



VIETNAM CHEMICAL CORPORATION
VANDIEN FUSED MANESIUM PHOSPHATE FERTILIZER



PRESENTATION
OF VANDIEN FUSED MANESIUM PHOSPHATE
FERTILIZER COMPANY



PRESENTATION OF VAN DIEN FUSED MAGNESIUM PHOSPHATE FERTILIZER COMPANY

Name of Company : **Van Dien Fused Magnesium Phosphate Fertilizer Company**
Transaction name : **Vandien fused magnesium phosphate fertilizer company(VAFCO)**
Director : **Eng. Bui Quang Lanh**
Governing body : **Vietnam Chemical Corporation (Vinachem)**
Year of establishment: **1963.**
Initial output : **20.000 ton of Fused Magnesium Phosphate Fertilizer per year.**
Present output: **450,000 ton per year, in which 300,000 ton of Fused Magnesium Phosphate Fertilizer and 150,000 ton of NPK Fertilizer.**
Address : **Phan Trong Tue Road, Van Dien Town, Thanh Tri, Hanoi.**
Telephone : **084.43 6884489, 084.43 6885174 Fax: 084.43 6884277**
E-mail : **vafco@vnn.vn**

Accreditations achieved:

- People's Armed Forces Hero 1999;
- Labour Hero in Renovation Period 2000;
- Environmental Prize 2002;
- 2 International Agricultural Fair Golden Medals;
- Vietnam Golden Prize;
- Golden Globe Prize 2005;
- Vietnam Golden Rice Ears – the Golden Quality Trademark at Golden Rice Ears Agricultural Fair – Soc Trang Expo 2007;
- World Intellectual Property Organization (WIPO) Prize 2002;
- State Prize 2000 for the work “Improving Cupola to produce Fused Magnesium Phosphate Fertilizer by Domestic Coal”;
- Vifotec Science and Technology Prize 1998;
- ISO 9001 : 2000 certification;
- Vietnam High Quality Goods Title;
- Famous Trademark in 2008
- At present, the Company is holding 6 patents and useful solutions (author : Eng. Bui Quang Lanh) :
 - Patent No. 1991 awarded on 12/4/2001;
 - Useful Solution Patent No. 265 awarded on 9/8/2001;
 - Useful Solution Patent No. HI – 0030 awarded on 11/01/1991;
 - Useful Solution Patent No. HI – 0031 awarded on 11/01/1991;
 - Useful Solution Patent No. HI – 0089 awarded on 17/10/1992;
 - Useful Solution Patent No. HI – 0167 awarded on 30/8/1996

VAN DIEN FUSED MAGNESIUM PHOSPHATE FERTILIZER (F.M.P)

I. Product presentation:

Fused Magnesium Phosphate Fertilizer (FMP fertilizer) is also known as fused magnesium calcium or magnesium phosphate, characterized by the following:

1- FMP fertilizer product is in sand grain shape, greenish gray, black... grain size approx. <2 mm, if necessary, it can be milled into fine powder. The majority of vegetation can gradually dissolve the very massive part of Fused Magnesium Phosphate Fertilizer lying inside the soil.

2- FMP fertilizer is a kind of crystal glass substance consisting of PO_4^{3-} ions and the short chain of silicate anion, Ca^{2+} and Mg^{2+} ions all have undurable relations with oxygen molecules. FMP fertilizer does not dissolve in water, the constituents of FMP fertilizer dissolve gradually due to the weak acids of the soil and generated by tree root surface. Solubility of FMP fertilizer in citric acid is approx. 99%.

3- FMP fertilizer does not coagulate when stored in bags or in bulk, does not alter its composition due to moisture, density 1.4 – 1.5, pH : 8.0 - 8.5 (characterized by weak alkali, having no adverse impacts on tree grain and roots even in direct contact).

4- Mixing and storing FMP fertilizer with other fertilizers are possible except for nitrosulphate

FMP fertilizer produced in Van Dien Fused Magnesium Phosphate Fertilizer Company, Hanoi, Vietnam is from Apatite ore with the composition as follows:

Table 1: Composition of Van Dien FMP Fertilizer

Type	P ₂ O ₅ (%)	MgO (%)	CaO (%)	SiO ₂ (%)	Microquantities
Class 1	16 - 18	≥15	≥28	≥ 24	Fe, B, Mn, Zn, Co, Cu, Mo ...
Class 2	15 - 17	≥15	≥28	≥ 24	

Over the world, though there are many kinds of magnesium phosphate fertilizer have been developed, yet FMP (Fused Magnesium Phosphate) fertilizer is the only kind of fertilizer made directly from natural kinds of stone, ore whose basic constituents are all easy-to-consume type and have great value to agriculture.

Fused Magnesium Phosphate (FMP) is regarded by the Japanese as a multi-substance fertilizer with a very high total nutritious content – highest among the kinds of fertilizer in use at present; because, apart from effective phosphorus P₂O₅ between 15 - 20%, the total alkali (CaO + Mg) ≥ 45%, SiO₂ ≥ 24% and other medium and microquantities (total multi-substance composition, medium quantities reaches over 90%). When fertilizing trees, FMP does not dissolve in water but dissolve completely in acid environment generated by tree roots therefore does not cause contamination to the environment, and is effective not only in improving productivity, quality of trees but also their resistance to diseases and fertility of the soil

II. Production method:

There are various ways of producing FMP fertilizer such as by gallery method, electric furnace (popular in Japan), by fuel burning, for example, cupola furnace, revolving furnace, cyclone and open-hearth furnace fueled by heavy oil, coke and finely pulverized coal. In Van Dien Fused Magnesium Phosphate Fertilizer Company, the cupola furnace method is being applied, using the material of cloddy Apatite ore mixed with alkali minerals that contain magnesium, silicone and anthracite coal as fuel to make up an aggregate to be fed into the cupola furnace together with air supply. Inside the cupola furnace, the burning reaction between oxygen and coal creates a temperature to heat the aggregate up to 1350 – 1450 °C; the aggregate is completely fused, then taken out, suddenly cooled down by water to become semi-finished FMP fertilizer product, which continues to be dried, packaged to become FMP fertilizer product.

III. Competitive capacity in terms of cost:

The main technical, economic indicators of the FMP fertilizer produced by Van Dien Fused Magnesium Phosphate Fertilizer Company at present is much more advanced compared with the products of the same kind produced in Japan and China, specifically:

+ In respect of power: Power consumption for 1 ton of FMP fertilizer in Van Dien Fused Magnesium Phosphate Fertilizer Company is much lower compared with that in Japan and China.

+ In respect of coal: In Van Dien Fused Magnesium Phosphate Fertilizer Company, domestic anthracite coal but at a much lower rate in comparison with China where coke is used and with Japan where oil is used when converting to money.

The quality of Van Dien FMP fertilizer is ever being improved thus meeting the needs within the territory of Vietnam and for export to Australia, Japan, Malaysia, Taiwan, South Korea, etc., plus the rather cheap labour, abundant raw materials and materials at home, therefore, the competitive ability of Van Dien FMP fertilizer is distinctively higher than other products of the same kind on the market.

IV. Usability of FMP fertilizer compared with other kinds of phosphate fertilizer:

The popular kinds of phosphate fertilizer today include:

Super phosphate is a kind that contains 16-16.5% P_2O_5 , since the production according to the method of disintegrating apatite by sulphuric acid H_2SO_4 to create mono calcium phosphate ($CaHPO_4$), the product has an acid radical, pH 4-5, water-soluble, thereby being sour, only suitable for the alkali soil type and with those countries characterized by dry, drought climate. For the zones with tropical, high rainfall, near the sea, fields flooded by water with acidic alum soil, when this kind of fertilizer is applied, it is usually washed out and the nutrition is lost, and the acidity is become worse and the sources of water are easily contaminated. In order to reduce such adverse impacts, super

phosphate is often combined with lime to eliminate acidity or put down to short-term trees, or divide into many parts to put down in sessions.

DAP fertilizer contains 18% N, 46% P_2O_5 , this is a kind of fertilizer produced according to the method of disintegrating apatite by acid to create a water-soluble, acidic product, therefore, like super phosphate, it make the soil sour and washed out, and is not suitable for tropical, flood and acidic-stricken countries

FMP fertilizer, with $Ca_2(PO_4)_2$ as the main constituent, not soluble in water yet well soluble in citric acid 2% environment (similar to the environment generated by tree roots), cannot be washed out, does not cause environmental contamination. Particularly, FMP fertilizer is alkali, pH 8 – 8.5 therefore can eliminate acidity, very suitable for acidic fields, exhausted hill and maintain soil, and tropical, hot, rainy countries.

FMP fertilizer has a very high total nutritious content – highest among the kinds of fertilizer in use at present (total multi-substance composition, medium quantities reaches over 90%). When fertilizing trees, FMP does not dissolve in water but dissolve completely in acid environment generated by tree roots therefore does not cause contamination to the environment, and is effective not only in improving productivity, quality of trees but also their resistance to diseases and fertility of the soil

In Japan, production of FMP fertilizer began as from 1950 and the data on consumption indicates an ever increase, it surpasses even super phosphate.

Table 3: FMP fertilizer consumption in Japan:

Year Product Description	1961 (1000ton)	1963 (1000ton)	1965 (1000ton)	1967 (1000ton)	1969 (1000ton)	1971 (1000ton)
Super phosphate	712	518	386	299	186	135
FMP Fertilizer	239	216	263	414	449	387

At the present time, with an output of nearly 9 million ton of rice per year, Japan still has to use over 200 thousand ton of FMP fertilizer.

According to the data of the chemical company limited Hinode (HINODE KAGAKU KOGYO KAISNA Ltd. – Japan), comparison of usability between FMP and super phosphate to various kinds of plant is as follows:

Table 4: Comparison of usability between FMP and super phosphate to various kinds of plant

<i>Kind of Plant</i> <i>Kind of Fertilizer</i>	<i>Rice</i> (kg/1000m ²)	<i>Wheat</i> (kg/1000m ²)	<i>Soya bean</i> (kg/1000m ²)	<i>Coza Bean</i> (kg/1000m ²)	<i>Potato</i> (kg/1000m ²)	<i>Peanut</i> (kg/1000m ²)
With fertilizing	315	59	83	44	1060	85
With super phosphate	452	280	225	185	2450	207
With FMP fertilizer	519	319	310	207	3090	238

Exceptionally, in the areas poor in phosphate, the outcome is outstanding.

For example, in Nagam: 1000m² fertilized by super phosphate yielded 187.3 kg; super phosphate plus magnesium yielded 224.8 kg; while applying FMP fertilizer in the similar quantity yielded 251 kg.

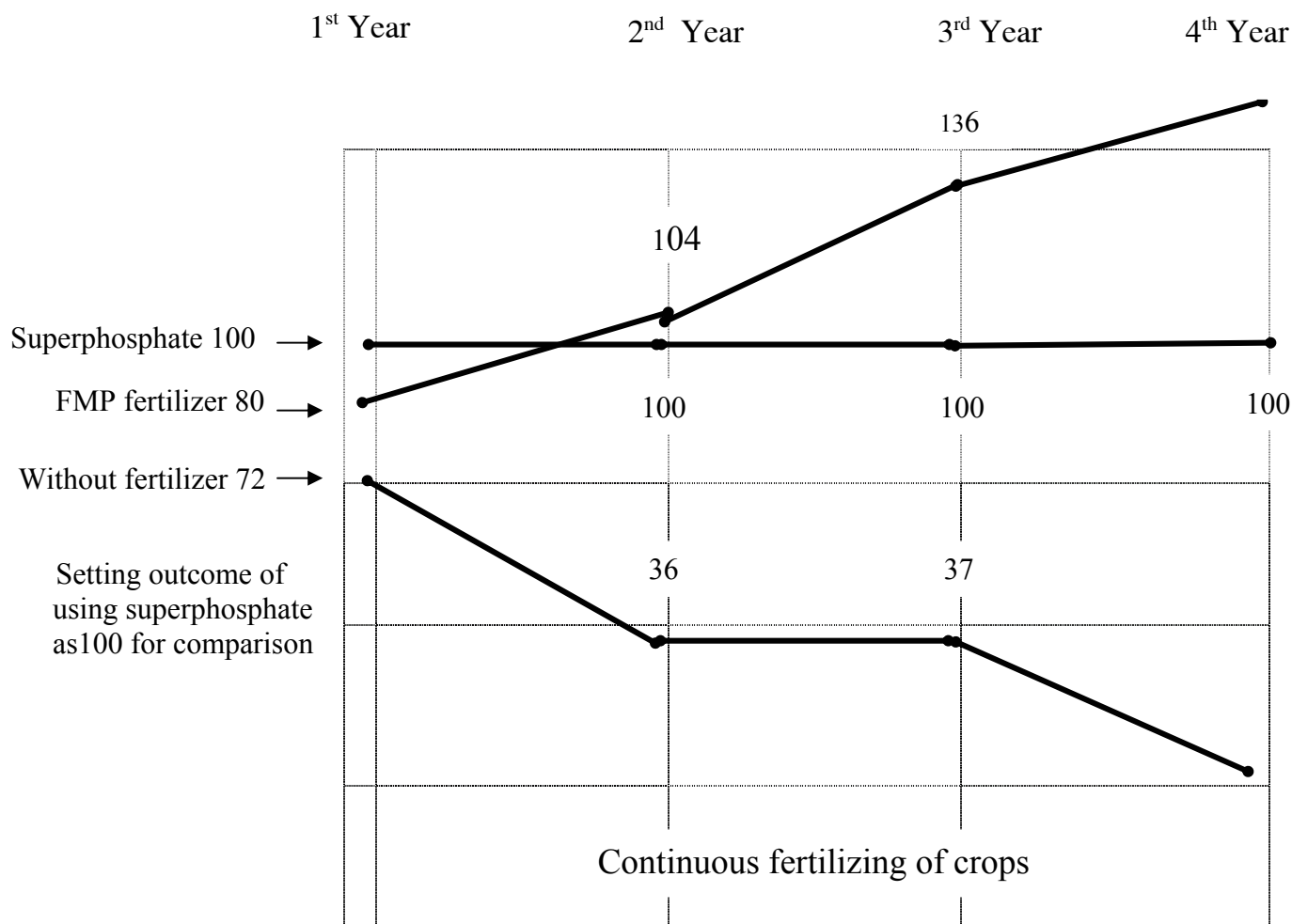
Experiments conducted in various stations of Japan also proved the dominance of FMP fertilizer over super phosphate.

Table 5: Comparing the usability between super phosphate and FMP fertilizer to kinds of plant by experimental stations in Japan (Comparative indicators against super phosphate)

<i>Place of Experiment</i>		<i>Akita Province Experiment Station</i>	<i>Nagano Province Experiment Station</i>	<i>Siduka Province Experiment Station</i>	<i>Oka dama Province Experiment Station</i>	<i>Damagata Province Experiment Station</i>	<i>Midegi Province Experiment Station</i>	<i>Tokyo University</i>
Type of Plant under Experiment		Wheat	Wheat	Wheat	Wheat	Wheat	Soya bean	Wheat
Yield (relative indicatio)	Land lot not fertilized with phosphate	70	23	2	0	60	63	0
	Land lot not fertilized with super phosphate	100	100	100	100	100	100	100
	Land lot not fertilized with FMP fertilizer	203	1045	122	143	137	139	319

Fertility of the soil increases thanks to continuous putting down FMP fertilizer:

Table 6: Experiment conducted at the agricultural experiment station of Toshighi Province. Compared with super phosphate, FMP had a higher and sustainable yielding indicator when continuously fertilized.



China is a power in producing and using FMP fertilizer; during the years 1990 – 2000, only in Yunnan, a province bordering Lao Cai Province of Vietnam, the output reached 1.2 million/year.

As summarized of the 24 experiments on the rice plant in Sichuan Province, China, every 1 kg of FMP fertilizer helped increase 2.3 -3.5 kg of paddy.

As summarized of the 10 experiments in Hunan Province, FMP fertilizer helped increase jute by 6.2%, flax by 30.6 – 40%; colza by 38.5%.

In Vietnam, from 1988 until now, Van Dien Fused Magnesium Phosphate Fertilizer Company – Vietnam Chemical Corporation, has been collaborating with science research agencies such Pedological – Agrochemistry Institute , Ministry of Agriculture and Rural Development, Pedological – Agrochemistry Station of Quang Ngai Province, Dong Thap Muoi Agricultural Research Centre and the universities of Agriculture I, Agriculture II in Hue, Agriculture III in Thai Nguyen, Can Tho Agriculture... as well as agricultural departments, agricultural expansion centres in provinces in carrying out experiments to use Van Dien FMP fertilizer on a large scale in various provinces in various kinds of soil, and the outcome was as follows:

For rice plant:

1 kg of Van Dien FMP fertilizer yielded 10 – 12 kg of paddy on average.

On swampy soil, that was 10 – 12 kg of paddy.

On acidic alum soil, that was 10 – 12 kg of paddy.

For corn:

1 kg of Van Dien FMP fertilizer yielded 5.8 – 6 kg .

1 kg of super phosphate yielded 5.8 – 6 kg corn grain.

For beans, peanut:

On acidic alum soil, Van Dien FMP fertilizer and super phosphate had the same effect, yet when the two were combined, outstanding outcome was obtained.

For sugarcane:

On alluvial soil, Van Dien FMP fertilizer increased the yield: 146 kg of cane / 1kg of P₂O₅

On exhausted soil, Van Dien FMP fertilizer increased the yield: 225 kg of cane / 1kg of P₂O₅

Sugar content increased by 0.,75 – 1.95%.

For mulberry:

Van Dien FMP fertilizer helped increase mulberry leaves, thickness of silkworm cocoon and length of silk fibres; reduce rate of diseased silkworms as resulted from effect of P₂O₅ and MgO.

On alluvial soil, super phosphate helped increase mulberry leaves by 4.8 %.

On alluvial soil, Van Dien FMP fertilizer helped increase mulberry leaves by 16.5 %.

For tea:

Super phosphate and Van Dien FMP fertilizer all helped increase the yield; depending on the rate of acidity, the outstanding effects of these two might vary; however, in case of using Van Dien FMP fertilizer, the quality of tea was improved.

For pineapple:

Van Dien FMP fertilizer (with Mg) helped increase the yield, reduce the rate of withered leaves (a popular disease of the pineapple).

8 g of FMP fertilizer put down / 1 pineapple plant on acidic alum soil helped increase the yield by 33.9%.

For black pepper:

On acidic alum soil, Van Dien FMP fertilizer helped increase the yield by 50%.

V. Advantages of FMP fertilizer

1- Each element contained in FMP fertilizer has an effect to give a very high increase in the fertility of the soil; each nutrient of FMP fertilizer is not water-soluble yet easily soluble in weak acidic content in the soil or generated by plant roots; solubility of each substance in citric acid 2 % is as follows:

- P₂O₅ : 98 – 99%
- CaO, MgO : over 98%
- SiO₂ : over 95%
- Fe₂O₃ : approx. 90%

If these substances are water-soluble, then P_2O_5 shall combine with iron, aluminum in the soil to form precipitants hardly absorbed by plants thereby reducing considerably the effect to increase the fertility of the soil; the residual of the fertilizer shall dissolve in water and is washed out. FMP fertilizer does not have that weak point, thus it is not washed out, not disintegrated in the soil and can maintain for a long time the effect of increasing fertility of the soil.

2- FMP fertilizer can neutralize toxic acids in the soil and from other fertilizers. The effect of FMP fertilizer is characterized by acidity, with pH between 8.0 – 8.5. Alkali elements (CaO, MgO contained in 10 kg of Van Dien FMP fertilizer nearly equal the quantity in 9 – 10 kg of calcium carbonate and this is enough to neutralize the acid contained in 11 kg of ammoniac sulphate or 9 kg of ammoniac chloride, or 16 kg of potassium sulphate, or 14 kg of potassium chloride.

3- FMP fertilizer is very convenient for use and can be store for a long time because it does not absorb moisture, does not disintegrate even in damp or (below 500 °C).

4- FMP fertilizer does not contain toxics substances, since it does not have an acidic sulphate or chloricradical, FMP fertilizer does not cause acidity to the soil, toxic gas or hydro sulpharic that can destroy plant roots on rice-fields.

Normally, the soil is poor in phosphate (P_2O_5), therefore, P_2O_5 is necessarily to be added. P_2O_5 is the important constituent of plant root cells which assist the roots in growing strongly thus further improving the yield.

Van Dien FMP fertilizer is not water-soluble, it lies within the soil and continues providing necessary nutrients for the plants, meanwhile, other kinds of fertilizer are easily soluble in water, for example, super phosphate, ammoniac sulphate can have immediate effects but are easily held by aluminum in the soil thus rapidly washed out. Plant roots still continue to dissolve P_2O_5 via immediate contact with FMP fertilizer in the soil. This effect is very important to the type of soil originating from volcano ashes, wild soil and exhausted fields poor in P_2O_5 .

5- Van Dien FMP fertilizer not only helps increase the fertility of the soil, suitable for many kinds of plant but also help prevent lack of magnesium and some other nutrients in the soil that support the plants' growth.

Mg and Ca are much in the soil but due to long-term withering in acidic alum soil, the alkali effect is void, this frequently occur in tropical and subtropical zones.

Mg is very necessary for creating Chlorophyll in plant leaves, the main constituent of the plants. Mg plays an essential role in the production of protein and fat in plants.

Mg improves the effect of phosphate, helping plants absorb the nutrients lying inside the soil and also participate in transporting P_2O_5 that has been absorbed in the tree-trunk. FMP fertilizer can be seen as the most suitable one in tropical and subtropical zones poor in P_2O_5 .

In such zones, many kinds of nutrient of plants are in the process of washing out; this situation can be improved by using FMP fertilizer continuously, on the one hand, FMP fertilizer helps increase the fertility of the soil, on the other, it assists the soil in maintaining the nutrients in an efficient manner.