COMPUTER SIMULATION OF THE TENSELY-DEFORMED CONDITION OF A SCREW SUPPORT TRAILERS

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Trailer is a vehicle that is not equipped with an engine. The need for it arises periodically when it is necessary to carry over long distances cargo that does not fit into the interior of the car or pollute it. The use of the trolley is unproductive and the truck is unprofitable.

One of the main parts of the car trailer is a support - a component of the suspension, which is installed in the amount of four pieces at the ends of the frame spar and belongs to the class of "jacks".

One of the common causes of failure of a support is a violation of the integrity of one of its structural elements. Therefore, to prevent defects at the design stage, the parts are calculated for maximum static and contact strength, determine the allowed bending stresses at constant and short-term (peak) loads.

Determined other characteristics that affect the reliability and life cycle of the support parts. These calculations are quite difficult, time consuming, require work

with a variety of literature, standards, considerable time and manpower. During design, such calculations are made each time anew if changes are made to the design detail.

To automate the solution of this problem and thus reduce the resources to solve it, it is proposed to use CAD/CAE SolidWorks system, which allows to simulate the stress-strain state of parts during operation, to analyze the results and to make conclusions about the reliability of the designed parts.

SolidWorks is a powerful engineering package for solid-state parametric modeling of complex parts and assemblies, ehis is a Parasolid geometric kernel design system designed specifically for use on personal computers running Windows.

Example, in SolidWorks Simulation carried out the simulation, calculation and analysis of the stress-strain state of the most loaded part of the trailer support – a screw (the finite element method was used). Stress-strain state – a set of internal stresses and deformations of a structure or its element, which arise when exposed to it by external loads, temperature fields or other factors.

The stress-strain state of the screw was determined by calculation methods in the form of stresses, deformations and displacements in the structure (it is the basis for the estimation of the static strength and the life of the structures at all stages of their life cycle).

The strength of the screw was represented by the values of the strength factor (safety factor). It is introduced to ensure safe and reliable operation of the support and its individual parts.

It was found that the minimum safety factor of the screw strength is more than sufficient, but it can lose its bearing capacity as a result of the balance between external and internal forces in any element of the trailer support. Therefore, continuing to determine the performance of a screw that can prevent its destruction is the definition of a possible loss of stability.

SolidWorks created a propeller simulation, and SolidWorks Simulation introduced the properties of the material from which it was made (fig. 1).

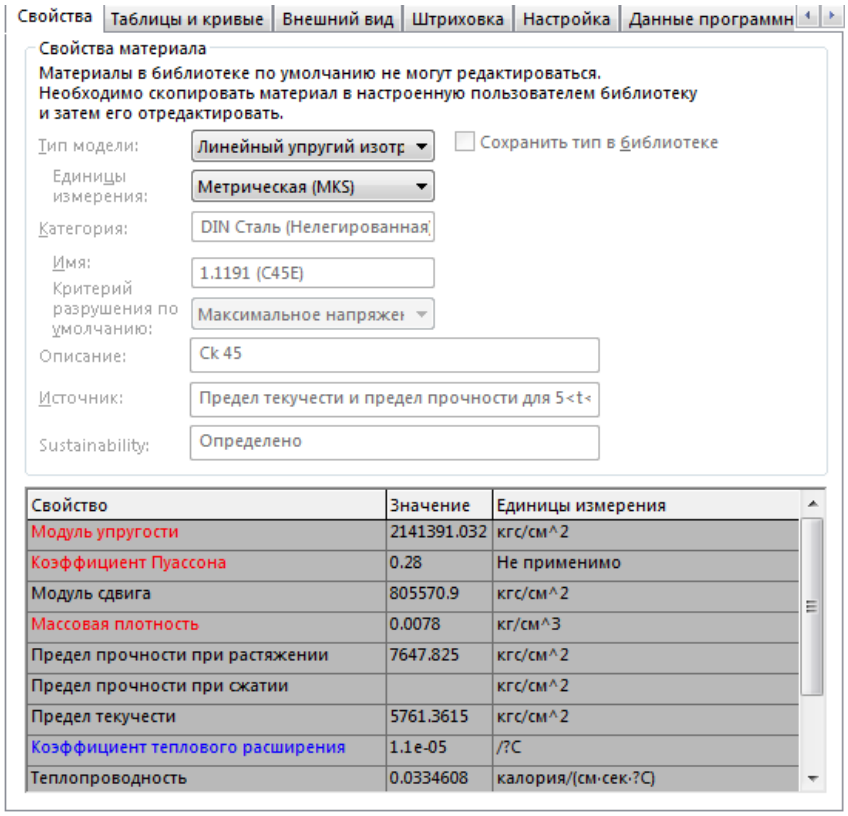

Fig. 1. Power screw material assignment window

After that, anchoring was carried out and the loading area was specified (fig. 2), contact interactions were determined, a finite element model of the screw was created (fig. 3).

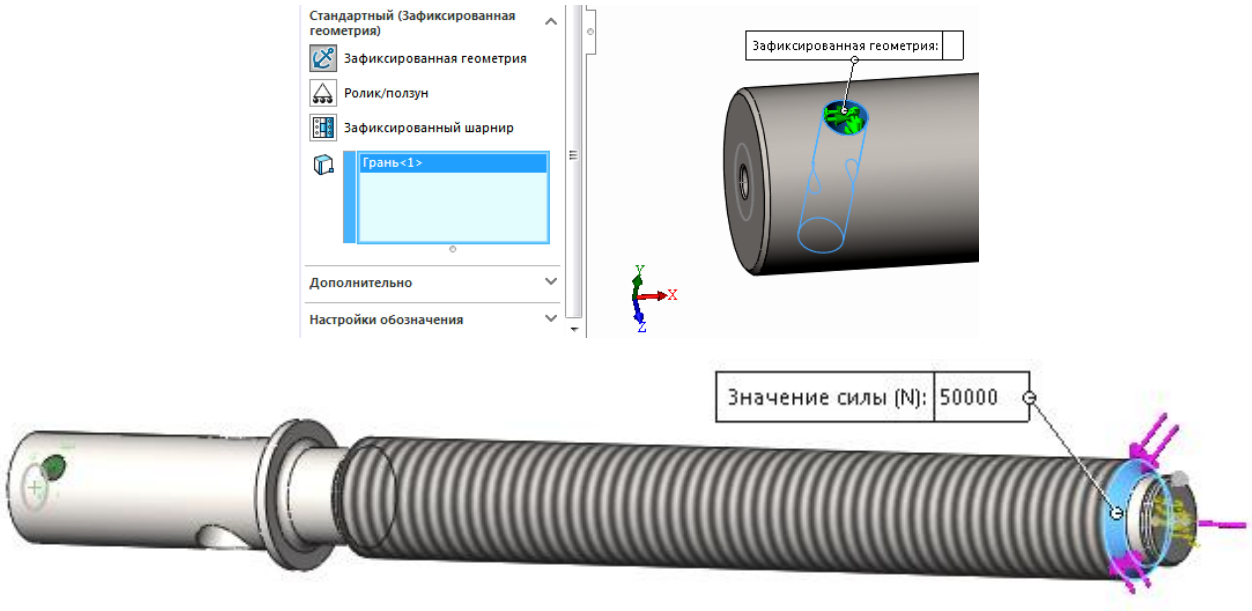

Fig. 2. Fixing and application of loads in the study loss of screw resistance

Сетка Детализация

Имя исследования	Потеря устойчивости 1 (-По умолчанию-)
Тип сетки	Сетка на твердом теле
Используемое разбиение	Стандартная сетка
Автоматическое уплотнение сетки	Выкл
Включить автоциклы сетки	Выкл
Точки Якобиана	4 точек
Размер элемента	8.03269 mm
Допуск	0.401635 mm
Качество сетки	Высокая
Всего узлов	15674
Всего элементов	9782
Максимальное соотношение сторон	11.874
Процент элементов с соотношением сторон < 3	94.1
Процент элементов с соотношением сторон > 10	0.0204
% искаженных элементов (якобиан)	0
Время для завершения сетки (hh:mm:ss)	00:00:07

a

b

Fig. 3. Parameters (a) and net finite elements of screw (b)

It is established that the maximum amplitude of oscillations is a = 0.003301 (node 135 – fig. 4); the safety margin with a possible loss of resistance is n = 5,1331, ie the loss of strength of the power screw does not occur.

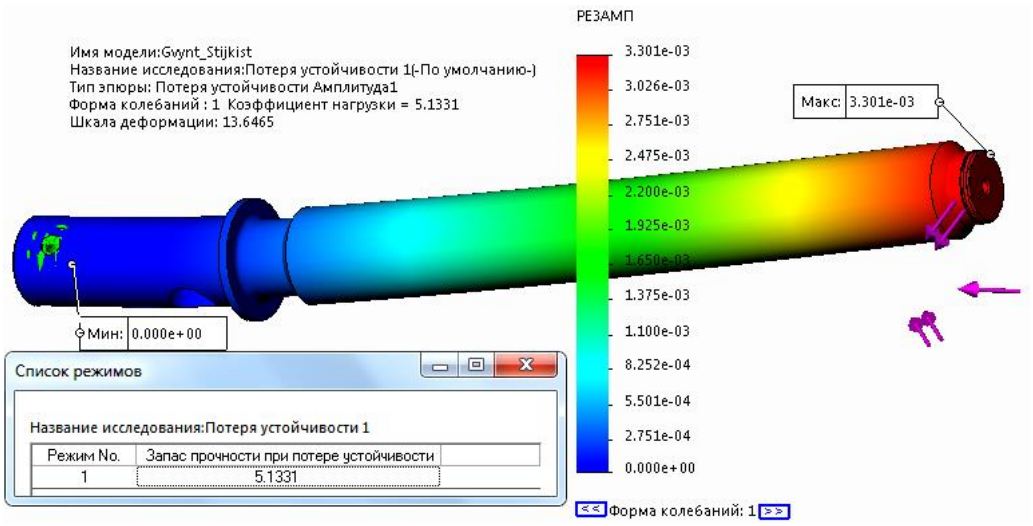

Fig. 4. Resulting amplitude and the safety margin with a possible loss of screw resistance

Thus, the study of a screw support trailers of the trailer support screw in SolidWorks Simulation provides a qualitatively new approach to the determination of its stability parameters. The developed models and methodical positions of the calculations allow us to proceed to the estimation of the load of the screw elements in different calculation positions.