INNOVATION

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 multi-stakeholder 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 industrials and pilot-scale tests conducted, related to new fertilizers, new processes, 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 and testing of new disruptive and more competitive technology for sulfur enhanced fertilizers, based on coating, with its validation for industrial implementation ;
- Development of new formulations of fertilizers doped with orthosilicic acid and biostimulants ;
- Development of three new feed formulations ready for industrial integration (MAP Feed, NaCaP, MgP) ;
- Developement on pilot stage of a new solution to produce NPK fertilizers from rock phosphate by steam blending for the Asian market, and new NPK formulations for the African market

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 earth elements (ORNL, CEA, Mines d'Albi, K-tech....) ;
- 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 new thickening technology for phosphate pulp, by centrifugal decantation 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) DLP tool by reducing calculation time from **12** hours to **2** hours.

d) SUSTAINABILITY AND THE CIRCULAR ECONOMY

- Industrialization of an additive based 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 decimation of phosphate and phosphoric acid (Co-Crystallization, Resine ion exchange, thermal treatment ,..) ;
- 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", a corporate incubator / accelerator to support internal innovative and entrepreneurial initiatives and ideas emanating from Group employees ;
- Launch of different challenge campaigns with support given to innovative ideas and projects for their development (Prototyping, MVP...).