Overview of Phosphate Industry

IYCr2014

"Crystallography for the next generation: the legacy of IYCr”

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Summary

1. Introduction

2. Keys OCP facts and figures

3. Overview of OCP Value Chain

4. Phosphate Market Situation

5. OCP Development Program
OCP logo symbolizes a shark tooth (Lamna obliqua) that are current Fossil in Moroccan phosphates. This figure is reproduced five times, representing the five stars of the national flag and on the other hand, the destinations of our products to the five continents. The set is in a circle around which are placed two ears folded in an arc, that symbolize the fertility and growth.
Phosphate, a Key Element for Plants Grow
Phosphate, a Critical Raw Material

Source: Report on critical raw materials for the EU – May 2014
OCP, Facts and Figures

#1 Phosphate Producer
- #1 Phosphate producer/exporter
- Over than 50% of proven reserves worldwide
- Most competitive phosphate rock cost position

30% Global Trade Market Share
- Market share by product category:
  - Phosphate: 33%
  - Phosphoric Acid: 47%
  - Fertilizers: 19%

$5.5bn revenues
- Turnover: USD 5.5 billion
- EBIDTA: USD 1.3 billion
- Employees: 23000 employees

$16bn Investment (2008-2025)
- Doubling of mining capacity
- Tripling of fertilizer production capacity
- Massive cost reduction through value chain optimization

Strong Contribution to Moroccan Economy
- 20.2% contribution to national exports
- 4.3% contribution to Domestic GDP

Mining

Processing

Exports

Phosphated Rock Production
26.4 MT

Phosphoric Acid Production
4.4 MTP2O5

Phosphoric Acid
2.0 MTP2O5

Phosphated Fertilizers Production
4.8 MT

Phosphated Fertilizers
4.3 MT

Source: OCP
OCP’s Product Portfolio

Traditional Products:
- Phosphate;
- Phosphoric acid (MGA);
- Phosphated Fertilizers (DAP/MAP/TSP).

Specific and Innovative Products:
- NPK Fertilizers;
- Sulfur Enhanced NPK Fertilizers;
- Micro-elements Enriched NPK Fertilizers;
- Water Soluble Fertilizers;
- Feeds (DCP/MCP);
- Trace Elements;
- Fluoride Products, Phosphogypsum…
OCP International Presence

90% *
North America

38% *
Europe

9% *
East Asia

30% *
South America

24% *
Africa

25% *
South Asia

36% *
Oceania

OCP’s import market share of phosphate in all forms in each region*
OCP Value Chain

Geology

- Khouribga
- Youssoufia
- Boucrâa

Extraction

- Khouribga
- Youssoufia/ Benguérir
- Boucrâa

50%

Phosphate Beneficiation

50%

Chemical Valorisation

- Jorf Lasfar
- Safi

50%

Exportation

- Casablanca
- Jorf Lasfar
- Safi
- Laâyoune
Geology

- Main constituent = Apatite
  \[(Ca, Na, Mg)_{10} (PO_4)_{6-x} (CO_3)_x F_y (F, OH)_2\]

- Associated minerals:
  - Dolomite & calcite
  - Quartz & opal
  - Montmorillonite & attapulgite
  - Gypsum & halite
Extraction

Drilling ➔ Blasting ➔ Pickling ➔ Defruiting ➔ Transport ➔ Mechanical Treatment
Phosphate Beneficiation
Chemical Valorisation – Phosphoric Acid

- **Phosphate**
- **Sulfuric acid**
- **Phosphogypsum**
- **Merchand Grade Phosphoric Acid**

**Steps:**
- Grinding
- Reaction Crystallization
- Filtration
- Concentration
- Treatment

**Chemical Reactions:**
- **Fluorapatite** + **Sulfuric Acid**
  \[ \text{Ca}_3(\text{PO}_4)_2 + \text{H}_2\text{SO}_4 \]
- **Phosphoric Acid** + **Calcium Sulfate**
  \[ \text{H}_3\text{PO}_4 + \text{CaSO}_4 \cdot n\text{H}_2\text{O} \]

**Calcium Sulphate Crystallization forms:**
- \(n=2\): Dihydrate
- \(n=0.5\): Hemi-hydrate
- \(n=0\): Anhydrous
Chemical Valorisation - Fertilizers

Phosphate Rock

\( \text{H}_2\text{SO}_4 \) → \( \text{H}_3\text{PO}_4 \)

- SSP
- MAP
- DAP
- NPK
- ASP
- TSP

\( \text{NH}_3 \rightarrow 2\text{NH}_3 \rightarrow \text{NH}_3 \)
• 80% increase in global crop production will be required within the next 40 years;

• Agriculture yield improvement through the use of fertilizers is the major driver to address the imbalance between food demand and supply.

Source: FAO – IFA
Long-term CAGR based on estimated production volumes in 1961 and 2014
OCP Additional Capacity Poised To Support Demand Growth

Global Phosphate-Based Fertilizer Demand Growth

MT P2O5

- ~2% 2013-2018 CAGR
- 1.7% 2018-2023 CAGR

Source: IFA – Argus FMB - OCP

Global Phosphate-Based Fertilizer Supply Growth

MT P2O5

- 8 MT P2O5 excl. AFRICA potential upside
- New Expansion Phase under study (Meskala)
- JPH, SPH and Laayoune Chemical Plant

OCP capacity expansion up to 2018
- 1.8

OCP capacity expansion up to 2023
- 4.2

Source: IFA – Argus FMB - OCP
OCP Launched an Important Investment Plan of $16Bn

New Mines and Benefeciation Plants

- Additional Mining Capacity:
  - More than 25 MT in Khouribga, Gantour, Meskala and Laayoune;

- New Rock Beneficiation Plants:
  - 3 in Khouribga;
  - 1 at Gantour,
  - 1 at Meskala,
  - 1 at Laayoune.

Slurry Pipelines (Instead of Trains)

- Slurry Pipelines:
  - Khouribga – Jorf Lasfar (Operational) 38 MT/year;
  - Gantour – Safi Pipeline (Planned) 10 MT/year.

A World Class « Plug & Play » Chemical Platform

- Jorf Phosphate Hub handling up to 10 new integrated fertilizer units & expansion of logistical infrastructures (storage, port...)

- Safi Phosphate Hub and Phosboucraa Chemical Complex.
The Slurry Pipeline as a Cornerstone of the Development Program

[Diagram showing the slurry pipeline network with major stations and distances indicated.]
www.ocpgroup.ma