Some Aspects Concerning the Stability of Waste Dumps

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ABSTRACT: The present papei aims to conti ibute to the improvement of ecological management decisional process, in the view of rehabilitate environment quality - from the point of view of environmental factor soil by establishing the necessary objectives for stability of waste dams

1 THEORETICAL CONSIDERATIONS

The mining activity perfoimed in Romania until the year 1989 was focused mainly onto reaching high production levels, fact which had led to neglect ecological issue and that had resulted in time of very serious damages for the environment

Rehabilitation of mining wastes dams ıepresents a constant concern of all specialists, who had cooperated along the years with very good results

The sliding of side slopes is part of the most complex natural processes, by the large numbei and vanety of the factors involved in bringing them abou and that is why side and slope stability has to be toieseen and assessed

Table 1 Situation of waste dumps in accordance with the souices of waste deposits affeient to mmmg ac tıvıtıes

Provenance of stored deposit	Storage surface (ha) Active	Pasive / In conservation	Total (ha)
From underground works	23 64	93 08	116 72
From coal processing plants	45 62	44 91	90 53
Total (ha)	69 26	137 99	207 25

As a result of the activity carried out at undei ground and piocessmg coal plants had been ıesulted a large amount of waste that were deposited in waste dumps

Piesent situation of the waste dumps as well as their location into the mining penmeter of Jiu Valley is presented in Table 1

In the view of rehabilitating die Jiu Valley envi ronmental quality, as regard the "soil" factor, it is imposing the improvement of ecological management It will be establish the affeient objective con cermng the ecological ıeconstructıon

Fiorn geological point of view, these deposits consist of the following types of rocks shale, mai ly - shales, marls, shaly - mails, marls - limestone, shmes, cmdei, etc

Deposits of waste dumps resulted from coal piocessmg plants in addition to the waste slimes resulted from the coal processing activity, includes also a lange of elements such as chemical ıeagents, lubricants, diesel, tar, etc

The settling ponds affeient to Coroesti coal piocessmg plant, with 24 8 ha total surface, occupy an important land area located in the Western Jiu light riverside, at 250m distance to the coal processing yard From technological point of view, the settling ponds have been formed by storing the residual slimes resulted from coal piocessmg process peifoimed at Coioesti coal processing plant onto a hon zontal platform embanked all aiound its surface Onto the settling ponds' supporting sides, the large size waste ıesulted from coal screening and ciushing processes together with olheı ıesıdues resulted fiom the technological process of Coioesti coal processing plant, have been transpoited and stoied. In order to protect the settling ponds against the possible West ern Jiu water floods, protective walls have been built

2 THE SYSTEM ANALYSIS OF SIDE STABILITY

The study stages of the instability phenomena aie presented m flow chart m Figure 1 The assessment of the mining works' stability was perfoimed by taken into consideration the stiuctural and physical characteristics of the locks and the stress - stiain

state in the rock massif repiesenting the input parameters, (Mannescu, 1988)

Besides, the deterministic and probabilistic methods based on measurements and observations, stability analysis can be undertaken by estimating the *stability factor*

A complete definition of the stability factoi can be given by compaung the stress state in the sliding plane, $F_s = t/r$, where,x_r represents the value of the mobilized shearing strength and it is the value of the tangential thrust produced in the rock- mass

Numerous methods of analyzing stability can be classified according to different criteria, nevertheless they can be classified into two large categories

Methods of static equilibrium

Methods of deformation, based on the stress-stıaın relation,

or mixed methods (Manea, 1998)

In the second category, the determination of the Stress State in the rock- mass, this is compared and done by several techmques

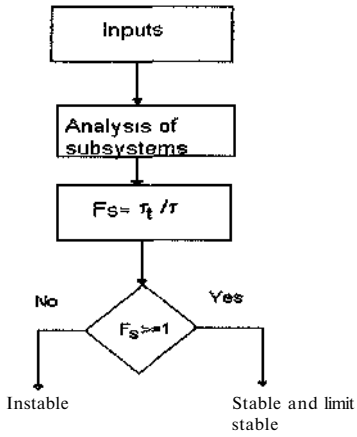

Figure 1 The flow chart of stability system

The method divides the analyses environment into small domains, on which a simple distribution of stresses and strains ıs consıdeıed, while the stresses aie average on a finite volume in the rock mass The ' a prion" knowledge of the position of break surface, by applying the finite element method indicates the aieas with stress concentration and their evolution with the load state, the areas with tensile stress and the displacements before slope break (Aiad et al 2000 a)

3 RESULTS AND COMMENTS

In the paper, the determination of the Stiess State was earned out using the finite element method (Salvadon and Baron, 1972)

In the case of a waste dump, which can become unstable owing to weather phenomena the analysis method of the Stress and Strain State by the finite element method had been applied For the conditions from Jm Valley coal Basin at Ileana 1 waste dump the solution of the numerical modeling was obtained The Ileana 1 waste dump lies on an area of 14 26 ha, having 21 m average height and a volume of 4 283 656 m^3

From the laboratory tests and the material characteristics it is known that the elasticity module, E= 200x $10^6 N/m^2$, Poisson coefficient u. = 0 3, ınneı friction coefficient q> = 34", apparent specific gıavıty y = 2 2x10^4 N/m^3, volume weight y =2 31x10^4 N/m\Arad et a1, 2000 a)

The displacement on the contour of the slope and Stress tensor has been plotted m Figures 2 and 3

In Table 2, are given the values of the parameters characterizing the stress state calculated m the point at the side bottom, the side top and the critical point to right extremity of the geometric model The model of the slope waste dump is rendered in Fıguıes 2 and 3

Table 2 The parameters of the stiess state foi the geometric model

Parameter (UM)	At the slope top	At the slope bottom	In the cnti cal point
	Value		
S_x(m)*	100	0 89	0 79
5»(m)*	-0 71	0 52	100
CT_{+},(10°N/m'r	4 14	2 07	6 21
a_M,(10'N/m')**	1 89	311	49
0_x(1O'N/m')*"	2 96	0916	48
aW N(nr)""	28	169	355
$i_{x)}$<10'N/mT"	1 82	0 85	2 59

* Displacement

** Tresca and von Mises Stress

•"• Stress tensor

Legende
—*— Stress c

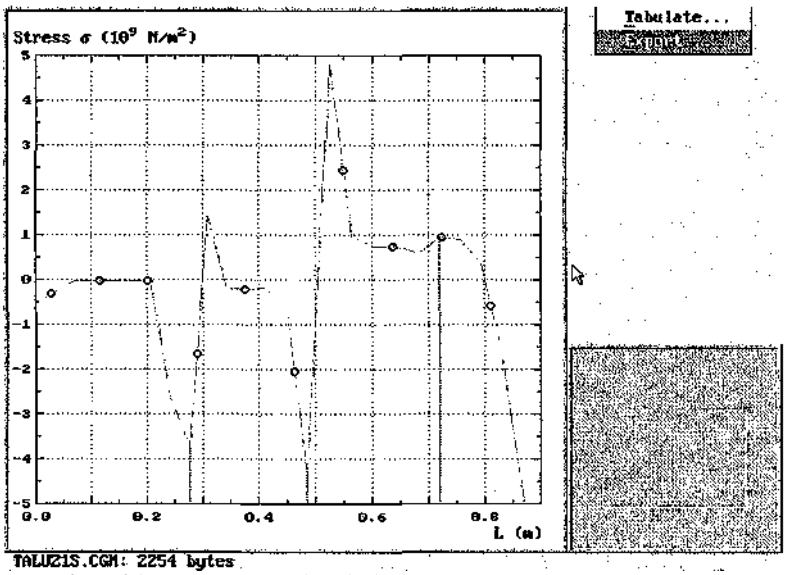

Fig. 2. The Variation form of the stress tensor .on the side slope

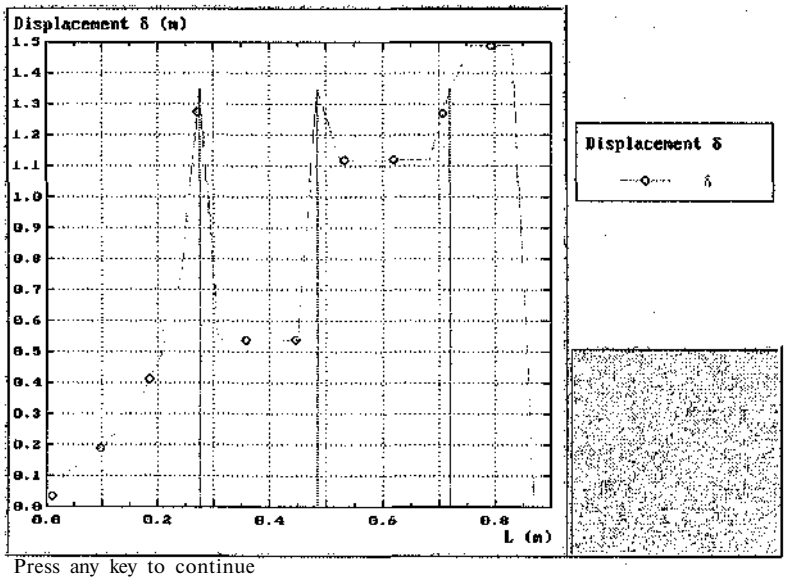

Fig.3 The variation of the displacement of the slope contour

4 CONCLUSIONS

Corroboration of the results obtained by numeiical methods, of slope modeling, and the statistical processing of the large numbei of instability phenomena by long term observations on them imposes making out prevision charts ot instability phenomenon

The prediction on slope stability, and in geneial on that of sides, is a requnement due to the negative impact ot the instability phenomenon on the snvironment

The numerical methods for the simulation of the Stress State in the waste dump of block were examined to assess their use in pıedıctıon sliding ot the slope (Ai ad, 2000b)

Fiom the analysis of the results obtained we find out that the stresses occurring in the waste dump slope are higher than the conesponding mechanical resistances (o_{ro} = 5x10^6 N/m^2, a_a = 1x!0^6 N/m^2, i_{rf} = 3 41x10^6 N/m^2) determined in the laboratoiy, theretoie the slope is unstable

Regarding displacements, it is found out that these have maximum values on the veıtıcal, which does not, however, affect waste dump stability

The accident data recorded from mine tailings dams indicate that the great majority of the sliding of these deposits occurred as function of the bad and low strength of dam foundation pioperties

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