

USING OF MICROPROCESSOR FOR WORK AND DIAGNOSTIC OF HYDROGEN GENERATOR

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Hydrogen as technical product is widely used in science and engineering. Hydrogen of high degree purification, it is possible to receive immediate in electrolyze on the basis of using of solid polymeric electrolyte (SPE) [1].

Intensive development of fuel elements, for which work the pure hydrogen is necessary, stimulates the development of new electrolyzers for using in hydrogen energetic. Electrolyzers with SPE could be an effective and useful for producing hydrogen its use in transport and power stations on the basis of fuel elements.

Nowadays in Ukraine are produced generators of pure hydrogen on basis of SPE for using in special aims and areas, where it is necessary the high quality of produced hydrogen [2].

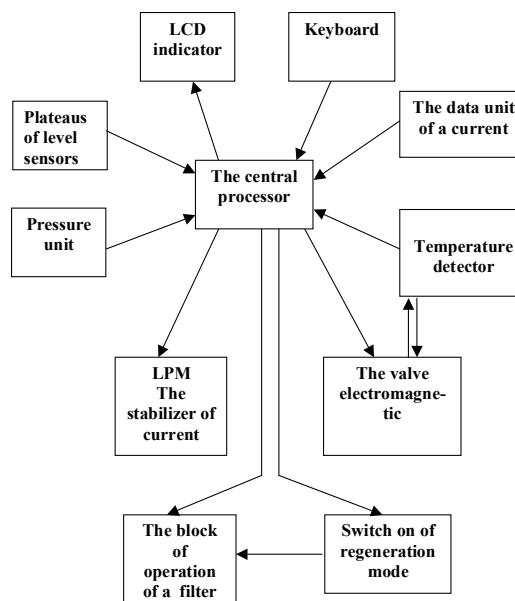
Technical characteristics of basic model of the produced hydrogen generator:

The rate of flux of hydrogen (productivity) cm^3/min	0 ... 100
Pressure, kg/sm^2	0 ... 6,0
Stability of maintenance of the rate of flux H_2 on a output	$\pm 0,2 \%$
Stability of pressure retention H_2 on a output	$\pm 0,2 \%$
Cleanliness of hydrogen of %	99,999
Average power consumption,	VA- 50,0
Dimensions, mm	180x370x355
Weight, kg	8,0

For operation of working modes, the condition of it's spare important parts and diagnostics of it's errors is used a special operating block.

The function and key schema of the block operation of the hydrogen generator designed on a basis and view of application of the microprocessor. It has allowed on it to assign functions of regulation both stabilization of pressure and rate of flux, installation and stabilization of temperature, estimation of a state of all parametric data units and acceptance on them of the solution, computing operations, check of disrepair, indication of the indications and deducing of the service information on the display of the generator

The electronic block of operations is constructed on the basis of a microprocessor kern of company Atmel with high capacity RISK-architecture of the Harvard type[4].



In a fig. 1 is shown the schema of communications of function clusters of the generator with the central processor of the generator.

The operation block consist of :

- Plateau of the central processor;
- LCD the indicator;
- Plateau of the keyboard;
- Plateau of data units of levels;
- Pulsing electrical power unit and switching.

On plateau of the central processor are located:

- Pressure units and rate of flux, and them regulating amplifiers,
- Channel of operation of a pulse-width current regulator,
- Channel of operation of an induction valve,
- Channel of operation of a heater,
- Analogue channel of a temperature detector,
- Optically unloosened channel of exterior guidance(management),
- precision a temperature-cancelled radiant of a reference voltage +5B.

With the purpose of expansion of functionality's of the processor on central plateau is organized the bi-directional bus bar of the data ensuring operation of the indicator, keyboard, interrogation of level sensors and control of power keys located in electrical power unit and switching.

As an information diagram board is applied reference character two-lower case 16- th discharge LCD indicator of the mark MTC-S16207AFGHSAY of the corporation Microtip with the built - in controller HD44780 (Cyrillic wearing) with LED illumination, semitransparent polarization and expanded temperature range. The size of signs 4,07x7,76 mm. The size of the module 100x38,8x10,0mm, display - 80,2x20,4mm.

The card of the keyboard contains five independent buttons interrogated by the processor.

The block of the central processing unit is constructed on the basis of power 8-bit AVR- of the microcontroller of the corporation Atmel Atmega 8 [3,4], which consists of:

- 8- channel 10-bit ADT (6 channels with 10-bit permission and 2 channels with 8- by bit permission),
- Bifurcated system of timers with possibility of handle of the LPM-CHANNEL,
- Programmed sentry timer with a separate RC-oscillator located on a chip,
- Serial interface with the mode inside circuit programming,

Processor on a chip contains except for 8 kilobyte of a base memory of programs and 1 Kilobyte of the operating storage device, 512 bytes non-volatile EEPROM, permitting are padding to save the operating information at switch off supply.

For measuring of H_2 is used a pressure unit of the Honeywell corporation mark 26PCFFA6D, containing chains of internal thermal compensation and calibration. The pressure unit is made of chemically passive materials. As the amplifier, which normalize the output signal of a unit is used the operational amplifier LM358, assembled on the scheme of the measuring amplifier.

As the sensor of a current the reference wire resistor C5-16 by power of 5 W is used. Its normalizing amplifier also is assembled on operational amplifiers LM358 under the scheme of the measuring amplifier.

As a temperature detector the sensor KTY84-130 of the corporation Philips is used. The output signal of a temperature detector enters on the scheme of linearization recommended by the corporation Philips for similar measurements.

The plateaus of data units of levels are contained with four identical independent channels, which

logic yields through the multiplexor - decoder controllable by the central processor. On plateau of the central processor three functionally similar sockets ensuring power supply, are located operation and interrogation of channels of a plateaus of a level sensor. A potential opportunity of detection up to 12 discrete fluid levels in a featured construction

The driving program of the central processor is written on language of AVR-assembler of firm Atmel and is tested with application of simulator Atmel AVR-Studio 3.55.

The objective code of the program contains more than 4000 functional - teams, available in long-term to eight kilobyte of Flash storage of the processor. The program for maintenance of tuning up (at lockout of power supply) using the built - in 512 bite EEPROM, also taking place on a crystal of the central processor. The performance of the program occurs in 1 kilobyte RAM including 32 registers of direct access.

The functioning of the program begins with testing and tuning up of interior structure of the processor.

At the following stage the interrogation of data units, keyboard and analogue channels of input of the processor is carried out. On the basis of the received information the central processor makes a decision on a starting state of system.

In all modes is carried out the evaluation of current gas consumption and definition of aggregate quantity of the produced gas, and also quantity of gas produced after regeneration of the filter On the basis of these data the resource of the filter and moment of its next regeneration is determined.

With the purpose of pinch of reliability and protection against malfunctions of the driving program the sentry timer-ensuring restarting of the program is applied in case of its inadequate operation.

References

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