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COMPUTER PROGRAM FOR CALCULATION OF THE OPERATING CYCLE OF INTERNAL COMBUSTION ENGINE

Students and scientists of some Engineering specialties carry out the thermal calculations of internal combustion engines (ICE) of different types. For performing this calculation faster and more accurately, has decided to create new software. DVS Program Engine Calculation in Alpha Version is designed for thermal calculation of 2-stroke and 4-stroke piston engines. During the process of development the program was fitted with the possibility of expansion the functional. The tools, used for creating the program are C ++ programming language and Qt framework.

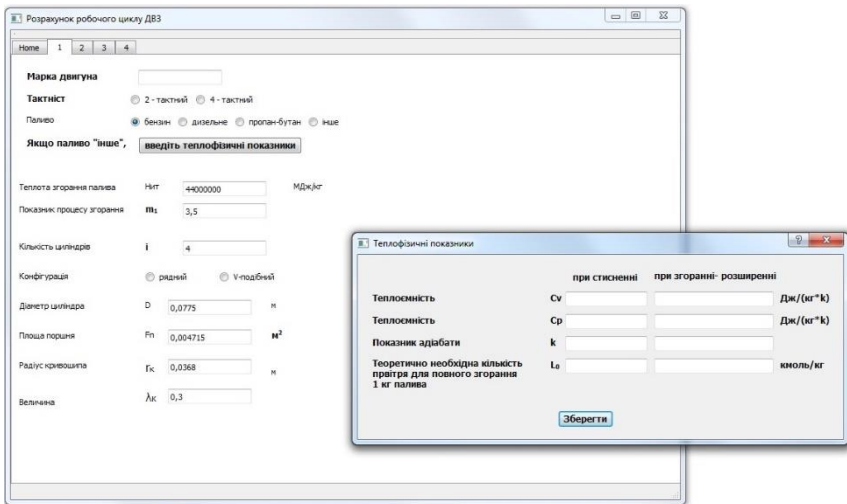


Figure 1 – The input window of initial data of the program DVS Engine Calculation

The physical-mathematical model of thermal calculation of second-level ICE is realized in the program algorithm:

$$\left. \begin{aligned}
 dV &= F_n r_k \left(\sin \varphi + \frac{\lambda_k}{2} \sin 2\varphi \right) d\varphi; \\
 dm &= \Delta m_{\tau_{it}} \cdot dx; \\
 dT &= \frac{1}{c_v m} (dQ_c + dQ_w) - T \frac{dm}{m} - (k-1) \frac{dV}{V} T; \\
 \frac{dp}{p} + \frac{dV}{V} &= \frac{dm}{m} + \frac{dT}{T}.
 \end{aligned} \right\} (1)$$

This model is developed on the basis of differential balance equations, that take into account the masses m and energy Q , the kinematic equations, as well as the equation of the working body state (pressure P and volume V) and its composition. The system consists of nonlinear differential equations with variable coefficients and is solved numerically using the modified Euler's method. After solving a system of equations with a step $\varphi = 1^\circ$ (angle of rotation of the crankshaft of the engine $\varphi = 0 \dots 720^\circ$), we obtain the table dependences $V(\varphi)$; $m(\varphi)$; $T(\varphi)$; $p(\varphi)$.

The developed program allows to significantly accelerate the process of thermal calculation of the engine and this contributes to the improvement of the quality of educational and scientific projects of students and researchers of the Internal Combustion Engines Department of Zaporozhye National Technical University.