and technology

(An ISO 9001:2015 Certified Institution)

Approved by AICTE New Delhi & Affiliated to Anna University Chennai

Anguchettypalayam, Panruti Taluk, Cuddalore –607 106, Tamilnadu, India



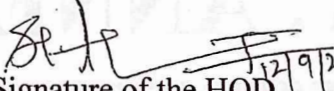
STUDENT PROJECT PROPOSAL

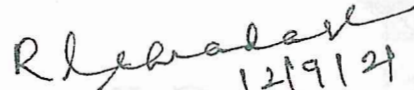
1	Name of the Student(s) One valid e-mail id	:	SINEKA R, PREETHI R, PARAMESWARI G, KRISHNA DHARSHINI S (ece@stannescet.ac.in)
2	Name of the Guide Department/Designation Institutional Address Phone No. & Mobile No.	:	Dr. S. Anita Associate Professor, St. Anne's College of Engineering and Technology, Anguchettyalayam, Panruti Taluk, Cuddalore District, Pincode – 607 106. Ph: 8668083982
3	Project Title	:	Saline Level Monitoring System using Lora Technology
4	Sector in which your Project Proposal is to be considered	:	Engineering & Technology
5	Project Details	:	Attached separately with this form
6	Has a similar project been carried out in your college/elsewhere? If so furnish details of the previous project and highlight the improvements suggested in the present one.	:	No

CERTIFICATE

This is to certify that **SINEKA R, PREETHI R, PARAMESWARI G, KRISHNADHARSHINI** Sis a bonafide final year student of P.G. Science / U.G. Engineering / P.G. professional courses of our college and it is also certified that two copies of utilization certificate and final report along with seminar paper will be sent to the Council after completion of the project by the end of April 2022.


Signature of the Guide 12/9/21


Signature of the HOD 12/9/21


Signature of the Principal/
Head of the Institution
Dr. R. AROKIADASS, M.E., Ph.D.,
Principal,

N.B.: 2 copies of the proposals are to be submitted through proper channel to The Member Secretary, TNSCST, DOTE Campus, Chennai - 600 025 on or before 17 September 2021, 5.00PM
St. Anne's College of Engineering & Technology,
ANGUCHETTYPALAYAM,
Siruvathur-(Post), Panruti-(T.K.),
Cuddalore-(Dist), Pin: 607 110.

Project Details

1.1 INTRODUCTION

Every human life has infinite value. Therefore, their lives must be protected in all the ways possible and it should not be taken for granted. The active living of human life is threatened by various factors due to the amplified death rate. It is mandatory to protect the lives of the people. In recent years, there is a rapid growth in the medical sector due to the technological advancements which assures speedy recovery of patients in the hospitals. Beyond multiple treatments available in hospitals, Saline Therapy is one of the most important treatments that many patients receive. So, when saline is catered to the patients, it has to be monitored by a doctor, a caretaker, or a nurse. But due to the busy schedule, negligence and inattentiveness of doctor and nurse in monitoring the saline level leads to critical condition like reverse flow of patients' blood into the saline tube. This critical condition harm a patient to highly and even leads to death in many hospitals.

Hence, the system is designed to control and monitor the saline level remotely by using Lora (Long Range) Technology. It is a low power wide area network where the saline level is observed up to 10km range. The proposed system continuously monitors the weight of the saline bottle with the help of a load sensor and it is converted into saline level. The saline level reaches to a threshold limit (10% of saline) it automatically switches off the flow with the help of the solenoid valve connected to the saline bottle. The notification is also sent to the person in charge with the help of the Lora Module (Ra-02).

The system utilizes the wide area with low power and offers high accuracy even in the remote area where the internet is not available. This is the first time the Lora technology is deployed in the medical sectors.

1.2 OBJECTIVES

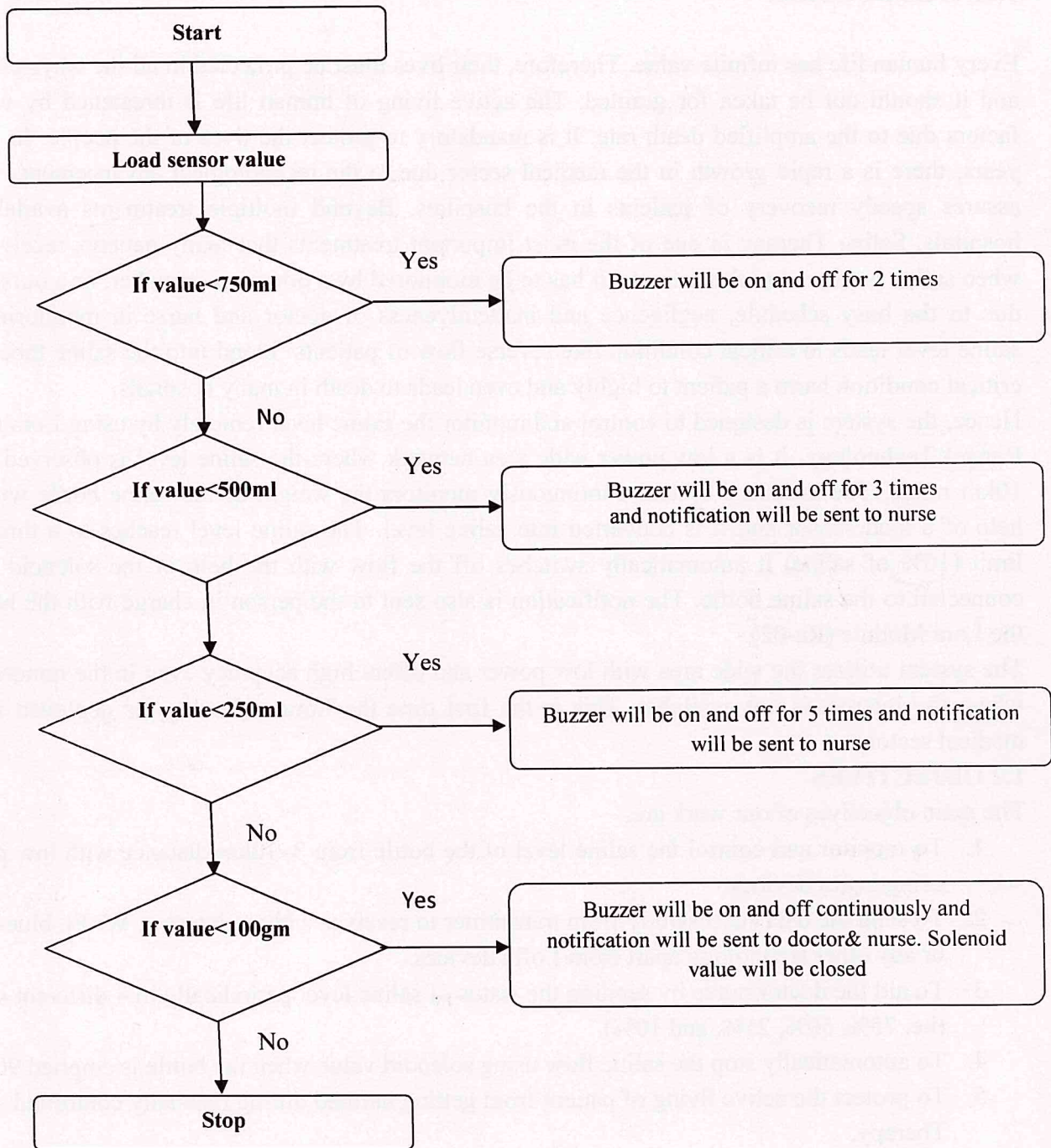
The main objectives of our work are,

1. To monitor and control the saline level of the bottle from 3–12km distance with low power using LoRa devices.
2. To send the data successfully from transmitter to receiver without internet, Wi-Fi, blue-tooth or any other technology apart from LoRa devices.
3. To aid the doctor/nurse by sending the status of saline level periodically in 4 different stages (i.e. 75%, 50%, 25%, and 10%).
4. To automatically stop the saline flow using solenoid value when the bottle is emptied 90%.
5. To protect the active living of patient from getting harmed during manually controlled saline Therapy.

1.3 METHODOLOGY

The proposed system is designed to control the saline level automatically using Low power long range technology called LoRa. The Load cell sensor is connected to the weight sensor amplifier module (HX711) which is used to measure the weight of the saline bottle. The measured weight is sent to the microcontroller (Arduino UNO R3) module where the weight in grams is converted into milliliters (indicates level of saline) and it is transmitted to the receiver module using RA02 LoRa Module. When the transmitted value is less than 750ml, 500ml, 250ml, the notification will be sent to doctor/nurse. In addition, the LCD module will display the current level of saline and it will be notified by the buzzer. When the level is reduced below 100 ml then the solenoid value which is connected to the saline tube is closed, thereby the critical condition like reverse flow of patients' blood into the saline tube is eliminated.

1.4 FLOW CHART:



1.5 WORK PLAN

S.No	Timeline	Work to be carried out
1.	Dec. 1 st – 31 st , 2021	Learning the basics of Arduino, Lora module and saline bottle along with literature review
2.	Jan.1 st – Feb. 5 th , 2022	Interfacing Load Cell & Weight sensor amplifier module with Arduino Uno
		Interfacing LCD & Lora Module with Arduino Uno
3.	Feb 6 th -Feb 20 th , 2021	Interfacing LCD Module with Arduino Uno
		Adding input switches at transmitter end for calibrating the Load cell value
4.	Feb 21 th -Feb 25 th , 2021	Write a program to Convert the weight value into Milliliters

5.	Feb 26 th -Mar 20 th , 2021	Designing the transmitter and receiver module separately and check the working of the model.
6.	Mar 21 st -Mar 23 rd , 2021	Final calibration and product development

1.6 BUDGET

S.No.	Component Name	Quantity	Unit Cost	Cost
1	RA02 LoRa Module Long Range Wireless Module 433Mhz	4	706	2824
2	Wireless Gain Antenna	4	250	1000
3	Buzzer	2	50	100
4	Adaptor(12V/1A)	2	140	280
5	LCD Display	2	130	260
6	Breadboard	4	80	320
7	Arduino UNO R3 Development Board ATMEGA16U2 ATMEGA328P (DIP)	3	700	2100
8	Programmer Cable	2	80	160
9	Jumper Wires	130	5	650
10	I ² C module	2	80	160
11	Load Cell with HX711 amplifier Module	2	420	840
12	Relay 2Channel(SSD)	2	210	420
13	Solenoid Valve	2	250	500
14	Board	2	150	300
15	Push Button	10	10	100
			Total Cost	10014

1.7 FUTURE SCOPE

The saline level is controlled and monitored using Lora Technology to protect the active living of human lives. The proposed work could be extended with more features using Lora Technology. The extended work is given as:

1. The wireless messages can send to doctors and nurses about the saline droplet rate.
2. Smart health system using Lora technology can be implemented, which gives the information about body temperature, blood pressure, heart rate and also the pulse rate.



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TAMILNADU STATE COUNCIL FOR SCIENCE AND TECHNOLOGY
DOTE Campus Chennai 600 025

STUDENT PROJECT SCHEME 2021-2022
UTILISATION CERTIFICATE

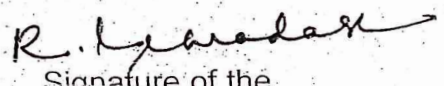
(TWO COPIES)

1. Name of the guide and address : D.V.S. ANITA
ASP/ECE
St. Annie's College of Engg & Tech.
Panruti
2. Name of the student(s) : R. Sineka, R. Prueti, G. Paramaswari
S. Krishna dharshini
3. Title of the project : Saline level monitoring system
using LoRa Technology
4. Project code : EEE-1418

It is certified that a sum of Rs. 7,500 (Rupees) Sanctioned by the council for carrying out above mentioned student project has been utilized for the purpose for which it was sanctioned and sum of Rs. 0 remaining unutilized is refunded.


Signature of the guide


Signature of the HOD


Signature of the
REGISTRAR/PRINCIPAL/DEAN
With SEAL
Dr. E. ARUKIADASS, M.E., Ph.D.
Principal,
St. Annie's College of Engineering & Technology
ANGUCHETTYPALAYAM,
Siruvathur-(Post), Panruti-17
Cuddalore-(Dist), Pin: 607

SALINE LEVEL MONITORING SYSTEM USING LORA TECHNOLOGY

R. Sineka, R. Preethi, G. Parameswari, S. Krishna Dharshini

Department of Electronics and Communication Engineering, St. Anne's College of Engineering and Technology, Panruti-607 106

Abstract

The primary objective of the present invention is to control the saline bottle automatically using Arduino and LoRa (Long Range) Technology. The proposed work uses LoRa device which is a low power wide area network that removes the barrier of internet requirement and also transmits the data wirelessly at a distance of 10KM with high accuracy. The load sensor is used to monitor the weight of the saline bottle continuously to overcome the inaccurate measurement using ultrasonic sensors and IR sensors. When the saline level reaches to a threshold limit (10% of saline or 100mL) it automatically switches off the saline flow with the help of the solenoid valve connected to the saline tube and the notification is sent to the person in charge with the help of Lora Module, LCD and Buzzer. Hence, the saline level monitoring using LoRa technology aids the doctors and nurses in the medical sectors.

Introduction

As the world population grows, the need for health care also increases. In recent years, progress in medical care has been rapid in combination of advanced field of engineering like sensors and microcontrollers. One of the recent technologies of engineering is IoT (internet of things). IoT is a technology aimed to communicate between computer to human and computer to computer over a network without any interaction. A new wireless IoT protocol called LoRa (long range) technology is adapted to solve the issues of natural resource reduction, energy management, infrastructure efficiency, pollution control, and disaster prevention. LoRa is a long-range communication protocol that was developed by Semtech.

The LoRa WAN is a standard for interoperability designed by LoRa Alliance and it is otherwise called as low power wide area network (LP-WAN). It has been applied in health care now a days. In health care, monitoring saline level is a challenging task for the care taker, relatives and nurses in the hospital as it needs to check continuously. If it fails the blood cells flow reverse to the bottle. This leads to the death of the human being. Hence, a smart system is developed using Bluetooth, GSM and IoT which measure the saline level. The intimation is given to the caretaker when the level reaches to 70ml and below 70ml through LED and buzzer, hence reduce the risk of using saline bottle. Though it reduces the risk of using saline bottle, it suffers by short range communication, power requirements. This problem could be overcome by LoRa technology for monitoring saline levels.

Motivation

- When saline is catered to the patients, it has to be monitored by a doctor, a caretaker, or a nurse. But due to the busy schedule, negligence and inattentiveness of doctor or nurse in monitoring the saline level leads to critical condition like reverse flow of patients' blood into the saline tube. This critical condition harm the patient too highly and even leads to death in many hospitals. In order to reduce the death rate a smart system must be implemented to monitor the saline level continuously.
- The existing smart system uses Bluetooth, GSM and IoT for monitoring saline level which suffer by the barriers of internet and high-power requirements. These barriers are removed by using LoRa technology.

Materials and Methods

The present invention provides a method to control the saline bottle automatically using microcontroller and transmit the saline level wirelessly using LoRa technology. Our system uses LoRa device, which is a low power wide area network that removes the barrier of internet requirement and also can transmit the data wirelessly at a distance of 10KM. It offers wide area with low power and offers high accuracy even in the remote area where the internet is not available. The load sensor is used to monitor the weight of the saline bottle continuously. When the saline level reaches to a threshold limit (10% of saline or 100mL) it automatically switches off the saline flow with the help of the solenoid valve connected to the saline tube and the notification is sent to the person in charge with the help of the Lora Module, LCD and Buzzer.

Working

The module consists of transmitter and receiver section where the saline level is monitored continuously and controlled automatically. The saline level information of the transmitter is sent to the receiver through which the care taker receives the notification. The transmitter consists of Arduino board, saline bottle, load cell relay, buzzer, antenna and Lora module. The load cell is connected with saline bottle with the HX711 amplifier. The HX711 consists of an amplifier and a 24-bit high precision analog-to-digital convertor for weighing the saline bottle. In addition, it is used as a breakout board to integrate with Arduino controller to read the load cell easily which measures the weight. When the weight of the saline is reduced to 750ml then the microcontroller will make the buzzer on for two times. When the weight is reached to 500ml the buzzer will be on for 3 times and when it reaches to 250ml buzzer will be on for 5 times. Finally, when the level is critical (ie.100ml), the relay which is connected to saline tube will make the saline valve off to avoid the reverse flow of the blood to the saline bottle and the buzzer will on continuously. All these transmitter information is sent to the receiver through LoRa module (RA-02).

The transmitted information will be received by the receiver LoRa module (RA-02). The receiver module will be placed in the doctor/ nurse cabin. The data is given to the Arduino board and that could be viewed by 16x2 LCD module. The LCD module is connected with Arduino through I²C (Inter-Integrated circuit) where it needs only two wires to connect with LCD.

Result and Discussion

The present smart system is designed to monitor the saline level continuously using Lora technology where the data transmission is reliant on secure networks with wide reach around 10KM radius and also consumes low power when compared with other networks. The load sensor reads the weight of the saline bottle. When the saline bottle level reaches to 750ml, 500ml and 250 ml the buzzer will be on for 2, 3 and 5 times respectively. When it reaches to critical level (100ml) the buzzer will be on and off continuously. The system will be much advantageous at night when the nurse does not check the saline level continuously. When saline reaches to the critical level, the alert message will be sent to the doctor or nurse, and it also pinches the saline pipe to stop the reverse flow of saline. It will be helpful in urban as well as rural areas where the human power and internet facility is inadequate. The system is automatic, reliable, cost effective and more convenient to use.

Conclusion

The saline level monitoring using LoRa technology system is implemented to aid the doctors and nurses in the medical sectors. Different levels of saline are monitored and controlled when the saline level reaches to critical to avoid reverse flow of blood to the bottle to save the human lives.

ANNA UNIVERSITY:: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report "SALINE LEVEL MONITORING SYSTEM USING LORA TECHNOLOGY" is the bonafide work of "G. PARAMESWARI (422118106007), S. KRISHNADHARSHINI (422118106303), R. PREETHI (422118106009)" who carried out the project work under my supervision.


SIGNATURE 18/6/22

**Dr. Sr. S. ANITA, M. Tech, Ph. D.,
HEAD OF THE DEPARTMENT**

Professor
Electronics and Communication
Engineering
St. Anne's College of Engg & Tech.
Anguchettypalayam,
Panruti-607106

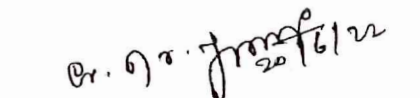

SIGNATURE 13/6/22

**MR. S. BALABASKER
SUPERVISOR**

Assistant Professor
Electronics and Communication
Engineering
St. Anne's College of Engg & Tech.
Anguchettypalayam,
Panruti-607106

Submitted for the ANNA UNIVERSITY examination held on 20/6/22


INTERNAL EXAMINER 20/6/22


EXTERNAL EXAMINER 20/6/22



TAMILNADU STATE COUNCIL FOR SCIENCE AND TECHNOLOGY

GOVERNMENT OF TAMILNADU



CERTIFICATE

This is to certify that the project entitled "*Saline Level Monitoring..... Lord Tech.....*" sponsored by the Council under the sector *Electrical, Electronics & com* carried out and presented by *R. Sineka*, *St. Anne's College of Engg. and Tech., Cuddalore* at the Seminar cum Exhibition of the **STUDENT PROJECT SCHEME 2021-2022** held at Excel Engineering College, Komarapalayam -637 303 has won the **SECOND** Prize for **Oral Presentation**.

Chennai-600 025

26.11.2022

DR. R. SRINIVASAN

Member Secretary



TAMILNADU STATE COUNCIL FOR SCIENCE AND TECHNOLOGY

GOVERNMENT OF TAMILNADU



CERTIFICATE

This is to certify that **Ms. R. Sineka**, **St. Anne's College of Engineering and Technology, Cuddalore - 607 106** has successfully completed the project titled "**Saline level monitoring system using LoRa technology**" in the Sector **ELECTRICAL AND ELECTRONICS ENGINEERING** under **STUDENT PROJECTS SCHEME** sponsored by the Council during the academic year 2021-2022.

Chennai-600 025

25.11.2022

No.EEE-1418/2022

DR. R. SRINIVASAN

Member Secretary



**TAMIL NADU STATE COUNCIL FOR
SCIENCE AND TECHNOLOGY**

**Government of Tamil Nadu
Chennai-600 025**

**STATE LEVEL STUDENT PROJECTS 2021-22
SEMINAR CUM EXHIBITION**

SECOND PLACE

Organized at

**EXCEL ENGINEERING COLLEGE
KOMARAPALAYAM - 637 303**

FORMAT FOR STUDENT PROJECT PROPOSAL

1. Name of the Student(s)

One valid e-mail id

:1.R.ARUN PRAKASH,
2.J.AROKIA TONY PLAY,
3.A.VIGNESH KUMAR,
e-mail id: arunprakash4944@gmail.com

Name of the Guide

: Mr. K.SHANMUGA ELANGO, M.TECH.,

2. Department/Designation

Associate Professor/MECHANICAL

Institutional Address

Mobile: 7094909711

Phone No. & Mobile No.

St. Anne's College of Engineering &
Technology, Anguchettypalayam,
Panruti - 607110

3. Project Title

: **Electrical Discharge Coating Of Aluminium Alloy Using WS_2 /Cu Green Compact Electrode**

4. Sector in which your Project

Proposal is to be considered

: Engineering & Technology

5. Project Details

: Attached separately with this form

6. Has a similar project been carried

out in your college/elsewhere?

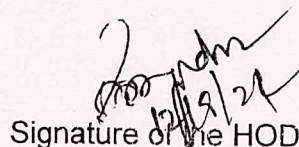
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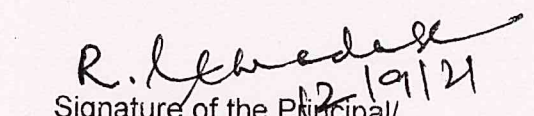
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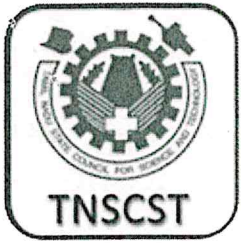
CERTIFICATE

This is to certify that Mr.R.ARUNPRAKASH, Mr.J.AROKIATONYPLAY, and A.VIGNESHKUMAR, is a bonafide final year student of U.G. Engineering of our college and it is also certified that two copies of utilization certificate and final report along with seminar paper will be sent to the Council after completion of the project by the end of April 2022.


Signature of the Guide


Signature of the HOD


Signature of the Principal/
Dr. R. AROKIA DASS, Ph.D.,
Principal,
St. Anne's College of Engineering & Technology,
ANGUCHETTYPALAYAM,
Sivavathur-(Post), Panruti-(T.k),
Cuddalore-(Dist), Pin: 607 110.



PROPOSAL FOR THE GRANT
of
STUDENT PROJECT SCHEME (TNSCST)

on

**“Electrical discharge coating of Aluminum Alloy using
Ws₂/Cu Green Compact Electrode”**

Submitted to

**TAMILNADU STATE COUNCIL FOR SCIENCE AND TECHNOLOGY
DOTE CAMPUS,
CHENNAI – 600 025.**

Submitted by

**R.ARUN PRAKASH
J.AROKIA TONY PLAY
A.VIGNESH KUMAR**

Department of Mechanical Engineering

ST. ANNE'S

College of Engineering and technology

(An ISO 9001:2015 Certified Institution)

Approved by AICTE New Delhi & Affiliated to Anna University Chennai

Anguchettypalayam, Panruti Taluk, Cuddalore –607 106, Tamilnadu,
India



FORMAT FOR STUDENT PROJECT PROPOSAL

1. Name of the Student(s)

One valid e-mail id

:1.R.ARUN PRAKASH,
2.J.AROKIA TONY PLAY,
3.A.VIGNESH KUMAR,
e-mail id: arunprakash4944@gmail.com

Name of the Guide

2. Department/Designation
Institutional Address
Phone No. & Mobile No.

: Mr. K.SHANMUGA ELANGO, M.TECH.,
Associate Professor/MECHANICAL
Mobile: 7094909711
St. Anne's College of Engineering &
Technology, Anguchettypalayam,
Panruti - 607110

3. Project Title : **Electrical Discharge Coating Of Aluminium Alloy Using WS_2 /Cu Green Compact Electrode**

4. Sector in which your Project
Proposal is to be considered

: Engineering & Technology

5. Project Details

: Attached separately with this form

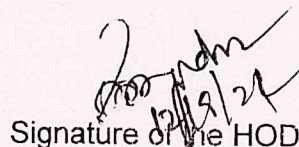
6. Has a similar project been carried
out in your college/elsewhere?
If so furnish details of the previous
project and highlight the improvements
suggested in the present one.

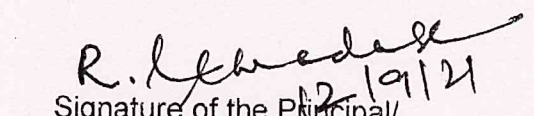
: No

CERTIFICATE

This is to certify that Mr.R.ARUNPRAKASH, Mr.J.AROKIATONYPLAY, and A.VIGNESHKUMAR, is a bonafide final year student of U.G. Engineering of our college and it is also certified that two copies of utilization certificate and final report along with seminar paper will be sent to the Council after completion of the project by the end of April 2022.


Signature of the Guide


Signature of the HOD


Signature of the Principal/
Dr. R. AROKIA DASS, Ph.D.,
Principal,
St. Anne's College of Engineering & Technology,
ANGUCHETTYPALAYAM,
Sivavathur-(Post), Panruti-(T.k),
Cuddalore-(Dist), Pin: 607 110.

PROJECT DETAILS

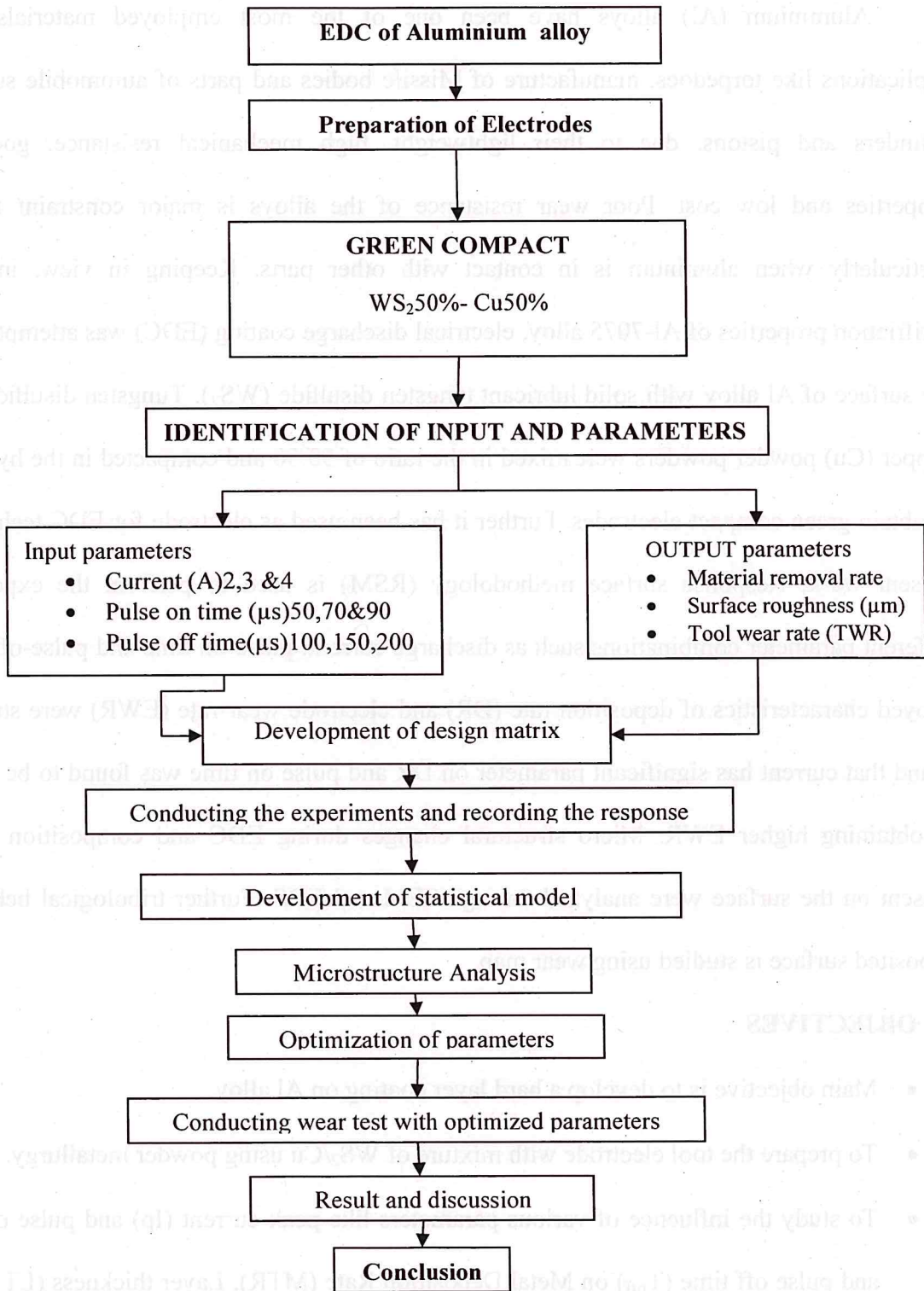
1.1 INTRODUCTION

Aluminium (Al) alloys have been one of the most employed materials in defence applications like torpedoes, manufacture of Missile bodies and parts of automobile such as engine cylinders and pistons, due to their lightweight, high mechanical resistance, good corrosion properties and low cost. Poor wear resistance of the alloys is major constraint for their use particularly when aluminum is in contact with other parts. Keeping in view, improving the antifriction properties of Al-7075 alloy, electrical discharge coating (EDC) was attempted to modify the surface of Al alloy with solid lubricant tungsten disulfide (WS_2). Tungsten disulfide (WS_2) and copper (Cu) powder powders were mixed in the ratio of 50:50 and compacted in the hydraulic press to obtain green compact electrodes. Further it has been used as electrode for EDC technique. In the present work, Response surface methodology (RSM) is used to perform the experiment with different parameter combinations such as discharge current, pulse-on time and pulse-off time on the alloyed characteristics of deposition rate (DR) and electrode wear rate (EWR) were studied. It was found that current has significant parameter on DR and pulse on time was found to be predominant in obtaining higher EWR. Micro structural changes during EDC and composition of materials present on the surface were analyzed through SEM and EDS. Further tribological behavior of the deposited surface is studied using wear map.

1.2 OBJECTIVES

- Main objective is to develop a hard layer coating on Al alloy.
- To prepare the tool electrode with mixture of WS_2 /Cu using powder metallurgy.
- To study the influence of various parameters like peak current (I_p) and pulse on time (T_{on}) and pulse off time (T_{off}) on Metal Deposition Rate (MTR), Layer thickness (LT) and Micro-hardness
- Evaluate the tribological performance of coated WS_2 +Cu electrodes.

1.3 METHODOLOGY



1.4 WORK PLAN

- Work materials to be purchased
- Electrodes to be prepared with various combinations of WS₂/Cu.
- Experiments have to be conducted.
- Micro-hardness has to be carried out on the deposited layer.
- Micro structure analysis (SEM & EDS) and wear test has to be carried out on the deposited layer.

1.5. BUDGET

S.No	Component Name	Quantity	Cost in Rupees
1	Tungsten disulfide (WS ₂)M powder	500g	2000
2	copper (Cu) powder	500g	600
3	Electrode manufacturing cost	3 Nos	4200
4	Aluminium7075 plate(200mmx200mmx6mm)	1No	450
5	Electro discharge coating cost	-	600
6	Testing costs(SEM,EDS,MICRO-HARDNESS AND WEAR)	-	3500
Total Cost			11,350

1.6 FUTURE SCOPE

Good adhesion between the work surface and the coated layer.

Capability to generate thick layer.

Provide simultaneous coating of multiple materials with different melting points.

TAMILNADU STATE COUNCIL FOR SCIENCE AND TECHNOLOGY
DOTE CAMPUS, CHENNAI - 600 025


STUDENT PROJECT SCHEME 2021-2022
UTILISATION CERTIFICATE


(TWO COPIES)

1. Name of the guide and address : K. Shammuga Elango
ASP/Mech
St. Anne's college of Engg & Tech
Panruti
2. Name of the student(s) : 1. Arokia Jothy Play - J
2. Arun Prakash - R
3. Title of the project : Electrical Discharge coating of
Aluminium Alloy using WS₂/Cu Green
compact Electrode.
4. Project code : EME - 063

It is certified that a sum of Rs. 7,500 (Rupees) Sanctioned by the council for carrying out above mentioned student project has been utilized for the purpose for which it was sanctioned and sum of Rs. remaining unutilized is refunded.


Signature of the guide


Signature of the HOD


Signature of the
REGISTRAR/PRINCIPAL/DEAN
With SEALS
DR. R. AROKIADESS, M.E., Ph.D.,
Principal,
St. Anne's College of Engineering & Technology,
ANGUCHETTYPALAYAM,
Siruvathur-(Post), Panruti-(T.k),
Cuddalore-(Dist), Pin: 607 110.

ELECTRICAL DISCHARGE COATING OF ALUMINIUM ALLOY USING WS_2/CU GREEN COMPACT ELECTRODE

R.Arunprakash and J.Arokiatonyplay

Department of Mechanical Engineering,
St. Anne's College of Engineering & Technology, Panruti - 607106

Abstract

Aluminium (Al) alloys have been one of the most employed materials in defence applications like torpedoes, manufacture of Missile bodies and parts of automobile such as engine cylinders and pistons, due to their lightweight, high mechanical resistance, good corrosion properties and low cost. Poor wear resistance of the alloys is major constraint for their use particularly when aluminum is in contact with other parts. Keeping in view, improving the antifriction properties of Al-7075 alloy, electrical discharge coating (EDC) was attempted to modify the surface of Al alloy with solid lubricant tungsten disulfide (WS_2). Tungsten disulfide (WS_2) and copper (Cu) powder powders were mixed in the ratio of 50:50 and compacted in the hydraulic press to obtain green compact electrodes. Further it has been used as electrode for EDC technique. In the present work, Response surface methodology (RSM) is used to perform the experiment with different parameter combinations such as discharge current, pulse-on time and pulse-off time on the alloyed characteristics of deposition rate (DR) and electrode wear rate (EWR) were studied. It was found that current has significant parameter on DR and pulse on time was found to be predominant in obtaining higher EWR. Micro structural changes during EDC and composition of materials present on the surface were analyzed through SEM and EDS.

Introduction

Present scenario aluminium alloys have increased rapid espousal in industrial applications because of its unique properties such as light weight and high specific strength, has led to fast replacement of ferrous materials, predominantly in aviation and automobile sectors results in reduction in weight and fuel consumption accompanied by enhanced performance and efficiency. Nevertheless wear resistance of aluminum alloy is very low. Hence surface modification becomes tremendously important to improve the wear resistance and increase the acceptability of aluminum alloy in industrial circumstances. Electrical discharge coating (EDC) is innovative technique used in latest years to modify the surface of alloy metal through electrical discharges in existing electrical discharge machining (EDM)

Motivation

The motivation for this project Aluminum is well accepted in the field of automotive and aerospace industries because of its light weight, nevertheless it possesses very low wear resistance. To improve the wear resistance and increase the acceptability of aluminum in industrial scenario, surface modification becomes extremely important.

Materials and Methods

In this experiment WS_2/Cu in the proportion of 50:50 wt%, are mixed Proper mixing of the powders is essential for uniformity of the finished product and also uniform composition throughout the mixture volume. Then the mixture was compacted in the 150-ton capacity hydraulic press. The workpiece used in the experiment was Aluminum alloy 7075. Electrical discharge coating (EDC) was accomplished on the surface of an Aluminium alloy7075 with WS_2/Cu composites prepared die sink EDM (5530EDME) with reverse polarity and immersed in a hydrocarbon dielectric medium.

Result and Discussion

The deposition rate (DR) increases in an EDC with a high current. This is due to the current's strong sparks melting and vaporizing the electrode material, which is then deposited on the workpiece. Deposition rate (DR) decreases with a high pulse on time, on the other hand. The pulse off time increases clearance of melted debris in the gap, resulting in enhanced ionisation of the dielectric medium and an increase in deposition rate (DR).when current and pulse on time increases Electrode wear rate(EWR) increases, that is mainly due to generation of high temperature and corresponding erosion of powder material from the tool electrode. When the pulse off time is increased, the temperature at the interface rises, promoting carbon formation from dielectric breakdown, which deposits on the electrode's surface and minimises Electrode wear rate (EWR). The presence of W and Cu along with other elements on the coated layer significantly deposited on the base material was confirmed with EDS analysis. XRD was obtained to identify the various compounds formed on the surface of the aluminum specimen.

Conclusions

Electric discharge coating (EDC) with WS_2/Cu green compact powder metallurgical electrode was carried out to modify the surface of 7075Aluminium alloy. Significant amount of material transfer from the electrode to the surface with Influence of controllable EDC parameters current, pulse on time and pulse off time on deposition rate and electrode wear rate have been

studied. From the result it can be concluded that DR increases with current. This is attributed at current initiate the strong sparks which melts and vaporize the electrode material and deposited on the workpiece. Conversely at high pulse on time DR decreases. This is owing to discharges energy for longer duration at high pulse on stimulate the heat at the gap became too high, which removes pre-deposited layer partially along with coating simultaneously. As the pulse off time is raises clearance of melted debris rapidly in the gap leads to ionization of dielectric medium increased results in increase in DR and also microhardness increased with increase in current and pulse on time.

Guide: **Mr.K.Shanmuga Elango**, Associate Professor, Department of Mechanical Engineering,
St. Anne's College of Engineering & Technology, Panruti - 607106

ANNA UNIVERSITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report “Electrical Discharge Coating Of Aluminium Alloy Using WS₂/Cu Green Compact Electrode ” is the bonafide work of “AROCKIA TONY PLAY . J”, VIGNESH KUMAR. A, ARUN PRAKASH .R” who carried out the project work under my supervision.

*for K-24
20/06/2022*

SIGNATURE

D R .D. OMMURUGADHASAN

HEAD OF THE DEPARTMENT

MECHANICAL

ST. ANNE’S COLLEGE OF

ENGG. & TECH.

PANRUTI

SIGNATURE

*K. Shanmuga Elango
21/6/2022*

Mr. K. SHANMUGA ELANGO, M.Tech.,

SUPERVISOR

ASSOCIATE PROFESSOR

ST. ANNE’S COLLEGE OF

ENGG. & TECH.

PANRUTI

Submitted for the ANNA UNIVERSITY examination held on 20.06.22

*K-24
20/06/2022*

INTERNAL EXAMINER

*Arjun
20/6/22*

EXTERNAL EXAMINER



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