

# DEVELOPMENT OF TRAINING STAND «SOFTWARE AND HARDWARE COMPLEX OF MANAGEMENT OF THERMAL OBJECT»

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**Abstract.** The paper presents the concept of an educational stand. The object of control is a thermal model of the object. A controlled variable is the temperature.

**Keywords:** programmable relay, PID controller, temperature sensor, temperature stabilization, hardware and software system

## Introduction

At the present stage of technological development manufacturing automation has gained great importance. Temperature control and maintain it at a given level is an important task in many fields of human activity - in agriculture, oil and gas industry, in the food industry. Automatic maintenance of temperature at the set level is necessary for many technological processes including in dangerous productions, for example, maintenance of temperature in tanks of oil storages therefore it is important to the experts working with automation systems to be able to create and customize system of stabilization of temperature.

## Formulation of a problem

The training stand was named «Software and hardware complex of management of thermal object». The main target of stand's creation is the training of future experts of automation systems.

## The general concept

The laboratory stand is intended for heating of water in capacities and maintenance of her temperature at the set level. At temperature increase of liquid there is a problem of it's uniform heating. Heating of liquid happens not on all volume, and locally as upper layers of water heat up quicker, then lower, and therefore, it becomes difficult to ensure desired accuracy. It is necessary to carry out mixing of the water when it is heating to solve this problem. Two pumps and the second (initially empty) capacity are for this purpose used. When pumping liquid from one capacity to another and back, there being stirred.

Measurement of temperature is carried out by two temperature sensors— thermo resistance and the thermocouple. Thanks to function of reservation of sensors in the TPM251 OWEN PID-regulator (Fig. 1), in case of refusal the main sensor there is an automatic inclusion of reserve. At liquid temperature increase above 80 °C occur emergency power off of the stand and the alarm system about an exit of adjustable size out of admissible limits. Management of a heating element happens also through TPM251 at connection him via the relay to the corresponding exit of the regulator.



Figure 1. Program PID controller OWEN TRM251

Control of pumps is exercised by means of the OWEN ARIES programmable relay (Fig. 2.). Thanks to the fact that the device doesn't contain in advance written program in the memory there is a possibility of creation of own program of control of the connected devices. Pumps and depending on the set algorithm are connected to exits of the programmable relay; there is their inclusion and switching off.



Figure 2. Programmable Relay PR114 OWEN

### Conclusion

The concept of the educational stand is developed for improvement of skills of creation, adjustment and customization of automated control systems automated temperature's control systems.

### References

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