



FACTSHEET INNOVATION AT OCP

OCP'S GOALS

1. Promote sustainable agriculture:
 - support balanced soil fertilization based on the 4R principles;
 - develop customized products
2. Diversify the product Portfolio & valorize by products;
3. Leading technical innovation in the phosphate industry
 - Developing a multistackholder ecosystem around phosphates
 - Support Open Innovation within the organization



KEY FIGURES - 2019

- More than **150** projects conducted in partnership with UM6P as well as other renowned partners ;
- Signature of **24** NDA, MTA, 15 collaboration Agreements and **47** specific contracts ;
- More than **40** industrial and pilot scale tests conducted, related to new fertilizers, additive testings, ... and more than **10** agronomic tests of new fertilizers formulas ;
- **2019** R&I spendings tripled compared to **2017**'s.

MAIN ACHIEVEMENTS 2019

a) FARMER SOLUTIONS

- Sourcing of a new coating technology for sulfur fertilizers, validated by laboratory and agronomic tests, that will be implemented industrially at OCP Plant (JFC 5) in **2020** ;
- Development of new formulations of fertilizers doped with orthosilicic acid and bio stimulants
- Development of three new feed formulations ready for industrial integration (MAP Feed, NaCaP, MgP) ;
- Pilot tests carried out to produce NPK fertilizers from rock phosphate by steam blending for the Asian market, and new NPK formulations for the African market ;
- Agronomic trials carried out to validate the performance of new fertilizer formulas (high-sulfur fertilizers, fertilizers doped with orthosilicic acid, etc.)

b) HACKING PHOSPHATE

- Preliminary mapping and evaluation of the potential of valuable elements contained in the Moroccan phosphates ;
- Implementation of global vision to launch R&I initiatives with various international partners for the valorization of rare earths elements (ORNL, CEA, Mines d'Albi) ;
- Launch of the preparatory work for the implementation of a pilot for thermal energy storage using phosphate-based materials ;
- Development of adsorbent materials from natural phosphate for the treatment of industrial effluents in collaboration with Mascir (validation of performance on a semi-pilot scale) ;
- Launch of innovation and R&D initiatives to develop phosphate-based materials for various applications (catalysis, hydroxyapatites, ...).



c) OPERATIONS EFFICIENCY

- Launch of the first industrialization of a solution for thickening phosphate pulp by centrifugal decanter at the downstream plant ;
- Pilot tests carried out to produce purified phosphoric acid by membrane (OCP process) ;
- Tests carried out at an industrial pilot scale for the recovery of P_2O_5 from phosphoric sludge. industrialization planned for **2020** ;
- Industrialization of a new NPK anti-caking solution, and laboratory and industrial tests conducted to evaluate a new and more efficient MAP-DAP fertilizer coating additive ;
- Improvement of the DLP (downstream Logistic Planning) planning tool by reducing calculation time from **12 hours to 2 hours**.

d) SUSTAINABILITY AND THE CIRCULAR ECONOMY

- Industrialization of a solution for the treatment of odours (fluorinated gases) in production workshops ;
- Launch of the industrialization of a solution for the recovery of process water from water cycling from phosphoric acid filter washing effluent ;
- Technical and economic evaluation of various processes for the decadmiation of phosphate and phosphoric acid (by resin, by co-crystallization, by nanofiltration, decadmiation during flotation, ...) ;
- Launch of engineering studies for the construction of a pilot plant for the recovery of sulphur from phosphogypsum ;
- Launch of the project to build a pilot plant for the production of Green Ammonia, in collaboration with the Fraunhofer Institute and the GEP ;
- Pilot tests carried out to evaluate the calcining phosphates using solar energy (SOLPART project).



R&I AGENDA AND PARTNERSHIPS

- Evolution of R&I Agenda with the UM6P, as a privileged partner, through the signature of **32** specific Agreements related to various topics linked to the four main streams (Farmer Solutions, Hacking Phosphate, Operations Efficiency, Sustainability & Circular Economy), while integrating new themes (medical, urban planning, humanities, etc.) ;
- Reinforcement of the collaboration with Mascir, as the Group's second privileged partner in R&I, with 13 new specific contracts signed, exploring synergy and complementarity with UM6P ;
- Set up of new strategic partnerships in R&I, through the implementation of collaboration with renowned partners (Ecole Polytechnique Montréal, University of Cranfield, Rothamsted Institute, Anhalt University, MIT, ASU, CEA, Prayon, FORBON, Solvay, IFDC, TIAMAT, Fraunhofer Institut, etc.) to better respond to the challenges of the Group that translated into an R&I agenda co-constructed with internal stakeholders.

PROMOTING R&I CULTURE

- Implementation of the "Bloom Lab", an incubator / accelerator to support innovative entrepreneurial initiatives emanating from Group employees ;
- Launch of challenge campaigns and support for innovative ideas for the development of prototypes.

