7th INTERNATIONAL MULTIDISCIPLINARY CONFERENCE
Baia Mare, Romania, May 17-18, 2007
ISSN-1224-3264

THE STATE OF STRAINS AND DISPLACEMENTS FROM THE STRUCTURE OF THE TOWER OF THE EXTRACTING INSTALLATION „ PUȚ MATERIALE JIEȚ “

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Abstract: *The development in safe conditions of the extracting process continuously imposes the need of optimal functioning of the extracting installations as important links in the transport flow of the mineral substance and of the sterile for the transportation between the underground and the surface of personal, machines and different mining tools. In the paper there is presented an analysis of the behavior of the towers of the extracting installation with regards to strains and displacements of the resistance structure during the functioning of the extracting installations with pulleys as a wrapping organ for the cables.*
Key words: *Strains, displacements, tower, extracting installation.*

1. INTRODUCTION

The calculation the structure of the mining extracting towers is done taking into consideration all the unfavorable combinations practically possible of the different loads called groups of loads and are established taking into account in their form the compatibility of their acting simultaneously.

The loads are classified into: permanent, short term - temporary, long term - temporary, and exceptional. The groups of loads with loads that can be introduced into groups of loads are the fundamental group of loads which contains permanent loads, long term loads, one or more short term loads and the special loads grouped from the fundamental group and one of the exceptional loads.

In order to establish the state of strain and displacements from the structure of the tower due to the short term functioning loads transmitted through the extracting cables during an extracting cycle, it has been taken into study the tower of the extracting installation „ Auxiliary well Jieț “ E. M. Lonea, which has the general and working data presented as follows.

2. THE INSTALLATION TAKEN INTO STUDY

The extracting installation which works on auxiliary well Jieț, from Lonea mining plant, which is devoted [3] for the underground supply with materials and tools as well as for transporting personal among levels 400 and 715 (the surface level being 715).

The extracting installation that supplies the well (fig.1) is unbalanced and has a hoistingmachine type BAMERT 3000×900 equipped with two asynchronous motors type MAF, (fig.2) of 125 kW power and a nominal rpm of 585 rpm.

The gear reducer of the machine is of type TD-170 having the gear ratio of 11,5.

Fig.1.Extracting installation „ Auxiliary well Jieț “

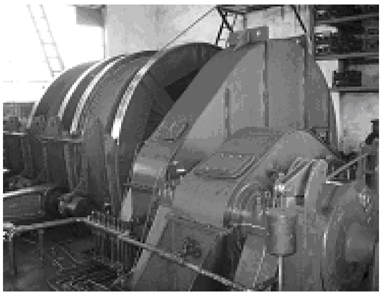


Fig.2.Extracting machine type BAMERT $3\times0,9$

Fig.3. Installation tower „ Auxiliary well Jieț “

The extracting ropes with diameters of Φ 27,5 mm and a mass (on a linear meter) of 3,2 kg/m on the left branch (from the extracting machine to the well) and Φ 27,5 mm and a mass 3,2 kg/m on the right branch are wrapped around the two extracting pulleys the superior and the inferior one, of Φ 2000 mm with a mass (the pulley, the axle of the pulley and the bearing of the axle) of 2050 kg (fig.3), laying on the tower at heights of 34.4 m respectively 31.4 m (pulley axle).

The ropes are wrapped in two layers on each of the two drums of the machine, from which one is fixed and one is mobile and which are hooked at one end by the exterior end (side) of them. The other end of the ropes going through the extracting pulleys is hooked to the extracting vessel through the rope tie device DLC.

The extracting vessels are untipping cages with one level, with two trolleys per level having a mass (own mass plus D.L.C.) of 3355 kg. The mass of a trolley is of 650 kg, and the effective load is 1600 kg/trolley.



Fig.4. Pulley platform Fig.5. Leading component Fig.6. Abutment

The concrete made tower (fig.3) with a height until the pulley axle of 34.4 m. The structure of the tower is composed of the extracting pulley platform (fig.4) sustained by the leading component(fig 5) and the abutment (fig 6) The extracting machine lies on the ground (at a height of 2,8 m to the 0 level of the well (well collar), sideways from the tower (well tower), at a distance (of the wheel axle), towards the vertical portion of the extracting ropes which enter the well of 27,32 m.

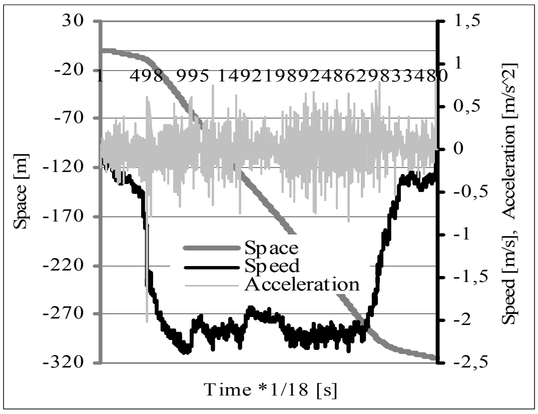
The length of the rope chord (the distance between the tangent points of the rope to the deviating pulley from the tower and the wheel of the extracting machine, in the central position of the chord (perpendicular on the wheel axle)), is for the left branch L_{cs}=37,62 m, and L_{cd}=44,89 m for the right branch.

The slope angles of the ropes chords are $\beta_s = 53^0\ 47'\ 04''$ for the left branch and $\beta_d = 49^0\ 39'\ 36''$, for the right branch, and the deviating angles (which are formed in the limit positions of the rope chord towards the interior side(interior angle) or exterior (exterior angle) of the wheel, over the central position of the chord) are: α_e st $=19'29''$ and α_i st=0 for the left branch and $\alpha_e$dr$=31'53''$ and α_i dr=0 for the right branch.

3. LOADS TRANSMITTED TO THE TOWER

Considering the elevator leaving the horizon 580 until it reaches the surface ramp(783 horizon) it has been taken into study the case of personal transport entering the underground when the left elevator full of personal is descending on the right wing (case 1), the right elevator is descending on the right wing (case.2) and in the case of the application of the safety brake (case 3 and case 4).

The kinematics elements for the cases taken into analysis are presented in figure 7, 8, 11 and 12.



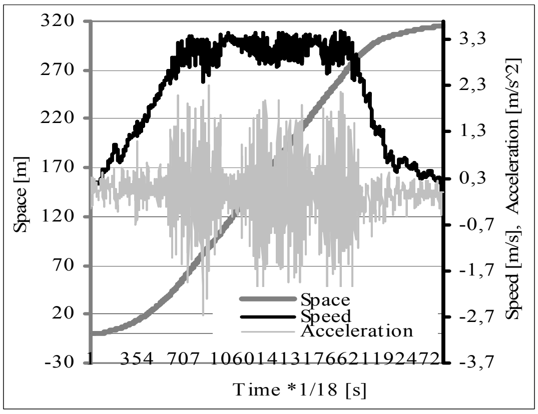
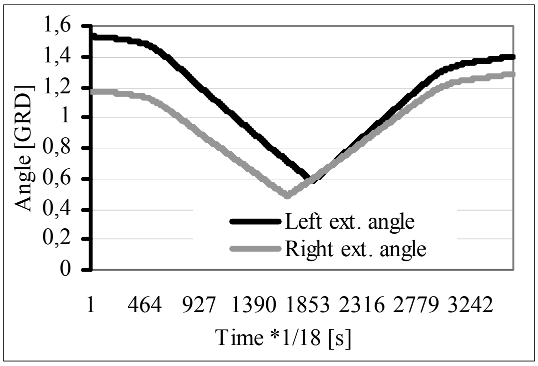


Fig.7. Kinematic elements on the elevator left climbing personal entrance, case1

Fig.8. Kinematic elements on the elevator left descending personal entrance , case 2



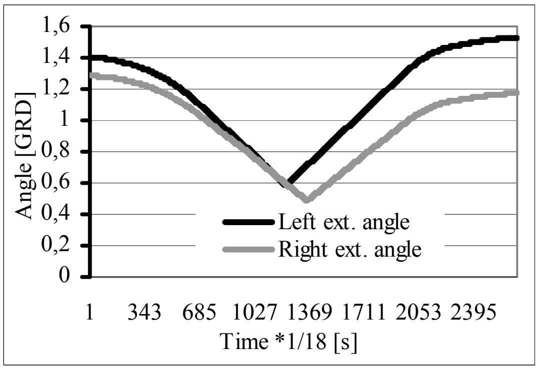
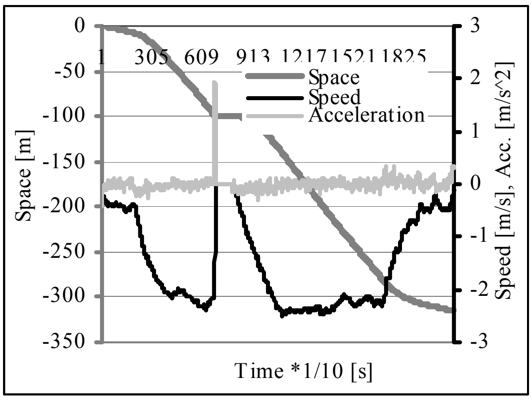


Fig.9. Deviating angles for case 1 from fig 7

Fig.10. Deviating angles for case 2 from fig 8



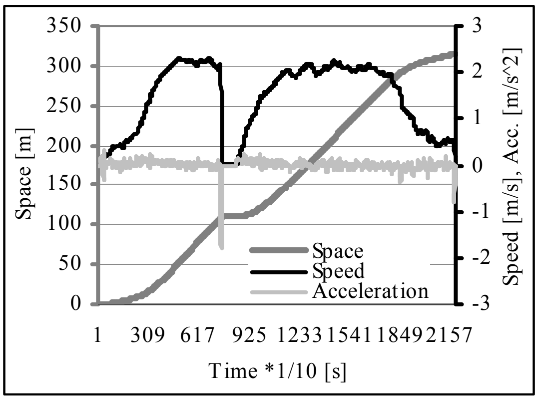


Fig.11. Kinematic elements for case 3

Fig.12. Kinematic elements for case 4

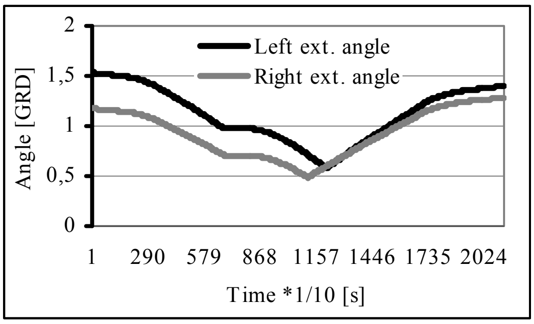


Fig.13. Deviating angles
for case 3 from fig 11

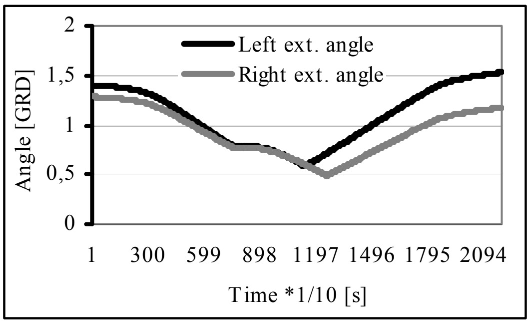


Fig.14. Deviating angles
for case 4 from fig 12

In the calculation of loads it has been used the d'Alembert [1] principle decomposing the efforts from the cable chords, in their touch points on the pulleys into components on three perpendicular directions which correspond to the axis system chosen in the discretisation of the structure of the tower of the installation. The components of the efforts from the cable chords variate both because of the incline angles of the chords but also because of the deviation angles[2] of them (fig.9,10, 13 and 14).

The variation the loads on the entire tower for each case taken into study is presented in figure 15, 16, 17 and 18.

4. STRAIN AND DISPLACEMENTS

The strein and the deplacements [1] for each case taken into study is presented in figure 19, 20, 21, 22, 23, 24, 25 and 26.

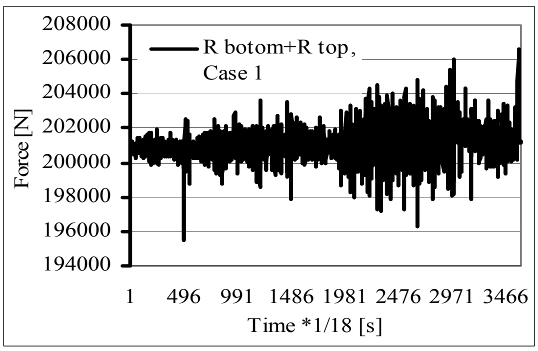


Fig.15. Total loads when the elevator
left climbing , right descending case 1

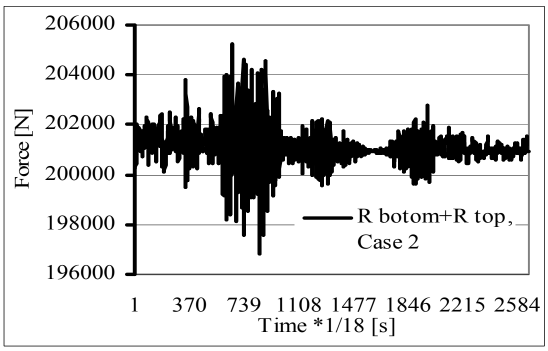


Fig. 16. Total loads when the elevator
left descending, right climbing, case 2

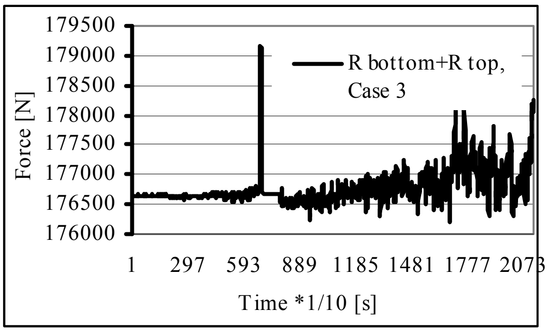


Fig.17. Total loads for case 3

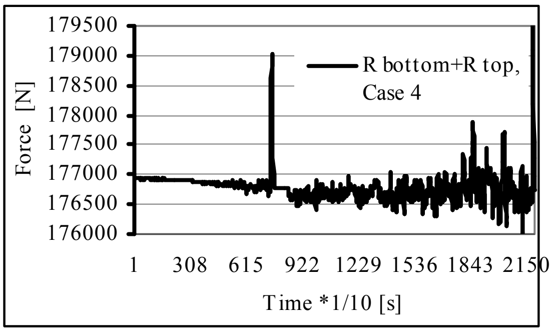


Fig. 18. Total loads for case 4

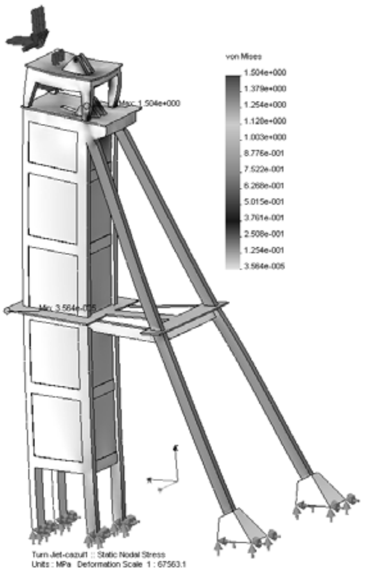


Fig.19. Strain, case 1

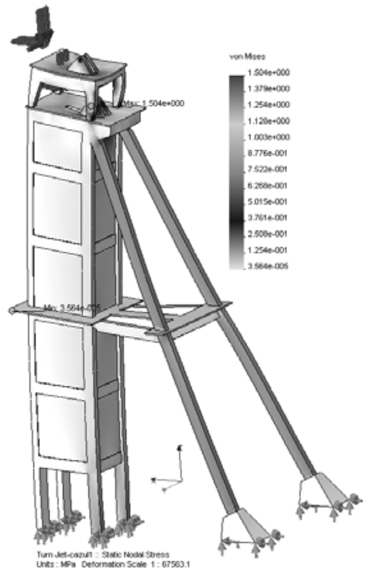


Fig.20. Displacements, case 1

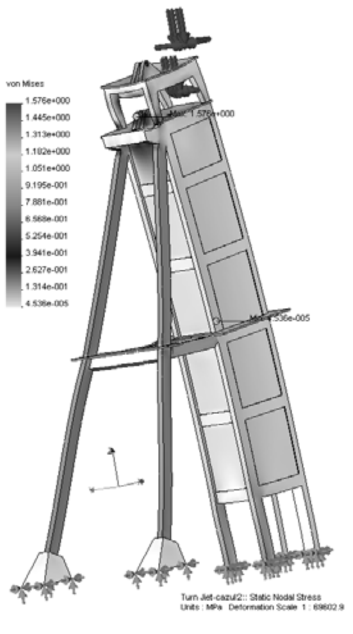


Fig.21. Strain, case 2

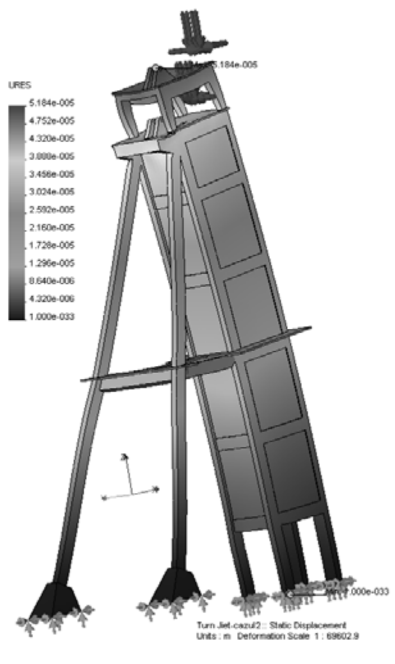


Fig.22. Displacements, case 2

5. CONCLUSIONS

There have been determined and localized the max values of strain and displacements from the tower structure, in order to establish the measuring points, in order to verify through experimental measurements the values obtained through numerical calculation Following these results there have been obtained information necessary in order to improve the maintenance of the extracting installations and to improve the existing system of repair and supply for this type of installations.

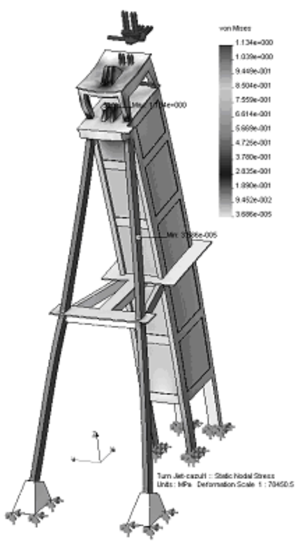


Fig.23. Strain, case 3

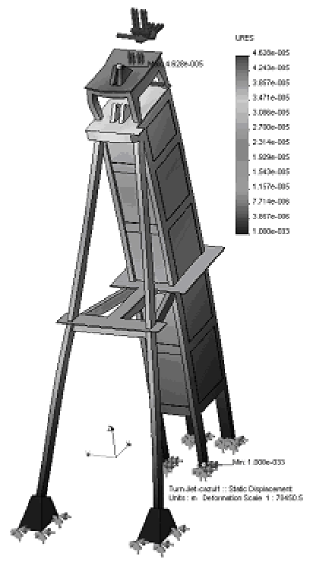


Fig.24. Displacements, case 3

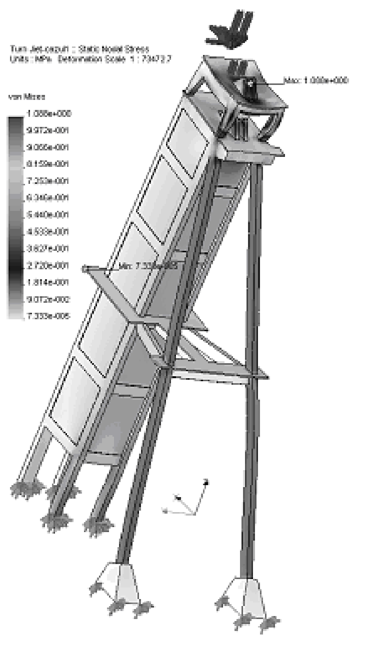


Fig.25. Strain, case 4

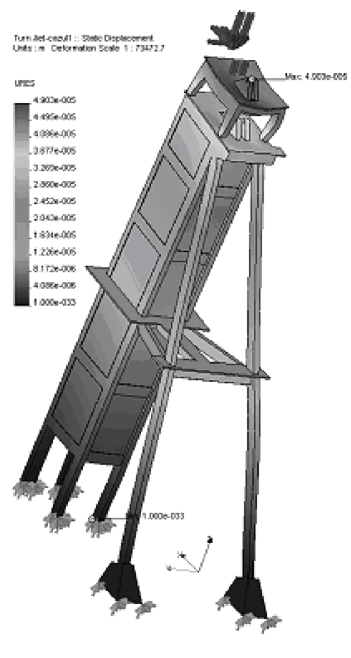


Fig.26. Displacements, case 4

6. RERENCES

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