

INTELLECTUAL "TRAP" OPERATING CONTROLLER

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It's known that one of the basic parameters characterizing oil-extracting enterprises is a productivity of oil wells. For this purpose, "Trap" group type measure devices ("Trap" GMD) are used at oil fields of Azerbaijan. It should be mentioned that these devices had been worked on and made by "Neftkimya" ETLI ("Neftqazavtomat" EIB) in 60th years of the past century and put into use as AQM-3 – centralized control system to productivity of oil wells [1]. But at the present an automatic and measure means of these devices have finished their functions, do not follow the requirements of the modern information technologies and systems, and can not be included into the information network. By other side, replacement of these devices totally with the new ones is not profitable from the economical point of view and confronts with financial difficulties. Therefore it is necessary to modernize automatic means of these devices with keeping on them technological equipments.

From this point of view modernization of AQM-3 centralized control system is an urgent issue. If we take into account that the modernization can also cover signal transmitters and operating organs of measure devices, then controlling and operating controller of the "Trap" measure device should be intellectual, programmable and in accordance with other devices. Taking into account all these requirements, an intellectual trap operating controller has been created in Special Constructor Bureau of ANAS Cybernetics Institute [2].

The Intellectual Trap Operating Controller (ITOC) has been created in order to define productivity of oil wells while using Trap type measure devices (TMD) that assembled at oil-fields. Controller runs CD-54 motor of U6-M typed level transmitter, used on TMD device on straight/opposite direction, receives signals of position, makes decisions by analyzing appeared accident cases, connects 16 wells to measure cisterns by shift and defines their productivity, creates information exchange using modern connection means with a computer which is placed at up system station.

The basis of ITOC is a universal AIDIO-888 measure, control and operating controller, which is used in local operating of different technological processes and created in Special Constructor Bureau of ANSA Cybernetics Institute.

AIDIO-888 controller is a module which is programmable, having optoisolation inputs and outputs, and RS485 connection interface.

Base of the controller consists of ATMEGA32-16 microcontroller which has rich instruction system (RISC) and nucleus AVR that runs with high speed (16 millions operation in a second). The base of AVR nucleus of this microcontroller which has 32Kbyte "programming" (FLASH), 2Kbyte "operating" (SRAM) and 1Kbyte "storing" (EEPROM) memories, consists of 32 special functional registers (SFR). And each of them directly connects to arithmetic logic unit (ALU) and gives a chance the operation to be fulfilled during tact. In the result, AVR nucleus microcontroller which has rich instruction system (RISC) runs 10 times more speed than conventional instruction system (CISC) [3].

It's possible to create different functional intellectual devices with accordance to input and output signals, and with downloading to the memory of AIDIO-888 controller a program of running algorithm of any technological process. This is a specification of AIDIO-888 controller.

A simple structure scheme of the controller is given in the Fig. 1.

A duty of AIDIO-888 controller is to run ITOC controller on measuring algorithm with synch-phased Trap method given in the Fig. 2.

A duty of TUM power module is to coordinate signals of AIDIO-888 controller with the signals of TMD.

LED-8 indication unit consists of 8 lightning diodes; its duty is to indicate the position signals entering to "inputs" of AIDIO-888 controller.

LED-5 indication unit consists of 5 lightning diodes; its duty is to indicate power operating signals given from "outputs" of AIDIO-888.

KB-5 key-board unit consists of 1 button and 4 keys. Its duty is to switch ITOC controller into "Manual" or "Program" operation regimes and to imitate commands with assistance of button and keys, which are given in order to run TMD when the device is in "Manual" regime.

QM-2 unit consists of two power supplies with 12 VDC and 5 VDC voltages. Its duty is to feed contact less position transmitters on TMD device and ITOC controller.

A duty of RM-1240MC radio modem module is to create an exchange of information through air between AIDIO-888 controller and a computer in up system station. RM-1240MC radio modem has been created on radio frequency (RF) transmitter element RC1240 which runs on 433 MHz frequency

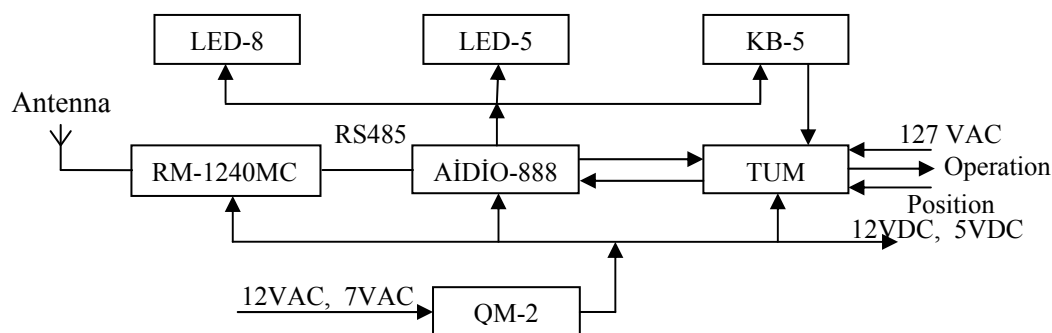


Figure 1. ITOC controller structure scheme.

AIDIO-888 – Measure control and operating controller; TUM – Trap accordance module; LED-8 – Indication unit of position signals; LED-5 – Indication unit of operating signals; KB-5 – Manual operating unit; QM-2 – Power supply of contact less position transmitters; RM-1240MC – Radio modem module.

AIDIO-888 controller and trap accordance module (TUM) have been used in creating ITOC controller. The controller has a connection interface with RS-485 line for exchange of information. In cases of no line connection, the controller lets to create air connection through RM-1240MC radio modem. QM-2 power module is used to feed the controller, LED-8 and LED-5 indication units are used to indicate processes going on controller, and KB-5 key-board unit is used to run the controller manually.

Non-contact commutation element has been used in creating ITOC controller, which runs fulfilling organs of TMD device. The device is feed with 12VAC (0,5A) and 7VAC (0,5A) alternate current voltages. The device commutates its 127VAC (0,5A) voltage to appropriate output in order to run power fulfilling organs.

The device has two basic running regimes: Manual operating regime and Program operating regime. You can choose the running regimes of the device with switching the key "Regime" on one of "Manual" or "Program" positions. Position of the "Regime" key is indicated in LED-8 indication unit. When the device is switched on the manual regime, AIDIO-888 stores this position and stops operation with program regime. Then with help of a button "Shift" in KB-5 unit and keys "EPV", "Measure" and "Reverse" we can give manually "Shift", "EPV", "Measure" and "Reverse" commands that runs trap measure device, and can follow how these commands are fulfilled on TMD device. While entering any command, 127VAC voltage is commutated to appropriate output through optic isolated triac in according to the same command on TUM module, and given to TMD and the command is fulfilled.

When absence of the "Measure" and Reverse" commands, CD-54 motor remains inactive. In this case, the motor should be given a constant break voltage in order the shaft of the motor not to move from overloading. During absence of the commands "Measure" and "Reserve", 127VAC voltage is given to the input of voltage rectifier through opto isolation "Break" triac on TUM module. And direct current voltage is passed from the rectifier to "Reverse" terminal and fulfills a function of break in the winding of CD-54 motor. During the commands "Measure" and "Reverse", the "Break" optic isolated triac on TUM module is being blocked and the break voltage is taken out of the motor. The motor moves in straight or opposite direction according to the given command.

In the Program operating regime, AIDIO-888 controller stores this position, undertakes running of TMD device and operates it with the program made on measure algorithm given in the picture 2.

The Software has been created at Windows NT/2000/XP circumstance using AVR-Studio 4 programming mean made for 8-bit AVR microcontroller.

References

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