



The research of wind loads on buildings and structures with increased level of responsibility

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Abstract

The article investigates the impact of wind on building construction-increased degree of responsibility. List the main methods for studying of wind loads applied to the present problem. The article describes experimental studies of wind loads on an object located in the complex of chemical production. The object is an outer construction with platforms with a technological equipment. The features of the layout and fabrication of the experiment in a special wind tunnel architectural and construction type. The results of investigations.

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1. Introduction

In accordance with GOST 27751-88 "Reliability of building structures and foundations" should be taken an increased level of responsibility for buildings in which the failure of the work can lead to serious economic, social and environmental consequences (tanks for petroleum and petroleum products with a capacity of 10,000 m and more, chemical industry facilities, pipelines, industrial buildings with spans of 100 m and more, communication facilities with high of 100 m and more and unique buildings and structures).

Formulation “construction of high level of responsibility” was included in the section “Wind Effects” acting SP 20.13330.2011 “Loads and effects” relatively recently. According to paragraph, 11.1.7 aerodynamic coefficients for

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such constructions must be taken based on the results of purging of models of structures in wind tunnels or on the recommendations, which have been developed by specialized organizations.

Currently, there are two most common method for determining wind loads on constructions: numerical simulation of fluid dynamics in specialized packages and experimental modeling in wind tunnels of architectural and construction type [1]. In this article we will look at the method of experimental modeling of wind effects on the complex of chemical production.

2. Formulation of the problem

The complex of chemical production is a complicated object, which includes a large number of production floors, pipelines, technological platforms, transport galleries, stack, flyover and etc. (Fig. 1)



Fig. 1. Complex of chemical production

The two methods for determining wind loads work equally well for classical buildings and structures of simple shape: numerical simulation works provided with verification experimental results [2,3]. However, for permeable structures (stack and flyover) efficiently conducting experimental modeling only. Primarily this associated with labor intensity and terms of calculations in the software systems: a large number of elements of permeable structures requires a substantial increase in the number of cells of the computational grid. This increases the power requirements of the cluster on which the calculations are carried out and increases the time commitment [5,7].

3. Conducting the tests

We chose the stand of a synthesis for the research. This stand provides to the complex for the production of carbamide (Fig. 2). The object is a outer construction with platforms with a technological equipment. This arrangement has sizes 26,0x37.0 m. Construction has a complicated configuration and is composed of several tiers. Maximum height is 58.97 m. In the layout design stage details that do not affect the aerodynamics of the design, have been eliminated. Scale layout was chosen by the best possible conditions of flow blockage given the size of the wind tunnel: 1:100 [2,6].

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