

*Materials of Conferences***COGNITIVE APPROACH IN
COMPUTATIONAL AERODYNAMICS**

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The beginning of cognitive science was in 1960. Cognitive technology in computer science is combination of methods, algorithms and software for modeling the cognitive abilities of the human brain to solve specific application problems [1, 2]. Cognitive technologies based on the achievements of scientific disciplines (mathematics, artificial intelligence and data mining, information technology), and largely invariant with respect to the subject area. For example – recognition; identifying patterns in the data; solving computer-aided design of complex systems; decision support systems with fuzzy input; etc. In the last century, the founders of cybernetics Alexander Bogdanov, Norbert Wiener, John Von Neumann formulated the idea of the combining a computer with human abilities. Cognitive technologies based on the achievements of scientific disciplines (mathematics, artificial intelligence and data mining, information technology), and largely invariant with respect to the subject area. This approach has been practically implemented for the development of nuclear energy for military and peaceful purposes (Los Alamos, Arzamas-16). To reduce project time and the number of expensive full-scale and experiments specialized the computer systems such as Knowledge Based Engineering, Computer Aided Engineering. The models are based on the “Physics” [3].

Numerical methods have considerable complexity. These reasons are complicated the possibility of preliminary design stage, which is considered a lot of options. Therefore, models based on a cognitive approach become natural. They are built on the basis of scientific and intuitive analysis of data obtained by means of theoretical, experimental, numerical studies. In addition, the specialist should have a basic knowledge of the construction and analysis of numerical algorithms, the planning computational experiments and at least one programming language.

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**MATHEMATICAL MODELING
OF AEROTHERMODYNAMIC
CHARACTERISTICS FOR HYPERSONIC
VEHICLES**

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The modeling of high-speed flows stipulates also the compliance with other similarity criteria, which includes first of all the criteria of Mach numbers (M) and Reynolds numbers (Re), as well as ensuring the low level of turbulence and flow homogeneity in the facility working section. The method of model fixation also influences significantly the accuracy of the experiment. The simultaneous solution of these problems within one experimental facility seems to be impossible. In the extreme case of free-molecular flow, the integral of collisions in the Boltzmann equation becomes zero, and its general solution is a boundary function of distribution, which remains constant along the paths of particles [1]. In the transitional regime, the most suitable method to compute heat transfer coefficient of hypersonic vehicle relies on bridging formulae [2]. In order to determine the force action and heat action of the gas on the body, it is sufficient to know local exchange coefficients of impulse and energy.

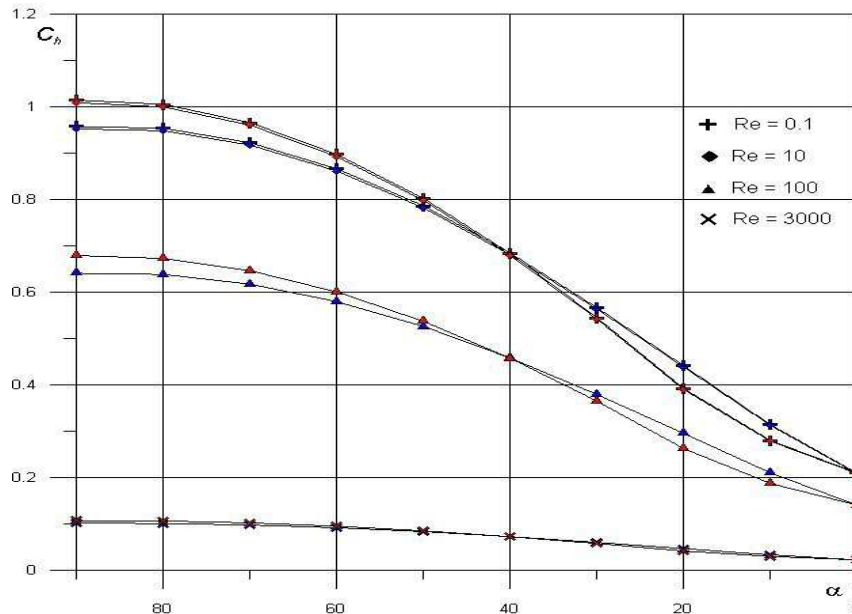


Fig. 1. Heat transfer coefficients $C_h(\alpha)$ for “Clipper” (blue) and “Falcon HTV-2” (red) [2]

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THE DEVELOPMENT WATER – SUPPLY WELLS CLEANING BY THE MECHANICAL, HYDRAULIC AND ELECTROCONTACT METHODS

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The mechanical methods of the decolmatation, which are widely used in the water – supply wells construction and exploitation practice, are very simple in the presence of the appropriate adaptations, and, moreover, they are easily to be carried out.

For the filters decolmatation of the development wells, and the various metal scrapers, grabs and spears are mainly used, which are mixed along the filter or are rotated in it, and they are allowed to be removed the colmatant from its inner surfaces. [4].

So, only the soft deposits are usually responded to such mechanical cleaning, moreover, due to the nature of the surface exposure, the unaffected main bulk of the colmatant is remained, having concentrated beyond the inner loop of the filter and within the filter zone (e.g. the depressive funnel).

The decolmatation hydraulic methods are mainly included such traditional technological and processing methods, as the wells filters washing with the water, and the air – lift pumpings out under the various schemes, as well as the water injection into the filters, using the packers and the hydrograbs, and hydro-spears.

So, they often resort to the direct flushing water of the of the filtered space through the drill pipes into the working surface of the filter, in the course of exploration and the development of the drilled wells to be removed the washing solution and the clay cake erosion on the mine’s shaft walls.

It is practiced the interval standardized water filters flushing, having pumped under the pressure through the various parker devices for deeper decolmatation of the exploited and development wells.

This technology disadvantage is that having ousted from the shaft bridging and colmatating material is remained in the pore space, that it can be re – clogged within the filtered zone during the subsequent operation. [3].

So, the hydraulic impact effectiveness, along with the disabilities, is significantly increased, when the erosion of the bridging and colmatating crust on the inner surfaces of the filter by the water artesian water jets is combined with the mechanical treatment.

The electro-hydro-contact impact upon the filters and within the filtered zone of the wells has