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Excavation Methods and Excavation Modelling from South Wells of Iran by Poro-elastic Method

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ABSTRACT

Excavation fluids are important sections on excavation operations which are being used to control well and propel excavation barrels to ground surface. Thus, they play important role in the operations without having excavation operations. Today, some of cases which used in excavation are made as artificial but all manufacturers insist on adaptability and the rigid laws pertain to geographical situation and regional limitations.Excavation clay consists of water and other materials in order to facilitate and continue excavation operation which has been used in Iran and different materials with physical and chemical properties have been added.In this article, by geo-mechanical modelling of tank and well with poro-elastic model which is derived from continuation, compromise, balance, hook and darcy equations, Poro-elastic equations are located in Matlab environment and solve by limited element in order to increase tensions and pressure around well during certain duration.

KEY WORDS: EXCAVATION CLAY, EXCAVATION CLAY SYSTEM, PORP-ELASTIC, LIMITED ELEMENT MODEL

INTRODUCTION

Excavation clay has long term history since last past to now, at first, the Chinese understood that the clay softens what is on structure and they believed that excavation clay helps to rise up the barrels from bottom of well. Regardless some well which excavated by Chinese in 18th century, some well excavated in row of stones by hand which the first well was excavated by two brothers named David and JospehRafner at 1806 to 1807 for salt water (Hartman, 1959).

In this regard, in 1829, when excavation was continued to excavate salt water in one of the states of America, immediately, 1000 barrels of oil were propelled from well instead of salt water. In systems which have been used till 1846 and after that, flowing water has been used. No data about excavation method. In 1890, Chapman pointed that water and plastics can and this

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is start of modern engineering in history of excavation clay. He obtained applications of excavation clay that means ability to prevent from watering in layers and concluded that another material has been used to cover well wall (Rothenburg *et al.* 1994).

Chapman pointed to application of soil, core of wheat, grains, cement and similar materials. In 1889, a watery well employer named Androw from America pointed that paste soils can be applied to make wall voids. At same year, person named John Yakingham stated that fat materials have been used instead of water to apply soil clays.On October 1990, Krat Mill stated that when excavation fluid was wetted by soil, it helped to make well significantly. Apparently, in that period, excavation fluid could not attract others and physical properties were not suitable to influence on it.It can be imagined that clay was made by well solids is so heavy or high granular and it has been used to slight it. If total granule is reduced or adds from tanks into new clay system, excavation is continued. If total weight is slight, well evaporates and if the drop is so much, falling of well wall caused cleavage of pipes(Hutin *et al.* 2001).

There are not effective additives ingredients for control physical properties and it was made by claying. 13 years after advent the first excavation clay for Lucas at 1901, the model was emerged as necessity in excavation industry in order to discuss excavation investigations. This problem was discovered in 1914 after vast research was performed by PoulardVehigourg who used more concentrated clay for excavating well in Oklahoma State. They stated that use of clay and soil is not new phenomenon in excavation industry and the first well has been excavated in Texas by clay but till 1913, when the wells were excavated by tower and without using clay, suitable clay is one which is so concentrated and can block voids of classes as if the fluid cannot penetrate into well, so that it has able to block sand voids, prevent from dropping of well and control gas pressures(Williamson, 1968).

MATERIAL AND METHODS

In order to display tension and penetration pressure of porosity environment, the fluids are obtained by combination, continuation, balance, compromise, hook and Darcy equations (1).

$$G\nabla 2u + (G+\lambda)\boldsymbol{\nabla divu} - \left(\mathbf{1} - \frac{K}{K_m}\right)\nabla \text{p}=0 \quad (1)$$

$$(1-\frac{\text{K}}{\text{K}_\text{m}})\text{ div ut} + (\frac{1-\varphi}{K_M} + \frac{\varphi}{K_F} - \frac{1}{(3K_m)^2} i^T Di)P_t + \frac{K}{\mu}\nabla 2p = 0 \quad (2)$$

In which y is fixed, Lame, G is shearing model, K stability, U is viscosity of fluid and u and p are replacement and pressure, t is time and u is porosity, D matrix of elastic fatigue, K, Km, KfYalk model of building, matrix and fluid (0, 11), i= two dimensions calculations also D is function of F (Young model) and V (Poison coefficient).

Modelling or solving element is written in Matlab environment.

Poro-elastic model was obtained as limited element model (2).

$$\begin{bmatrix} M & -C \\ 0 & H \end{bmatrix}\begin{bmatrix} u \\ \text{p} \end{bmatrix} + \begin{bmatrix} 0 & 0 \\ C^T & S \end{bmatrix}\begin{bmatrix} u_t \\ p_t \end{bmatrix} = \begin{bmatrix} f^U \\ f^p \end{bmatrix} \quad (3)$$

In this model, parameters (4) are:

$$\text{M}=\int B^T DBdv \quad (4)$$

$$\text{H}= (\text{K}/\mu)\int (\nabla N)(\nabla N^T)dv \quad (5)$$

$$\text{S}=\int N[((1-\varphi)/\text{Ks}) + (\varphi/\text{Kw}) - (1/(3\text{Km})2)\text{ iTDi}]\text{ NT dv} \quad (6)$$

$$\text{C} = \int [B^T iN - B^T D\left(\frac{i}{3Km}\right)N]\text{ dv} \quad (7)$$

One of the best methods for solving equations is obtained by Zozanagheh (3).

$$\begin{bmatrix} M & -\theta C \\ C^T & S+\theta\Delta tH \end{bmatrix}\begin{bmatrix} u_{n+1} \\ p_{n+1} \end{bmatrix} = \begin{bmatrix} (\theta-1)M & -(\theta-1)C \\ C^T & S+(\theta-1)\Delta tH \end{bmatrix}\begin{bmatrix} u_n \\ p_n \end{bmatrix} + \begin{bmatrix} f^u \\ \Delta t f^p \end{bmatrix}$$

In which, θ = 1.2 is considered.

In order to discuss effect of weight increment on tensions of clay and penetration pressure, firstly, a tank with pressure 500 psi (34e5pa) is considered and clay pressure is increased to 870 (60e5pa) and its effects are discussed on tension and pressure.

Borderline situations are displayed for following figure:

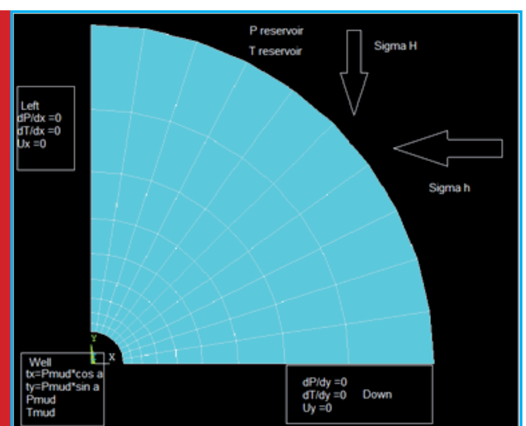

FIGURE 1. Tank and well by borderline situations

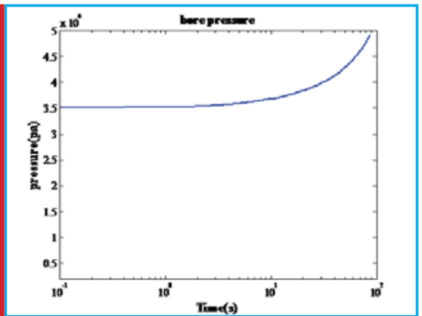

FIGURE 2. Increment of penetration pressure (pascal) on touching with clay in terms of second

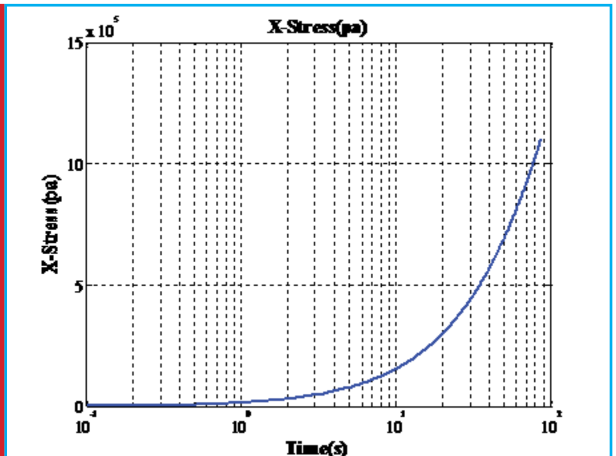

FIGURE 3. Increment of tension in step of x (PASCAL) to second

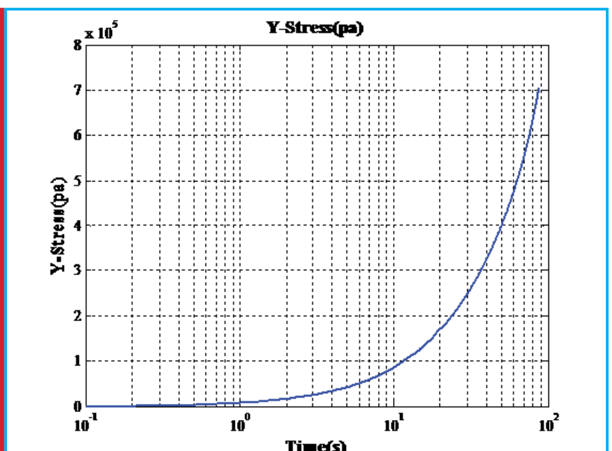

FIGURE 4. Increment of tension in Y (pascal) to second

RESULTS AND DISCUSSION

In order to discuss effect of weight increment for tensions and well of wall, firstly, a tank with pressure of 500 is considered and scale of pressure is increased till 870.

Entrance data are:
E=560e5 Pa,
K=16.e-14 m2
μ=26222 Pa.s
ν=2624, ϕ=2614
λT=162,
Kf=1e12 Pa,
Km=22e5 Pa,
ρfcf=1022242
ρscs=1520222
βs=14e-. °C-1,
βf =322e-. °C-1,
Sigmah=360e.Pa,
SigmaH=4e. Pa
fu,fp

Which are node load of pressure and replaced node of pressure equal to zero and all nodes are equal to tank pressure.

CONCLUSION

With increment weight of excavation clay and pressure around well is increased and in the lacking calculation of total weight, in this article, by increment of weight of clay from 34e5 to 60e5 in Pascal and as for information it was increased as 96% from tension around well.

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