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NUMERICAL SYSTEM FOR MEASUREMENT FLUID DEBIT

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ABSTRACT:
The paper presents system for measurement fluid debit with a good precision. The system contain a debit transducer (DT), adapter current-voltage (I/U), analogue/digital converter (A/D C) - and a decimal display device (DDD). It can be used on the industrial processing's and industrial automation labs.

KEYWORDS:
numerical system ,analogue/digital converter, decimal display device, debit

1. INTRODUCTION

In technological process the measurement of the fluid debit is the most important for command of this processes. When we make a measurement for debit we must chose a method with a very good precision for that case.

2. THE BLOCK DIAGRAM OF THE DEBIT MEASURING DEVICE

The block diagram of the debit measuring device is given in figure 1 and consists in:

- debit transducer (DT);
- adapter current-voltage (I/U);
- analogue /digital converter (A/D C);
- decimal display device (DDD).

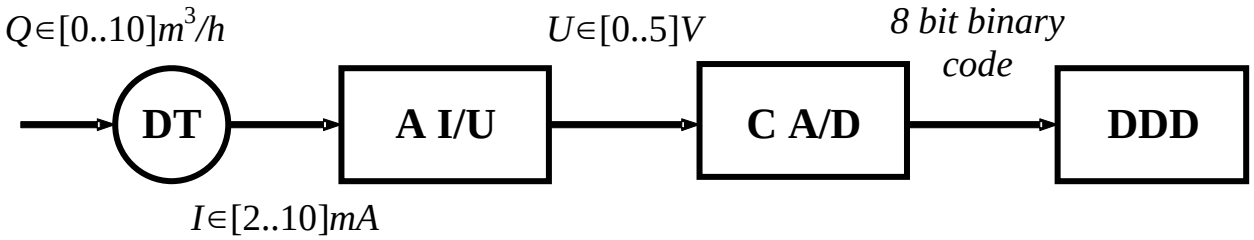

Fig. 1.The block diagram of the debit measuring device.

We chose a transducer based on fluid baffle. The characteristics of the level transducer:

- statical pressure : 17,5 N/mm2
- domain: 0...1500 mmH_2O;
- output: 2...10 mA c.c. ;
- source: 220V – 50/60 Hz.

The functional diagram of adapter is presented in figure 2.

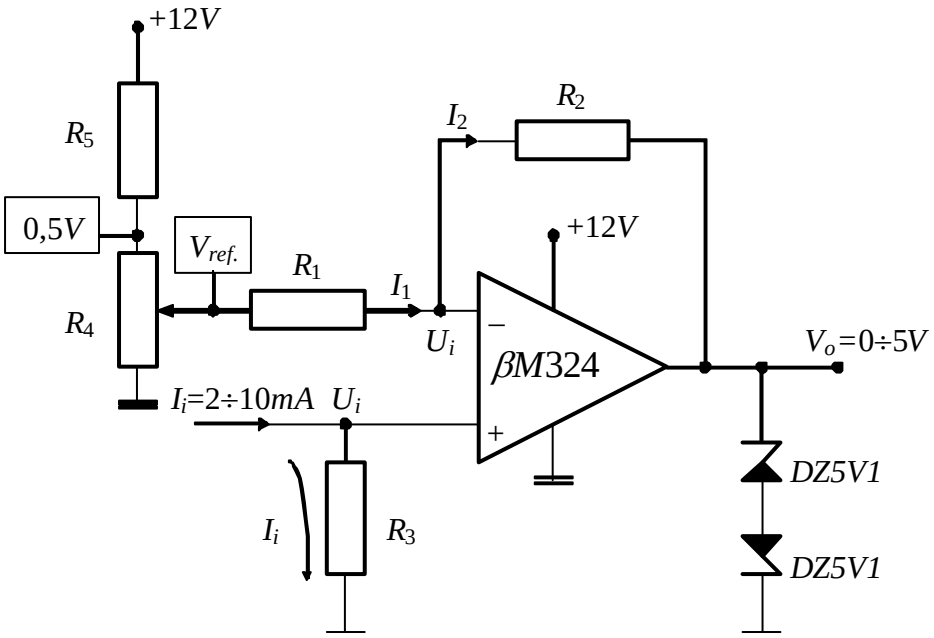

Fig. 2: The scheme of adapter

I used an 8-bit analogue /digital converter with 4 multiplex inputs. These inputs can be configured for the following means of operation:

- to read one input only (measures the voltage between the input and the null);
- differential reading (measuring the voltage between two inputs).

The converter turns the input voltage corresponding to one of the operation means, into an 8-bit binary number, the inputs to be read being programmed by the user. Circuit ADC0844 is a CMOS analogue /digital converter with successive, 8-bit approximations and with multiplex analogue inputs. It contains an internal clock and a logic control unit which, according to the command that was given, i.e. reading (on EMBED Equation.3 pin) or writing (on EMBED Equation.3 pin), generates the binary code corresponding to the voltage converted to pins D0(D7 in order to be read, respectively switches to high impedance the binary outputs and reads from pins MA0(MA3 the code set by the user, code that triggers the multiplexor at the input of the integrated circuit.

During the writing command, circuit 74LS244 (which contains 8 non-reverse separators – buffers with 3-STATE outputs) reads the binary code corresponding to the 4 switches MA0÷MA3, code that generates inputs MA0÷MA3 of I.C. ADC0844. This code is shown by LED's L9÷L12.

During the reading command, circuit ADC0844 generates at outputs D0÷D7 the binary code corresponding to the converted voltage, which is read by circuit

74LS374A (circuit containing 8 LATCH-D type bistables with 3-STATE outputs) and is displayed by e LED's L1÷L8.

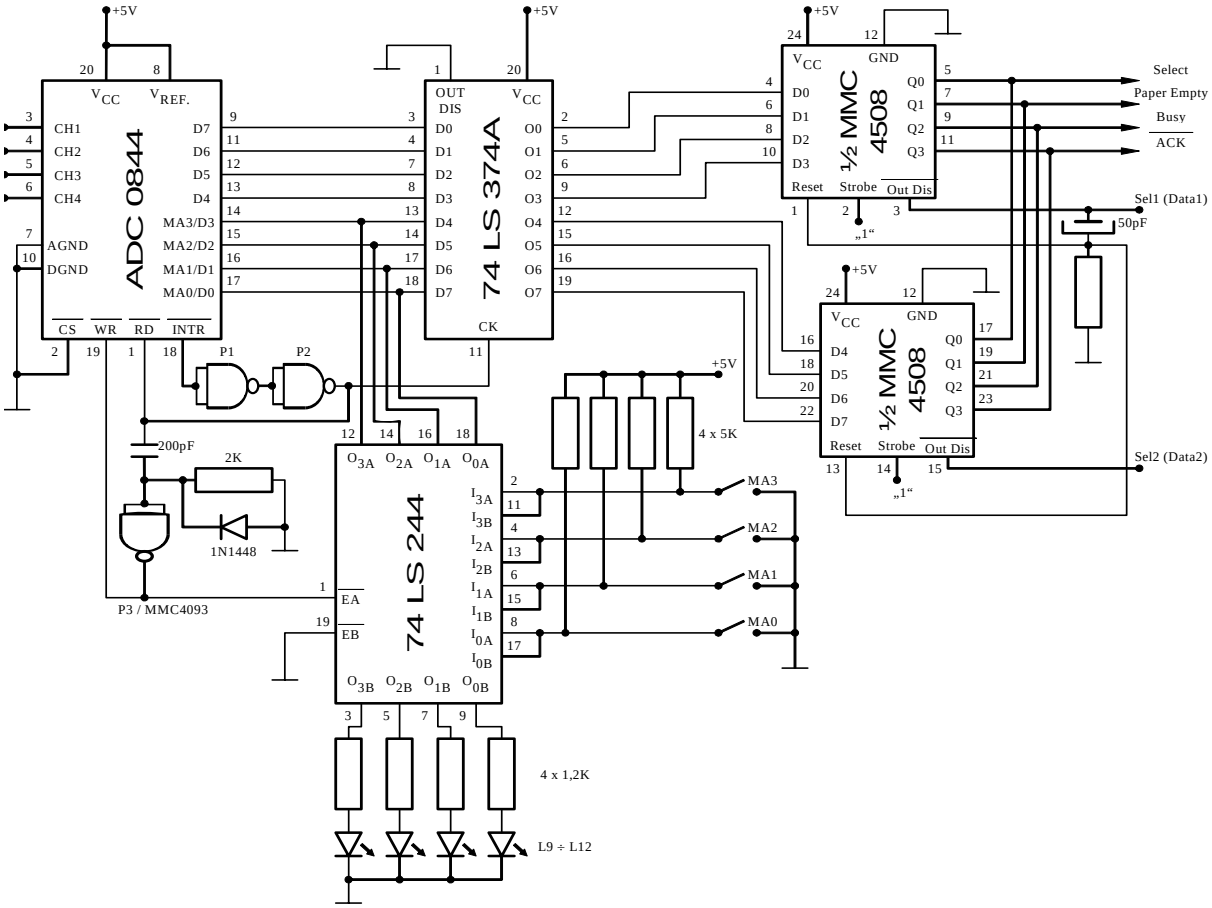

Fig. 3 Diagram of the analogue / digital converter

The decimal display device DDD has two roles:

- The read and interpret the binary code read;
- To display the measured debit.

3. GRAPHICAL INTERFACE FOR DISPLAY DEBIT

The display device for this system is a PC who change information with the system for measurement debit on the parallel port (LPT1, LPT2 or LPT3).

To make the graphical interface we used programming language Borland C++.

```
#include "conio.h"
#include "stdio.h"
#include "graphics.h"
#include "stdlib.h"
#include "dos.h"
#include "math.h"
#define DATA 0x0378
#define STATUS DATA+1
#define XORINPUT 0x47
void sistaxe(void)
{
 setcolor(BLUE);
```

```
 line(10,460,630,460); line(20,470,20,160);
 line(620,462,630,460); line(620,458,630,460);
 line(18,170,20,160); line(22,170,20,160);
 settextstyle(0,0,1); setcolor(CYAN);
 outtextxy(5,150,"Q[mc/h]"); outtextxy(600,445,"t[s]");
}
void plansa(int x, int y)
{
 clearviewport();
 setcolor(LIGHTRED); rectangle(0,0,x,y);
 settextstyle(2,0,7); setcolor(LIGHTCYAN);
 outtextxy(50,10,"Sistem for debit measurement between 0..10 m3/h");
 settextstyle(0,0,2); setcolor(GREEN);
 outtextxy(50,100,"DEBIT: 0..10 mc/h"); outtextxy(370,100,"TIME:");
 sistaxe();
 delay(100);
}
void afis_time(int hour, int minute, int sec.)
{
 char sir[80];
 sprintf(sir,"%02i:%02i:%02i",hour , minute, sec.);
 setfillstyle(EMPTY_FILL,0); bar(450,100,580,115);
 settextstyle(0,0,2); setcolor(YELLOW); outtextxy(450,100,sir);
}
void write_debit(float debit)
{
 char sir[80];
 sprintf(sir,"%4.1f",debit);
 setfillstyle(EMPTY_FILL,0); bar(150,100,220,120);
 settextstyle(0,0,2); setcolor(YELLOW); outtextxy(150,100,sir);
}
void main()
{
 struct time timp;
 int gdriver, gmode, maxx, maxy, input,
                        x_curent, y_curent, x_last, y_last;
 unsigned char sec_crt, hour, minute, sec., quit_program;
 char caracter;
 float debit;

 quit_program=sec_crt=hour=minute=sec.=0;
 x_curent=20; y_curent=460;

detectgraph(&gdriver,&gmode);
 initgraph(&gdriver,&gmode,"C:\BC45\BGI");
 maxx=getmaxx(); maxy=getmaxy();
 plansa(maxx,maxy);
 afis_time(hour, minute, sec.);
 do
        {
         debit=0;

         outportb(DATA,0x04); input=inportb(STATUS);
input=input ^XORINPUT;
         if((input&0x80)==0x80)
                debit=debit+128;
         if((input&0x40)==0x40)
```

```
            debit=debit+64;
        if((input&0x20)==0x20)
            debit=debit+32;
        if((input&0x10)==0x10)
            debit=debit+16;

        outportb(DATA,0x02); input =inportb(STATUS);
input = input^XORINPUT;
        if((input&0x80)==0x80)
            debit=debit+8;
        if((input&0x40)==0x40)
            debit=debit+4;
        if((input&0x20)==0x20)
            debit=debit+2;
        if((input&0x10)==0x10)
            debit=debit+1;

        debit=debit*10/255; write_debit(debit);

        x_last =x_curent; y_last =y_curent;
        x_curent++; y_curent=460-ceil(debit*30);
            if(x_curent>610)
              {
                x_anterior=20;
                x_curent=21;
                bar(3,150,630,470);
                sistaxe();
              }
        setlinestyle(0,0,3); setcolor(YELLOW);
        line(x_last, y_last, x_last, y_curent);
        setlinestyle(0,0,1); delay(100);

        gettime(&time);
        if(sec_crt!=time.ti_sec)
            {
             sec_crt=timp.ti_sec;
             sec.++;
             if(sec.==60)
                {
                 minute++;
                 sec.=0;
                 if(minute==60)
                    {
                     hour++;
                     minute=0;
                     if(hour==100)
                        hour=0;
                    }
                }
             afis_time (hour, minute, sec.);
            }
        if(kbhit())
            {
             caracter=getch();
             if(caracter==0x1b)
                quit_program=1;
            }
```

```
        }while(!quit_program);
 closegraph();
}
```

4. THE CONCLUSIONS

The device we created measures the fluid debit mensuring a high precision of the measurements. It is being used for different measurements during the laboratory classes of Industrial Automation, but also in industrial processes.

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