NUMUNDO OIL MILL AND ZERO EFFLUENT DISCHARGE.

By

Dixon Chiang

New Britain Palm Oil Limited, P. O. Kimbe, West New Britain Province, Papua New Guinea.

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Manager for the Numondo Oil Mill
New Britain Palm Oil Limited, P. O. Kimbe, West New Britain Province, Papua New Guinea.

ABSTRACT

In continuing with the Company's development of the Oil Palm Industry, a new mill was proposed for the West side of Kimbe town in 1999. This would not only meet the additional crop coming from the small-holders and villages but also to complement existing milling capacities.

Numundo Oil mill was commissioned in August, 2001. The new mill occupying approximately 7 1/2 hectares of land fully comply with the Papua New Guinea Oil Palm Processing Industry Code of Practice which is to minimize environmental impact by recycling all mill effluent and by-products back to the plantation, which is in essence zero effluent discharge.

The Company's commitment to the environmental sustainability was further enhanced with the recent accreditation of ISO 14001, a much sought after Environmental Management System in the Industry.

INTRODUCTION

In the planning stage, every social and environmental aspect of the mill was carefully considered and the potential elements of pollution and by products of the mill were identified.

Aside from experience, much was learnt from the older existing mills in operation. The new mill was designed to overcome many of the older mills shortcomings. It is by no means complete.

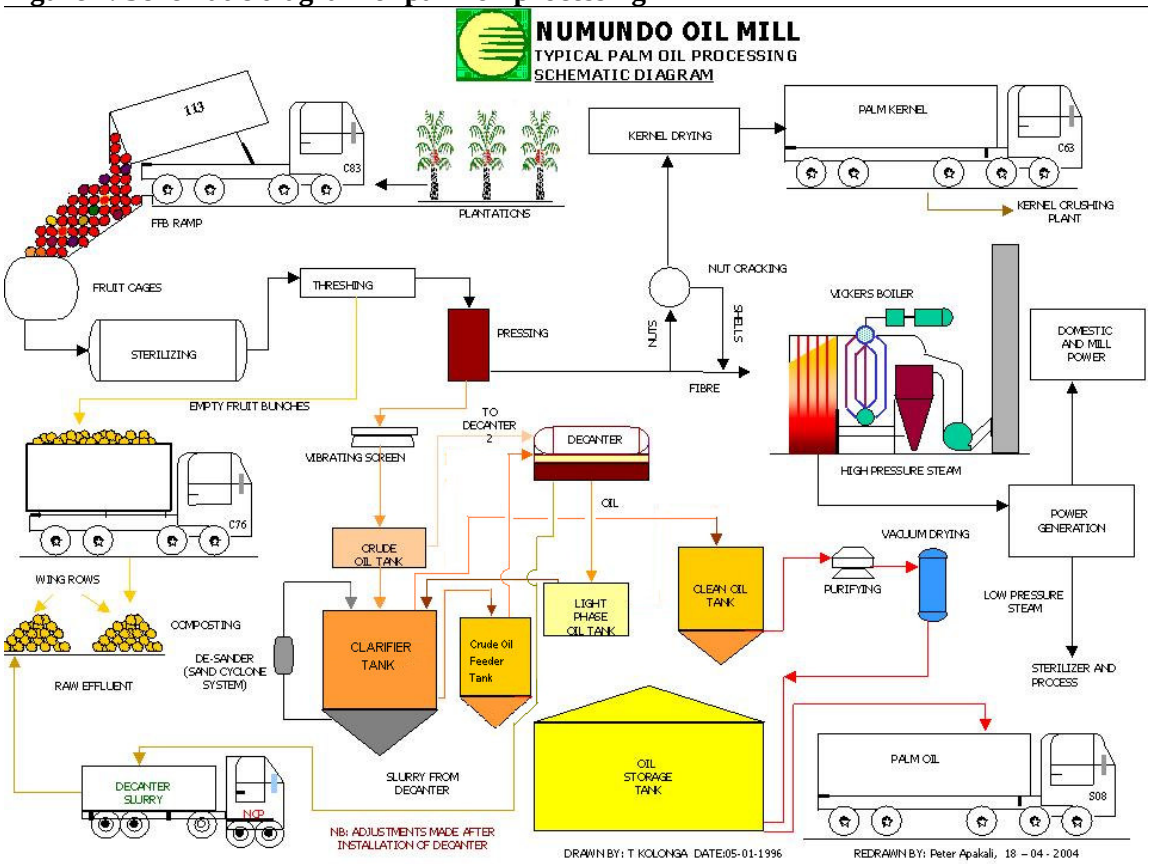
Incorporating new technology into the mill and including in-house development of composting of effluent and empty bunches are some of the many achievements implemented.

MILL PROCESS

Mill capacity

The mill has a capacity of processing 40 tonnes FFB per hour. These include 4 units of 15tph screw presses with one unit used as a standby. Provision for future extension of the mill capacity requires the addition of a parallel line with similar presses or reduced number of units using bigger capacity screw presses. The designed of the mill and up to date maintenance has ensured the mill achieving well above the mill throughput of 40 tonnes FFB per hour. The mill flow chart is as described in Figure 1

Figure 1. Schematic diagram of palm oil processing



MILL PRODUCTIVITY AND OUTPUT

Mill Productivity

The Mill processed 200,209 tonnes FFB in 2003 last year, 12% surplus against the budgeted figure of 178,471 tonnes. It is expected similar trend will continue with the current year as crops for the first half of the year has superseded by 26% against budgeted.

A proportion of 10% of the crop received are from the village oil palm and small-holders.

A total of 46,676 tonnes of crude palm oil and 9695 tonnes of palm kernel were produced in 2003. In terms of extraction rates, for 2003, CPO was 23.31% and PK was 4.84% . For the first half current year, the Mill continues to achieve above 23% at 23.11% and 4.88% for CPO and PK respectively. Refer to Chart 1 to III in Appendices

Part of the CPO produced are shipped overseas to fulfill sales contract made while the balance are transported by road tankers to our very own Kumbango Oil Refinery. All Palm kernels produced are transported to Kumbango Kernel Crushing Plant.

Mill by products

1. Empty Fruit Bunches (EFB)
The EFB are conveyed from the threshing drum and dropped into the skip bins stored below the conveyors in the Mill. The Fruit trucks collect the filled EFB skip bins to the Compost site for composting, after delivery of Fresh Fruit Bunches from the plantations.
The composition of EFB to FFB for the Mill recorded is 19%

2. Steriliser Condensate
25% of the sterilizer condensate produced were recycled for crude oil dilution. Later when the ECO-D decanter trials were started, the recycling was stopped and became the major part of the effluent. The condensate is pumped to the Compost site via the relief pond.

3. Smoke
The Boiler operating under good combustion control should only produced a slight haze from the stack. During the boiler tube cleaning or soot blowing black smoke will be visible for limited periods no more than ten minutes within eight hours. The effects are limited to a small radius around the Mill site. The smoke density recorder installed measures the smoke emission and the charts and records are compiled and sent to the Department of Environment and Conservation every six months. The opacity recorded for both the Vickers Boilers are well below the 40% limit

4. Noise
The Mill generates noise from vehicles off loading bunches, steam discharges, fans for product conveying and diesel engine cooling. Regular steam discharge points are fitted with silencers. Overall noise nuisance will extend no more than 200-300 metres from the Mill and would largely be blanketed by the surrounding palms. No residence will be constructed nor any population will reside within a radius of 700 metres of the Mill. Workers within the Mill are provided with hearing protection for use in especially noisy areas, such as the engine room and kernel station.

5. Odour
The Mill generates odours, mainly from the cooked fruits, which is not unpleasant and is dispersed within a hundred metres of the Mill. Similarly the effluent ponds also generate an odour resulting from bacterial production of hydrogen sulphide and methane, this odour is a typical rural one similar to that produced from cattle farming and its effects are very localized. Prevailing winds are North-West and South-East. There are no habitation exists or will exist downwind of the Mill for several kilometers.

6. Effluents
With the Mill designed for zero effluent emission from the start there would not be any effect on water courses in the Kulu-Dagi catchment.

QUALITATIVE ASPECTS

ZERO-EFFLUENT DISCHARGE

Background

New Britain Palm Oil has added a new mill about every ten years since inception. The development at Numundo provided an opportunity to make significant improvements in environmental standards ensuring that NBPOL stayed a leader in the field. From the start it was envisaged that there would be no discharge of treated effluent to any watercourse.

Land application trials

The first proposal was to consider land application with a designated area provided for irrigation using shallow ditches between the palm rows. Trials had previously been conducted at Kapiura Mill and absorption tests were also carried out on Garu plantation. From these trials it was established that ground absorption was excellent however performance declined due to solids in the treated effluent that would have resulted in frequent cleaning of ditches. Nevertheless a plan was put in place for Numundo Mill covering an area of about 150 hectares. To reduce the solids problem a two phase decanter was proposed for the mill effluent discharge to reduce initial BOD level and solids component. The effluent would then undergo anaerobic breakdown for a period of at least 60 days, to reduce BOD to less than 5000 ppm that was the limit for land application.

Composting trials

At this time trials were being conducted at the Bebere nursery for the composting of Empty Fruit Bunches (EFB). The objective of these trials was to produce potting compost for the nursery to replace topsoil that was increasingly hard to come by and of variable quality. Part of these trials involved application of raw mill effluent to the EFB windrows. This was pumped from the nearby Mosa Mill cooling pond. Results from this trial were surprising in that there appeared to be a number of benefits to the composting process but above all the amount of effluent that could be absorbed by the EFB was quite unexpected. Initially the ratio was 2:1 but it was found that this could be reliably increased to 3:1 and potentially higher without significant run-off.
The “normal ratio” of POME to EFB is about 3.25: 1 so it became clear that this system could potentially absorb all the mill liquid effluent in its raw state and produce high quality compost in a period of about 112 days.
Measurements at the mills indicated that the actual ratio of POME/FFB was nearer 4:1 and often more, so action was taken to reduce this to the minimum.

Development of full scale composting

Once it was established that this could be achieved the decision was made to change the Numundo plan to a full scale composting system utilising 100% of the mill output.
While Numundo had a large nursery it would only utilise about 25% of the compost produced at 40 tph initial capacity. It was therefore decided to spread the compost on plantations in order to partly replace inorganic fertiliser.
An area of about 9 hectares was set aside for the compost with both water supplies for wetting and a pumped effluent supply from the mill.

At the mill it was decided to have one reserve pond that would be used at the initial start up as the quantity of EFB built up and also if there were periods (of particularly high rainfall) when application to windrows was not possible. The pond capacity at 9000 cubic metes would give at least 30 days retention at peak production.

The reserve pond was put to full use in the first few months of operation with the circumstances prevailing. It had been expected that the mill would be in operating for the May peak month however delays resulted in an August start. This put a significant part of the compost building into the November to March wet season. This would not have been a problem but the wet season turned out to be the worst on record with 687 mm of rain in December (more than double the five year average) followed by a further 2600 mm in the three months after. This was a severe test but the system survived, nevertheless it was felt prudent for the first windrows (the ones that are saturated with effluent) to be put under cover.

Once through this first phase the operation improved steadily however there were still some problems with localised run-off resulting in collection lagoons being constructed from which liquid could be recycled during drier periods.

Productivity of the composting system

Future developments

SUSTAINABILITY ASPECTS

Ongoing checks and trials are done to ensure the sustainability of the Environment. Two projects are under strict monitoring. One is the ISO14001 and the other is the ECO-D decanter trials underway currently.

ISO 14001

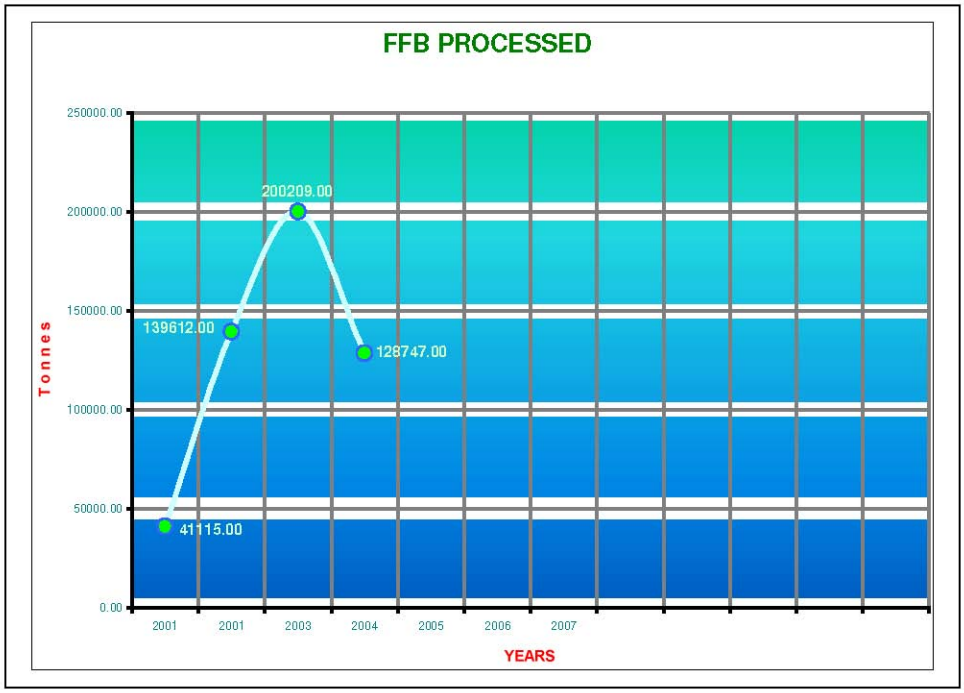
As one of the leaders in Agriculture from the private sector, attaining ISO14001 has push the Company in the forefront in environmental protection and sustainable development. Not only the Company' s public image has improved, much competitive advantage will be seen in our sales of our product overseas.
The Environmental officer carries out regular internal audits in the mill and ensures that all aspects of the ISO 14001 elements are in compliance and reviewed. Various checks made are documented and stored as required by the EMS.

ECO-D Decanters

The 2-phase decanter was considered for trials to improve the oil recovery efficiency in the oil room. With the reduction in the dilution of the crude oil, the liquid effluent in the Mill can be reduced by as much as 30%
Initial testing carried out revealed that Oil loss on wet and on Dry basis are achievable at 1.57% and 9.80% respectively.

Appendices

CHART 1 NUMUNDO OIL MILL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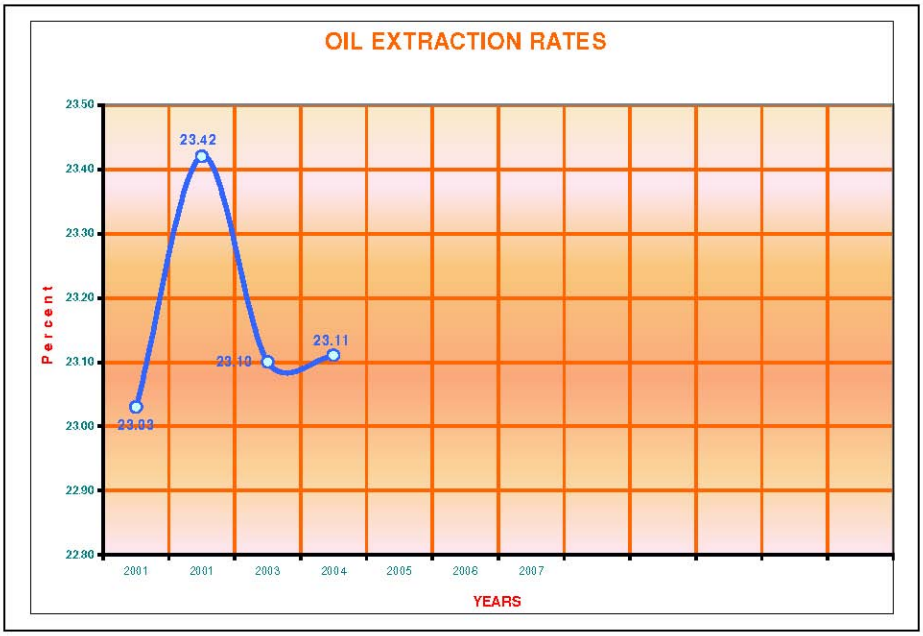
2001
2003
2004
2005
2006
2007
YEARS

CHART II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23.40
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23.20
23.10
23.00
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22.80
Percent
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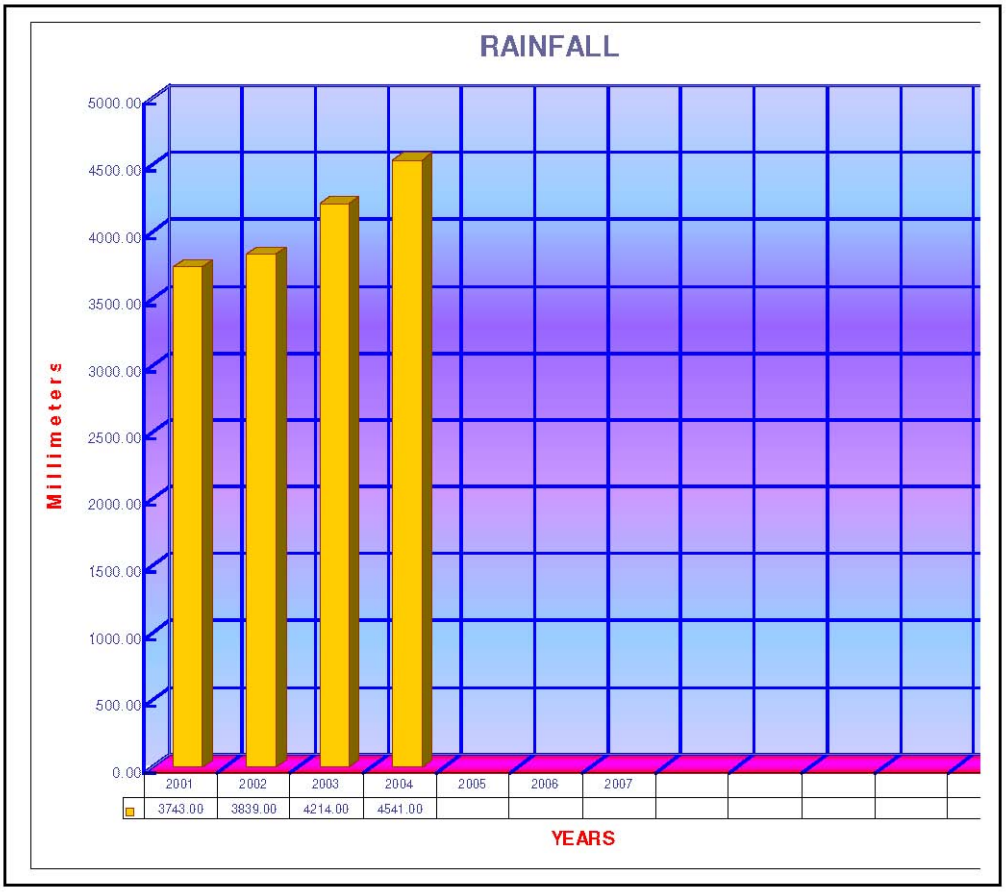
23.10
23.11
23.03
2001
2001
2003
2004
2005
2006
2007
YEARS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500.00
0.00
Millimeters
2001
2002
2003
2004
2005
2006
2007
3743.00
3839.00
4214.00
4541.00
YEARS

The Second Kulim Conference, 2004, West New Britain, Papua New Guinea, Sept 27th – 29th.