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Phosphatic Fertilizer Complexes

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NEED FOR FERTILIZERS

A growing population leads to increased demand for food. This places pressure on agriculture to produce more crops and livestock to meet the nutritional needs of the expanding population. As a result, thrust on improving the soil fertility becomes important. To improve soil fertility, addition of nutrients in the form of fertilizer is essential.

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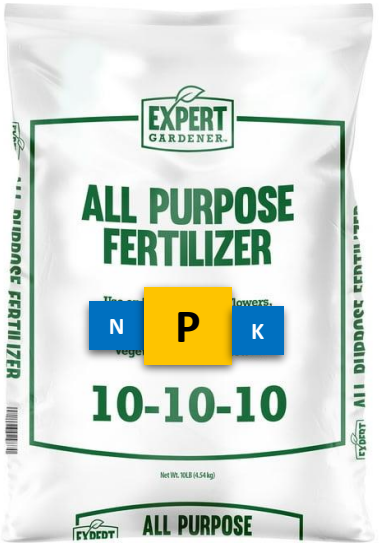
PHOSPHATE AS A PRIMARY NUTRIENT



Three primary nutrients are required in the soil: Nitrogen, Phosphorous and Potassium. The Three numbers on the Fertilizer bag typically depict the % nutrient content of fertiliser. The first nutrient is nitrogen as ammonia, the second nutrient is phosphorus as phosphoric anhydride, and the third one is potassium as potassium oxide.

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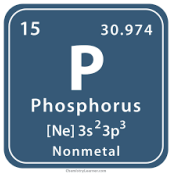
PHOSPHATES AS A PRIMARY NUTRIENT



Phosphorus is one of the primary nutrients for plants and crops, as it helps in the growth and development of their roots, flowers, and fruits. Phosphorus-containing fertilizers are produced from phosphoric acid, which is based on naturally available phosphorus-containing minerals i.e. Rock phosphate.

Phosphate rock mines are where phosphate rock, a mineral rich in phosphorus, is extracted from the earth. These mines are found in limited quantities in several parts of the world, with significant deposits located in countries such as Morocco, China, Jordan, Senegal, Tunisia and the United States, also in Iraq. The extracted rock is processed with sulphuric acid to produce phosphoric acid, which is used to manufacture fertilisers and other products.

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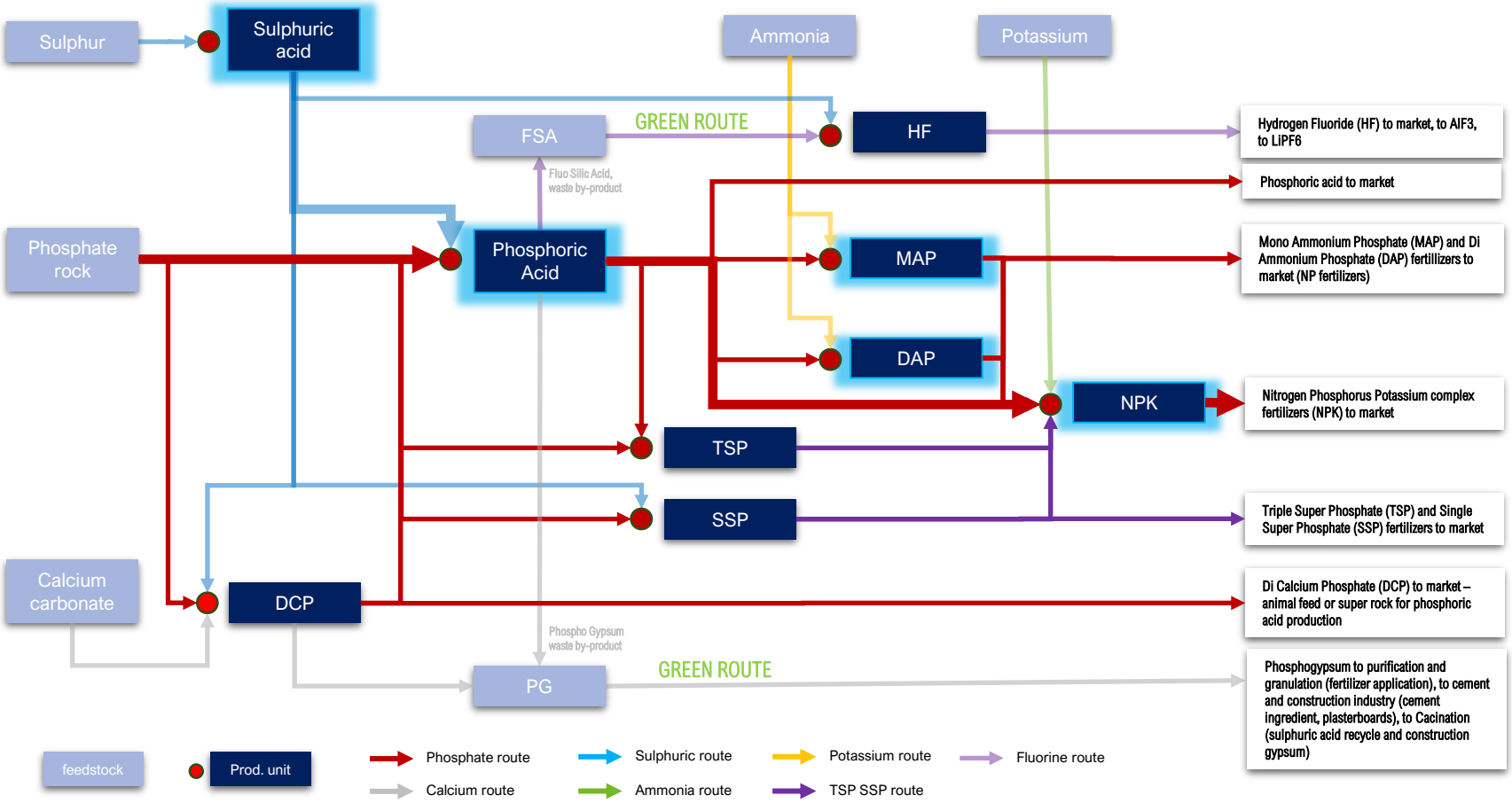
PHOSPHATIC COMPLEX BLOCK DIAGRAM



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PHOSPHORIC ACID PLANT - PAP

The phosphoric acid plant is at the core of a phosphate fertiliser complex. Phosphates contained in the rock are converted to phosphoric acid by an attack with sulphuric acid under closely controlled conditions and process steps. There are several process routes available, to be evaluated on a case-by-case basis subject to rock quality, Capital Cost, desired phosphogypsum application, etc.

Ballestra is a permanent licensee of PRAYON Technologies, the world's leading phosphoric acid licensor, and has enjoyed a long-term fruitful relationship with Prayon resulting in a significant list of references.

Prayon has different processes for Phosphoric acid production, which are based on the type of Gypsum crystal produced.

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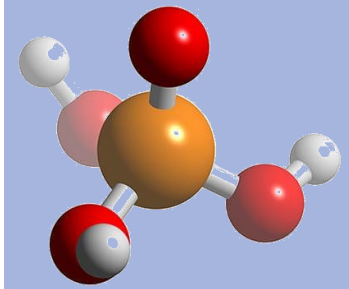
PHOSPHORIC ACID TECHNOLOGIES WORLD CLASS



BALLESTRA AND PHOSPHORIC ACID

PRAYON

- Ballestra is one of the few permanent licensees of Prayon Technologies
- All process configurations available (DH - dihydrate, HH - Hemihydrate, CPP – Central Prayon Process, DA-HF – dihydrate attack hemihydrate filtration, Hemy Dihidrate)
- Purified Phosphoric Acid technology with latest developed technical experience
- Thirteen projects successfully delivered
- High competence in process engineering (DBI process engineering team has been employed continuously in phosphoric acid projects for the last years, gaining a remarkable design experience).
- Competence in critical detail design, such as:
  - Process equipment detail design
  - Piping/Ducting design, piping and ducting stress-analysis
  - Skilled team of erection supervisors and commissioning engineers
  - Procurement experience with main industry Vendors
- Experience in the integration of phosphoric acid plants in larger fertilizer projects

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SULPHURIC ACID PLANT - SAP

The Sulphuric Acid Plant (SAP) produces the vital blood and the energy for the entire complex. Sulphuric acid is used throughout the complex to extract reactive phosphoric acid from the rock. The plant also, particularly if equipped with hi tech HRS system, will also cover all the steam and electric power demand of the complex.

Ballestra is a permanent licensee of and entertains daily relationship with MECS Elessent Technologies, the world leading phosphoric acid licensor, and the only one to date with long list of references for HRS systems.

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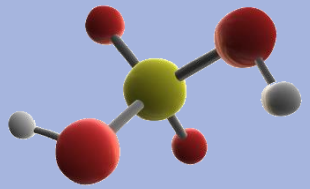
SULFURIC ACID TECHNOLOGIES A WORLD LEADER



BALLESTRA AND SULPHURIC ACID

- Working with MECS/Elessent Clean Technologies since 1991 for World class licensed double absorption technology f
- All configurations available (sulphur burning, off/gas plants, HRS enhanced heat recovery system, etc.)
- Successfully completed more than 55 projects since 1991.
- Repeat orders from clients is the testimony of our capabilities
- Developed expertise in process engineering
- High competence in critical detail design, such as:
  - Process equipment detail design
  - Piping/Ducting design, piping and ducting stress-analysis
  - Procurement experience with global procurement capability
- Skilled and experienced team of erection supervisors and commissioning engineers

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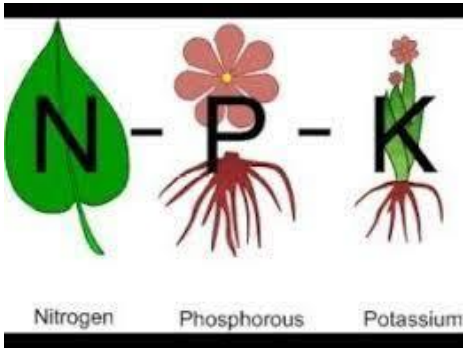
MAP, DAP AND NPK



The fertilizer plant produces the complex fertilizers in many different grades in granular form and ready to sell.

Reliability, flexibility, uniformity of production and capability to change production type are the name of the game.

Ballestra plays a leading role in the market of phosphatic fertilizers with an all-star team of technologists with design and operational experience in cutting edge MAP, DAP, NPK technologies.

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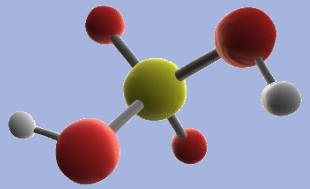
MAP DAP NPK TECHNOLOGIES AN EXCEPTIONAL TEAM



BALLESTRA AND MAP DAP NPK

- Unmatched capital of professional expertise in MAP, DAP, NPK
- 27+ MAP DAP NPK plants designed and executed by Ballestra people
- No-nonsenses, flawless design, proprietary pipe reactor
- Extreme flexibility, exceeding competing technologies
- Technology and contracting knowledge merged: reliability extended to the finest details of the plants
- Robust solids handling design capabilities
- In-house pilot testing and labs
- Procurement experience with global procurement capability
- Skilled and experienced team of erection supervisors and commissioning engineers

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SSP AND TSP

SSP and TSP are simple and straightforward units converting the rock phosphate into granular P fertilisers with nutrients readily available to crops. SSP and TSP are often the entry door to the world of phosphates, allowing to quickly exploit the potential of a rock phosphate deposit and grow capital to add further process units.

Ballestra has deep experience on SSP and TSP. We helped Clients to access the world of phosphates, thus starting a growth process up to leading world positions in Phosphoric Acid, MAP, DAP and NPK

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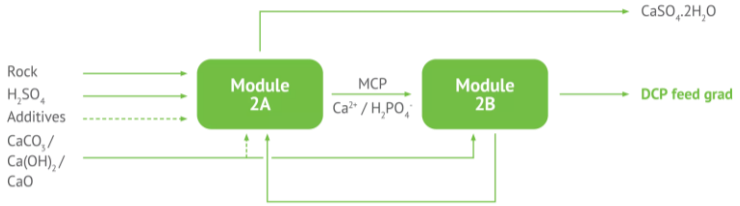
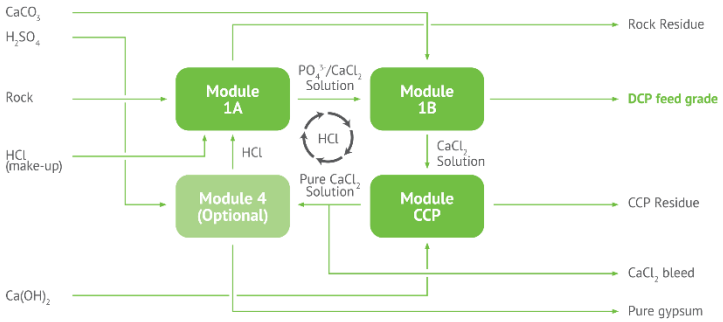
DCP

Dicalcium phosphate (DCP) is a type of calcium phosphate which is dibasic. It is primarily used in the animal feed industry, as a valuable source of nutrition for livestock, providing essential minerals necessary for their development.

DCP is also a powerful system to boost the content of P2O5 of the rock phosphate and can be seen as one of the most effective approaches to rock beneficiation and enrichment to increase the value of the feedstock before feeding a phosphoric acid plant.



Prayon Technologies GET MORE P process



Prayon Technologies ECOPHOS process

Ballestra is one of the few companies with hands-on experience and references about DCP. The process may be sulphuric acid based (GET MORE P) or Hydrogen Chloride based (ECOPHOS). In the latter case it perfectly integrates with Ballestra's Potassium Sulphate production technology, which produces hydrogen chloride as useful byproduct to feed the ECOPHOS and avoid the investment for Module 4 (see picture)

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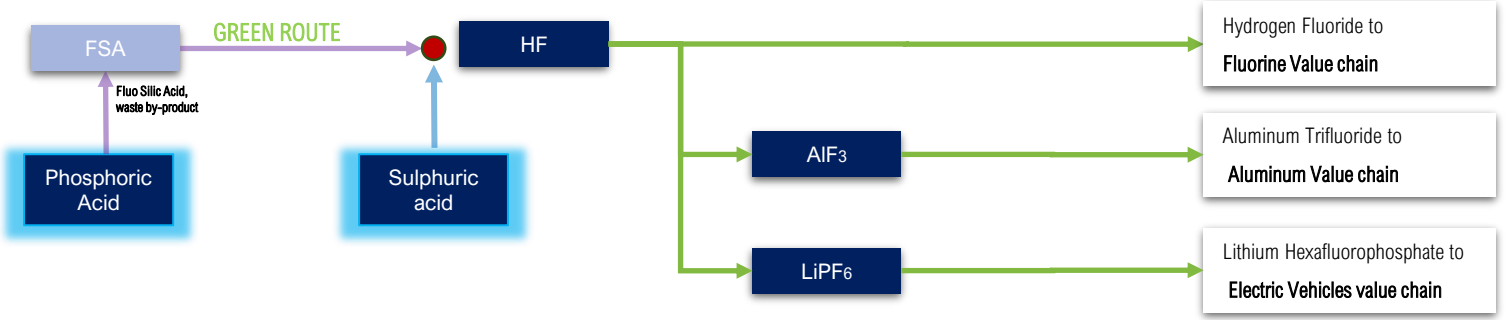
HF FROM FSA – THE GREEN ROUTE

FSA, fluosilicic acid is a byproduct fatally produced in phosphoric acid plants. It is extremely corrosive and it is normally disposed of by neutralization. Ballestra, together with its fully-owned Swiss subsidiary BUSS Chemtech, can provide the unique FSA to HF technology, transforming a dangerous and almost worthless chemical in valuable Hydrogen Fluoride, to access value chains such as:

- the fluorine and fluorinated compounds via HF,
- the Aluminum value chain via Aluminum Trifluoride
- the world of energy transition with electric vehicles battery electrolyses such as lithium hexa fluorophosphate



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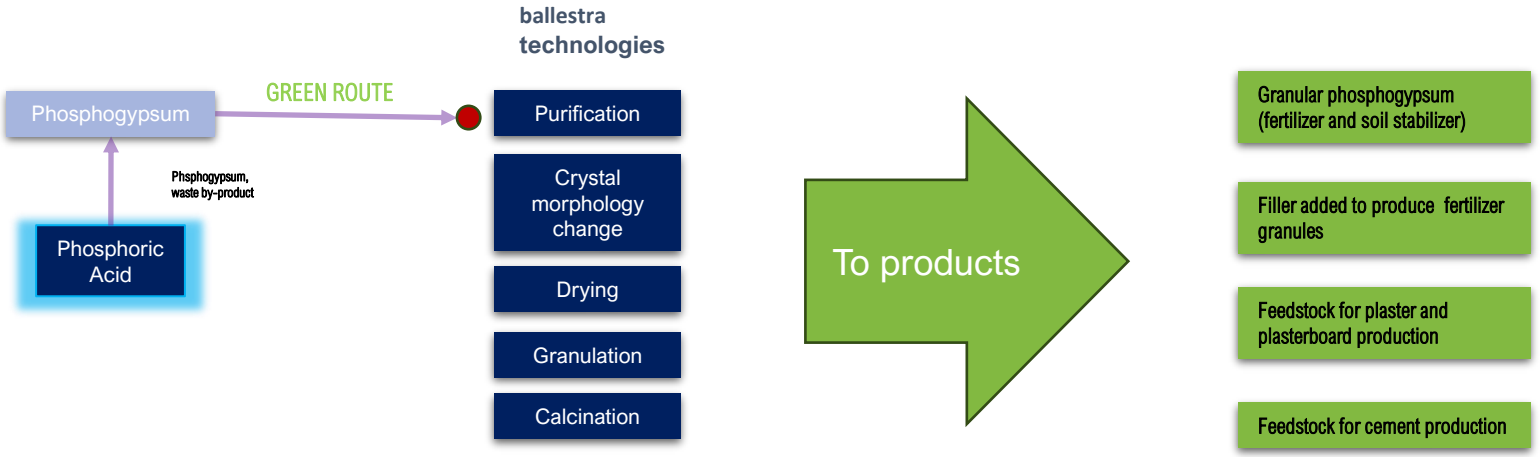
PHOSPHOGYPSUM UTILIZATION – THE GREEN ROUTE

Significant quantities of gypsum byproduct are produced in every phosphoric acid plant, about 4-5 kg per ton of produced P_2O_5. Such phosphogypsum is wet and contains several inorganic salts and trace organic compounds present as minor components in the rock phosphate. Ballestra's well-known R&D facilities and capabilities allowed the development of technologies to utilise and monetize phosphogypsum as fertilizer, fertilizer filler, feedstock for the cement industry and for the plaster and plasterboard industry.



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A WORLD LEADER

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CHEMICALS FOR LIFE

Ballestra is a world leader in several market niches

Detergents, Surfactants – Market Leader
Soap – Market Leader
Sulphuric Acid – Main MECS Licensee worldwide
Phosphoric Acid – Main Prayon Licensee worldwide
Hydrogen Fluoride – Market Leader
Fertilizers and granulation - Major world player

Ballestra is a well qualified technology-oriented contractor and licensor, encompassing all phases of a project cycle, from R&D and process development, engineering, supply of process technologies, plants and proprietary equipment and machinery.

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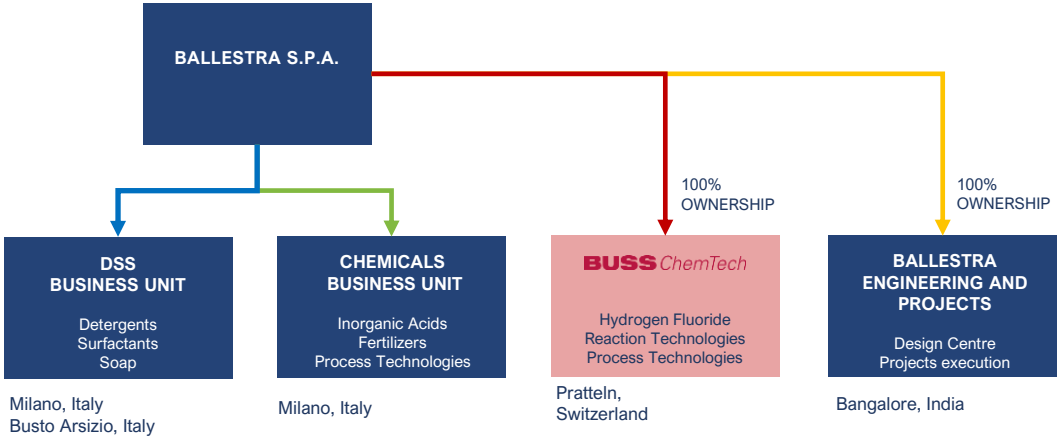
BALLESTRA GROUP'S STRUCTURE



400 EMPLOYEES	4 OPERATING OFFICES	4 LABS AND INDUSTRIAL PILOT INSTALLATIONS	WORLDWIDE SALES NETWORK AND PROJECT EXPERIENCE
	Milano, Italy Busto Arsizio, Italy Pratteln, Switzerland Bangalore, India	Milano, Italy Grassobbio, Italy Busto Arsizio, Italy Pratteln, Switzerland	

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PROVEN RELIABILITY

Experience & Leadership

Uniquely strong R&D and Innovation

Product Processing Expertise

Sustainable Development

Experienced Project Execution

Efficient Customer Service

Global Presence

Over 75 years of technology and reliability

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UNIQUE CLIENT PORTFOLIO

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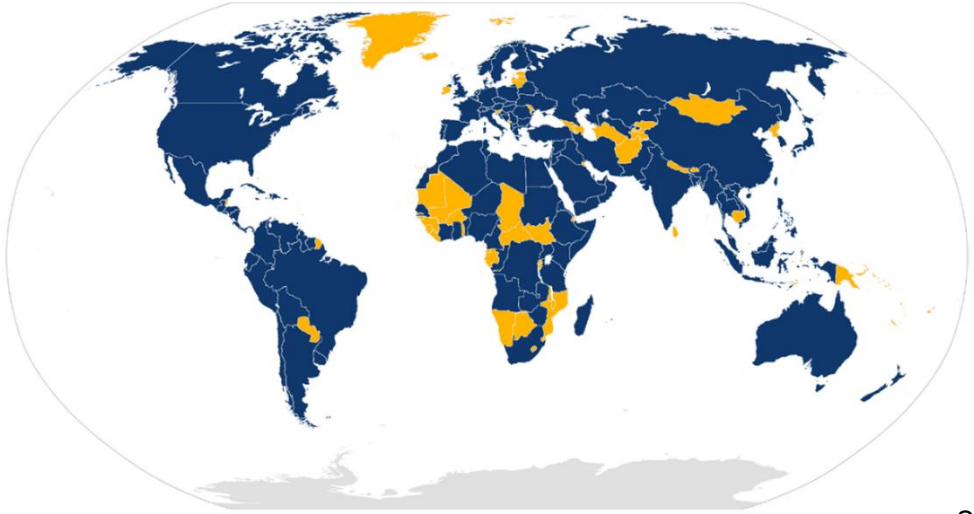
GLOBAL REACH



COUTRIES HAVING AT LEAST A BALLESTRA'S PLANT

COUTRIES WITHOUT BALLESTRA'S PLANT

Starting from 1960, Ballestra performed hundreds of process plants EP or EPC projects.

While EP projects are preferred because of risk control, a worldwide network of construction partners allows to complement of high level construction services.

Whatever the country is, Ballestra has the experience to deliver.

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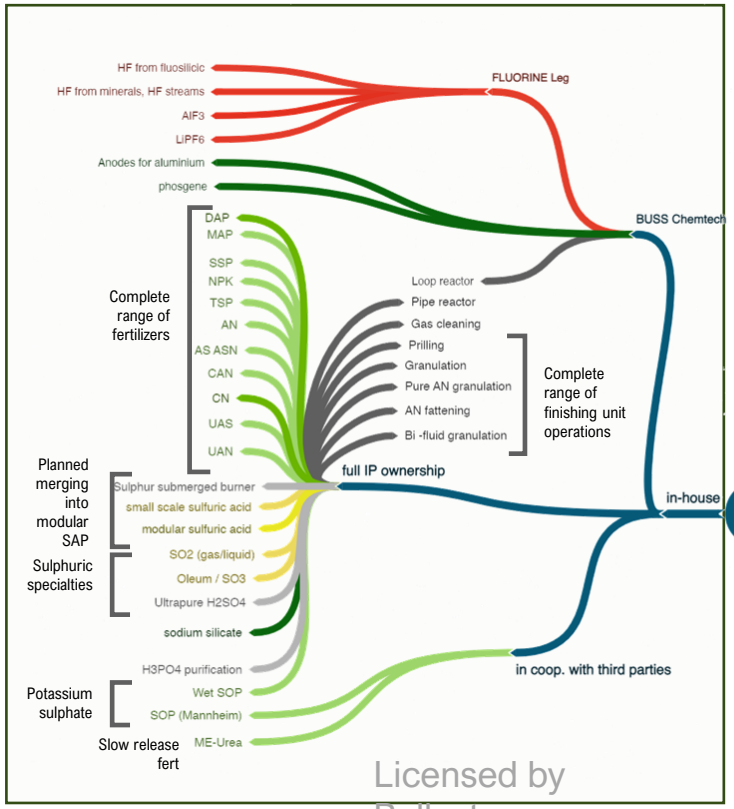
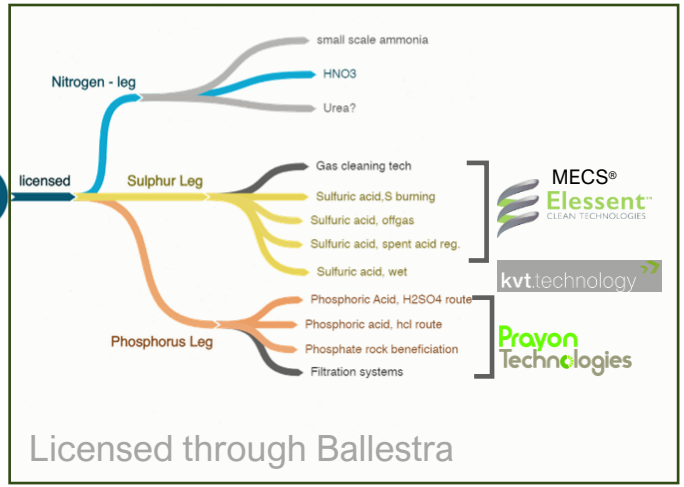
CHEMICALS TECHNOLOGY PORTFOLIO

- Sulfuric acid technologies
- Phosphoric acid technologies
- Fertilizer technologies
- Nitrogen technologies
- Other technologies
- Unit operations
- Hydrogen fluoride technologies
- Coming up



Ballestra Chemicals BU technology portfolio



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