FEDERAL UNIVERSITY OF PETROLEUM RESOURCES, EFFURUN

SCHOOL OF POST GRADUATE STUDIES

SUBMISSION OF RESEARCH PROPOSAL

**BY**

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ELECTRICAL /ELECTRONIC ENGINEERING

(INTRUMENTATION AND CONTROL OPTION)

**TITLE OF PROPOSED TOPIC**

PROCESS INSTRUMENT CONTROL SYSTEM FOR INDUSTRIAL OPERATIONS

SUPERVISED BY

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**INTRODUCTION**

In today's rapidly evolving industrial landscape, the integration of advanced technologies has become pivotal in enhancing operational efficiency, precision, and control. One such groundbreaking innovation is the "Personal Computer Microcontroller-Based Process Instrument Control System," a cutting-edge solution poised to revolutionize industrial operations. This system represents a seamless fusion of personal computing power and microcontroller technology, offering a dynamic and adaptable approach to process instrument control. By harnessing the capabilities of this integrated system, industries can usher in a new era of optimized operations, real-time monitoring, and data-driven decision-making. In this comprehensive exploration, we delve into the intricacies, benefits, and transformative potential of this remarkable fusion, outlining its applications across diverse sectors and highlighting its role in shaping the future of industrial processes.

The proposed design (Wireless Process Instrument Control System for Industrial Operations), is a smart control system where industrial devices can be controlled remotely by using a mobile phone or personal computer (PC) as an interface which reduces risk of accident, increase productivity and reduces cost. System operators can be use to control instruments remotely and also get report data from them such as temperature reading , start and stop process pump, switch on and off process heater

**1.1 PROBLEM STATEMENT**

It has been observed that manual control for industrial equipment in the industrial sector have several challenges associated with it, which include:

1 The switch operator's life could be put at risk.

2 Damage of industrial equipment.

3 Time wastage.

4 Expensive

5 Customer dissatisfaction.  
As a result of the outlined issues with manual control system, the development of a system capable of controlling Process instrument via a computer system is intended. The system's goal is to solve the associated problems.

**1.3 AIM AND OBJECTIVES**

The aim of this project is to design and construct a wireless based process instrument control system

The objectives of this project are to;

i To develop and implement a highly efficient, adaptable, and user-friendly control system that seamlessly integrates personal computer and microcontroller technologies

ii To design a wireless and distributed interface control for instruments on site such that one can use Mobile phone or PC to operate them within 10meters range by default and also extends distance of operation using repeaters

iii To design a system that provide seamless and reliable remote monitoring, control, and data acquisition for a wide range of industrial operations.

**1.4 REVIEW OF RELATED WORKS**

A proper literature review was carried out to give relevant information about related works that have been done by previous researcher and the approached used by such researcher on this proposed topic. So many literatures were reviewed but for the purpose of this proposal only few will be listed below:

Rifqi Firmansyah1, Muhamad Yusuf, and Pressa P. Surya Saputra, 2020, They designed a wireless control system for a heater process, the heater was used to maintain the temperature of the liquid so that the products produced are appropriate with standard specification. However, this study is limited in the number of instruments it can control and real-time monitoring.

**Swati Sharma & Sarabijit Singh (2018)**

In this project the implementation of smart dustbin management system using IoT as a hardware and ionic framework as our software insures the cleaning of dustbins soon when the garbage level reaches its maximum. If the dustbin is not cleaned in specific time, then the record is sent to the higher authority in our case the admin who can take appropriate action against the concerned employee.This system also shows the use of PIR sensor, IR sensor and APR module. When some motion is detected by

the PIR sensor it opens the gate of West dustbin using the servo motor and when the PIR detects the motion APR module gives the information fed into it of minimum 30 sec. For our lucrative part that is shoe polish we have used IR sensor and to rotate the brush we have used the DC motor. The smart garbage management system makes the garbage collection more efficient the use of solar panels in such systems may reduce the energy consumption. These dust bin model can be applied to any of the smart

cities around the world. A waste collecting and monitoring team which is deployed for collection of garbage from the city can be guided in a well manner for collection.

**Chidi Ebere & Stanley Ogbor(2018)**

This paper provides a low cost-effective and flexible home control and monitoring system with the aid of an integrated micro-web server with internet protocol

(IP) connectivity for access and to control of equipment and devices remotely using Android-based smartphone app. The proposed system does not require a dedicated

server PC with respect to similar systems and offers a new communication protocol for monitoring and controlling the home environment with more than just

switching functionality. The use of Web Services is an open and interoperable method for providing remote access service or applications can communicate with each

other Smart home interfaces and device definitions to ensure interoperability between Wi-Fi devices from various manufacturers of electrical equipment, meters

and smart energy enables products to allow manufactured. In this project gives the intelligent operation for lamps and fans. Here the system is connected with temperature control and lamp control. Light dependent resistor (LDR) and Temperature sensor (LM35) are the main components for this automatic

control of lamps and fans. Here the LDR is responsible for lamp control and LM35 is responsible for controlling the operation of fan. The proposed home energy control

systems design intelligent services for users and provides, The proposed system are implemented with smartphone.

1. **C. M. HENRIQUE,L. C. M. HENRIQUE,and H. M. HENRIQUE(2020)**

This work deals with implementation of an experimental flowrate control unit using free and low-cost hardware and software. The open-source software Processing was used to develop the source codes and user graphical interface and the open-source electronic prototyping

 platform Arduino was used to acquire data from an experimental unit. Work presents descriptions of the experimental setup, the real-time PID controllers used and theoretical/conceptual issues of Arduino. PID controllers based on internal model control,minimization of the integral of time-weighted absolute error, Ziegler-Nichols, and others were tuned for setpoint and load changes and real-time runs were carried out in order to make real-time use of control theory learned in academy. Results showed the developed platform proved to be suitable for use in experimental setups allowing users compare their ideas and expectations with the experimental evidence in a real and low-cost fashion. In addition, the instrumentation is simple to configure with acceptable level noise and particularly useful for

control/automation learning with educational purposes

**1.5 PROPOSED METHODOLOGY**

The following are the methodology that would be adopted for the proposed study;

1. Detailed Literature review of wireless control system by viewing all possible ways of optimizing efficient wireless control system
2. The required Circuit for the remote-control circuit shall be designed, modeled and simulated using PROTEUS software tool by interconnecting each component.
3. The coding of the microcontroller shall be done using the Arduino IDE software using C language and the sketch gotten shall be uploaded into the Arduino.
4. User Interface Development: Designing user-friendly interfaces on the personal computer to enable intuitive configuration, control, and monitoring of industrial processes. Ensuring accessibility to operators with varying technical backgrounds.
5. Real-time Monitoring and Control: Implementing mechanisms for real-time data acquisition, process monitoring, and remote control through the personal computer interface. Enabling operators to visualize and regulate critical process variables in real time.
6. The result of the various simulations shall be presented, analysis of the results shall be carried out and it shall be validated with the hardware implementation.

**1.6 SCOPE OF THE PROJECT**

The scope of the "Process Instrument Control System for Industrial Operations" encompasses the design, development, implementation, and integration of a comprehensive control system that merges the power of personal computers and microcontrollers. This system will focus on enhancing the control and monitoring capabilities of industrial processes across diverse sectors, including manufacturing, energy production, chemical processing, and more

The scope includes:

1. Hardware and Software Integration:Designing and integrating hardware components, including microcontrollers, sensors, actuators, and communication modules, to establish a cohesive control framework. Developing software interfaces that facilitate seamless communication and data exchange between the personal computer and microcontroller components.

2. Security and Reliability: Implementing robust security protocols to safeguard sensitive industrial data and prevent unauthorized access. Ensuring the reliability of the system through redundancy, fault tolerance, and error handling mechanisms.

3. Scalability and Adaptability: Designing the system with the flexibility to accommodate various industrial processes, irrespective of their complexity and scale. Allowing for future expansions and modifications to meet evolving operational requirements.

3. Compliance: Ensuring that the system adheres to relevant industry standards and regulations governing process control and data management.

The scope of this project aims to create a versatile and adaptive control solution that brings together the capabilities of personal computers and microcontrollers to transform industrial operations, leading to improved efficiency, reduced downtime, enhanced product quality, and informed decision-making.

**1.7 EXPECTED OUTCOME**

At the end of this research it is expected that;

1. A wireless process instrument control system with seamless and reliable remote monitoring, control, and data acquisition for a wide range have been designed.
2. A highly efficient, adaptable, and user-friendly control system that seamlessly integrates personal computer and microcontroller technologies would have been implemented on a hardware prototype.

# **References**

# [Philip F O Kpae](https://uniport.academia.edu/PhilipKpae) (2016). Design and Implementation of a Smart Home (Smoke, Fire, Gas and Motion Detector

Indira Knight ,Apress , connecting Arduino to the web Vol. 01

Gubbi, J., Buyya, R., Marusic, S., Palaniswami, M (2013). Internet of Things (IoT): A vision, architectural elements, and future directions. *Future Generat.Comput. Syst. 29(7*), 1645– 1660

Happ, D., Karowski, N., Menzel, T., Handziski, V., Wolisz, A. (2017). Meeting IoT platform requirements with open pub/sub solutions. *In: Annals of Telecommunications. Springer*

Lambrou, T. Anastasiou, C. Panayiotou, C. and Polycarpou, M. *(2014).* A low-cost sensor network for real- time monitoring and contamination detection in drinking water distribution systems", *IEEE Sen- sors Journal, 14 (8), 2765-2772.*

Park, K., Kim, S. (2015): Design of mainframe for IoT framework. In: *International Conference on u- and e-Service, Science and Technology.*