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**GROWTH OF TUNISIAN PHOSPHATES SECTOR**

**by**

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# Growth of Tunisian Phosphates Sector

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## Present Sector Activity

The Tunisian phosphates sector consists of the following two companies :

1. The first company consists of many phosphate rock mines located in South West of Tunisia (GAFSA). Mining has started since 1890: **Compagnie des Phosphates de Gafsa (CPG)**. The main mines are: Metlaoui, Kef Eddour, Redeyef, Moularef, Mhdilla.

CPG has 7.5 million tonnes (Mt) as yearly production capacity of phosphate rock as follows:

- 1 Mt exported,
- 6.5 Mt used for phosphoric acid and fertilizers production in Tunisia.

Phosphate rock is conveyed by train:

- to Sfax harbor for exportation,
- to production sites at Gabes, Sfax and La Skhira.

2. The second one is the **Groupe Chimique Tunisien (GCT)** which is growing with phosphate rock production development.

The GCT production sites are the following ones:

- Sfax plant producing triple superphosphate since 1949. Present yearly production capacity is 400,000 t of TSP.
- Gabes plants (production started between 1970 and 1980):
  - phosphoric acid plant producing phosphoric acid (510,000 t  $P_2O_5$ /year) and dicalcium phosphate "DCP" (120,000 t/year).
  - DAP plant producing phosphoric acid (410,000 t/year) and diammonium phosphate "DAP" (1,300,000 t DAP/year).
- Mdhilla plant: producing triple superphosphate since 1985 (500,000 t/year).
- Skhira plant: producing phosphoric acid since 1988 (380,000 t  $P_2O_5$ /year).

All GCT's plants are running at 110% of their nominal capacities.

CPG and GCT have developed their own know-how for phosphate rock extraction and upgrading and phosphoric acid/fertilizers production using filtered phosphate rock with 15% moisture.

**About 10% of GCT product is for local market, 90% is exported.**

**Harbor facilities:**

- Sfax harbor:
  - Export of phosphate rock and TSP
  - Import of sulphur
- Gabes harbor:
  - Export of phosphoric acid, DAP and DCP
  - Import of sulphur and ammonia
- La Skhira harbor: Export of phosphoric acid

**Sector Development**

Many development projects have been undertaken in the Tunisian phosphates sector in order to increase production capacities, consisting mainly in:

- CPG: producing phosphate rock quality according to new specifications.
- GCT: diversifying end-products.

**GPG Development**

During the last 10 years, CPG has undertaken an optimization program in order to:

- Perform the quality of phosphate rock.
- Reduce the energy consumption (by deleting the drying system and providing wet phosphate).
- Increase the production capacity in order to comply with the GCT demand.

The program was based on:

- The transfer to the wet phosphate,
- The use of huge and bigger mining equipments,
- Flotation of “undersize particles” in the factories.

***CPG project:*** Silica Phosphate Rock Flotation.

JALLABIA and MZINDA mines located at MDHILLA SECTOR provide silica phosphate rock obtained after washing operation. This above mentioned production started from 1996.

- New project capacity treatment can reach 3 Mt per year of raw phosphate rock.
- The project feasibility studies have been initiated since 1984.
- Laboratory and pilot plant tests and trials have been done in order to optimize treatment process of phosphate.
- A technical-economic feasibility study showed that  $P_2O_5$  concentration in the phosphate rock may be increased from 12% to 29.5%.

The main sections of treatment plant are:

1. Mechanical preparation (grinding, screening,...)
2. Washing
3. Flotation

Cost of the project: 49 million Tunisian Dinars (USD 40 million)

Estimated planning of the project: 2005/2009

## **GCT Development**

During the last 10 years, GCT underlook an optimization program in order to improve its production capacities, product quality and environmental linked aspects.

These actions are mainly:

- Adaptation of the factory equipments to the wet phosphate consumption.
- Optimization and improvement of the phosphoric acid process.
- Improvement of the DAP capacities and qualities by the use of pipe reactors instead of the pre-neutralizer.
- The improvement of the TSP capacities and quality by modifying the TSP process (increase of the phosphoric acid concentration and reduction of the recycled rate).

These actions made possible the increase of total  $P_2O_5$  production from 1.53 million to 1.69 million t  $P_2O_5$ /year, the DAP capacities from 0.8 million to 1.3 million t DAP/year and the TSP capacities from 0.79 million to 0.9 million t TSP/year; and phosphate rock consumption from 6.0 million to 6.5 million t/year.

It is important to note that these actions in the different plants were set up with low investments or minimal changes consisting only of some optimizations, debottlenecking and normal replacement of some equipments.

Side actions have been undertaken in the environmental field such as:

- Converting main sulphuric acid plants from simple absorption to double absorption.
- Revamping the washing system in the DAP and TSP plants.
- A new project for phosphogypsum's ground storage instead of present rejecting in the sea. This project is at present in the detailed engineering phase and the preparation of the tender documents.
- The phosphogypsum deposit will be no more put in the sea but transferred in a dried form by railways to an area located at about 25 km far from the factories.
- The investment will be financed by 50% by the European Bank of Investment (BEI).

## **GCT Projects**

The following three projects have been selected in order to develop GCT activities:

1. Production capacity extension of La Skhira Phosphoric Acid Plant with a partnership with India.
2. DAP production capacity extension of Gabes plants for more sales flexibility (phosphoric acid or DAP).
3. Technical phosphoric acid production in the frame of product diversification.

## Phosphoric acid plant : Skhira II plant

### Presentation

Capacity:	330,000 t P <sub>2</sub> O <sub>5</sub> /year
Utilities:	
Industrial water:	osmose (sea water)
Cooling water:	sea water
Electrical feed:	
- Turbo-alternator 16 MW	
- Interconnection with Skhira plant I	

### Production of sulphuric acid

- Unit 3,600 t/day H<sub>2</sub>O<sub>4</sub>
- Double absorption process

### Phosphoric acid production

#### *Weak acid*

- Capacity: 1,000 t P<sub>2</sub>O<sub>5</sub>/day
- Process: GCT/SIAPE process
- Rock attack: 1 tank
- Filtration: 2 rotating filters  
or 4 belt filters (3 in operation + 1 stand by)

#### *Concentrated acid*

- 3 concentration loops 340 t P<sub>2</sub>O<sub>5</sub>/day: 25 to 54% P<sub>2</sub>O<sub>5</sub> (vacuum pump and barometric condenser)

#### *Phosphogypsum*

- Dry storage

Realization planning: 2005/2008

Estimated project cost: 250 million Tunisian Dinars (USD 200 million)

### DAP project

GCT has already two DAP plants and is projecting a third plant (with 600,000 t/year as production capacity) planned to start up in 2007. This plant will consume yearly 290,000 t P<sub>2</sub>O<sub>5</sub> supplied in site by phosphoric acid plant and/or partially transferred by rail from La Skhira plant.

The new DAP unit will be integrated in the Gabes DAP factory at Gabes fertilizers complex and will use existing logistics for:

- Handling
- Ammonia supplying
- Product loading

This project will be composed by:

- DAP production unit located at existing DAP factory.

- DAP storage extension (+ 50,000 t)
- Phosphoric acid transfer logistics for Gabes or from Skhira by railway (tank wagon) from La Skhira plant to Gabes site.
- Interconnection with existing off-sites.

The new DAP plant will consist of:

- Attack, granulation and drying section.
- Screening, grinding and final product selection section.
- Cleansing equipment and gas washing section.

Estimated planning: 2004/2007

Estimated project cost: 75 million Tunisian Dinars (USD 60 million)

### Technical acid project

In the frame of its product diversification, the GCT has started since 1997 a feasibility study for production of technical phosphoric acid in collaboration with Tunisian University and International Engineering offices.

The project was identified after completion of laboratory and pilot tests.

One plant of 10,000 t P<sub>2</sub>O<sub>5</sub> as yearly production capacity was included in the GCT development program.

This plant will be set up at La Skhira factory and using all necessary facilities in site.

The main sections of this project are the following ones:

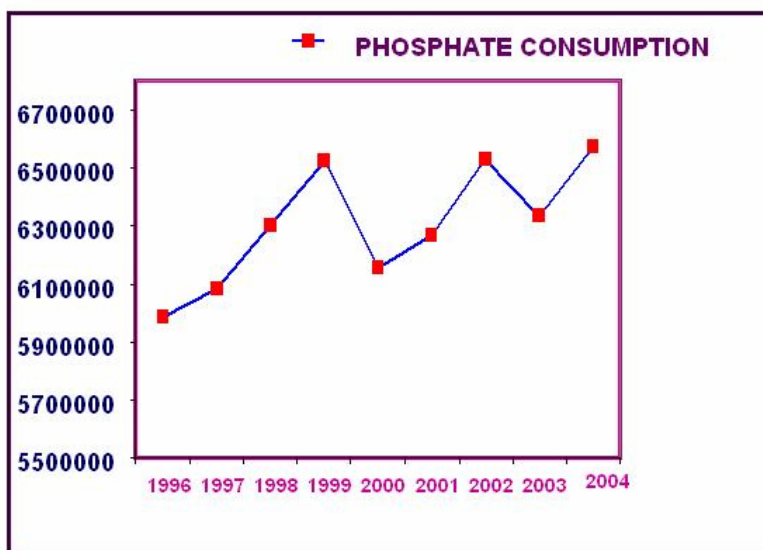
- Upper pre-treatment of crude phosphoric acid.
- Extraction, washing and re-extraction by solvent section.
- Phosphoric acid post-treatment section: concentration, discoloration and defluorination.

Estimated project cost: 10 million Tunisian Dinars (USD 8 million)

Estimated realization planning: 2005/2007

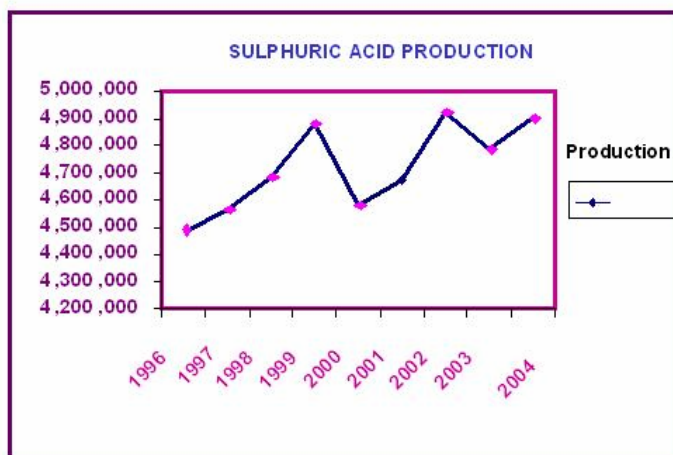
## TOTAL PHOSPHATE ROCK CONSUMPTION

Year	Phosphate consumption
1996	5.982,030
1997	6.084,349
1998	6.299,767
1999	6.526,842
2000	6.152,767
2001	6.266,650
2002	6.529,755
2003	6.335,877
Pre.2004	6.573,707



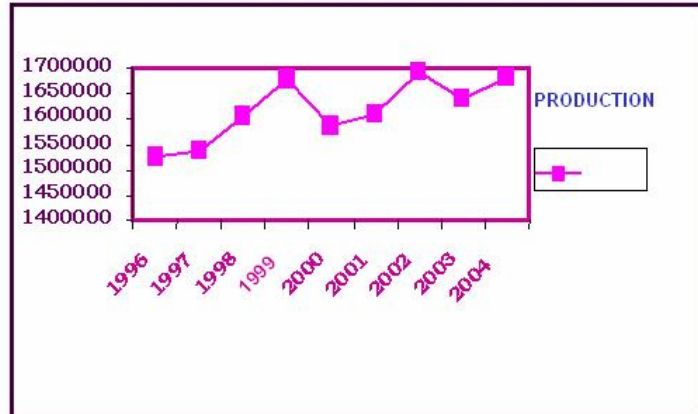
## TOTAL SULPHURIC ACID PRODUCTION

Year	Sulphuric acid consumption
1996	4.483,391
1997	4.560,458
1998	4.680,419
1999	4.881,129
2000	4.578,020
2001	4.669,606
2002	4.920,364
2003	4.781,309
Pre.2004	4.899,371



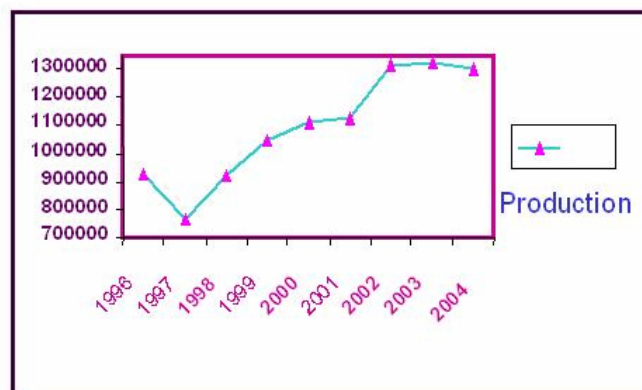
# TOTAL P2O5 PRODUCTION

Year	P2O5 consumption
1996	1,526,706
1997	1,537,324
1998	1,606,210
1999	1,678,638
2000	1,584,672
2001	1,610,348
2002	1,691,035
2003	1,637,626
Pre.2004	1,679,475



# TOTAL DAP PRODUCTION

Year	DAP consumption
1996	927,453
1997	764,836
1998	919,741
1999	1,048,150
2000	1,113,037
2001	1,124,627
2002	1,315,078
2003	1,324,050
Pre.2004	1,302,180



# TOTAL TSP PRODUCTION

Year	TSP consumption
1996	790,289
1997	736,300
1998	768,716
1999	812,256
2000	790,151
2001	782,146
2002	790,843
2003	871,844
Pre.2004	890,779

