

Some thoughts on Eppawala Phosphate Deposit

Attention is once again being focused on the Eppawala Phosphate Deposit. Appointing committees has taken place at regular intervals over the past 34 years and is now turning out to be a cause for cachinnation.

Over the years scientists have expressed their views that this non-renewable resource should be fully surveyed, and every aspect of the deposit should be examined in detail.

This is nothing new as one could identify the same phraseology being used in the terms of reference for most reports presented to the Ministry of Industries over the decades. The most interesting aspect of this exercise is that these reports have suffered the same fate - no worthwhile suggestions have been made or action taken.

The Eppawala Apatite Deposit was discovered on the 04th April 1971 during the commencement of the NP insurrection by a team of Geologists (Dr. M. M. J. W. Herath, S.B. Basnayake et. al.) during the course of mapping of the Dambulla one inch topographical sheet in the N.C.P. Drilling investigations by the Geological Survey Department (GSD) (presently Geological Survey and Mines Bureau - GSMB) proved a deposit of 25 million tons by drilling to a cumulative depth of 5181 feet with 21 drill holes varying in depth from 538 to 105 feet covering mainly the northern parts of the deposit. The deposit extends in depth to 125 metres or more from the surface. The phosphate rich ore zone (leached zone) extends to 60 metres from the surface with an average phosphate pentoxide (P₂O₅) content of 35 percent. However, with depth fresh rock is encountered and the P₂O₅ content drops to around 10 percent. The southern areas have not been examined. It is observed that the inferred reserve in the southern parts is over 40 million tons. The entire deposit covers a terrain of 7 sq. km.

During the period 1971 - 1976 the Geological Survey Department (presently GSMB) made every effort to get the apatite examined by foreign research institutions for its suitability for fertilizer manufacture. The late Hon. T. B. Subasinghe was then the Minister in charge of the subject. This period also witnessed the greatest development of the mineral sector of the Island including the first joint venture with Noritake of Japan for porcelain dinnerware manufacture.

Detailed characterization of the rock was undertaken by the International Fertilizer Development Corporation in Alabama (USA) in April 1975. The Apatite was classed as a chlorine rich fluorapatite, a phosphate rock which is sparsely soluble and therefore cannot be used for short term crops. The phosphate rock deposit is a unique one unparalleled elsewhere in the world.

In normal circumstances by acidulation (with sulphuric acid) the apatite can be converted to monocalcium phosphate (MOP), single super phosphate (S.S.P) which could be absorbed by plants (16 - 20 percent) available P₂O₅. Triple super phosphate (TSP) is a more concentrated form with 45-50 percent available P₂O₅. The main draw-back in manufacturing water soluble fertilizer by acidulation with the Eppawala apatite is the inherent chemical character of the rock. The relatively high chloride content (average 1.1 percent) and the high iron and aluminium oxides content (average 7-8 percent) are the major drawbacks. International standards acceptable are less than 0.05 percent chloride and less than 4 percent iron and aluminium oxides. The high chloride content it is mentioned gives rise to serious corrosion problems in plant and machinery and the high iron and aluminium contents retards the filtration process during conversion of rock to phosphoric acid (first stage) by reacting with sulphuric acid. Therefore contrary to some scientists (who are all-round experts) the Eppawala phosphate deposit is undoubtedly not the best in the world, it is only a unique deposit.

Although the Eppawala apatite is a high grade ore (35 percent P₂O₅) it is found not suitable for conventional acidulation processes for the manufacture of high analysis phosphate fertilizer such as di and mono ammonium phosphate (DAP and MAP) single super phosphate (SSP) and triple super phosphate (TSP).

In 1972 the local use of the rock was initiated by the GSD and representative samples were distributed to all agricultural research institutes including the Central Agricultural Research Institute at Gannoruwa. Long term field trials were carried out which revealed its suitability for long term crops especially in well drained acid soils. This effort by the GSD was mainly responsible for the present production of powdered rock at Eppawala by Lanka Phosphate Limited (LPL). The citric acid solubility of the powdered rock is about 2 percent and at present a large tonnage is supplied to the fertilizer mixing industry by LPL.

Worldwide tenders were called on two occasions for the overall development of the deposit in the form of joint venture agreement. Firstly Agrico Chemical Industries was selected and after final negotiations the project was shelved in 1984. In 1993 the Government again called for worldwide offers to set up a joint venture. In the meantime Agrico Chemical Industries was bought over by Freeport McMoran of USA and Freeport McMoran was selected and the first round of negotiations commenced in March 1994. The main features of the proposal were as follows:

1. The mining of around one million tons of apatite rock per annum. 2. Industrial unit to produce 600,000 tpy of DAP, MAP and TSP for export



Phosphate mine in Eppawala

3. Certain quantity of the mined apatite to be exported in raw form without value addition

4. Estimated cost of project US\$ 400 million.

The negotiating Committee of the Ministry of Industrial Development (MID) was studying the investment package from Freeport as submitted to the Committee. The negotiating Committee was to finally study this proposed package to evolve a counter package in the best interests of the country without jeopardizing the interests of the national economy. This was the stand by the MID. However, no formal decision was taken concerning this issue.

This, in brief, is the story of the Eppawala Apatite Deposit which has undoubtedly become a Geological curiosity. Whatever is known of the deposit is the result of studies undertaken by the GSD (presently GSMB). The initial Geological mapping, the identification of the deposit, extent of the deposit, drilling investigations to prove the resource, the nature and characterization of the deposit, initiation for its local use in powdered form and the possibilities of export in value added form are areas studied by the GSD for the development of this resource from the very inception of its discovery in 1971.

There are only a few options left for the Government to consider the development of this resource.

1. The resource could be developed on a large scale for the production of MAP, DAP and TSP with foreign collaboration where the technology is available including export markets for the finished products - say a joint venture with an organization like Freeport McMoran of USA.

2. The development of the resource on a small scale say around 100 150,000 tons of water soluble phosphate per annum with provision for future expansion if necessary. The production of single super phosphate (SSP) was satisfactorily proven by studies at the IFDC. It is frequently mentioned that the demand for SSP in world markets is now very limited. The latest literature available reveals that the manufacture of SSP is out dated. Therefore the suggestion by our scientists to manufacture SSP is totally out dated and not productive enough and is not viable. It is like going back to our bullock cart days when sophisticated transport systems are freely available.

What is required of any Committee appointed by Government is a proposal which is functional, a tangible one. This is not the time to advise our politicians and planners that we should undertake a detailed survey of the area. This has been done and 25 million tons proved. Detailed surveys are usually undertaken when a joint venture agreement has been finalized mainly for projects on a large scale where considerable tonnages are mined annually. This is to ensure a supply position of a particular tonnage and grade over 25 years the approximate period of the amortization of most industries.

It has been observed that when scientists and others discuss the phosphate deposit in Eppawala, they give the impression that it was discovered only yesterday. No mention is made of the R



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and D work undertaken on this deposit. The GSMB is never mentioned. Politicians and planners are naturally misled, they feel that we should start this exercise from scratch.

Very few scientists in Sri Lanka have had the opportunity of working in very large multi-national industrial organizations for considerable periods. Those who have had this rare experience are the ones who understand what industry is all about. They are the ones who have a feel for it, and are in a better position to voice opinions on various aspects of industrial development. What is required now is a fresh look at these valuable mineral resources with a new vision and a pragmatic approach and not allow the Eppawala Phosphate Deposit to further remain a Geological curiosity.

Modern mining and processing methods have become so capital intensive that few of the developing countries can expect to bring a sizable project into operation on their own. Therefore the interdependence of the developed and developing countries is real and will grow. Foreign participation for joint ventures on our mineral deposits is the only answer to enter into international markets.

The mineral industry differs from other productive sectors because of its well known capital intensive characteristic, long lead time and high risk factor. Technology is undoubtedly one of the prime motive forces of development. While dependence on foreign technology may be inevitable in the process of economic diversification and better returns from minerals, the building up of national capabilities is essential. The import of foreign technology should therefore be viewed essentially as a springboard to self-sustaining development.

Lastly, no development of this resource could be undertaken unless a court order is settled which states that all available phosphate deposits in the Island should be surveyed and all resources proved.

This will also include monazite deposits as well. This assignment will take a minimum of 30 to 50 years to be achieved. This again is the result of the advice given by some of our scientists who are experts in them all.

Dr. M. M. J. W. Herath
Consultant to the Ministry of Industrial Development