بسم الله الرحمن الرحيم

{ هو الَّذي جَعَلَ لَكُمْ الأَرْضَ دَلُولًا فَامَشوا فِيهَا }

{ مناكِبِهَا وَكُلُوَّا مِن رَزْقِهِ وإِلَيْهِ النَّشُورِ }

{ صدِقَ اللَّهُ العَظِيمُ }

سورة الملك (67)
Mining Sector In Egypt

By
Dr. Sayed Ahmed Ali
• The Egyptian Mineral Resources (EMRA) was established in 1896 and was entrusted by Egypt for preparing geological mapping for desert regions in Egypt and for searching, exploring and evaluating its mineral resources.

The authority provides technical consultations to many of government agencies, mining companies, housing and construction projects, and land reclamation. As well as, it helps agencies concerned with water and energy affairs.
Geological mapping

• The authority provides its services in preparing geological and structural maps of different scales.

Mineral Exploration

Preparing detailed studies and geological and geochemical exploration, researches for basement rocks, sedimentary rocks and different mineralization halos (occurrences).
EMRA SERVICES

Geophysical Studies

Doing aero magnetic, electromagnetic, radiometric geophysical survey, Self Potential (SP) and Induced Polarization (IP)

Well logging with Gamma-ray measurement, Measure the density, Measurement of the neutron, Thermometry, Measure the diameter of the well, Measuring a inclination of well angel, Self-electric voltage measurement, Measurement of electrical resistance

Making seismic studies, geotechnical studies and ground water researches using Ground-penetrating radar (GPR).
EMRA SERVICES

Evaluation of the Ores

• Estimating the certain geological reserve of discovered ores, preparing reports and detailed maps.

Drilling

• Drilling inclined and vertical wells with different diameters and depths for the purpose of mineral exploration and ground water researches.
The Geological Information Center

Egyptian Mineral Resources Authority Prepares publications of maps and information packages about different ores, and offering them for sale, and providing the service of information searching as well as The Geological Library that available for every one.

In addition to preparing digital geological maps of different regions either by field studies or from satellite images by the Geographic Information systems (GIS) unit.
EMRA SERVICES

The environmental Department

• Preparing geo-environmental reports and studying the locations of natural hazards.

The Geological Museum

Carrying out advanced scientific studies of all vertebrate and invertebrate fossils, minerals, rocks, Chondrite, Gem stones and showing large number of rare samples that represent these types.
The General Administration of Labs

Mineral and geochemical studies
preparing and study thin and polished sections by polarized and electronic microscope.

Making qualitative analysis using X-Ray Differential (XRD) for rocks and quantitative analysis using X-Ray Fluorescence (XRF) for minerals and rocks

And Inductively coupled plasma / optical emission spectrometry (ICP/OES).

Carrying out atomic adsorption and fire assay for Gold, and making analysis of rock samples, ores, water and air samples using different measuring devices
Examining and granting mining ores, exploration and Exploitation licenses requests according to the governing laws and rules.
MINING THE

Mining is the pick up any rocks or extraction the minerals or any natural materials from ore body, which takes a variety of bodies as a veins, blocks or layers, they are present on the surface of the earth or subsurface.
MINING INDUSTRY IN EGYPT

Mining industry in Egypt Characterized by like all other industries periods but continued as an unknown soldier behind the success of many of the industrial, agricultural, and other activities, which helped push the country's economic development wheel.

Egypt is rich by mineral resources which economically -quality raw materials that reach back over one of seventy minerals, including gold, iron, phosphate and ilmenite and white sand, black sand, gypsum, kaolin and ornamental stones, coal, manganese, sulfur, niobium, tantalum and other large economic raw materials, which is characterized by some scarcity at the level of the world.
mineral resources in Egypt and the world is divided into three main components:

A - solid energy raw materials include: -
    Carbon raw materials such as coal and oil shale.
    Radioactive materials such as uranium and thorium. (Nuclear Materials Authority)

B- metallic materials include: -
    - Iron ore: ilmenite chromite, manganese - - -
    - Non-ferrous materials: Copper, Lead, Zinc, Nickel, Cobalt - - vanadium .... etc.
    - Precious metals: Gold , Silver,, Platinum - -

C - Non metallic ores to include: -
    The chemical industry and fertilizer raw materials such as potassium phosphate evaporite - - sulfur limestone Talc - -
    Refractory and ceramic raw materials such as feldspar choline girls Sand Glass - - zircon quartz bentonite
    Construction materials such as limestone- sandstone basalt sand - gravel dolomite.
ACHIEVEMENTS OF EMRA

The previous field works and expeditions led to discovery of many ores of high economic value, which is utilized some of them now, such as:

Iron ore (Bahariya oasis), Maghara Coal mine, North Sinai

Phosphate ore (Nile Valley, the Red Sea, Abu Tartour),

Ilmenite ore in Abu Ghalga - Abu Ghosoun),

Kaolin ore zone (Kalabsha - Aswan and east of the city of Abu Zenima),

White sand (sand glass) Kinds (Wadi Qena and North and South Sinai),

limestone ore and dolomite zones (Bani Khalid in Samalout and North Sinai and Abu Rawash), and other raw materials utilized currently, such as:

Gold, areas (Alsokari- Hamesh) in addition to other research areas such as gold (Valley Alaqa- or Alfoackher- Wadi Cream.. etc.) and most of them are concentrated in the southern and central eastern Desert,

There are also some metals and other raw materials in the process of exploitation, such as niobium and tantalum ores, tin, quartz and feldspar zone (Abu Dabab).
A - SOLID ENERGY RAW MATERIALS INCLUDE: -
CARBON RAW MATERIALS SUCH AS COAL

<table>
<thead>
<tr>
<th>نوع</th>
<th>C</th>
<th>H</th>
<th>N</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>مادة خشبية</td>
<td>49.7</td>
<td>6.2</td>
<td>0.9</td>
<td>43.2</td>
</tr>
<tr>
<td>البيت</td>
<td>56.6</td>
<td>4.8</td>
<td>1.7</td>
<td>36.9</td>
</tr>
<tr>
<td>اليجنايت</td>
<td>65.2</td>
<td>3.5</td>
<td>1.2</td>
<td>30.1</td>
</tr>
<tr>
<td>البتيومين</td>
<td>84.5</td>
<td>4.6</td>
<td>1.5</td>
<td>9.4</td>
</tr>
<tr>
<td>الأنثراسيت</td>
<td>93.6</td>
<td>2.3</td>
<td>1.1</td>
<td>3.0</td>
</tr>
</tbody>
</table>

There are four types of Coal according to Chemical composition

Maghara Coal mine, North Sinai is bituminous Coal
MAP SHOWS THE OCCURRENCES OF THE COAL IN EGYPT
SOME INSTRUMENTS IN MAGHARA MINE (BEFORE IT CLOSED)

Maghara Coal mine, North Sinai, subsurface working
OIL SHALE

Major Process Steps in Mining and Surface Retorting

1. Mining and crushing
2. Retorting
3. Oil upgrading
4. Oil to refinery

- Spent shale disposal on-site
- Reclamation

Oil shale sample
SUBSURFACE MINING TO OIL SHALE

Major Process Steps in Thermally Conductive In-Situ Conversion

1. Drilling and site preparation
2. Heating and production
3. Postproduction clean-up
4. Oil to refinery

The Shell In-Situ Conversion Process

Oil shale

Overburden
OIL SHALE OCCURRENCES IN EGYPT

Outcrops of Duwi and Dakhla Formation
40 gal/t max. FISCHER ASSAY YIELD

Cross Section A-A'

Gebel Hamrawein
Gebel Duwi

1000
500
Sea Level
OIL SHALE OCCURRENCES IN EGYPT (CENTRAL EASTERN DESERT)

1. Wassif area (40 gallon / ton) – 1
2. Hamrawein area (20 gallon / ton) – 2
3. Dawi area (40 gallon / ton) – 3
4. Abu Shgeila area (23 gallon / ton)
5. Al Atshan area (not known)
6. Abu Tundub area (not known)
7. Um El Heweitat
8. Al Beida
9. Al Nekheail
10. Naser
11. Ali Zean
12. Younes
13. Mohammed Rabah-
location map to Iron ore in Egypt, There are nine occurrences
IRON ORE IN EGYPT

area 1 - Abu Marwa
area 2 - Wadi Karim
area 3 - Wadi El Dabbah
area 4 - Umm Ghamis El Zarga
area 5 - Gabal El Hadid
area 6 - Um Nar
area 7 - El Ewinat
Aswan area - 8
Bahariya area – 9

The Iron ore ranges between 38% to 55% of iron oxide and it becomes economic.
Iron is used in Ferrous Alloys and steel industries.
Location map to manganese Ore in Egypt

Um Bogma
Ash El Malaha
Abu Ramad
Manganite mineral is found in Sedimentary Rocks.

Manganese is used in Ferrous alloys, non-ferrous alloys and steel industries.
Ilmenite is the source of Titanium element.
Ilmenite in Egypt is found in:
1. Abu Ghalaga area, South Eastern Desert
2. Area between Al Aresh and Rosetta
3. North Sinai
GHROMITE ORE IN EGYPT
Chromite is the source of Chromium element and used in alloys.

Chromite is found in Abu Dahr, Sol Hamed and other areas as lenses, pockets and layers in ultra mafic rocks.
The oldest gold mine map in the world in fawkhair area, Eastern Desert, Egypt
Atallah Gold mine, Roman building
The essential old mines in Eastern Desert (more than 100 old mines are concentrated in the Eastern Desert)
Gold Tailing Sites in Egypt

 مواقع تفايـات الذهب في مصـار
Sukari Gold Factory
PRODUCTION AREAS IN SUKARI GOLD MINE
THE FIRST GOLD ALLOYS (HAMASH EGYPT COMPANY, 2007)
COPPER ORE (OCCURRENCES) IN EGYPT
COPPER ORE IN SOUTH SINAI
Feldspar ores (occurrences) in Egypt
FELDSPAR VEINS IN EASTERN DESERT IN EGYPT

1. Rod Ashab
2. Marwat Seweigat
3. Wadi EL Gemal
4. Wadi EL Gendi
5. Umm Rashid
6. Abu Khrug
7. Umm Ghayam
8. Rod EL Laqah
9. Abu Hargal
10. Bir Abraq
FRIABLE FELDSPAR IN SOUTH SINAI
QUARTZ ORES IN EGYPT
Veins, blocks, pockets and layers

Agate
Jasper
Amethyst
milky Quartz
Quartz ores (occurrences) in Egypt
WHITE SANDS PRODUCTION IN EGYPT

Used in optics, crystals and photo cells
White sands location map in Egypt
LOCATION MAP FOR MAGNESITE ORE IN EGYPT
SALT DEPOSITS LOCATION MAP IN EGYPT

Solar Deposits
Rock Salts
BLACK SANDS LOCATION MAP IN EGYPT
BLACK SANDS ARE MANY MINERALS WHICH ARE CHARACTERIZED BY HIGH SPECIFIC GRAVITY

Gold, platinum, chromite, magnetite, zircon, monazite, rutile, shene, garnet, topaz, corundum, imenite and others. They are formed from placer deposits by water and waves.
Cement Industry

• The Egyptian cement industry consists of twelve players.

• In 2002, Egypt ranked 13th among the major cement producing countries.

• The major export markets for Egyptian cement are Mediterranean countries in Europe, Arabian Gulf countries, and north and east Africa. Smaller quantities are exported to the east coast of the USA.

• As a result of low raw material costs and reliable, competitively priced energy, Egypt has significant cost advantages over other cement producing countries.
Chemical Components

Calcium Oxide 64% \( \text{CaO} \)
Silica 22% \( \text{SiO}_2 \)
Alumina 6% \( \text{Al}_2\text{O}_3 \)
Iron Oxide 3% \( \text{Fe}_2\text{O}_3 \)

And minor other oxides like MgO, K2O, Na2O and P2O5
<table>
<thead>
<tr>
<th>Oxides</th>
<th>Major Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lime</td>
<td>Limestone, Chalk, Marl</td>
</tr>
<tr>
<td>Silica</td>
<td>Sand, Clay, Shale, Slag, High-silica limestone</td>
</tr>
<tr>
<td>Alumina</td>
<td>Shale, Clay, Sand, Bauxite, Alumina ore refuse, Fly ash</td>
</tr>
<tr>
<td>Iron Oxide</td>
<td>Mill scale, Iron ore, Clay, Ore washings, Pyrite cinders</td>
</tr>
</tbody>
</table>
## Effects of Minor Oxides on Process and Products

<table>
<thead>
<tr>
<th>Oxide</th>
<th>Effect</th>
<th>Typical Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MgO</td>
<td>Concrete expansion</td>
<td>&lt; 4 to 5% in clinker</td>
</tr>
<tr>
<td>K₂O &amp; Na₂O</td>
<td>Concrete cracking, Kiln instability</td>
<td>1% depending on SO₃, 0.6 for low-alkali cement</td>
</tr>
<tr>
<td>SO₃</td>
<td>Kiln rings, instability, stack emissions</td>
<td>1 to 2% depending on process and alcalis</td>
</tr>
<tr>
<td>TiO₂</td>
<td>Low impact</td>
<td>1%</td>
</tr>
<tr>
<td>P₂O₅</td>
<td>Negative impact on concrete strength</td>
<td>0.5%</td>
</tr>
<tr>
<td>Cl⁻</td>
<td>Kiln instability, stack emissions</td>
<td>0.02% raw mix, less depending on process</td>
</tr>
</tbody>
</table>
RAW MATERIALS EXTRACTION AND MIX PREPARATION

Cement
Gypsum additive
Grinding
Burning

Clinker

Prehomogenization

Homogenization

Kiln dust

Kiln Feed

Kiln

Dosing

Additive Materials

Raw Mix

HOMO SILO

Grinding
Clays is essential in cement industry
Drilling is the tool to known the ore such as clays and limestone.
Cement Plants in EGYPT
**TOURAHM CEMENT COMPANY**

<table>
<thead>
<tr>
<th><strong>Production</strong></th>
<th>4 Million Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NO. of Lines</strong></td>
<td>4</td>
</tr>
</tbody>
</table>

**Middle Eocene Limestone**
- Blast vibration claims with military
- Presence of complicated structures

**Pliocene Clay**
- Low reserves
HELWAN CEMENT COMPANY

<table>
<thead>
<tr>
<th>Production</th>
<th>3.5 Million Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO. of Lines</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Middle Eocene Limestone</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Blast vibration claims with 15th May town</td>
<td></td>
</tr>
<tr>
<td>• Presence of complicated structures</td>
<td></td>
</tr>
<tr>
<td>• Dolomite bands</td>
<td></td>
</tr>
<tr>
<td>• High SO$_3$ in the upper layers</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pliocene Clay</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Low reserves</td>
<td></td>
</tr>
</tbody>
</table>
# NATIONAL CEMENT COMPANY

<table>
<thead>
<tr>
<th>Production</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NO. of Lines</strong></td>
<td>2</td>
</tr>
<tr>
<td><strong>Middle Eocene</strong></td>
<td>• High SO$_3$ in the upper layers</td>
</tr>
<tr>
<td><strong>Pliocene</strong></td>
<td>• Low reserves</td>
</tr>
</tbody>
</table>

**Clay**

[Map showing geological formations and locations]
### ALEX. CEMENT COMPANY

<table>
<thead>
<tr>
<th>Production</th>
<th>1.75 Million Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO. of Lines</td>
<td>1</td>
</tr>
</tbody>
</table>

**Pleistocene Limestone**
- Problems of Bedewing squatters
- Different material handling
- Purchased limestone
- Variation in quality

**Miocene clay**
- No clay quarries
- Purchased clay
- Variation in quality

**Recent marl Clay**
- Variation in quality
<table>
<thead>
<tr>
<th><strong>Production</strong></th>
<th>Million Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

| **NO. of Lines** | 3          |

| **Middle Eocene Limestone** | • Dolomitic limestone in the lower section |

| **Miocene (Suez)** | • Low reserves  
                       | • Interburden layer |

| **Upper Eocene (Qattamia)** | **Clay** |

---

**SUEZ CEMENT COMPANY**
ASSIUT CEMENT COMPANY

<table>
<thead>
<tr>
<th>Production</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO. of Lines</td>
<td>3</td>
</tr>
</tbody>
</table>

**Lower Eocene Limestone**
- Presence of chert
- Many cavities filled with deleterious materials

**Pliocene Clay**
- Low $\text{Al}_2\text{O}_3$ content
- Slightly high $\text{Fe}_2\text{O}_3$
<table>
<thead>
<tr>
<th><strong>Production</strong></th>
<th>3.5 million tons</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NO. of Lines</strong></td>
<td>3</td>
</tr>
</tbody>
</table>

**Pleistocene Limestone**
- Problems of Bedewing squatters
- Different material handling
- Purchased limestone
- Variation in quality
- Dolomitic limestone of El-Hammam ridge

**Miocene clay**
- No clay quarries

**Recent marl Clay**
- Purchased clay
- Variation in quality
# ELMINYA CEMENT PLANT

<table>
<thead>
<tr>
<th><strong>Production</strong></th>
<th>0.2 Million Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>White Cement</strong></td>
<td></td>
</tr>
<tr>
<td><strong>NO. of Lines</strong></td>
<td>1</td>
</tr>
</tbody>
</table>

- **Middle Eocene Limestone**
- **Cretaceous Kaolin**
### BENI SUEF CEMENT COMPANY

<table>
<thead>
<tr>
<th>Production</th>
<th>1.4 Million Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO. of Lines</td>
<td>1</td>
</tr>
</tbody>
</table>

**Upper Middle Eocene Limestone**

- Presence of high SO$_3$ in the upper layers

**Upper Eocene Clay**

- Presence of high SO$_3$ in the upper layers
**EGYPTIAN CEMENT COMPANY**

<table>
<thead>
<tr>
<th>Production</th>
<th>6 Million Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO. of Lines</td>
<td>4</td>
</tr>
</tbody>
</table>

**Middle Eocene Limestone**
- Presence of high SO$_3$ in the upper layer

**Recent Silt Clay**
SINAI CEMENT COMPANY

<table>
<thead>
<tr>
<th>Production</th>
<th>1.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO. of Lines</td>
<td>1</td>
</tr>
</tbody>
</table>

Cretaceous
Senonian
Limestone
Middle
Eocene
Clay
## SINAI WHITE CEMENT COMPANY

<table>
<thead>
<tr>
<th>Production</th>
<th>0.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO. of Lines</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cretaceous Limestone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cretaceous Kaolin</td>
</tr>
</tbody>
</table>
## MISR CEMENT COMPANY (QENA)

<table>
<thead>
<tr>
<th>Production</th>
<th>1.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO. of Lines</td>
<td>1</td>
</tr>
</tbody>
</table>

### Upper Cretaceous Limestone
- Presence of high SO₃

### Plio- Pleistocene Clayey Sand
- Free SiO₂ in the clayey sand
### Production
- Million Tons: 1.4

### NO. of Lines
- 1

#### Upper Middle Eocene Limestone
- Presence of high $\text{SO}_3$ in the upper layers

#### Upper Eocene Clay
- Presence of high $\text{SO}_3$
- Presence of high Cl
- Variation in quality

---

**MISR BENI SUEF CEMENT COMPANY**
## Raw Material Situation

<table>
<thead>
<tr>
<th>Plant</th>
<th>Limestone</th>
<th>Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tourah</td>
<td>Blast vibration claims with military Presence of complicated structures</td>
<td>Low reserves</td>
</tr>
<tr>
<td>Helwan</td>
<td>Blast vibration claims with 15th May town Presence of complicated structures Dolomite bands High SO₃ in the upper layers</td>
<td>Low reserves</td>
</tr>
<tr>
<td>National</td>
<td>High SO₃ in the upper layers</td>
<td>Low reserves</td>
</tr>
<tr>
<td>Alexandria</td>
<td>Problems of Bedewing squatters Different material handling Purchased limestone Variation in quality</td>
<td>No clay quarries Purchased clay Variation in quality</td>
</tr>
<tr>
<td>Suez</td>
<td>Dolomitic limestone in the lower section</td>
<td>Low reserves Interburden layer</td>
</tr>
<tr>
<td>Assiut</td>
<td>Presence of chert Many cavities filled with deleterious materials</td>
<td>Low Al₂O₃ content Slightly high Fe₂O₃</td>
</tr>
<tr>
<td>Ameryah</td>
<td>Problems of Bedewing squatters Different material handling Purchased limestone Variation in quality Dolomitic limestone of El-Hammam ridge</td>
<td>No clay quarries Purchased clay Variation in quality</td>
</tr>
</tbody>
</table>
## Raw Material Situation

<table>
<thead>
<tr>
<th>Plant</th>
<th>Limestone</th>
<th>Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elminya</td>
<td>Presence of some increase in Cl</td>
<td></td>
</tr>
<tr>
<td>Beni Suef</td>
<td>Presence of high $\text{SO}_3$ in the upper layers</td>
<td>Presence of high $\text{SO}_3$ in the upper layers</td>
</tr>
<tr>
<td>Egyptian</td>
<td>Presence of high $\text{SO}_3$ in the upper layer</td>
<td>Clay is delivered from far distances</td>
</tr>
<tr>
<td>Sinai</td>
<td></td>
<td>Presence of high $\text{SO}_3$ in the upper layers</td>
</tr>
<tr>
<td>Sinai White</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Misr (Qena)</td>
<td>Presence of high $\text{SO}_3$</td>
<td>Free $\text{SiO}_2$ in the clayey sand</td>
</tr>
</tbody>
</table>
| Misr Beni Suef  | Presence of high $\text{SO}_3$ in the upper layers | Presence of high $\text{SO}_3$  
|                 |                                                | Presence of high Cl                            |
As a result of:

1) low raw material costs
2) Relative low energy price,
3) Transportation Infrastructure.
4) Climatic Conditions
5) Deposits morphology

Egypt has significant cost advantages over other cement producing countries.
Cost of cement is:

29% energy,

27% raw materials,

32% labor

12% depreciation
1) Late Cretaceous phosphates in Egypt form a part of the extensive Middle East-North Africa phosphogenic province.

2) North Africa phosphogenic province of late Cretaceous to Paleogene age contains the greatest amount of phosphates in the geological history.

3) Duwi Formation forms a part of this province and its phosphate resources exceed 3 billion metric tons.

4) The Phosphate bearing rocks are found in three main locations, Red Sea coast (Quseir-Safaga district), Nile Valley and Abu Tartur.
PHOSPHATE ZONE IN EGYPT
Sequences of Upper Cretaceous-Lower Tertiary Phosphate Rocks in the Three Locations of Egypt
<table>
<thead>
<tr>
<th></th>
<th>ABU TARTUR</th>
<th>NILE VALLEY</th>
<th>RED SEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P_2O_5$ Of The Economic Beds</td>
<td>26</td>
<td>20-26</td>
<td>23-29</td>
</tr>
<tr>
<td>Thickness Of Productive Beds</td>
<td>1.3-6</td>
<td>0.5-1.0</td>
<td>0.5-1.0</td>
</tr>
<tr>
<td>Reserves (Million Ton)</td>
<td>990</td>
<td>70</td>
<td>80</td>
</tr>
<tr>
<td>Structure</td>
<td>Very Broad Folding, Minor Faulting</td>
<td>Gentle Folding (Flanks 2-5°) Faulting</td>
<td>Faulted Syncline (Flanks 5-30°)</td>
</tr>
<tr>
<td>Mining Method</td>
<td>Underground (Long Wall Face)</td>
<td>Open Cast Underground (Room &amp; Pillar)</td>
<td>Underground (Room &amp; Pillar, Long Wall Face)</td>
</tr>
<tr>
<td>Cement/Matrix</td>
<td>Dolomitic, Clayey (Phosphatic)</td>
<td>Calcitic, Siliceous, Dolomitic, Phosphatic</td>
<td>Calcitic, Dolomitic, Siliceous, (Phosphatic, Pyritic)</td>
</tr>
<tr>
<td>Host Rocks</td>
<td>Shale, Glauconite, Silt-Sandstone</td>
<td>Bioclastic Limestone, Chert, Dolostone</td>
<td>Oyster Limestone, Dolostone, Bituminous Shale, Chert</td>
</tr>
</tbody>
</table>
شركة النصر للتعدين

El Naser Mining Co.

المستند الرئيسي: المحاميد- إدفو- أسوان
ت: 28222888288822 (07) فاكس: 288974 (07)

فرع القاهرة: الشارع: محمد حامد فهمي- الدقي
ت: 72351127 72351327 72351232 (07) فاكس: 72351119 72351232 (07)

E-mail: Elnasrmining@Elnasrmining.com
<table>
<thead>
<tr>
<th>Serial No.</th>
<th>Area</th>
<th>No. of Boreholes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>El-Gadida Quarry</td>
<td>675</td>
</tr>
<tr>
<td>2</td>
<td>Badr Quarry</td>
<td>542</td>
</tr>
<tr>
<td>3</td>
<td>Fath Quarry</td>
<td>393</td>
</tr>
<tr>
<td>4</td>
<td>Um Higara Quarry</td>
<td>551</td>
</tr>
<tr>
<td>5</td>
<td>Um Tundoba Quarry</td>
<td>208</td>
</tr>
<tr>
<td>6</td>
<td>El-Amal Quarry</td>
<td>402</td>
</tr>
<tr>
<td>7</td>
<td>Um-Salama</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td><strong>Total No. of boreholes</strong></td>
<td><strong>2864</strong></td>
</tr>
</tbody>
</table>
The thickness of the overburden in the different mines is:

1. The minimum & maximum of overburden thickness in El-Gadida mines range between 0.3 and 43.6m respectively;

   El- Amal mines range between 0.8 and 19m respectively;

   Badr mines range between 1.2 and 50.1m respectively;

   Fath mines range between 23 and 58.5m respectively;

   Um Higara mines range between 2.9 and 50.1m respectively;

   Um Tundoba mines range between 2 and 32.3m respectively;

   Um Salama mines range between 3 and 46.5m respectively;
The thickness of the phosphate ore in the different mines is:

El-Gadida mines range between 0.2 and 4.6m respectively;

El- Amal mines range between 0.1 and 3.8m respectively;

Badr mines range between 0.2 and 3.8m respectively;

Fath mines range between 1.0 and 3.0m respectively;

Um Higara mines range between 0.1 and 2.2m respectively;

Um Tundoba mines range between 0.1 and 3.4m respectively;

Um Salama mines range between 0.2 and 3.0m respectively;
The minimum & maximum P2O5% in:

El-Gadida mines range between 11% and 37.5% respectively;

El-Amal mines range between 10.6% and 30% respectively;

Badr mines range between 12.6% and 37% respectively;

Fath mines range between 18% and 32% respectively;

Um Higara mines range between 10% and 32.5% respectively;

Um Tundoba mines range between 10.9% and 32.3% respectively;

Um Salama mines range between 20.1% and 33.4% respectively;
El-Nasr Company Phosphate Concessions around El-Seibaiya
Abu Tartur Plateau
Phosphate Egypt Company
Entrance of Abu Tartur Phosphate Subsurface Mine
### Surface Geological Reserve of Phosphate Ore In Abu Tartour area

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>P₂O₅ (%)</th>
<th>Average Width (Meters)</th>
<th>Depth (Km)</th>
<th>Section No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>2230000</td>
<td>25</td>
<td>4.35</td>
<td>1</td>
</tr>
<tr>
<td>12455316</td>
<td>10748110</td>
<td>2920000</td>
<td>26</td>
<td>3.78</td>
<td>2</td>
</tr>
<tr>
<td>11511640</td>
<td>9550122</td>
<td>2380000</td>
<td>24.6</td>
<td>3.64</td>
<td>3</td>
</tr>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>1720000</td>
<td>24.6</td>
<td>5.43</td>
<td>4</td>
</tr>
<tr>
<td>15211572</td>
<td>12636526</td>
<td>3330000</td>
<td>26</td>
<td>5.05</td>
<td>5</td>
</tr>
<tr>
<td>3700751</td>
<td>3140658</td>
<td>750000</td>
<td>23.7</td>
<td>2.50</td>
<td>6</td>
</tr>
<tr>
<td>13652172</td>
<td>11759392</td>
<td>1880000</td>
<td>25.5</td>
<td>7.30</td>
<td>7</td>
</tr>
<tr>
<td>6508794</td>
<td>5891447</td>
<td>4150000</td>
<td>25</td>
<td>4.25</td>
<td>8</td>
</tr>
<tr>
<td>16598285</td>
<td>13630550</td>
<td>1950000</td>
<td>25</td>
<td>4.40</td>
<td>9</td>
</tr>
<tr>
<td>79638530</td>
<td>67356805</td>
<td>21310000</td>
<td>25</td>
<td>15.3</td>
<td></td>
</tr>
</tbody>
</table>

The table above shows the estimated reserves of phosphate ore in Abu Tartour area.
• The maximize of the added value.
• Increase the financial returns of the national income of mineral resources, by adjusting rents fees and royalties for ore mining law that applicable since 1956, which has not undergone any change in accordance with the prices of ores to global markets.
• Working to activate and attract investment in this promising sector, providing the needs of the country's mineral ores.
THE MINERAL RESOURCES LAW (198 / 2014)

- Establishment of industrial projects on mineral ores available, to optimize the economic exploitation of these resources, with the establishment of industrial zones projects list them.
- Increase employment opportunities for young people.
- Increase the chances of attracting Arab and foreign and domestic investment.
- Increase in Egyptian income from foreign and local currencies.
Mining Investment Opportunities in Egypt in 2015
Thank You