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SOFTWARE FOR DETERMINATION OF EQUIVALENT DIAMETER AND FRICTION FACTOR OF PIPES WITH CIRCULAR AND NON CIRCULAR CROSS SECTION SHAPE

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ABSTRACT
Determination of equivalent diameter and friction factor is a very important in engineering practice. Therefore, in terms of hydraulic calculations of simple and complex pipelines i.e. calculating friction head losses, it is necessary to determine equivalent diameter and friction factor, which is in some cases simple decision and in others it can be complicated, especially if hydraulic calculations are performed for complex pipelines.
In this work, created software has been presented, which enables calculation of equivalent diameter and friction factor of pipes which are either circular or non circular cross section shape. Vast number of authors who have been working on the problem of friction head losses caused by friction have concentrated on circular cross section shape of pipelines.
This software represents great contribution to hydraulic calculations of pipelines. It can also be used as a modul in termination of flow losses of simple and complex pipelines as well as stand-alone application for calculations of equivalent diameter and friction factor.
Practical use of software will significantly reduce calculation time for flow losses, which will be cost-effective in design of pipelines, or hydraulic systems in general.
Final version of the software for calculating equivalent diameter and friction factor of circular and non circular cross sections shape of pipes has been created using Microsoft Visual Basic 6.0 Enterprise Edition.
Key words: equivalent diameter, friction factor, software.

1. INTRODUCTION
Intensive development of science and techniques has in general conditioned an intensive development od design process of pipelines network and technology of pipe manufacturing. Significant influence of modern technique and technology in within the scope of pipelines network design has led to significantely improved economical parameters, by decreasing time necessary for pipelines network design, realization costs are reduced.
Analysis and fluid flow calculations in pipelines is done by various methods. Today in massive use are analytical, numerical and experimental methods. Friction forces between themselves are causing

energy loss. Mechanical energy losses friction caused are calculated and expressed as pressure drop in pipelines between two characteristic cross section shape.
Considering that pressure drops in system is basic parameter in drive unit selection, factors describing pressure drops represent significant factors in hydraulic pipelines calculations. The most important factor is friction factor, which depends upon fluid flow velocity, geometry of pipes (shape, size, roughness) and fluid viscosity.
Determination of friction factor are significantly increased in complex pipelines calculations. Because of this need for iteration and achieveing higher quality. Today is more and more in use numerical analysis, i.e. certain softwares for calculations of pipelines and their networks.
Friction factor among other parameters depends upon equivalent diameter which is, also, necessary to calculate. Calculating equivalent diameter is especially expressed during determination of friction factor of pipes with non circular cross section shape.
From above said for a best solution of this problem is necessary to design and apply software for determination of equivalent diameter and friction factor of pipes with circular and non circular cross section shape.

2. PROGRAM ALGORITHM

In figure 1. it can be seen simplified algorithm for determination of equivalent diameter and friction factor of pipes with circular and non circular cross section shape. Slated figure represents main program and six sub programs.

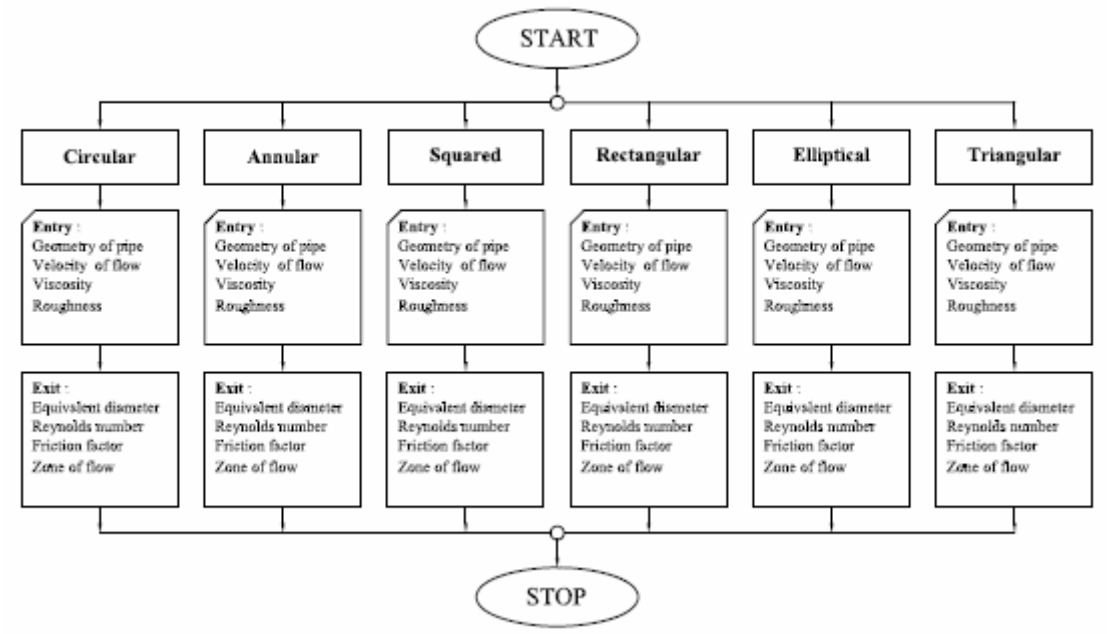

Figure 1. Simplified algorithm of software for determination of equivalent diameter and friction factor of pipes with circular and non circular cross section shape

Based on defined algorithm software for determination of equivalent diameter and friction factor of pipes with circular and non circular cross section shape is developed. Software is developed in Microsoft Visual Basic 6.0
Sub algorithm of software for determination of equivalent diameter and friction factor of pipes with circular and non circular cross section shape is presented in figure 2., and in figure 3. interface of software for determination of equivalent diameter and friction factor of pipes with circular and non circular cross section shape.

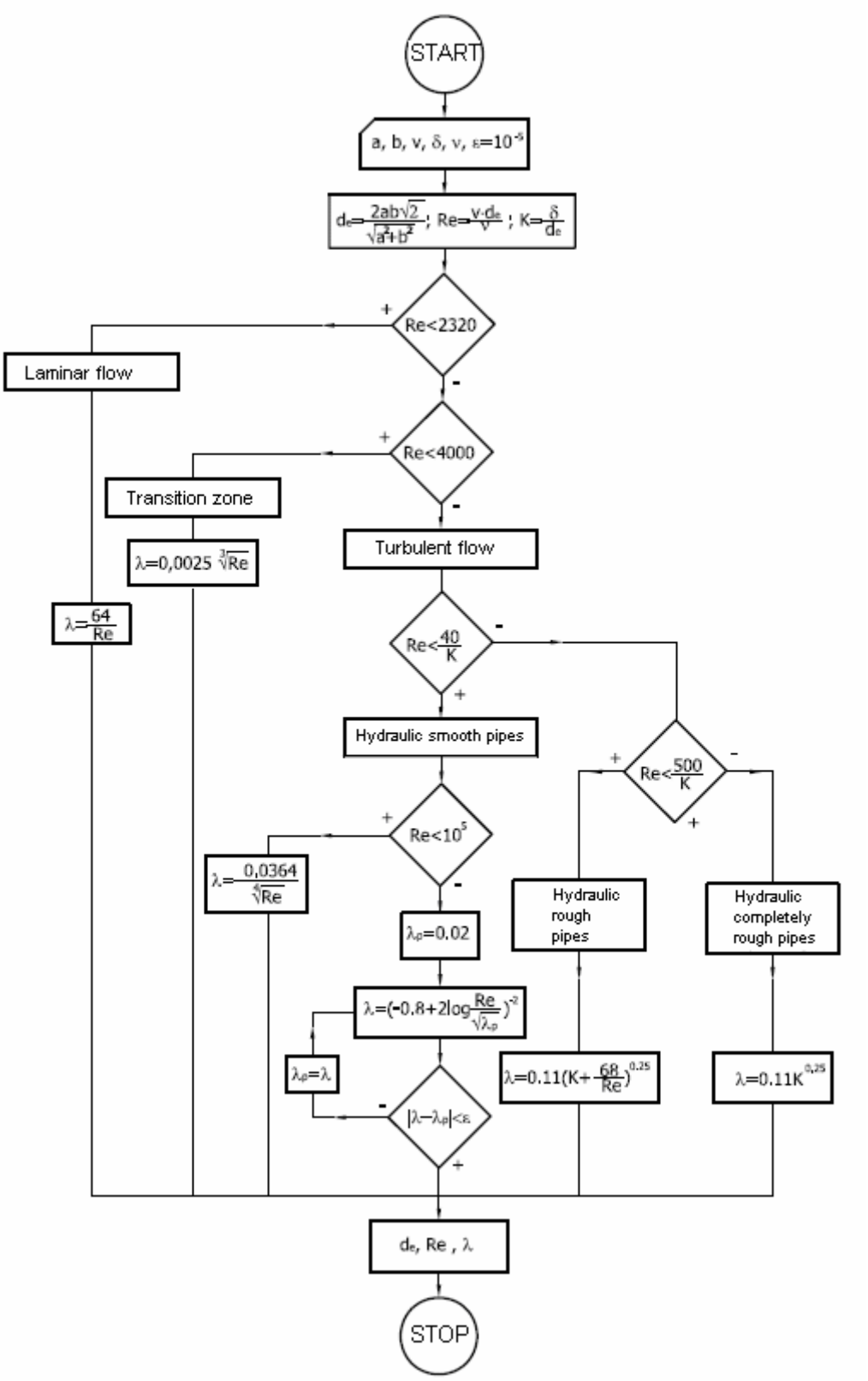

Figure 2. Sub algorithm of software for determination of equivalent diameter and friction factor of pipes with elliptical cross section shape

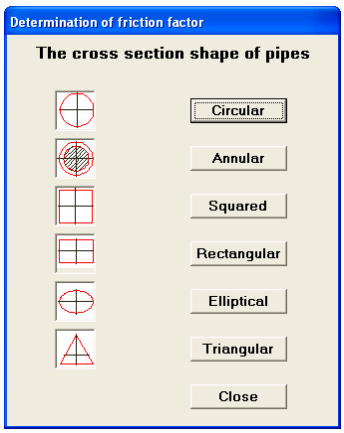

Figure 3. Interface of software for determination of equivalent diameter and friction factor of pipes with circular and non circular cross section shape

3. TESTING OF SOFTWARE

After writing the code testing of software is done. In figure 4. test for pipes with circular cross section shape and squared cross secton shape is shown. Data used for testing can also be seen in this figure.

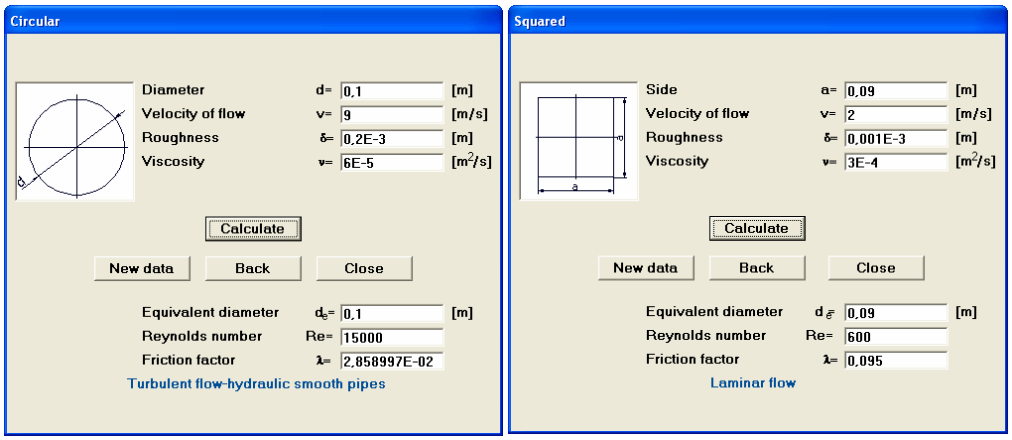

Figure 4. Test of software for determination fluid flow through pipes with circular and squered cross section shape

After testing the software it can be slated that results gained by application of this software are consistent with analitical results, and this software can be successefully applied in hydraulic calculations of simple and complex pipelines.

4. CONCLUSION

This software represents great contribution to hydraulic calculations of pipelines. It can also be used as a modul in termination of flow losses of simple and complex pipelines as well as stand-alone application for calculations of equivalent diameter and friction factor.

Practical use of software will significantly reduce calculation time for flow losses, which will be cost-effective in design of pipelines, or hydraulic systems in general.

5. REFERENCES

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