

TERRACE MINING OPTIMUM EXCAVATION STRATEGY

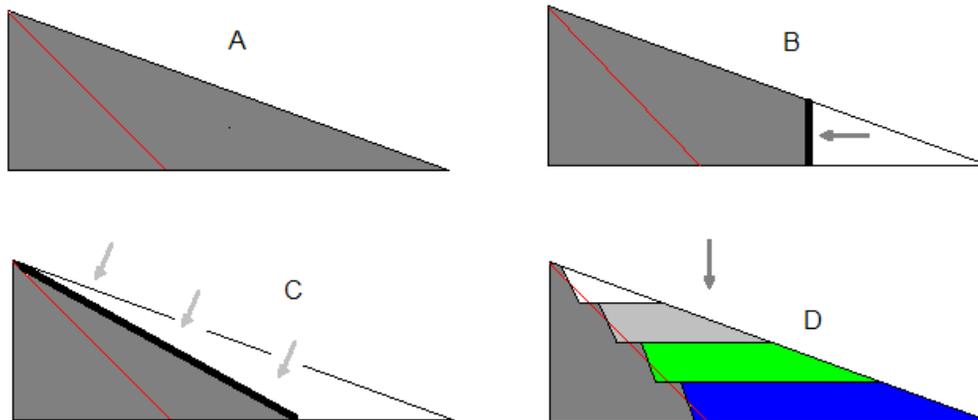
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This note deals with the geometrical facet of the cultivation of a terrace quarry as performed by the software ALE Advanced Land Editor. ALE suggests several work tools. Some of these tools are automatic up to the design of a quarry in 3d mode by a single command or "wish". Other commands allow local adjustments.

Cultivation Strategy

The figure A shows the grey section of an hill side to be excavated. The red line in the same section is the track of the final average slope of the quarry. The main problem is to set a cultivation strategy to go step by step to the final result.



The figure B shows an excavation from down to top in such a way to get a service platform for moving materials and other operation. Following this strategy you will soon generate an high step and will be forced to move upward the excavation front line. You see that working this way a possible rolling stone can land on the service platform with danger for persons and materials.

The figure C shows an excavation here and there along the hill side in such a way to progressively increase the slope up to the final result. It is evident that the above danger is still there and is also increased.

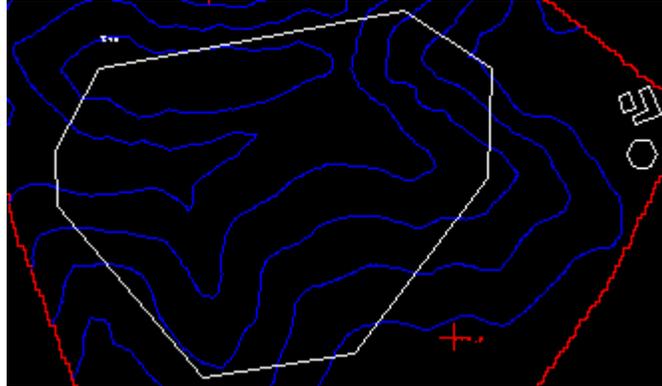
The figure D shows an excavation from top to down by terraces. A small service platform is first generated at the maximum elevation and than is increased and moved downward.

Let us suppose to choose the last strategy. We shell still choose an elevation step and a width of each terrace. The note [Cultivation of Terrace Mining](#) deals with this problem..

Automatic Modelling

Note that the above considerations have been done on a single section whereas the mining may be developed on a large and complex shape. The strategy is clear but the design needs a long work to get a large number of cross sections and develop the cut volume calculations. The ALE Advanced Land Editor program elaborates a single stage project (see next figure) and automatically generate all the design documents (maps, sections, calculations, 3d views) for each progress terrace. Of course this is a suggestion because no software can substitute the expertise of a qualified professional engineer.

Let us observe the work steps. The next figure shows a territory and an boundary line to select the area to be cultivated.



ALE provides a card where you should indicate the elevation step, the width and the maximum angle of the terrace.

Starting from these data, a window immediately shows the calculated average slope of the quarry.

It is possible to select a normal orizontal terraces quarry or an inclined terraces one.

Horizontal
 Inclined

3 Points
 Polar coordinates

Optimized
 Max volume

Terrace angle:
 Elevation step:
 Terrace Width:

Average angle of excavation = 32,3° Distance between 2 terraces = 7,88 m

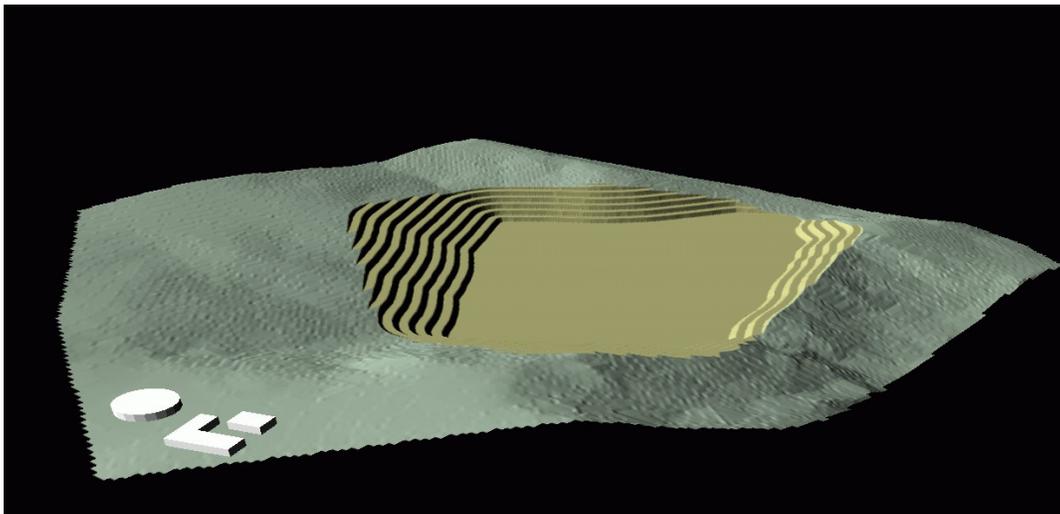
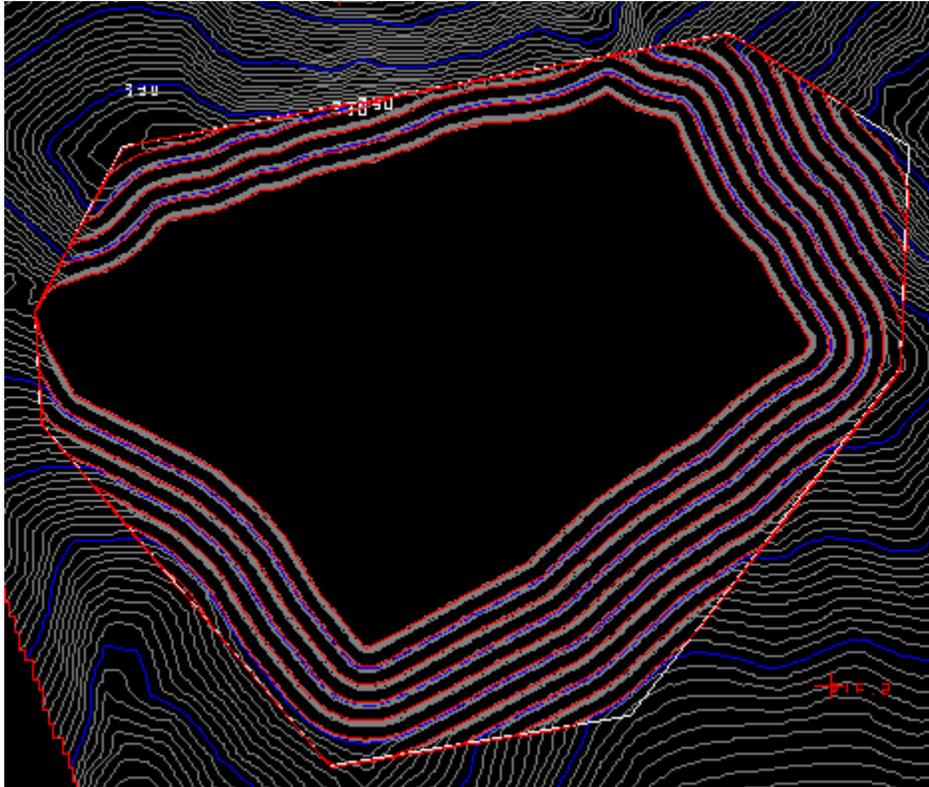
Now ALE shows a summary of the proposed design :

Ale

Terrace Width = 5
 Elevation step = 5
 Max slope = 60°
 Minimum elevation of the excavation = 312,8
 Distance between terraces = 7,89
 Average angle = 32,4°
 Number of terraces = 10
 Terrace elevation :

1	312,8
2	317,8
3	322,8
4	327,8
5	332,8
6	337,8
7	342,8
8	347,8
9	352,8
10	357,8

Then ALE automatically generates the final design going step by step from the top to down :



Optimum volume

Making reference to the first figure of this note, you see that it is hard to get a larger excavation volume using the same design parameters. As ALE make the same work in the 3d space the proposed shape is neat to an optimum.

Management of the Project

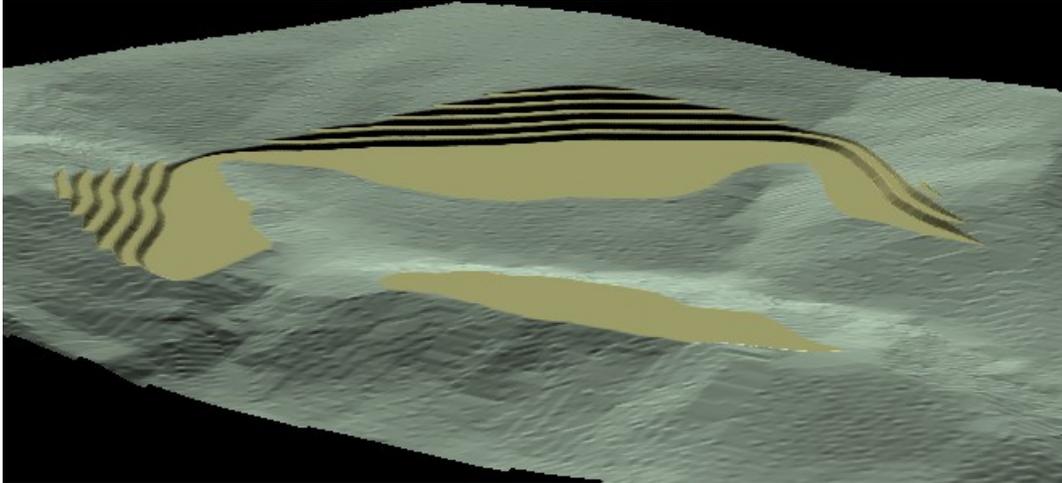
ALE adds power but allows a large freedom.

Any parameter of any single terrace of the quarry may be managed and changed. Also the map shape of each terrace may be edited as a polyline. The project will be immediately updated.

In-between Configurations

As ALE generates the project step by step, the design documents (maps, sections, volumes, 3d views) are available for the in-between configurations.

The next figure shows the configuration following 6 out of 10 terraces.



Calculation of the Excavation Volumes

The method to calculate the cut and fill volumes both by cross sections and by prisms is illustrated in the note [Calculation of Cut and Fill Volumes](#).

Evaluation Version

An evaluation version may be downloaded from the following site.

WWW.GEODIS-ALE.COM