OIL UPON THE WATERS

Palm oil wastes in Malaysia

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Shortly after the palm oil mill began operations about 30 kilometres upstream, fisherman Ahmad bin Lahat was out of work.

Ahmad's livelihood was the freshwater Malaysian giant prawn, and before the palm oil mill began dumping its effluent into the Sungei Benut river near where he lived in southwest peninsular Malaysia, Ahmad and about 50 other fishermen prospered from the sales of their plentiful catch.

Palm oil effluent looks something like thin, grey soup. Like soup, it is served piping hot — as high as 80°C — by nearly 200 mills into waterways throughout Malaysia. Microorganisms in the water absorb the organic matter of palm oil wastes as nutrients, converting them to more stable compounds in a natural digestive process. This biodegradation requires oxygen, and the usual measure of the organic pollution potential in wastewater is its biological oxygen demand (BOD).

As Ahmad bin Lahat discovered, large amounts of organic pollutants can create an oxygen demand sufficient to choke off all life in the water into which they are discharged — including those oxygen-dependent microorganisms that normally biodegrade them. An average palm oil mill in Malaysia, for example, produces wastewater with a BOD equivalent to a city of about 145 000 people.

Oil palm is an important crop in Malaysia (and an increasingly important one in Thailand, Indonesia, the Philippines, Nigeria and Peru). The process to extract the oil, which is used for the manufacture of margarine and other edible products, requires large quantities of water for steam sterilizing the palm fruit bunches and clarifying the extracted oil. Large amounts of wastewaters are released, and most of the major river basins along the west coast of Malaysia are affected. In the late 1970s, a quarter of the mills were in designated "protected catchment areas" for water supplies for human consumption.

The waterways received not only the suspended and dissolved wastes, but also acidic phenol compounds. The result was a stink that discouraged people from using the water to drink, wash clothes or utensils, or bathe. Although the industry brought considerable prosperity to Malaysia, the wastes created considerable hardships for the rural people who had to draw their water or livelihoods from polluted streams and rivers. The problem extended to urban water supplies and even into Singapore, which imported a major portion of its water supply from Malaysia.

TIGHTENING STANDARDS

In 1977, the Government of Malaysia enacted legislation to regulate pollution from the palm oil industry. Until then, few palm oil factories had any means of controlling their waste discharges. Those that did simply passed their wastes through settling tanks — not a sufficient treatment. In a series of staggered reductions, palm oil effluent pollution was to move from an untreated BOD of between 20 000–30 000 mg/litre, to 250 mg/litre in five years. Other polluting components of the wastewaters were to be reduced accordingly. Existing mills were required to take remedial action, and before any new mill construction was permitted, the Malaysian Division of Environment had to be satisfied that effluent treatment was incorporated into the planning.

Many mills lacked the necessary technical capability to control wastewater discharges to meet the new regulations, and the costs of conventional treatment plants were too high to be practical for most. To preserve a valuable industry and conserve an equally valuable environment, low-cost, effective treatment processes had to be found.

How to preserve a valuable industry and conserve an equally valuable environment?

In 1977, the Asian Institute of Technology (AIT), based in Thailand, and the Division of Environment (DOE) of the Ministry of Science, Technology and Environment of Malaysia began a study to identify appropriate palm oil treatment technologies. In 1979, IDRC provided a grant that enabled researchers to assess the available technologies, and determine the most feasible for further development.

The industry itself had begun to innovate to meet the new standards. One of the larger groups, Guthries, was investigating using the raw effluent to irrigate palm oil plantations themselves. The high organic content, and particularly the potassium component, of the wastewater was found to complement fertilizers, thus saving up to CA$100 per acre per year, Guthries estimates. Unfortunately, this disposal method requires that enough land suitable for irrigation lie close to the mill, and the high solids content, acidity, and concentrations of metals in the effluent limit this use as well. Other processes, such as converting effluent to methane gas by fermentation, or drying it for use as an animal feed were investigated.

SETTLING POLLUTION

The AIT/DOE study found that holding palm oil wastewaters in shallow treatment ponds for about 15-20 days could be an effective treatment. These stabilization ponds, as they are called, combine physical settling processes and bacterial action to reduce the BOD of wastewater by 95 percent or more — by levels well within the regulations. The type of pond researchers believe produces the best results relies on anaerobic bacteria — those bacteria that can grow in the absence of oxygen. Anaerobic bacteria exist in and near the bottom layers of a pond, where the heavier organic load of settled waste solids and the absence of oxygen provide a suitable environment. Some pretreatment of the wastewater by the addition of lime to neutralize acidity is required for best performance.

This single anaerobic pond system would be the cheapest to build initially, but would require continual outlays for the purchase of chemical liming agents. An alternative, involving recirculating part of the treated wastewater to dilute and neutralize incoming raw effluents and to charge it with active digesting microoganisms, was the most economical to operate and maintain. However, it was more expensive to build initially.

But as the study points out, treatment by either of these two methods "is economically feasible without imposing much stress on the part of the oil palm processors."

Statistics produced by an industry body, the Palm Oil Research Institute of Malaysia, suggest that effluents are now being drastically reduced in the wake of the new legislation and the adoption of treatment technologies. The Institute claims that prior to 1978, an estimated 222 tonnes of effluent were dumped daily into Malaysian waters. By last year, this had been slashed to 16 tonnes per day, according to the Institute.

Even with these claimed reductions, the DOE believes it will be 15 to 20 years before Malaysian rivers show any marked improvements. Palm oil wastes are only one of many pollutants contributing to the hardships of people like Ahmad bin Lahat. Deforestation and indiscriminate land clearing have produced serious silting problems. Coupled with polluting effluents from palm oil's big brother in Malaysia, the rubber industry, and human wastes from urban centres, these sources of pollution will require continued vigilance and innovative treatment methods to safeguard Malaysia's rivers for its people. □

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