# Remote Control Of Proportıonal Valve In Energy Effıcıency Wıth Gsm

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**ABSTRACT**
*In this study, the remote control of the proportional valve control system was carried out with a smart phone in order to provide equal heat to the subscribers in heating with geothermal energy. PT100 was used in the measurement of heat exchanger temperature values. In addition, smart phone programs with android operating system were prepared in order to remotely control the system over the internet or closed wi-fi network, and the proportional valve was remotely controlled in accordance with the purpose.*
*As a result of this study, the heat exchanger return temperature was adjusted to the desired temperature with GSM, allowing the subscribers to warm up evenly.*
**KEYWORDS**: *Geothermal energy, remote access, energy efficiency, smartphone control.*

## I. INTRODUCTI0N

Geothermal energy, which is one of the most important renewable energy sources, is a resource that can be used in numerous fields such as electricity generation, medicine, tourism, agriculture and industry today. [one]. The word geothermal is composed of the Greek words geo (earth) and thermal (heat)[2]. Geothermal energy is basically a kind of thermal energy found in the lower layers of the earth and considered as an important renewable energy source. This energy source has been used for centuries for heating water and earth, for medical treatments or for cooking[3]. A geothermal resource can be defined as hot water and steam, which is formed by the heat accumulated in various depths of the earth's crust, whose temperatures are constantly above the regional atmospheric average temperature, and which may contain more dissolved minerals, various salts and gases than the normal underground and surface waters around it. Geothermal energy, on the other hand, includes all kinds of indirect or direct benefits[4]. As the meaning of geothermal word; geo means "earth" and thermal means "heat", so geothermal means "ground-heat". Geothermal energy ; It is an environmentally friendly, cheap, renewable and national energy[5].

Geothermal energy production cost is low compared to other energy sources. This cost is even lower when it comes to integrated uses. Geothermal energy is an inexhaustible and renewable alternative energy source[6]. Today, the energy need arising from the increasing population and industrialization cannot be met with the limited resources of our country, and the difference between energy production and consumption is growing rapidly. In this case, it becomes increasingly important to utilize our existing energy resources more effectively. In order to meet the rapid increase in energy demand, it will be beneficial to use renewable energy sources. [7].

In geothermal heating centers where heat balancing cannot be done, continuous hot water must bepumped in order to provide the heat required by the subscribers[8].

## II. GEOTHERMAL ENERGY USAGE AREAS

95% of the known geothermal areas in Turkey are suitable for heating and spa use, and the other is suitable for electricity generation[9]. Geothermal energy is also used in growing tropical plants and fish, heating animal farms, street and airport runways, swimming pools, thermal treatment centers and other touristic facilities[5].
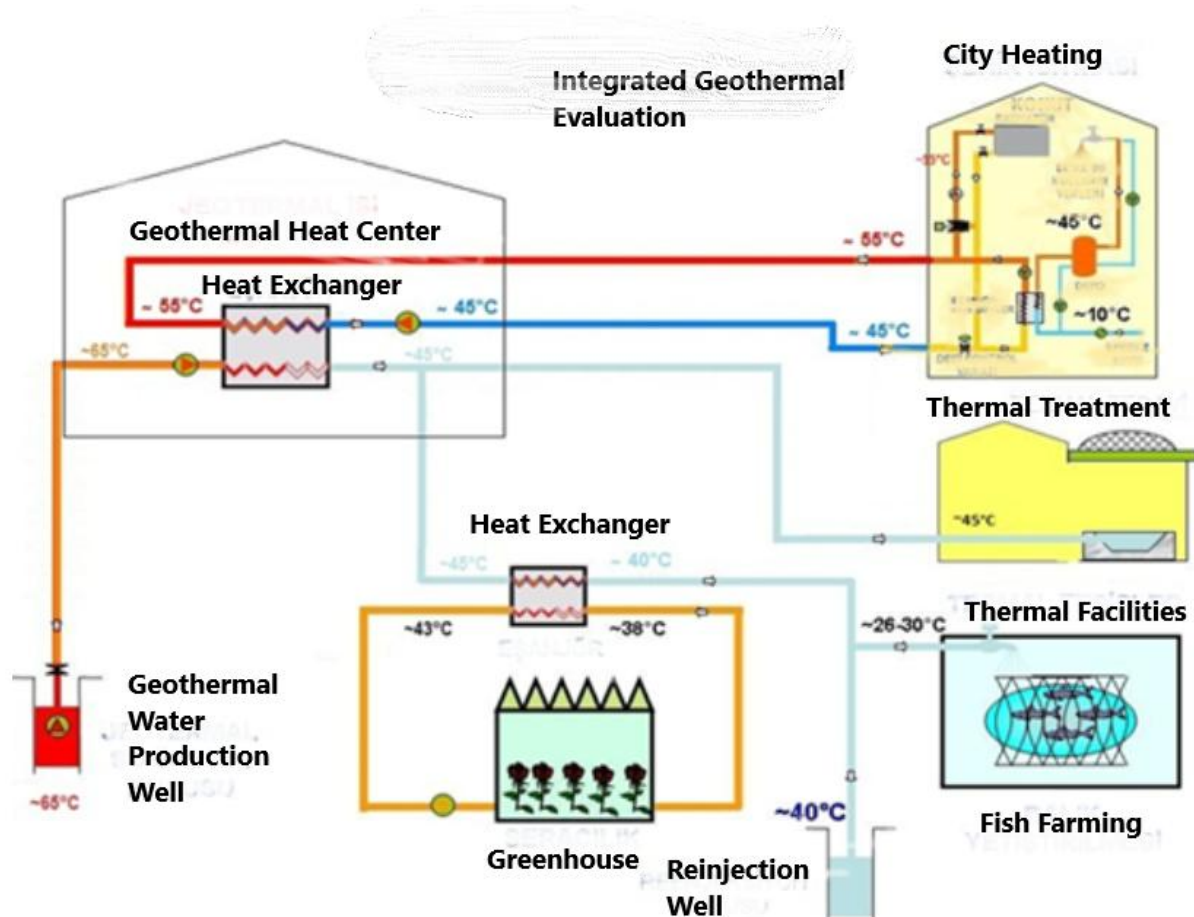
Figure 1. Connection of Houses and Other Units in District Heating[10]

The unjust heating caused by manual controls in district heating, which includes many residences, is the biggest problem of this system. The building entrance temperature values of the subscribers close to the heat exchanger centers are high, and the building entrance temperature values of the subscribers far from the heat exchanger center are low. This causes an uneven heating. When the heat pricing mentioned in the previous issues is based on m², those who can't get warm have to pay the same amount.

### III. PROGRAMMABLE LOGİC CONTROLLERS (PLC)
Programmable Logic Controller The initials of the words "Programmable Logic Controller" are called PLC for short. PLCs are computer-based devices. PLC system provides great convenience in solving very complex and difficult automatic control circuits and problems.

### IV. SYSTEM CONTROL WİTH ANDROİD OPERATİNG SYSTEM
All operating systems are available to communicate with external hardware. Cell phones are run by an operating system. Smartphones with Android or other operating systems can exchange information with external hardware. It can be used as a panel by performing many purposes such as operation, control, monitoring, changing value.

Figure 2. GSM view

## V. KTP 400 OPERATOR PANEL SCREENS İN PROPORTİONAL VALVE SYSTEM

In this panel, system operation, temperature value assignments, timing settings, error messages etc. Operations and observations related to controlling the entire system can be made.
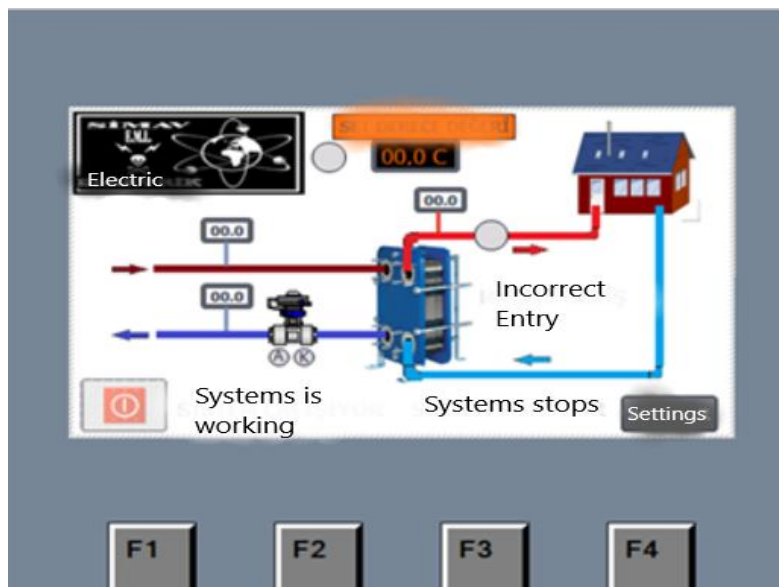

Figure 3. Operator Panel Main Screen[9]

It is the main screen where we can observe that the system is running, the temperature values coming to and returning to the heat exchanger, the temperature value leaving the house, the set temperature value, and the circulation pump is active. The system cannot be started or stopped from the main screen. Only the position of the system can be observed. Intervention of the system is done by pressing the "setting" button in the lower right part of the main screen in order to make the necessary settings.

## VI. EXAMİNATİON OF PHONE SCREEN MENUS İN PROPORTİONAL VALVE CONTROL

In addition, it will be a waste of time to go to the device every time when instant intervention is required in the system. The easiest method to access the under-building control system is smartphones with android operating system. Access to the system is provided from anywhere via the Internet or by phone via closed network Wi-Fi. All operations such as set assignment values, start-stop, all settings of time modes, monitoring of temperature values made from the operator panel can be done easily from these devices.

Figure 4. Proportional Control Main Screen on Phone

When the "HMI LOGO" icon on the phone is clicked, the main menu appears on the phone screen in this way. If the phone is not connected to the system, the Date and Time field will be blank. Proportional valve control is started with the "Time 1", "CAMERA" and "RUN" buttons at the bottom of the screen.When the "RUN" button is clicked, the following screen appears on the phone.
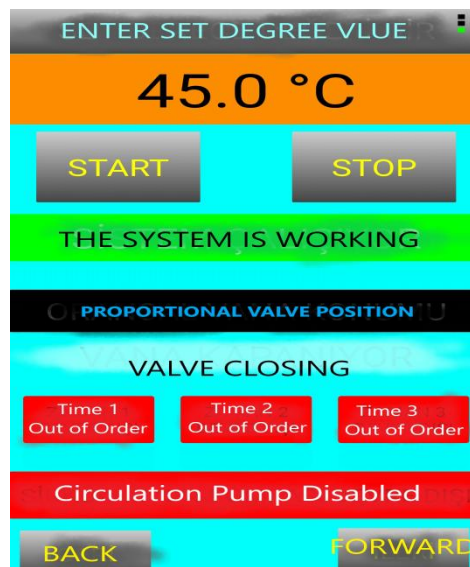


Figure 5. Screen where Set Value is Entered, Started and Stopped and Positions are Monitored

The upper part of the screen is where the setpoint value of the heat exchanger return temperature is entered. It is set at 45°C. START and STOP buttons are necessary for starting and stopping the system. Below the buttons is a text message indicating that the system is running or stopped. The message changes to red when stationary and green when running. The message below is the message showing the status of the valve. The messages below this are text messages indicating whether the time modes are enabled or disabled. The message on the screen changes as the activated time mode is "ENABLED" and the text changes to green.

The bottom message shows the status of the circulation pump. When the temperature value of the water coming into the building rises to a certain degree, the circulation pump will be activated. A message indicating that it has been activated will appear on the screen and will turn green.With the "NEXT" and "BACK" buttons, the desired menu is accessed.
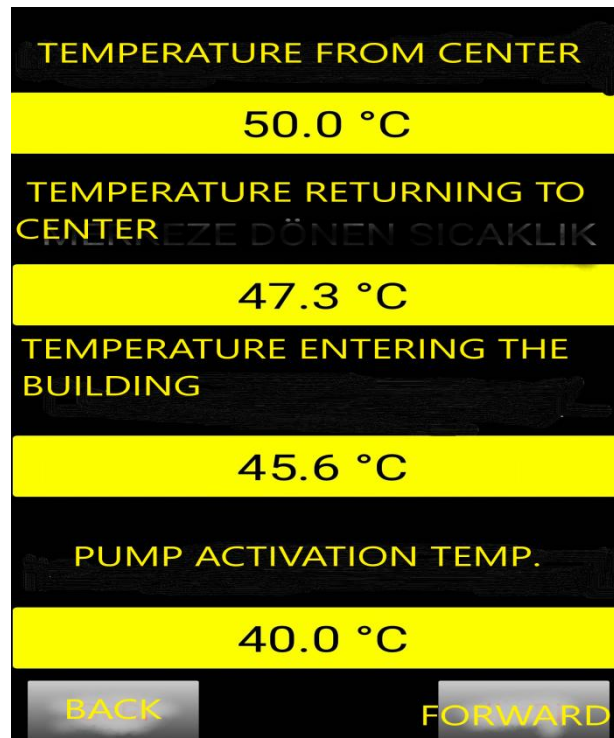
Figure 6. Screen Monitoring Temperature Values

In this menu, incoming, returning and entering temperature values are observed. The activation temperature of the circulation pump can also be seen. The switch-on temperature of the pump can be changed programmatically to another desired degree. The menu is switched with the "forward" and "back" keys. Since the phone will be used by an operator in this system, there is no need for additional encryption. There is no such thing as going to or near the control panel, heat exchanger system. The operator connected to the network system can easily control the valve settings from anywhere. A malicious intervention to the valve (cutting, tripping, etc.)

## VII.     CONCLUSION

Control of the heat exchanger return temperature was made with smart relays, keeping the system under control and operating the smart relays were provided by different operator panels and GSM with android operating system. In addition, when instant intervention is required in the system, the waste of time is eliminated by going to the device every time, and necessary interventions are made with smart phones with android operating system. All operations such as set assignment values, start-stop, all settings of time modes, monitoring of temperature values made from the operator panel are done via GSM. As a result of this study, the heat exchanger return temperature was adjusted to the desired temperature with GSM, allowing the subscribers to warm up evenly.

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