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АНАЛИЗ ВОЗДУШНОЙ СИЛЫ ЦИЛИНДРОВ И КОНУСОВ В ПРОГРАММЕ ВИРТУАЛЬНЫХ ИСПЫТАНИЙ

ANALYSIS OF CYLINDER AND CONE AIR FORCE IN VIRTUAL TEST PROGRAM

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В статье изложены методы определения сопротивления воздуха при взаимодействии с цилиндрическими и коническими поверхностями определенные с помощью программ виртуальных испытаний (Flow design). Исходя из виртуальных испытаний сделаны заключения о способах преодоления сопротивления воздуха.

The article describes methods for determining the air resistance when interacting with cylindrical and conical surfaces, determined using virtual test programs (Flow design). Based on virtual tests, conclusions were made about ways to overcome air resistance.

Ключевые слова: аэродинамика, аэродинамическая труба, схема обтекания, коэффициент сопротивления воздуха, сила сопротивления воздуха.

Keywords: Aerodynamics, aerodynamic tube, flow design, air resistance coefficient, air resistance force.

INTRODUCTION

Aerodynamics is the branch of hydrodynamics that studies the laws of motion of air and the laws of force on the surface of objects, as well as the motion of objects with respect to air. The study of car aerodynamics began to be studied at the beginning of the last century. The first aerodynamic tube was designed by Frank Venham in 1871, but it was used to study the aerodynamics of aircraft, and to determine the strength and

resistance coefficients of the air acting on them. This method is also used in the study of car aerodynamics [1].

A number of parameters need to be considered when obtaining research results in aerodynamic tubes. One such parameter is the air temperature during the experiment. Because when the temperature changes, the density of air also changes [2] (Table 1).

Table 1

temperature C°	density of air, kg/m ³
35	1,1455
30	1,1644
25	1,1839
20	1,2041
15	1,2250
10	1,2466
5	1,2690
0	1,2922

The formula for calculating the air resistance is as follows:

$$P_w = K \cdot F \cdot V^2 .$$

Here K is the coefficient of air resistance, which depends on the shape of the body, the density of air.

$$K = 0,5 \cdot \rho \cdot C_w .$$

RESULTS OF VIRTUAL TEST

Today, virtual tests are conducted to ensure the reliability of the results. Virtual test programs are being developed as part of engineering programs and separately [3]. One such program is Autodesk's Flow design program for virtual aerodynamic testing.

Virtual tests were performed for spheres, cylinders, cones and other shapes. The results of the experiment for the cylinder were as follows:
The average value of the coefficient of resistance is 2.45
The average value of the resistance force is 10.01 N.

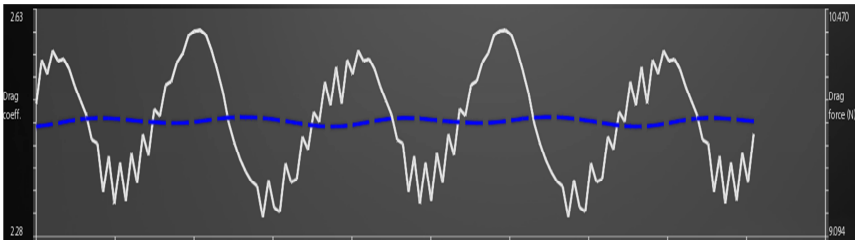


Figure 1 – The result virtual test of cylindrical body

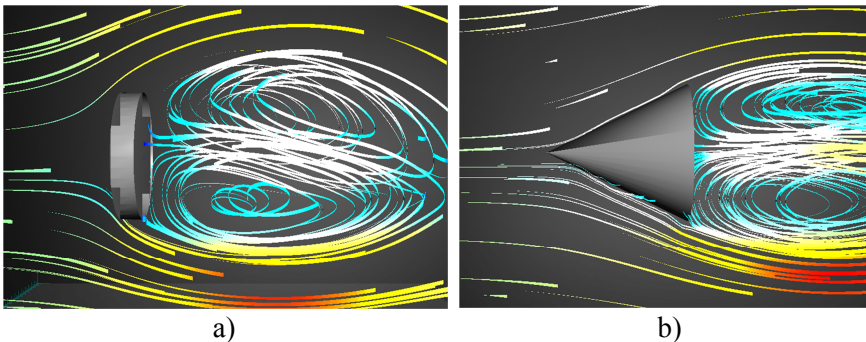


Figure 2 – A virtual test performed on cylindrical (a) and cone-shaped (b) body

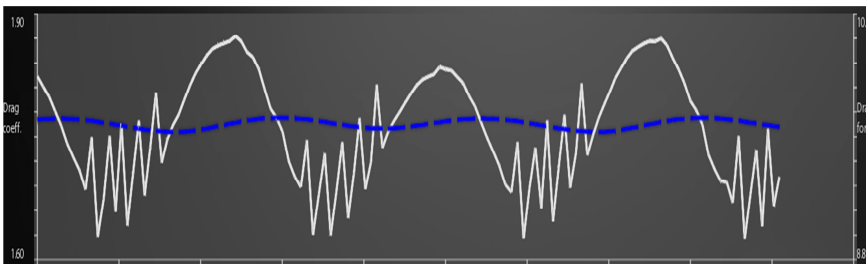


Figure 3 – The result virtual test of cone body

The average value of the coefficient of resistance is 1,71.
The average value of the resistance force is 8,99 N.

CONCLUSION

During the study, the cylinder diameter and the cone base diameter were selected uniformly. This ensured a uniform output of their front surfaces (F). But the results came out differently. The main reason for this was the difference in the coefficient of air resistance.

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ИНФОРМАЦИОННО-КОММУНИКАЦИОННЫЕ ТЕХНОЛОГИИ В ИНЖЕНЕРНОЙ ГРАФИКЕ

INFORMATION AND COMMUNICATION TECHNOLOGIES IN ENGINEERING GRAPHICS

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Проанализированы особенности учебного процесса в условиях дефицита учебного времени, выявлены недостатки, снижающие его эффективность, предложено перестроить учебный процесс на основе возможностей, предоставляемых современными информацион-