Applicant's Name: **COROMANDEL INTERNATIONAL LIMITED**

Title: **A CARBON ENHANCED DIAMMONIUM PHOSPHATE FERTILISER AND A METHOD OF PREPARING THE FERTILISER**

ABSTRACT:

This invention deals with the new concept of enhancing the efficiency of DAP by addition of organic carbon to the product. The organic carbon added to DAP is in the form of high molecular weight compounds such as humic acid and fulvic acid. The organic compounds increase the P availability in different ways (Ref: Soil Fertility and Fertilizers by Tisdale and Nelson).

WE CLAIM:

1. A carbon enhanced DAP fertilizer composition with higher P utilization efficiency characterized in the surface of DAP granules with a coating of organic carbon solution applied thereon, and wherein the solution has atleast 80% water content.

2. A carbon enhanced DAP fertilizer composition with higher P utilization efficiency characterized in the incorporated organic carbon into the body of the DAP granules and wherein the organic carbon is in powder form.

3. The carbon enhanced DAP of claim 1 and claim 2 wherein the organic carbon partly or wholly replace the filler content in the DAP composition.

4. The carbon enhanced DAP of claim 1 and claim2, wherein the organic carbon may be humic acid.

5. The carbon enhanced DAP of claim 4 wherein the humic acid is obtained from potassium humate.

6. The carbon enhanced DAP of claim 5 wherein the dosage of potassium humate is 2-30Kg/ton of DAP whereby organic carbon content is in the range 0.1% to 1% obtained in DAP composition.

7. The carbon enhanced DAP of claim 5 wherein the potassium humate is also the coloring agent of the prepared DAP.

8. The carbon enhanced DAP of claim 1 and claim 2 wherein the organic carbon may be fulvic acid.

9. The carbon enhanced DAP of claim 1 and claim 2 wherein the organic carbon is a high molecular weight compounds.

10. A method of preparing a carbon enhanced DAP fertilizer composition to obtain higher P utilization efficiency in DAP comprising :

a. preparing an organic solution in water and

b. adding the prepared organic solution to the phosphoric acid liquor that is fed into the pipe reactor in the conventional DAP manufacturing process wherein the method is characterized in the addition of organic carbon to the phosphoric acid liquor to incorporate the organic carbon into the body of the DAP granules.

11. The method as claimed in claim 10 comprises further the steps of :

a. preparing organic carbon solution by dissolving potassium humate in water and

b. adding the prepared solution to the phosphoric acid liquor that is fed into the pipe reactor in the DAP manufacturing process.

Dated on this the 20th day of November, 2013.

For **COROMANDEL INTERNATIONAL LIMITED**
By its attorney,

(BRINDA MOHAN)

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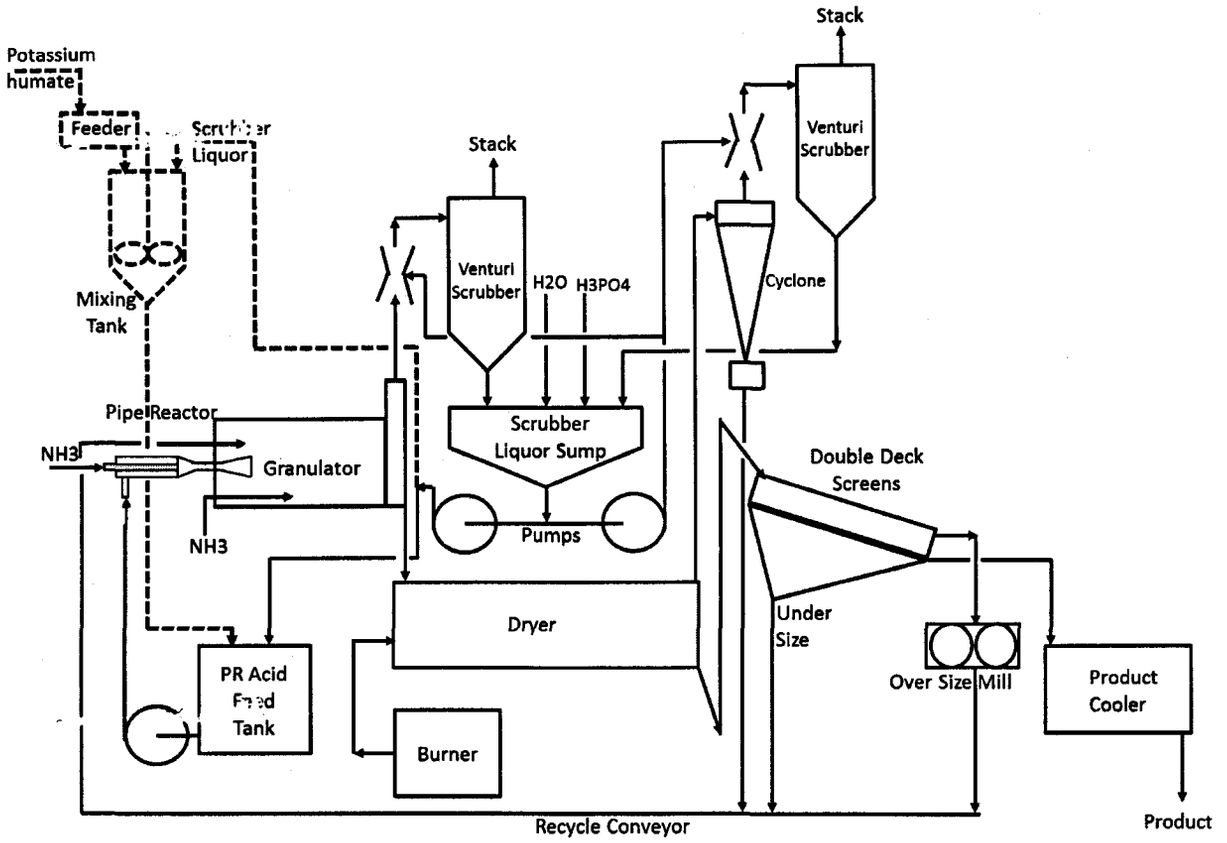

Fig. 1: Carbon Enhanced DAP Manufacturing Process Flow Sheet

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Fig. 2

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FIELD OF INVENTION

A novel method for preparing DAP and obtaining a carbon enhanced DAP.

PRIOR ART AND BACKGROUND

Diammonium Phosphate (DAP) is a widely used phosphatic fertiliser in India. It is a major source for phosphorus (P) nutrient for crops. The P content of DAP is expressed in terms of P_2O_5. DAP contains 18% N and 46% P_2O_5. A number of studies have established that the efficiency of utilization of P is around 15%-20% during the first season of application and 60% over the entire life cycle of the product. The balance P gets fixed in the soil and remains unavailable to the crop. Therefore if the utilization efficiency of P can be increased, this will help to reduce the per hectare requirement of DAP and also conserve the valuable P resource.

SUMMARY OF THE INVENTION

This invention deals with the new concept of enhancing the efficiency of DAP by addition of organic carbon to the product. The organic carbon added to DAP is in the form of high molecular weight compounds such as humic acid and fulvic acid. The organic compounds increase the P availability in different ways (Ref: Soil Fertility and Fertilizers by Tisdale and Nelson).

a) They form complexes with P nutrient that is more easily assimilated by plants in the fertilizer

b) They replace the $H_2PO_4^-$ ion on adsorption sites

c) They coat Fe/Al oxides to form a protective layer and thereby reduce P adsorption

DESCRIPTION OF THE INVENTION

The source of organic carbon is potassium humate which is a commercially available product. It contains around 30-35% organic carbon. According to literature, one kilogram of concentrated powder of humic acid is equivalent to 30 metric tons of manure (New Ag International).

Various methods of addition potassium humate is disclosed.

1) Coating of potassium humate concentrated solution on the surface of DAP granules

2) Incorporation of potassium humate in to the body of the DAP granules

The first method compels the use of solution with water content of 80% which is not preferred as it increases moisture content of the product and hence the caking tendency. Hence the second method was tried and found to be satisfactory as the powder gets mixed uniformly. This method is advantageous from another angle that there is no limitation on the quantity that can be dosed unlike the liquid coating where there is limitation on dosage.

Diammonium Phosphate 18-46-0 grade fertilizer is having sufficient cushion within its composition for addition of other components. The additional components that is added will partly or fully replace the filler content in its composition. Thus because of the addition of humic substances the original NP grade of DAP will not get disturbed and can be maintained by adjusting the filler addition.

The typical filler addition in DAP is 30-40 kg/ton. Therefore, potassium humate can be added to the extent of 30-40 kg/ton. In one aspect DAP was prepared with 2 kg of potassium humate per ton of DAP fertilizer gives 70 grams of humic acid content in 50 kg of DAP fertilizer (humic acid content in Potassium humate is 70%). The product was prepared by dissolving potassium humate in water and adding the solution to the phosphoric acid liquor that is fed to the pipe reactor in the DAP

manufacturing process. The conventional process for DAP is modified to the extent that an additional ingredient is added to the phosphoric acid liquor.

"Carbon enhanced DAP" was produced in another aspect with the dosage of 2 kg of potassium humate per ton of DAP and the samples have analysed for Organic Carbon content. It is found to have 0.1% Organic carbon and 454 ppm of K2O.

The potassium humate in the DAP 18-46-0 grade fertilizer gives an attractive brown colour to the fertilizer granules in addition to the Organic Carbon content. This brown colour gives a distinctive appearance to the DAP product. In the usual manufacturing process of Di Ammonium Phosphate the colour of the granules vary from white, light green and black depending on the source of the acid used for the manufacture. Thus potassium humate also acts as a colouring agent to achieve a uniform brown colour irrespective of the source of acid.

The inventive step lies in the following aspects of the invention

1) Addition of organic carbon DAP to enhance the nutrient utilization efficiency

2) Addition of organic carbon to DAP in the form of humic acid

3) Selection of potassium humate as the source of humic acid for addition to DAP

4) Addition of potassium humate in solution form to phosphoric acid feed tank

5) Dosage of potassium humate can be from 2 to 30 kg/ton of DAP

6) The above dosage gives organic carbon content from 0.1% to 1% in DAP

7) Potassium humate also acts as colouring agent for DAP

8) Potassium humate is incorporated into the body of the granule instead of coating

9) The process involves mixing a solution of potassium humate with phosphoric acid liquor in the conventional process for DAP.

10) The Carbon Enhanced DAP is superior to normal DAP as it will give higher P utilization efficiency

The details, embodiments and values have been provided for sake of easy and better understanding of the invention and hence the same cannot restrict the scope of the invention. All variations and modifications are covered with the scope of invention.

DESCRIPTION OF THE DRAWING

Fig. 1 is a flow sheet of the present invention as an addition to the prior art conventional process for the production of granular Di ammonium phosphate with organic carbon addition system. The block colour lines and vessels indicates the conventional process and the dotted lines are the new invention to add potassium humate into the system. The feed phosphoric acid is introduced into scrubber liquor sump and quantity of water also added into this. A portion of ammonia is introduced into the pipe reactor and remaining quantity is fed into granulator. Partially ammoniated scrubber liquor from sump is fed to pipe reactor feed tank and a portion is taken into potassium humate mixing tank. In this present invention the potassium humate solution from mixing tank is also introduced to the pipe reactor feed tank from that it is directly fed into pipe reactor where reaction takes place. High moisture containing material of carbon enhanced di ammonium phosphate granules are discharged from the granulator and fed into dryer. Exhaust gases containing ammonia and water vapour from the granulator arescrubbed by phosphoric acid in the scrubber. The carbon enhanced DAP granules after leaving the dryer are fed to product cooler through double deck screens. Oversize granules from screens are crushed in oversize mills and resulting crushed material is combined with fines falling

from screens, dusts from cyclones are recycled back to granulator. The final cooled carbon enhanced DAP granules are send to storage.

Fig. 2 illustrates the DAP with potassium humate crystals.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention of producing carbon enhanced Di ammonium phosphate fertiliser requires potassium humate addition set up as shown in dotted lines in Fig. 1. Quantity of solid Potassium humate is introduced into mixing tank through feederand the required quantity of scrubber liquor is introduced to that, where the dissolution of humate takes place and finally potassium humate solution is prepared by agitation. The solution of potassium humate is directly introduced to the pipe reactor feed tank for preparing carbon enhanced di ammonium phosphate fertiliser.