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Definitions of the deformation and roll of a tower of a solar steam generator

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ABSTRACT: This paper discusses the study of the position of the geometric parameter of the solar steam generator, determining the heel and deformation of the tower of the paragenerator by the methods of geodetic observations.

KEYWORDS: steam generator, roll, deformation, tower, bush, benchmark, cycle, wheel, design.

I.INTRODUCTION

The tower-type solar steam generator (LNG) facilities are a complex engineering facility that is being built and operated in harsh conditions. Their design features are due to the functional purpose and nature of the power influences experienced by the structures during operation.
The total height of the solar steam generator (LNG) is 89.0 m. The design of the LNG tower provides in the aisles of marks:
- from 0.00 to 66.00 m - a through 8-post lattice lattice metal structure with a diameter at the base of 10.00 m, and at around 66.00 m-4.5 m:
- from 66.00 m to 80.08 m-through 8-rack metal construction with frame nodes, where there are: lower protective screens, solar steam generator, frame platforms:
- from 80.08 m to 89.0 m - the head of the tower (a tent with a diameter of 15 m), where a suspended crane of a beam with a loading capacity of 5-10 tons, an upper protective screen, a drum of a solar boiler, and a platform for servicing technological equipment are located. Bearing structures within the mark of 80.00 -: - 87.50 m is 10 racks.

II. THEORETICAL BACKGROUND

Diaphragm pads are designed over the entire height (after 7.5 m). A shaft is provided inside the LNG tower to the level of 80.08 m. To lift people, a passenger and freight elevator is provided, as well as internal and external stairs. The protective shields consist of three stainless 1.5 m steel sheets and only a 360 mm tire package, which is mounted on the frame.
The solar boiler is located on a metal tower 80.08 m high. A steam turbine with all the auxiliary equipment is installed in the machine room, which is a separate building located at the base of the solar boiler tower.
As a rule, the main values of geodetic work in the construction of tower structures are to ensure spatial connections of various technological processes and installation operations. Ultimately, geometrical accuracy and, consequently, the serviceability and functionality of the constructed one is realized through the production of geodetic measurements and technical decisions are made on them to solve the identified construction defects or the consequences of deformation.

III.RESULTS

Depending on the height and purpose of the structure, quantitative estimates of its reliability and deformability have been developed, which are supported by the results of periodic field surveys and special measurements. In many cases, changes in the geometric parameters of high-rise structures during operation are checked by geodetic methods, while important values are attached to the determination of the heel and sediment of a tower type.
As a rule, tower-type structures have considerable height with a small footprint and are therefore subject to external factors (temperature, wind, natural vibrations, etc.), resulting in elastic deformations, bends, banks, etc.
The tower roll is a very important indicator characterizing the deviation of the vertical axis of the shell from a vertical line or the deviated given plane of the cross-section of the shell from the horizon. Roll is expressed in linear, angular and relative measures. Note that absolutely rigid structures could determine the roll according to the leveling of the

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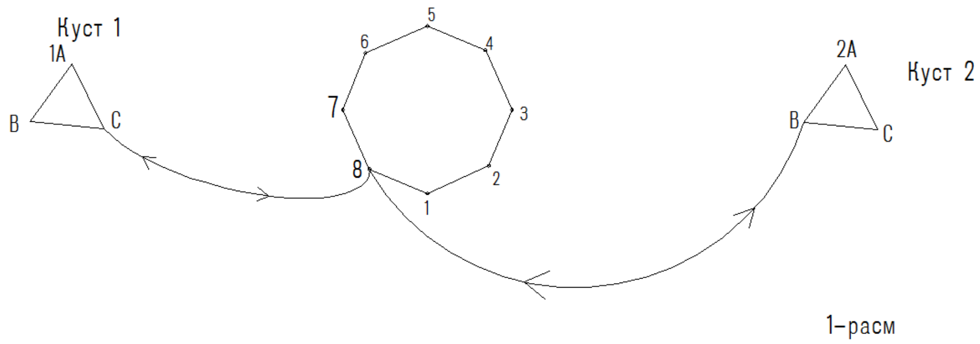
foundation. However, a number of factors affect the structures, leading to the bends of the tower and its slopes, regardless of the stability of its lower part. Among these factors include the wind load, which is the main one, in which rigid structures perceive it as static: the reaction of flexible structures depends on the frequency of free vibrations (intrinsic). If you know the wind speed, wind profile in height, you can calculate the bend of the structure from the wind load. The action of this factor can be avoided by performing geodetic observations in calm weather. The natural vibrations of the structures operate with a constant amplitude, so this error can be taken into account. A significant influence on the accuracy of determining the verticality of a structure is exerted by deformations arising under the influence of solar radiation. Changes in the intensity and direction of solar radiation during the day cause a bend of the structure whose vector also changes. In addition, the concept of an absolutely rigid structure is conditional enough, in fact, such structures do not exist. In this regard, full information about the rolls and bends of the tower can be obtained on the basis of complex field measurements by comparing the leveling results with the results of monitoring the position of the tower body.

IV.DISCUSSIONS

A study of the heel of the steam generator tower was carried out by methods based on the results of leveling sedimentary grades and angular notches. On the basis of each 8-post carrier frame, 8 sedimentary grades were fixed. Absolute elevations of sedimentary grades were determined by leveling out two reference bushes located at a distance of 400 from 500 m from the center of the LNG tower. Each bush of benchmarks consists of three deep characters located at a distance of 20-25 m from each other (Fig. 1.)



Leveling was carried out according to the program of class II in the forward and reverse direction by a high-precision level N_i=004.

$$S_i = H_o - H_i$$

where H_o -mark of the observed point and the initial (zero) cycle of observations;
H_i-elevation of the same point in the i-m observation cycle. Accordingly, the average precipitation is:

$$S_{cp} = \frac{\sum_{i=1}^{n} Si}{n}$$

When n-number of points observed; Difference in uneven precipitation for two points observed $n$and$m$in one observation cycle with number i.

$$(\Delta Snm)i = (Sn)i - (Sm)i$$

or for the same point n as the difference in precipitation in two cycles$iui+1$:

$$(\Delta Sn)i, i+1 = (Sn)i - (Sm)i + 1$$

and relative precipitation are determined by the formula:

$$\eta = \frac{(\Delta Sn,m)i}{L}$$

where L – distance between two points.
If in the initial cycle of observations the sedimentary marks were conditionally located in the planeXOY , and in the next cycle they moved to position $1^1,2^1,3^1,\ldots\ldots n^1$, then to determine the roll you need to find the angleλbetween

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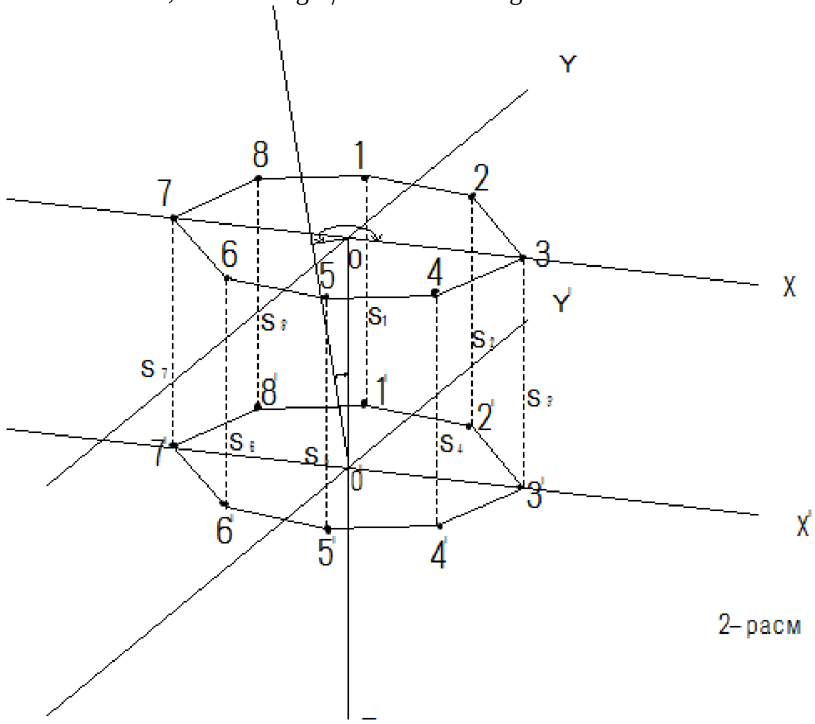
normalO^1N and axis coordinate OZ , and angleφ characterizing the direction of the full roll.



2– расм

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