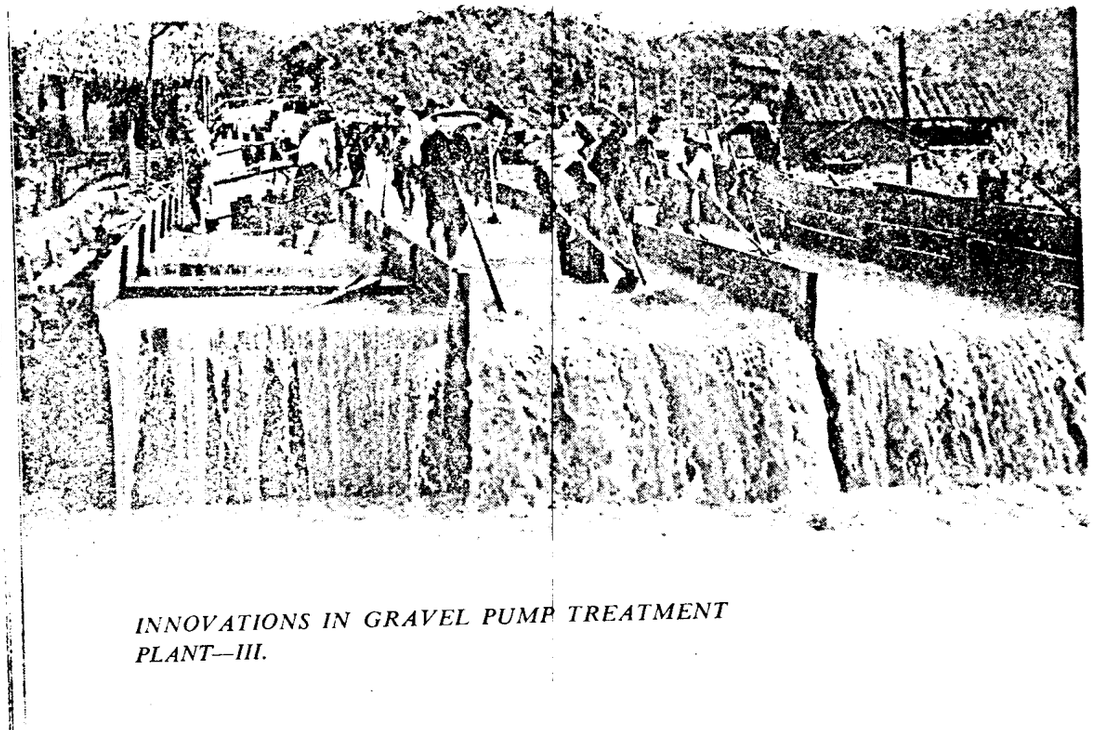

INNOVATIONS IN GRAVEL PUMP TREATMENT PLANT—III.

Innovations in Tin Treatment in Malaya

The following article ends the series that has presented "Innovations in Treatment Plant for Gravel Pump Tin Mines in Malaya", by J. H. Harris, Chief Research Officer, Department of Mines, Federation of Malaya. The article, published in its entirety, has been published by permission of the Chief Inspector of Mines with the authority of the Minister of Natural Resources of the Federation. The illustration shows cleaning-up operations on a palong.

THE daily recovery from the plant previously described exceeds by about 50 per cent that formerly attained by means of sluices, on the same tonnage of ground. That any increase in grade of ground treated is not solely responsible for this can be shown by the fact that demonstrable tailings losses have been cut down by a significant amount. Whereas, formerly, dulang washers working in the tailings were able to recover up to 10 pikuls per month (1 pikul equals 133⅓ lb.), the recent comparable figure has been 0.8 pikul. At the same time, a loss of extreme fines, never before suspected (because it was not reported in prospecting results or noted in palong concentrates), has now become apparent in the form of −300 mesh cassiterite in the cyclone overflow. This may amount to 1 or 2 pikuls per day. Recovery of these extreme fines although possible, may be uneconomic. Tests will be undertaken to endeavour to collect part, at any rate, of this material.

At another mine, jig tailings containing fine cassiterite have been treated by screening on a fine sieve bend, the undersize from which has been passed via a hydrocyclone to a shaking table. Economic recoveries of −300 mesh cassiterite have thereby been achieved.

The plant is more compact and durable than a sluice. It requires less operators and can work continuously without time lost on clean up. The capital cost of the plant may amount to about $M40,000. This, amortized in five years gives a fixed charge of $M8,000 per annum as against the cost of between $M10,000 and $M15,000 per annum for building and maintaining a palong. The power required for its operation costs no more than the labour and pumping costs for weekly sluice clean up, which have now been eliminated.

The total flow to the plant as at present set up is 60 cu. yds. per hour. In normal Malayan practice, at least four 4-cell rougher jigs would be used to treat this and the tailing losses would be high. Here, however, it has been demonstrated that about 60 per cent of this feed can be rejected at once as slimes with no loss of recoverable tin, leaving about 25 cu. yds. per hour to be dealt with by only one 2-cell rougher jig followed by another as a scavenger, while at the same time reducing tailings losses of recoverable tin by a very great amount.

The small losses of recoverable tin in the present plant are in the tailing from the scavenger jig. This is mainly due to the fact that the locally made jig in use is not satis-

factory in operation. It is planned to replace this jig by a more efficient machine with the object of still further improved recovery.

Applications

With suitable modifications, it is considered that the plant described would be suitable for all the many hundreds of gravel pump mines in Malaya, and also for the opencast alluvial mines where the ground is excavated and transported dry and puddled before treatment. A pilot plant constructed on these lines at one of the latter type of mine has, in fact, already demonstrated the possibilities of remarkable improvement in performance.

Application to the jig plants used in dredging practice has also been considered, and there seems little doubt that improvements could also be achieved in this field. High-pressure hydrocyclones have already been successfully used on one dredge and pilot scale experiments with low-pressure hydrocyclones are planned.

The immediate value of these innovations lies in the improvement in recovery which is attained at little or no greater cost. More important than this, however, is the effect of lengthening the life of the available ore reserves by ensuring more output from the existing yardage. Furthermore, the possibility is now offered for successful retreatment of great quantities of old tailings, thus adding important tonnages to the known ore reserves.

Summary

The innovations described here are based chiefly on a novel method of coarse wet screening and on the use of low-pressure hydrocyclones at a flow rate and with a coarseness of feed not hitherto attempted. Incidental to this, it was demonstrated that, contrary to orthodox theory, jigs would give satisfactory performance on Malayan tin-bearing alluvials when presented with a long range feed in which gangue minerals preponderate in the larger sizes. The open nature of the bed so formed, it is thought, provides a system of interstices which encourages trapping of heavy mineral down to fine sizes. Significant amounts of even −300 mesh cassiterite can be caught by this means.

It will be noted, from the tin distribution figures above, that 65.2 per cent of the total tin was +85 mesh. Of this, much used to be lost in the sluice, and it was doubtful if total recovery was 50 per cent. The jigs, however, fed as described, had no difficulty in catching this and, indeed, most of the tin in the cyclone underflow, bringing the recovery to well over 70 per cent.

There seems no doubt that what used to be spoken of as "fine tin" can now be recovered for the greater part. Extreme fines, −300 mesh, the existence of which was previously practically unrecognized, are now being shown by pilot scale work to be physically recoverable, but not necessarily always economically so.

[*Acknowledgement is due to Mr. Leow Yan Sip, the operator of the mine, for permission to carry out the experiments described in these articles, for much practical help and for his persistence at considerable expense in the early stages; to Inche Abdullah bin Mohamed Yusoff and Mr. I. R. M. Chaston, both Research Officers in the Research Division, the former for installation and supervision of pilot plant, and the latter for improvements in the design of hydrocyclones leading to greatly enhanced capacity and lower cost of construction; and to the Richards Construction Co. Ltd. (through their agents, Sime, Darby and Co. Ltd.) for the loan of a Yuba jig. Photographs, except where otherwise stated, are by the Research Division, and copyright is reserved by the Government of the Federation of Malaya.*]

Activities of C.F.P.O. in the New Hebrides

THE Compagnie Française des Phosphates de l'Oceanie (C.F.P.O.) has its headquarters in Paris and its principal activity is on the island of Maka-ea, near Tahiti. The company's installations at Makatea, nd particularly the arrangements for the loading of ships, ere modernized in 1954. The Makatea workings can roduce more than 250,000 tons of phosphate annually, nd in the region of 220,000 tons are exported yearly to apan, Australia, New Zealand, Hawaii, and India.

Although this operation is still at the height of its pros-erity, researches have shown that the life of the present eposit is limited. In consequence, the C.F.P.O. began, in 954, to prospect in the New Hebrides, using as the basis its investigation a report by Aubert de la Rue.

A geological mission headed by Mr. J. M. Obellianne, a oung geologist from the College at Nancy, explored the ands of Efate, Santo, Pentecost, Maewo, and the Torres roup during the period 1954-58. Valuable geological in-rmation was obtained everywhere and was communi-ted to the Condominium Mines Department. At the esent stage of prospecting, however, the only deposit garded as being immediately workable and of certain onomic value is that of Forari, which was discovered in ne, 1955. After very thorough geophysical study, de-led prospecting, and analyses and treatment of the ore, project for working it has been submitted to the board, d a decision is likely in the very near future.

The deposit lies mainly to the north and on the left bank of the River Forari, extending to the upper valley of the river. The centre of gravity of the richest zone is about 3 km. from the coast. The deposit is a surface one consisting of a layer of manganese oxides, and treatment tests have shown that a marketable ore containing 46 per cent manganese may be obtained after relatively simple washing and screening. Although the rich layers are not very thick and are often rather irregular, they form a mass of some importance and of easy access. It is these factors which, especially in the case of a deposit on the edge of the sea, make for an economic proposition.

The principal installations which it would be necessary to erect are:

(*a*) In the area of the deposit, a washing plant connected to a pumping station on the River Forari;
(*b*) Near Metensa, a shelter for the generators which will provide power for the exploitation, a storage place for ore waiting to be exported, and a wharf, together with offices, workshops, store sheds, and quarters for staff and workmen;
(*c*) A small road network.

The ore would be extracted by the mechanical opencast method, using diesel-engined equipment. The ore would be transported to the washing plant and from there to the wharf in diesel lorries.