4. *Kuchikyan L.M. Physical ortics of fire lightguide. M.: Energy, p. 190.*
5. *Zenoviy Mykytyuk, Bolormaa Dalanbayar, Orest Sushynskyy, Julia Semenova. Light scattering in induced cholesterics: the roles of scattering on domains and selective scattering. Proc. of XIV Conference on Liquid Crystal, Chemestry, Physics and Applications, Zakopane, 2001, Poland.*
6. *De Gennes P. G.// C. r. Acad. sci. –1972.-274.-ser. B. –p. 758-760.*
7. *Belyakov V. A., Dmitrienko V. E.., Orlov V. G. – UFN, 1979, v. 127, p. 222.*
8. *Belyakov V. A., Dmitrienko V. E. Light Scattering in Solids. New York, London, Plenum Press, 1979, p. 377.*
9. *Beliakov V. A, Sonyn A. S. Optics of cholesteric liquid crystals. M.: Nauka. 1982. – p. 360.*
10. *Berreman D. W. – Mol. Cryst. – Liq. Cryst. 1973, v. 22, p. 175.*
11. *G.Okosi et all. Fibre lightguide sensors.- M.: Mir, 1991. 26-47 p.*
12. *Kalsho B. et all. Fibreoptic sensors. – M. : Mir, 1992. p. 487.*
13. *T.N.Krylova. Interference coating. – M. Nauka, 1973. 5-31p.*
14. *X-G.Unger. Planar and fiber optic waveguide. - M.: Mir, 1980. 75-256p.*

Petrin Drumea, Mircea Comes, Adrian Mirea

Hydraulic and Pneumatic Research Institute,
Cutitul de Argint 14, 75212 Bucharest 4, Romania

MODULE FOR FUEL CONSUMPTION MEASUREMENT

Today is important for transport companies to monitorize fuel consumption. To perform this task is necessary to have on the car a black box inaccessible to driver. This can be done using a flow transducer coupled to a smart electronic module. The authors designed a volumetric rotational transducer that contains a Hall sensor. The pulses generated by this sensor as well as driving wheels rotation information are used by an electronic module to calculate total fuel consumption.

1. INTRODUCTION

Fuel consumption is a very important problem for a company activating in the field of constructions or transporting. Small decreases of this parameter can lead to higher profits and better economic efficiency. The first step in order to reduce fuel consumption is to measure properly this quantity; the level of remaining fuel in fuel tank is not a good estimation of consumption because nobody can be sure that the missing fuel in the tank was consumed by the engine or it was a leakage in the fuel circuit or, even worse, the fuel was stolen form the tank. To avoid this incertitude the best way to evaluate fuel consumption is to measure the fuel flow from the injection pump to the engine and compute fuel consumption using this parameter. This paper describes the fuel consumption measurement system and shows some experimental results performed on a hydraulic stand involving flow measurement with this system; the system will be tested on a car as soon as possible.

2. FLOW TRANSDUCER

One of the simplest flow transducers is the hydrometric propeller shown in figure 1. The liquid flow in the pipe generates the rotation of the propeller. The rotational speed of this device increases if the liquid flow increases; also, the number of rotations depends to the volume/mass of the liquid that passed through device and there is a linear dependence between these parameters for a specific geometry of the entire transducer [1]. In order to measure this speed or the number of rotations 2 small magnets on opposite sides of propeller's spindle are placed and, above them, on the transducer's frame, one Hall sensor [4] to detect magnet position. The number of pulses at the Hall sensor output divided by 2 is the number of rotations and is proportional (for the transducer used in this application) with liquid volume passed through transducer.

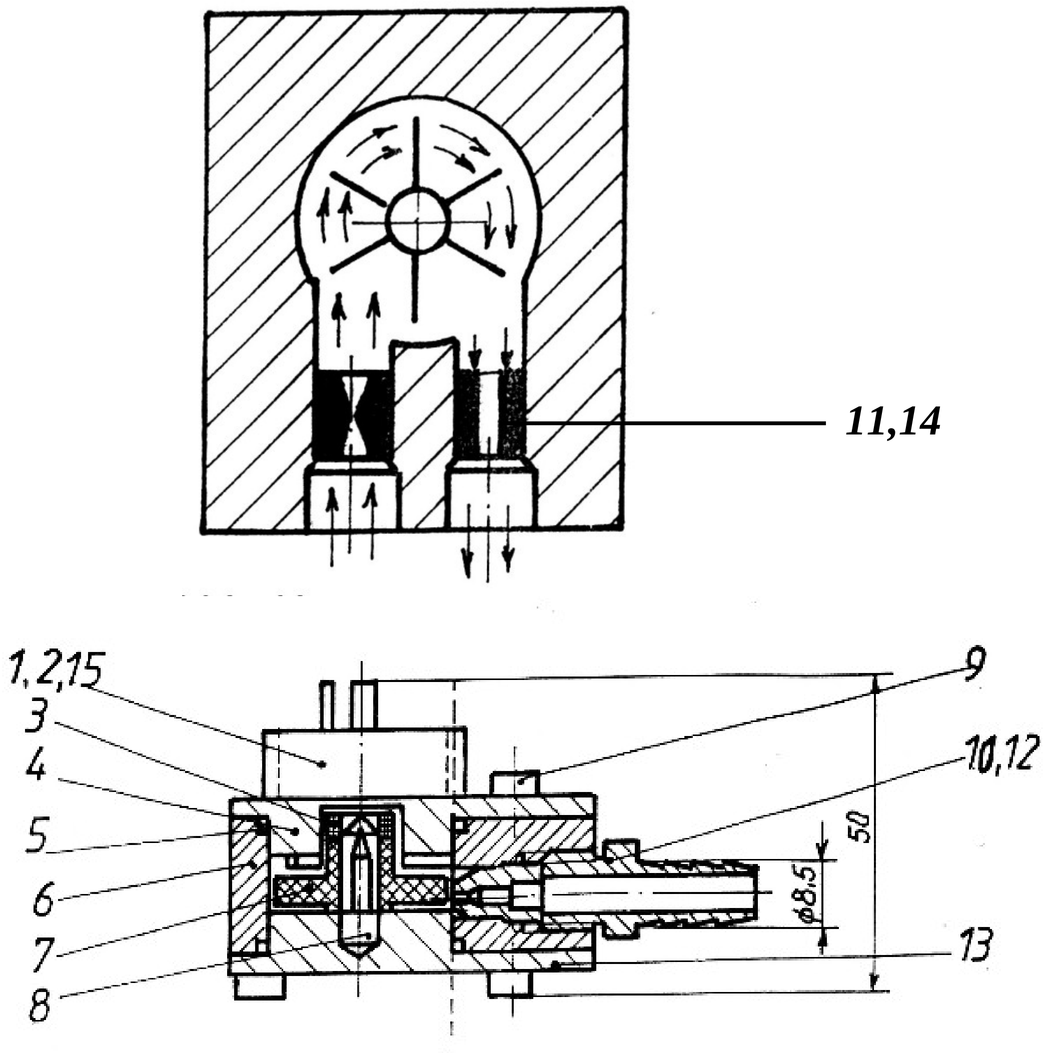

Fig. 1. Hydrometric propeller flow transducer:
1 – conector; 2 – screw M3x10; 3 – permanent magnet; 4 – cover I; 5 – ring O ϕ 28x1,8; 6 – body; 7 – rotor; 8 – spindle; 9 – screw M4x12; 10 – linkage; 11 – pastille; 12 – duse; 13 – cover II; 14 –electronic module; 15 – magnetic sensor

This type of flow transducer has several advantages – is very simple, easy to manufacture, good linearity, – but also one disadvantage – there is a small pressure difference between input and output; however, this difference is not critical in this application.

3. SYSTEM DESCRIPTION

Block schematics for entire system structure is shown in Figure2. The fuel is taken from the tank by the injection pump and supplies the engine. The flow transducer is placed after injection pump because there may be a return circuit of fuel from injection pump to tank. There is also a Hall rotation transducer placed on gearbox; this is very useful to detect if the car is moving and to measure the distance passed by the car. In this way it’s possible to know how much fuel was consumed, when, and if the car was moving.

The smart module unit consists of three elements – measurement system.

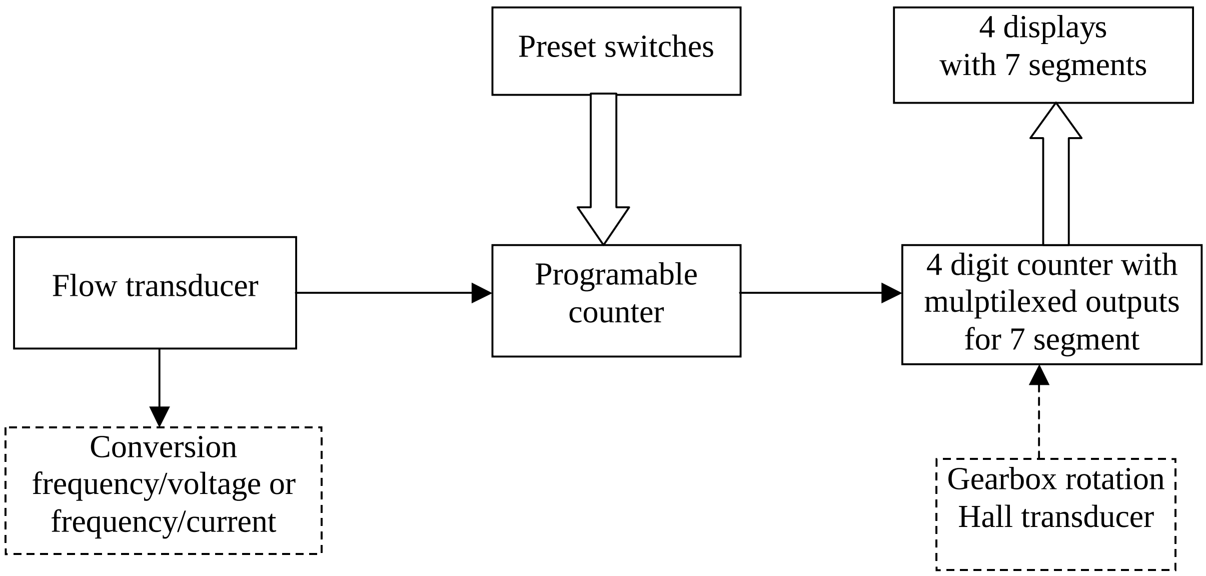

Fig. 2. Structure of fuel

4. EXPERIMENTAL RESULTS

At this stage of the design the module wasn’t tested on a car but only on a hydraulic stand at Hydraulics and Pneumatics Research Institute. The block schematics of the testing system is shown in figure 3.

The PC can command (via one Digital to Analog data acquisition board) the level of oil flow of hydraulic unit. The TestPoint application ([5], [6]) generates at the output of DAC board a ramp signal that produces a specific level of flow (liquid volume). The reference transducer and the ADC board measure this flow/volume in one minute and pass this data to TestPoint application; in this time the smart module counts the pulses generated by his flow transducer and sends this number to PC via RS232 interface. The TestPoint application plots the point (flow measured by reference transducer, number of pulses from smart module) and then proceeds to next point of ramp signal. There are 100 generated points on the ramp so entire test ends after 100 minutes. The smart module for flow measurement has good linearity and could be used in a real measurement of fuel flow. The graphics obtained are shown in figures 4, 5, 6.

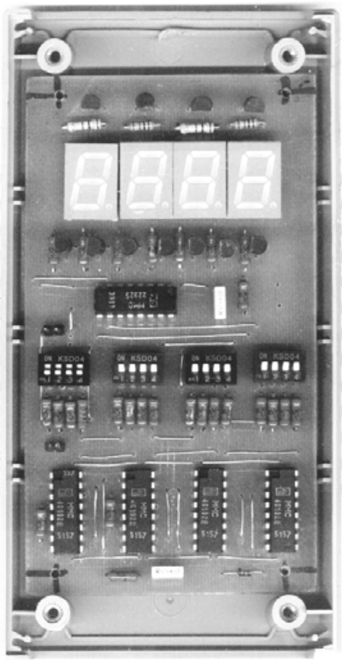

Fig. 3. Electronic module

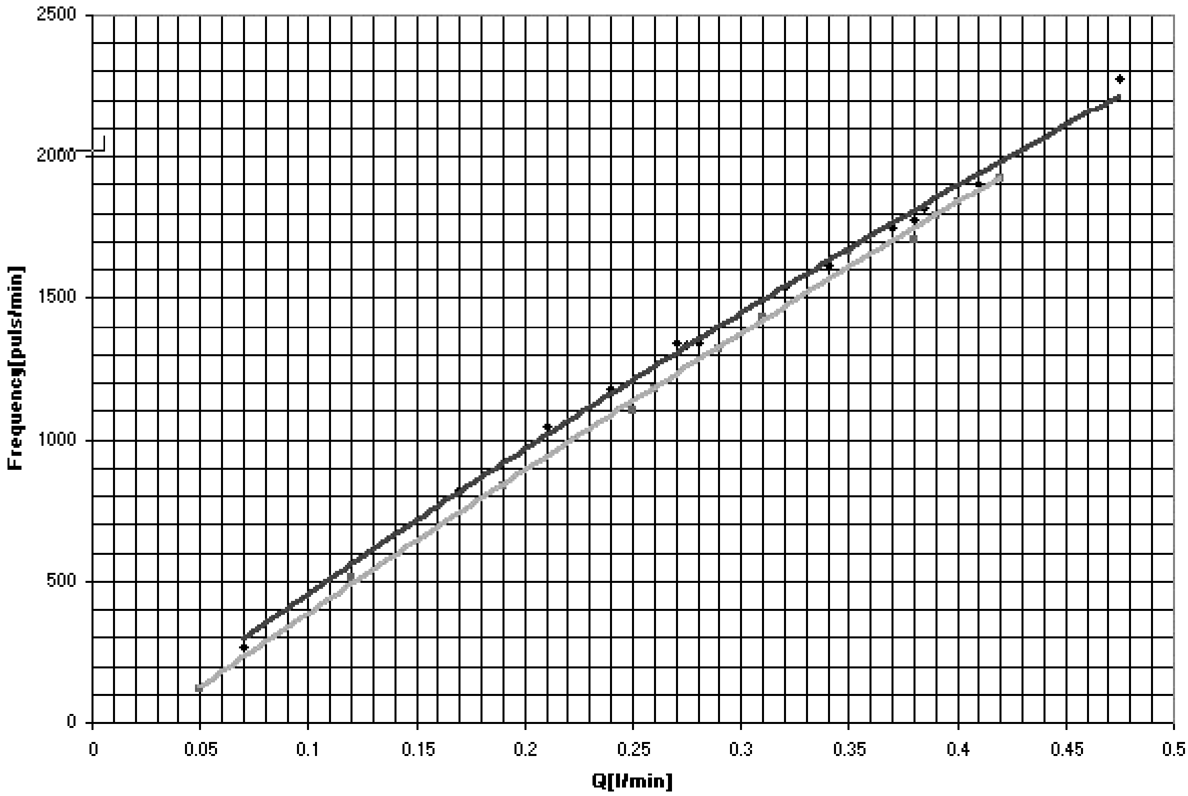

Fig. 4 Flow to frequency diagram

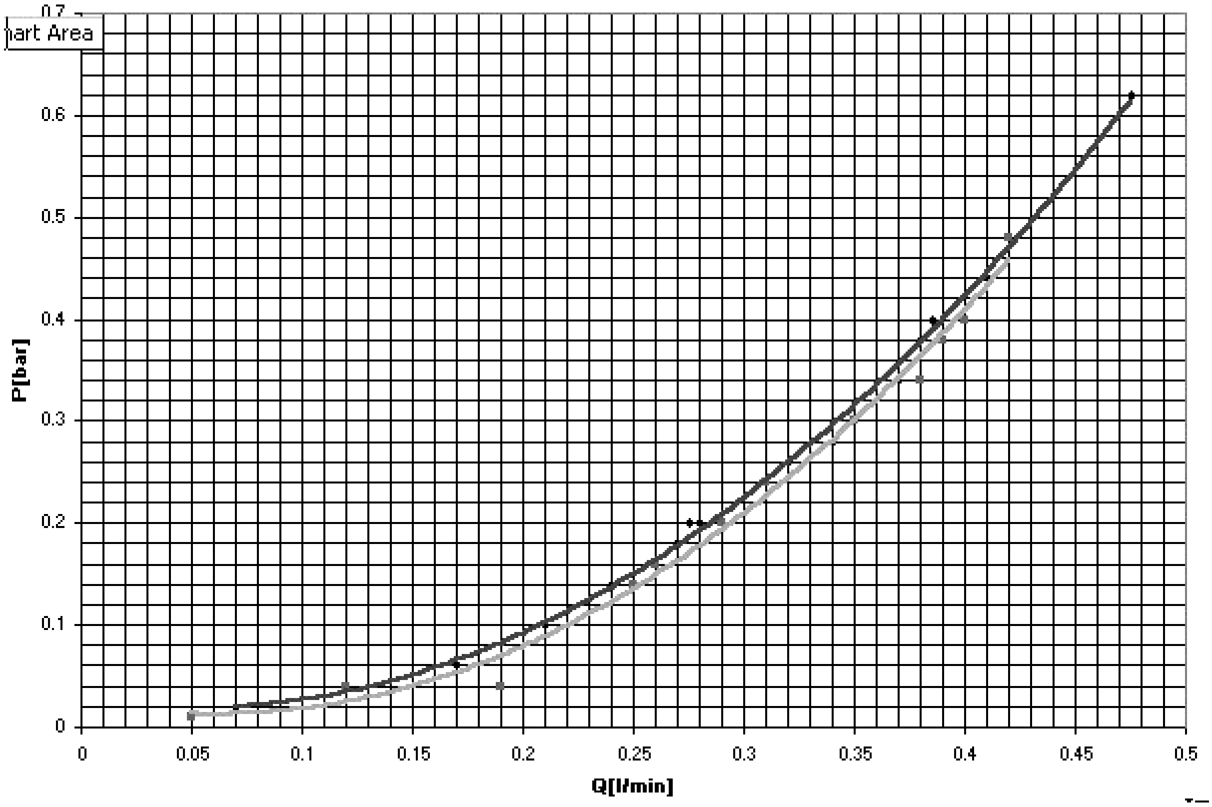

Fig. 5 Pressure drop to flow diagram

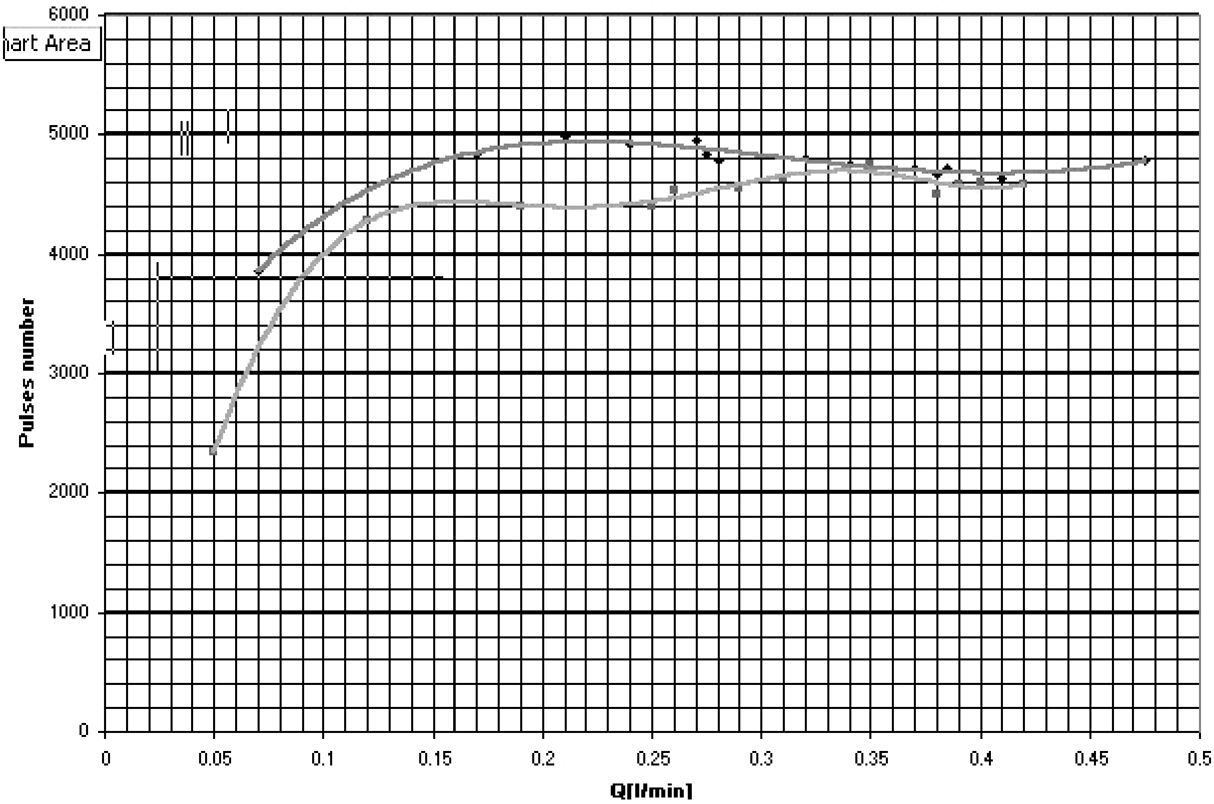

Fig. 6 Calibration diagram

5. CONCLUSIONS

A fuel consumption measuring system can reduce costs in a company that uses many vehicles.

Such a system, with high lustiness and reability, low dimension, made with not accesible settings, has a big market in Romania and can be very profitable for the producer and also for its user.

This system is now in testing stage at Hydraulics and Pneumatics Research Institute and we hope it will be produced and sold to customers this year.

6. REFERENCES

[1] G. Ionescu, V. Sgarciu, H. M. Motit, R. Dobrescu, C. Stamate "Transducers for ndustrial automation", Editura Tehnica, 1996, Bucuresti.

[2] MICROCHIP TECHNOLOGY INC., "Embedded control handbook – Volume 1", Microchip Inc., 1997.

[4] M. Ciugudean, V. Tiponut, M.E. Tanase, I. Bogdanov, H. Carstea, A. Filip, "Linear Integrated Circuits", Editura Facla, 1986, Timisoara.

[5] KEITHLEY METRABYTE, "DAS1802ST and DDA08 User's Guide"

[6] Capital Equipment Corporation, "TEST POINT Techniques and Reference", 1996.

[7] SIMTEK, "nvSRAM Data Book", 1999.

Natalija Dorosh, Galyna Kuchmiy

Lviv Polytechnic National University, Department of Electronic Devices
12 Bandery Str., 79013 Lviv, Ukraine.

EFFICIENCY IMPROVEMENT OF MICROELECTRONIC DEVICES FOR SPECTRAL TRANSFORMATION OF SIGNALS

The methods of increase of efficiency of microelectronic devices for spectral transformation of signals are shown, at the expense of use of algorithms of fast spectral transformations with active use of pauses between receipt of readout of a researched signal. The structural organization and functionalities of the digital microprocessor NM6403, on the basis of which it is possible to realize algorithms of spectral transformations in different bases of functions is given .

Introduction. The important direction of development of microelectronics is designing and introduction of the special integrated circuits for realization of algorithms

- spectral transformations in different bases of functions;
- algorithms of a digital filtration;
- algorithms of coding - decoding; modulations and demodulations;
- algorithms for formation (synthesis) of signals of the given form;
- algorithms for organization of the interface and standard protocols of the data transfer.

Such integrated circuits make the conducting world companies as Zilog, Texas Instruments, Motorola, Siemens, Analog Devices.

For realization of spectral transformations frequently use the signals processors (SPU) of the Analog Devices company.

Such SPU work on frequencies F=50-100Mhz, have own codes of commands and are not compatible to processors of other firms. At realization of complex (difficult) algorithms with