ABSTRACT

Internal Erosion initiated by water movement along channels called tunnel erosion, often crack or defect the dam's structure. It is one of the main causes of water structure's (dams, dikes, etc.) collapse. This phenomenon can be divided into 3 phases, tunnelling, collapse, and the opening of the channel inside the dam [1]:

- "Tunnelling" transport large quantities of particles due to the hydraulic gradient. It's happen fast in a preferential path especially in some point of dam structure's weaknesses.
- The gradual collapse of the roof of tunnel erosion allows the expansion of the channel.
- The opening of the channel is started after the collapse of the channel by tunnel erosion.

Research has been done to explain the phenomenon of collapse, but there are still questions, including the formulation, phase, and form of the rupture. Moreover, the equation used is not always adapted to the various cases of the soil. Research by Hunt and Hanson showed the different phases of a dam collapse with a rate of expansion of a hole driven only by the constraint of shearing.

Through this numerical study, we find that their hypothesis is not correct, because there are other parameters that affect this phenomenon and also the effect of traction force. The study is simplified by modelling an earthen dam with a given cavity; where the undrained cohesion is controlled to see at which value of cohesion the fracture achieved. This simplification is the opposite in the real case, where the cohesion is fixed but the cavity expands. We find that the collapse of the earthen dam because of the tunnel erosion occurs in two stages: the arching effect in the channel across the dam that makes vertical sag then collapse, and the expansion of the channel which is inclined more like a slope. The high of the dam and the form of the "tunnel" cavity also influenced the failure mode.

Keyword: Internal Erosion, Collapse, Numerical Study, Tunnelling.