WIRELESS TEMPERATURE CONTROL

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Project Advisor

Mr. Saeed-ur-Rahman Turk

Submitted By

Waqas Tahir	050620 - 007
Zeeshan Aziz	050620 - 039
Uzair Ali	050620 - 110

Department of Electrical Engineering

UNIVERSITY OF MANAGEMENT AND TECHNOLOGY
(UMT)

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By

Waqas Tahir
Zeeshan Aziz
Uzair Ali

University of Management and Technology

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Project Advisor **Project Co-ordinator**

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(Signed)

Waqas Tahir	050620 - 007
Zeeshan Aziz	050620 - 039
Uzair Ali	050620 - 110

Abstract

The goal our project is to design a temperature controller which will control the temperature of any field area . The Temperature can be seen anywhere through wireless Indicator within its range .

Table of contents

Chapter 1

Introduction

1.1 Introduction

This is the type of the Programmable Temperature Controller , that detects the temperature of the field area and controls the temperature according to the set point. Wireless module is used for monitoring the temperature in the remote area. This will indicate the current process value (Current temperature) and set point .

Output of the controller will be types : 4 ~20 mA and relay

1.2 Aim of the project

Aim of the project is to design the Microcontroller Based Temperature Controler that will be used in any feedback control system to maintain the temperature of the system at specific set point . A Extra feature of this Controller is to transmit Process current temperature and Setpoint to remort area ,so that it could be wirlessly indicated it in the control rooms .

1.3 Concept

In the Industry every Boiling ore burring process has a specific temperature that should be maintined during its process . The temperature Controller we are design has capibilty of sensing more than 600 C temperature .Two types of outputs are available switching and current output . 8051 Microcontroller is used as processing unit ,Rtd Pt100 as resistance temperature detector . FSk modulation circuit is designed to modulate the sertial data and sen it by FM to the receiving module .

1.4 Project Application

Controlling the temperature of Continues Pan system in Industry and Boilers

Chapter 2

Process of Control System

2.1 Introduction to Control System

In a modern **control system**, electronic intelligence controls some physical process.Control systems are the "automatic" in such things as automatic pilot and automatic washer. Because the machine itself is making the routine decisions, the human operatoris freed to do other things. In many cases, machine intelligence is better than direct human control because it can react faster or slower (keep track of long-term slow changes), respond more precisely, and maintain an accurate log of the system's performance.

Control systems can be classified in several ways. A **regulator system** automatically maintains a parameter at (or near) a specified value. An example of this is a homeheating
system maintaining a set temperature despite changing outside conditions. A **follow-up system** causes an output to follow a set path that has been specified in advance. An example is an industrial robot moving parts from place to place. An **event control system** controls a sequential series of events. An example is a washing machine cycling through a series of programmed steps.

Natural control systems have existed since the beginning of life. Consider how the human body regulates temperature. If the body needs to heat itself, food calories are converted to produce heat; on the other hand, evaporation causes cooling. Because evaporation is less effective (especially in humid climates), it is not surprising that our body temperature (98.6°F) was set near the high end of Earth's temperature spectrum (to reduce demand on the cooling system). If temperature sensors in the body notice a drop in temperature, they signal the body to burn more fuel. If the sensors indicate too high a temperature, they signal the body to sweat.

Man-made control systems have existed in some form since the time of the ancient Greeks. One interesting device described in the literature is a pool of water that could never be emptied. The pool had a concealed float-ball and valve arrangement similar to a toilet tank mechanism. When the water level lowered, the float dropped and opened a valve that admitted more water.

Electrical control systems are a product of the twentieth century. Electromechanical relays were developed and used for remote control of motors and devices. Relays and switches were also used as simple logic gates to implement some intelligence. Using vacuum-tube technology, significant development in control systems was made during World War II. Dynamic position control systems (servomechanisms) were developed for aircraft applications, gun turrets, and torpedoes. Today, position control systems are used in machine tools, industrial processes, robots, cars, and office machines, to name a few.

Meanwhile, other developments in electronics were having an impact on control system design. Solid-state devices started to replace the power relays in motor control circuits. Transistors and integrated circuit operational amplifiers (IC op-amps) became available for analog controllers. Digital integrated circuits replaced bulky relay logic.

Finally, and perhaps most significantly, the microprocessor allowed for the creation of digital controllers that are inexpensive, reliable, able to control complex processes, and adaptable (if the job changes, the controller can be reprogrammed).

The subject of control systems is really many subjects: electronics (both analog and digital), power-control devices, sensors, motors, mechanics, and control system theory, which ties together all these concepts.

Every control system has (at least) a **controller** and an **actuator** (also called a final control element). Shown in the block diagram in Figure 1.1, the controller is the intelligence of the system and is usually electronic. The input to the controller is called the **set point,** which is a signal representing the desired system output. The actuator is an electromechanical device that takes the signal from the controller and converts it into some kind of physical action. Examples of typical actuators would be an electric motor, an electrically controlled valve, or a heating element. The last block in Figure 1.1 is labeled **process** and has an output labeled **controlled variable.** The process block represents the physical process being affected by the actuator, and the controlled variable is the measurable result of that process. For example, if the actuator is an electric heating element in a furnace, then the process is "heating the furnace," and the controlled variable is the temperature in the furnace. If the actuator is an electric motor that rotates an antenna, then the process is "rotating of the antenna," and the controlled variable is the angular position of the antenna.

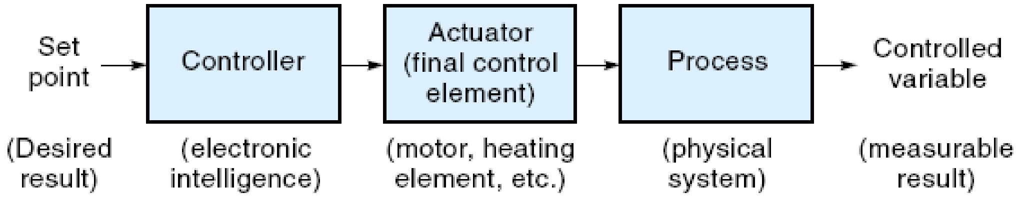


Fig. 1.1 Block diagram of a control system

2.2 Types of Control Systems

Control systems can be broadly divided into two categories: open- and closed-loop systems. These are discussed below

2.2.1 Open-Loop Control Systems

In an open-loop control system, the controller independently calculates exact voltage or current needed by the actuator to do the job and sends it. With this approach, however, the controller never actually knows if the actuator did what it was supposed to because there is no feedback. This system absolutely depends on the controller knowing the operating characteristics of the actuator.

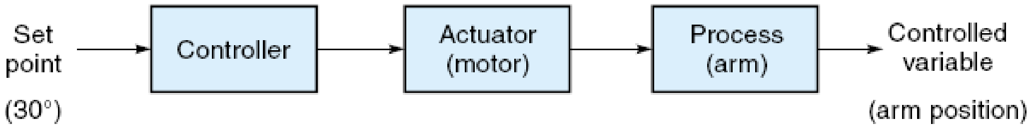


Fig. 1.2 Open-loop control system

Open-loop control systems are appropriate in applications where the actions of the actuator on the process are very repeatable and reliable. Relays and stepper motors are devices with reliable characteristics and are usually open-loop operations. Actuators such as motors or flow valves are sometimes used in open-loop operations, but they must be calibrated and adjusted at regular intervals to ensure proper system operation.

2.2.2 Close Loop Control System

In a closed-loop control system, the output of the process (controlled variable) is constantly monitored by a sensor, as shown in Figure 1.3(a). The sensor samples the system output and converts this measurement into an electric signal that it passes back to the controller. Because the controller knows what the system is actually doing, it can make any adjustments necessary to keep the output where it belongs. The signal from the controller to the actuator is the forward path, and the signal from the sensor to the controller is the feedback (which “closes” the loop).

In our project we are following closed loop system .In this loop. temperature sensor will give feedback the current temperature as Process value.

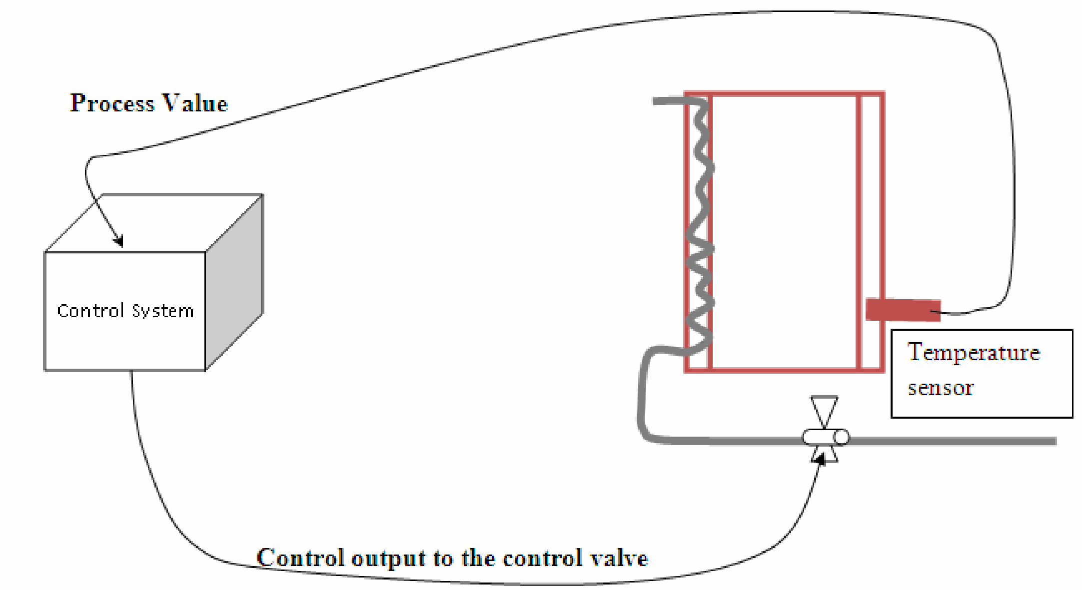


Fig. 1.3 Conceptual diagram of a temperature control system

Fig. 1.3 shows the concept of a temperature control system. Steam pipes influence the temperature of the pan. The flow of steam is dependent on the operating control valve. The temperature sensor is placed inside the pan to sense the pan's temperature and sends the process value to the control system. The control system, then controls the control valve according to a desired set point temperature. If the process value is less than the set point, the control system causes the control valve to open more which causes more steam to flow in the pipes and hence, the temperature of the pan rises. As the temperature rises and gets close to the set point value, the control system accordingly causes the control valve to close gradually until the set point and process value are equal.

2.3 Feedback Control System

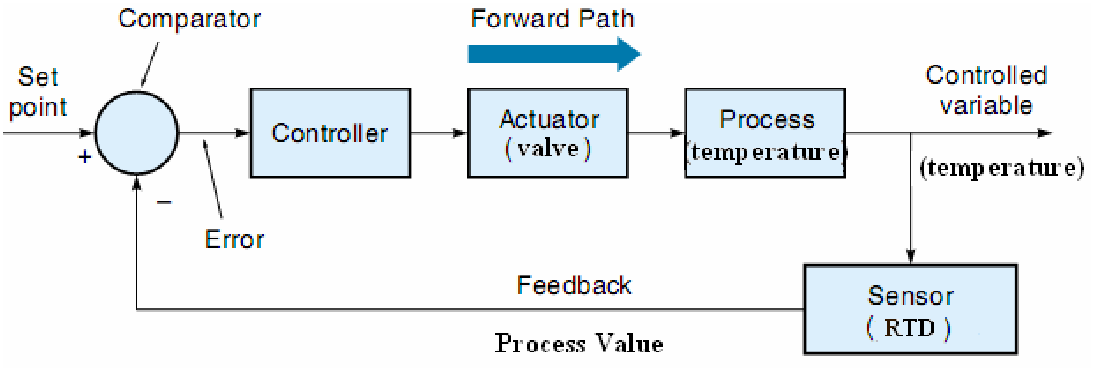


Fig. 1.4 Block Diagram of Feedback Control System

Fig.1.4 shows the block diagram of the feedback control system of our control system. The temperature sensor, RTD, constantly monitors the the controlled variable i.e. the temperature.

The signal from the controller to the actuator is the forward path, and the signal from the sensor to the controller is the feedback (which "closes" the loop). The feedback signal is subtracted from the set point at the comparator (just ahead of the controller). By subtracting the process value (as reported by the sensor) from the desired position (as defined by the set point), we get the system error. The error signal represents the difference between "where you are" and "where you want to be." The controller is always working to minimize this error signal. A zero error means that the output is exactly what the set point says it should be.

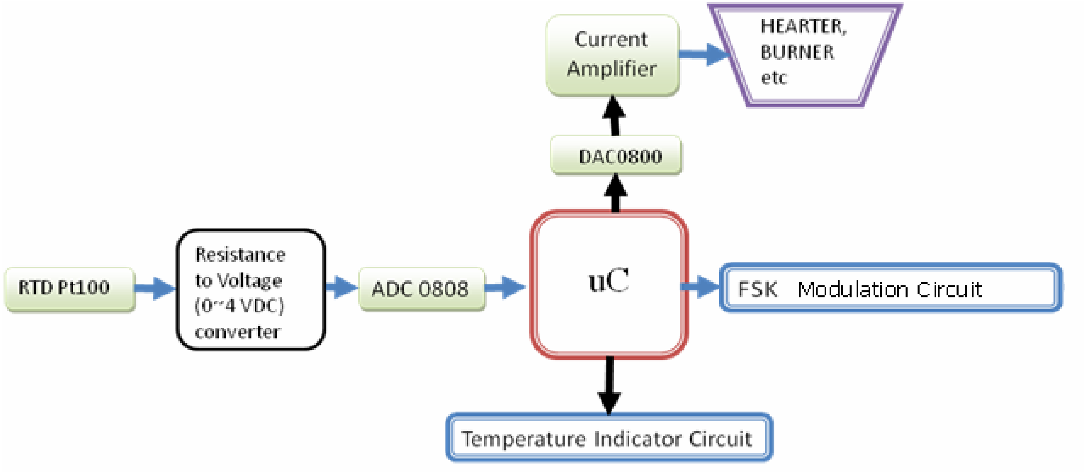
Chapter 3

Design

We have divided our design into two parts.

Controller
Wireless Indicator

Controller



Wireless Indicator

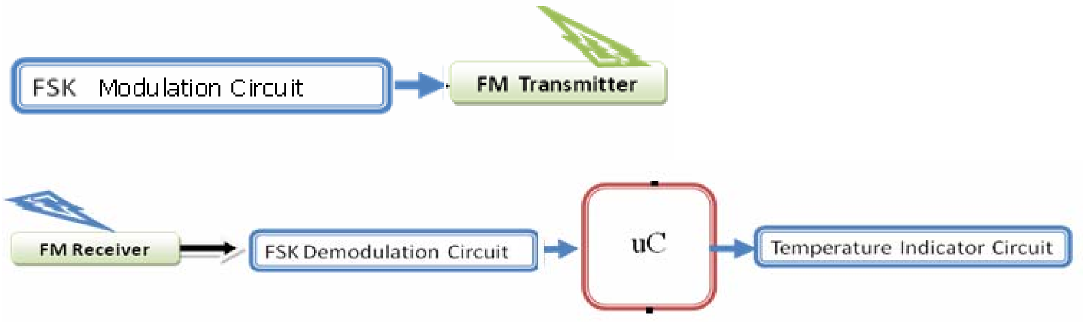


Fig. 3.1 Block diagram of the project design

Fig. 3.1 shows the block diagram of our design. The controller part of the project consists of temperature sensor RTD Pt100 which takes input from the enviornment and sends it to resistance to voltage converter which acts as a transducer. The ADC converts the analog voltage to digital form for the microcontroller to work on. The microcontroller, after processing the input from ADC, sends the output to DAC, temperature indicating circuit and FSK modulation circuit. The DAC converts the digital output from the microcontroller to analog form and sends it to a current amplifier which then can be used to manipulate the control valve of a heater, burner, etc.. according to the set point.

In the wireless part of the project, the output from the FSK modulator is transmitted in analog form with the help of a low power FM transmitter. The FM receiver which we have used as radio receiver receives the electromagnetic waves from the air media and sends the output to an FSK demodulation circuit. The FSK demodulator, after demodulating the analog data gives the digital output to microcontroller for displaying it on the temperature indicatior circuit.

Chapter 4

Temperature Controller Design