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«Metrological Support of Innovative Technologies»  
ICMSIT-2020

«Development of an application of a pipeline network calculation»

O S Kharitonova, T V Volodchenko, V V Bronskaya, T V  
Ignashina, D S Balzamov, L E Khairullina and Ch B Minnegalieva



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# Problem statement

The main stages of development of a pipe network calculation application at the coding level in C# language are presented.

Databases are implemented by Microsoft SQL Server. Visual Studio was used as an integrated development environment for code writing, as well as a rich set of control elements written using .NET Framework.

The necessary solutions for the task was developed after complementing the functionality of these code control elements.

## Oil transport.

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Type of transport	Note
Pipeline	Pipelines are commonly used. They are not energy-intensive and have a lower carbon footprint.
Rail transport	Rail transport has low capital costs, but low speed, carbon emissions and accidents.
Truck tank	It is the limited method of oil transportation due to storage capacity, but truck tanks have the greatest flexibility for many directions of oil delivery.
Water transportation	It is the cheapest way of oil transport (Compared to the pipeline, barges are cheaper by 20-35% depending on the route). A disadvantage is the speed.

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## “Menu” form.

Gas (compressor)

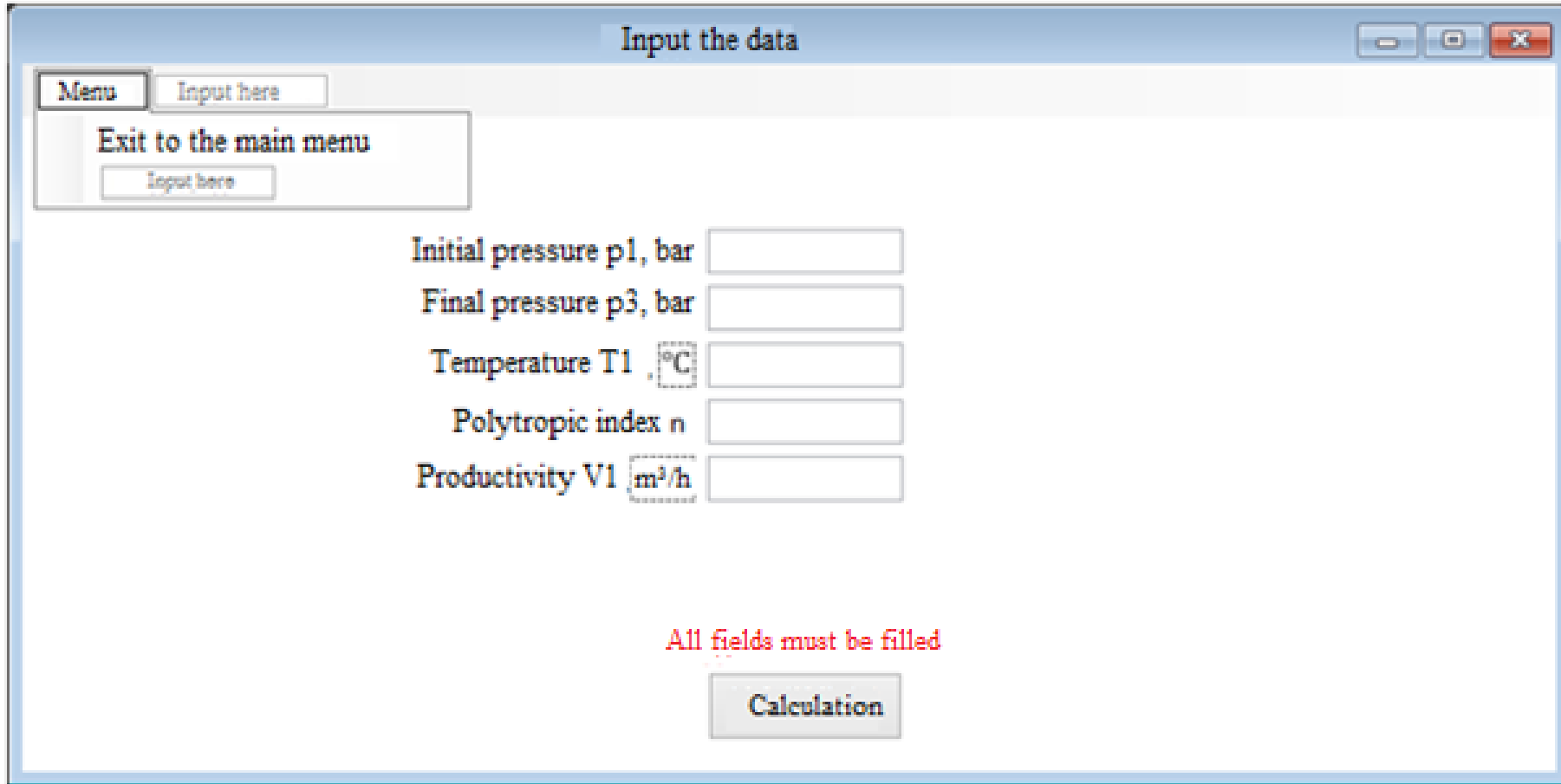
Newtonian liquids (pump)

Non-Newtonian liquids (pump)

Implementing the transition between forms.

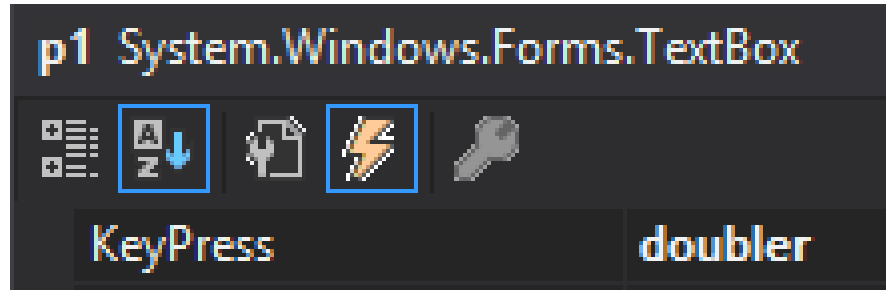
```
ссылка: 1  
private void button1_Click(object sender, EventArgs e)  
{  
    Hide();  
    Gas10 Gas = new Gas10();  
    Gas.ShowDialog();  
    Close();  
}
```

“Gas10” form (Data input form for the calculation of the pipeline network (gas)).



The screenshot shows a software window titled "Input the data" with standard Windows window controls (minimize, maximize, close) in the top right corner. The window contains a menu bar with "Menu" and "Input here" options. Below the menu bar is a section titled "Exit to the main menu" with a sub-label "Input here" and a corresponding button. The main area of the form contains five input fields, each with a label and a unit: "Initial pressure p1, bar", "Final pressure p3, bar", "Temperature T1 °C", "Polytropic index n", and "Productivity V1 m³/h". At the bottom of the form, there is a red text warning: "All fields must be filled" and a "Calculation" button.

## KeyPressyvent



## “Doubler” function

```
links: 5
private void doubler(object sender, KeyPressEventArgs e)
{
    char ch = e.KeyChar;
    if (!Char.IsDigit(ch) && (Keys)ch != Keys.Back && ch != ',')
        e.Handled = true;
}
```

## Output of the results of solving the problem

```
public double p1, p2, p3, v1, v2, v3, G;

link: 1
private void Gas11_Load(object sender, EventArgs e)
{
    info.Text = "Compressor productivity = " + Math.Round(G);
    chart.Series[0].Points.AddXY(p1, v1);
    chart.Series[0].Points.AddXY(p2, v2);
    chart.Series[0].Points.AddXY(p3, v3);
}
```

## Data input form for pipeline network calculation (liquid).

\_ □ ×
Input the data

Menu
Database

Section length:

from tank to pump, m

  $l_{bc}$ 

from pump to heat exchanger, m

  $l_{M1}$ 

Roughness, mm

  $\Delta$

Liquid

 ▾

Pipeline material

 ▾

Debit, m<sup>3</sup>/h

  $Q$ 

Liquid rate, m/s

  $v$ 

Initial temperature °C

  $t$

Quantity:  
(before heat exchanger)

ported float valve

entry the pipeline

stopcock valve

rotation of 90°

All fields must be filled

# Conclusions

Results, implementation

- The calculation result is the selection of the pump and compressor taking into account the maximum period of trouble-free operation.
- The obtained results are the basis of the code for the expert control complex with controlled parameters of transport, both liquid and gas.



# Contacts

**O S Kharitonova<sup>1</sup>, T V Volodchenko<sup>2</sup>, V V Bronskaya<sup>2</sup>, T V Ignashina<sup>2</sup>, D S Balzamorov<sup>3</sup>, L E Khairullina<sup>4</sup> and Ch B Minnegalieva<sup>4</sup>**

<sup>1</sup> Department of Chemical Technology of Petroleum and Gas Processing, Kazan National Research Technological University, 68 Karl Marx Street, Kazan 420015, Russia

<sup>2</sup> Department of Chemical Process Engineering, Kazan National Research Technological University, 68 Karl Marx Street, Kazan 420015, Russia

<sup>3</sup> Department of Power Supply of Enterprises and Energy Resource Saving Technologies, Kazan State Power Engineering University, 51 Krasnoselskaya Street, Kazan, 420066, Russia

<sup>4</sup> Department of Information Systems, Kazan Federal University, 35 Kremlyovskaya Street, Kazan 420008, Russia  
[olga.220499@mail.ru](mailto:olga.220499@mail.ru)

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