

# Acidulation Applications for the Broadfield Processing System



## ACIDULATION PROCESS DEFINED

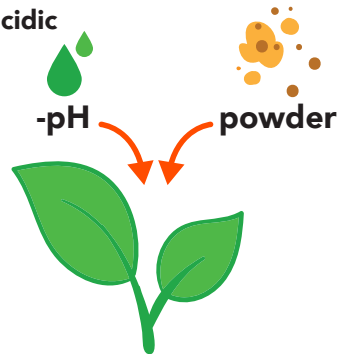
**Making something slightly acidic**

### Fertilizer Applications:

Using acid to make rock more soluble in water

### Phosphate Fertilizer:

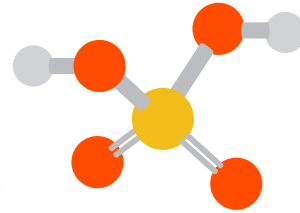
Convert insoluble Phosphate Rock to soluble Phosphate-Rich Fertilizer



Sulphuric Acid:

Phosphoric Acid & Single Super Phosphate (SSP)

Phosphoric and Sulphuric Combined: **ESP**



Phosphoric Acid: Triple Super Phosphates (TSP)

Nitric Acid: Nitro Phosphates

## COMMONLY ACIDULATED PRODUCTS

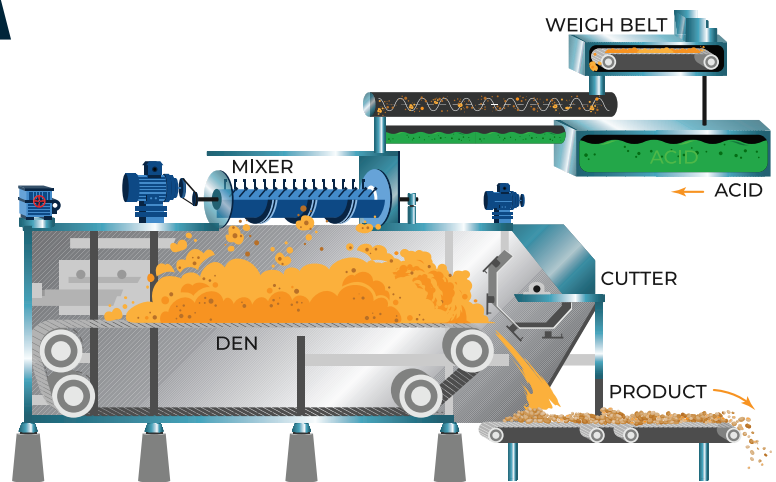
Sulphuric Acid + Limestone: Synthetic Gypsum

Sulphuric Acid + Iron Oxide: Iron Sulphate

Sulphuric Acid + Jaderite: Lithium Extraction

Phosphoric Acid + Salt of Ammonia: Mono Ammonium Phosphate (MAP) & Di Ammonium Phosphate (DAP) – Manufactured by spraying the Ammonia and Phosphoric acid directly into the Den

Phosphoric Acid + Limestone: Mono calcium Phosphate (MCP) & Di Calcium Phosphate (DCP)



## MATERIALS COMMONLY ACIDULATED



Phosphate Rock



Sewage



PCP (Precipitated Calcium Phosphate)



Salt of Ammonia



Bones



Iron Oxide



Jaderite

## A BRIEF TIMELINE OF PHOSPHOROUS



**1669**

Hennig Brand discovered Phosphorus in 1669 by processing (many) gallons of urine.



**1769**

In 1769 Calcium Phosphate discovered in bones and fossils.



**1774-1779**

1774 – Phosphoric Acid discovered and first produced in 1779.



**1840**

In 1840 Justus von Liebig theorizes "acidulation", and John Lawes proves it can be done.



**1873**

In 1873 First SSP made in USA at the Bradley Fertilizer Co. in Massachusetts

## MATERIALS COMMONLY ACIDULATED



Plants can only absorb nutrients in solution, only O<sub>2</sub> & CO<sub>2</sub> can be absorbed as gasses.



If all minerals were soluble, they would have leached out long ago and the seas wouldn't be salty.



Many minerals can be reacted with acid to make them soluble.

## FUN FACTS