The Certificate of Competency Scheme for Refineries

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Introduction

In the period 1887 to 1913, little effort was directed in Malaysia toward determining an economic use for the oil palm *Elaeis guineensis* and it remained an ornamental plant. Some work was begun in 1903, and when results looked promising in 1913, the first commercial planting was initiated. Since then, the oil palm has grown to become the premier export earner for Malaysia, in 1984 beating petroleum (less natural gas), tin and rubber.

Inspired by the success Malaysia has enjoyed with this commodity an increasing number of tropical countries have begun oil palm planting projects of their own. In general, these countries are, and will continue to be net Importers of edible oil, having large populations whose growth is difficult to contain. However, where the rate of oil palm planting will lead to the production of oil tonnages in excess of projected requirements it is reasonable to speculate, the excess will be placed in the export markets — markets which Malaysia has worked hard to create and consolidate.

It is recognized in Malaysia that in the long term, all other things being equal, such markets will most easily be retained by those suppliers who maintain *consistently high discharge quality*.

The Certificate

In an effort to effect a general improvement in quality, the Palm Oil Research Institute of Malaysia, in 1983, introduced and offered to the refining industry a scheme to be known as the Certificate of Competency. Organized and administered by the Institute's Technical Advisory Section, the scheme strives to determine whether or not it is possible, under the constraints of the systems in place, for a refinery to produce a consistently high quality of oil. The scheme does NOT and is NOT INTENDED to quantify the quality of a specific batch of oil.

The operation of the scheme depends upon the compilation of a questionnaire by the assessing officers, points being awarded based on comparisons with other refineries inside and outside Malaysia and on the experience and knowledge of the assessing officers. Success in the assessment was at its inception, dependent on the refiner accruing a minimum score of 65% of available marks.

When the scheme was first discussed within the Institute, it was necessary to decide on the parameters which would need to be included in the assessment. This was done and our first ideas compiled into a questionnaire which was circulated to the industry for comment. At that stage, some refiners were reticent regarding the operation of the scheme. However, others were extremely interested and provided many helpful suggestions which were incorporated into the format of the questionnaire where possible. The revised format was again circulated to the Industry for further comment.

While this further comment was awaited, the Advisory Service asked for volunteers to support the performance of a trial Certificate Assessment at their installations. In the event, two refiners offered us this facility.

The idea of performing a trial assessment was twofold. Firstly, it afforded the assessing officers the chance to debug the system in advance of an official assessment and to check the general operation of the proposed assessment

mechanism. Secondly, it gave at least one refiner the opportunity to determine, in advance of the others, whether possession of our Certificate would or would not assist him in his business.

One 'dummy' assessment was duly performed and a written report of the visit and our findings submitted to the refiner. A further meeting was arranged to discuss these results in detail with his staff and to plan the next step.

The questionnaire appears to be rather simple in essence. The questions asked should not, however, be taken too much at face value.

The questionnaire is broken down into sections which would seem fairly predictable to a competent oil refiner. These sections are:

(1) General Appearance
(2) Quality Control
(3) Factory Operations
(4) Product Disposal
(5) Storage Conditions
(6) Maintenance

The first section, dealing with General Appearance, covers attention to such items as hygiene in the factory and the appearance of the operating personnel. This section also deals with the operational performance of the staff.

Section 2 is concerned with Quality Control including interaction between laboratory and the plant. Part A of Section 2 is concerned with the performance of the laboratory as a source of prediction and its likely ability to keep the production manager out of trouble. In this section several key analyses have been intentionally omitted to give the chemist an opportunity to volunteer that his laboratory 'does more than PORIM asks about'.

Section 3, Factory Operations, is concerned with the care taken by the production department to avoid abuse of the oil. It will be obvious that this section of the questionnaire is constructed with physical refining in mind due to the relatively low incidence of chemical refining in Malaysia. Modification to allow for alkali refining is straightforward.

The Product Disposal section (4) is self-explanatory as is section 5 on Storage Conditions.

Maintenance (Section 6) was one of the subjects which the industry requested be included.

In the scheme as instituted, the maximum mark available was 276. The pass mark was 65% of this, *i.e.* 179. However, since not all refiners can respond to all sections, the score is calculated as a precentage of total marks actually available. In many cases this is less than 276, since not all refiners have, for example, a packaging operation. The points available to them will be reduced to 256 and their percentage score calculated accordingly.

At this point, it is worth looking in detail at some section of the checklist used by our officers in their assessments. The two which have been selected are section 2 - Quality Control and section 3 - Factory Operations. The reasons for choosing to elaborate on these two sections should be self-evident. Quality Control is one of the key operations and what price quality control if the operational people do not respond to the QC department.

The section dealing with quality control (2) is weighted in so far as it accounts for a total of 80 points from a possible 276. It is divided into two sub-sections, the first of which looks at the way the laboratory is run, including the range of tests performed.

Part two or this section tries to assess how the laboratory and the production department interact.

PART B, Question 'F' asks about laboratory cross checks which will be referred to later.

Section 3 of the assessment form deals with the actual plant operation and carries a possible score of 31 points. This is an important section although the total is low. Whilst the score is "low" it is relatively easy to fare badly due to lax attention to operational parameters. This is one of the reasons why we require a minimum score of 50% in each section as well as an overall minimum score of 65 per cent.

In physical refining, there is a much higher possibility of the oil being thermally abused. Hence the questions regarding temperature and vacuum. Deodorizer recorder charts for the previous seven days are inspected to convince the assessors that the temperature has not been dropped for their visit.

The refiner who participates in our Certificate scheme is also required to take part in the Institute's annual laboratory cross check, of which the methodology is as follows:

Two similar samples of crude palm oil, CX and CY and two similar samples of refined palm olein, RX and RY are distributed to all participating laboratories. The samples are analysed for: Cloud Point, Slip Point, Iodine Value, Free Fatty Acids, Moisture, Impurities and Colour. The object of the exercise is to keep a close assessment of the standards achieved by the laboratories conducting palm oil analyses and to identify and resolve any problems.

These crosschecks have been in operation since 1982, when 24 refiners and 20 palm oil mills participated. In 1983, this number had swelled to 28 refiners, 17 millers, 11 independent laboratories and two laboratories from overseas. By 1984, participants include 25 refiners, 30 millers and 16 independent laboratories.

Analytical results submitted by the participants are subjected to (1) two sample chart analysis showing random and systematic errors, and (2) basic statistics including mean, standard deviation, coefficient of variation, maximum and minimum value, range and median.

The participants are then graded on a scale of A to D, depending upon the number of standard deviations they are away from the correct values.

Each alphabetical scores is then converted to an arithmetical score on a scale of 1 to 10 by the Advisory Service and that figure applied to question 2b(f) in the score calculation. The conversion was achieved by allocating points as follows: A=1; B=0.5; C=0.25; D=0.

In the three years of operation of the scheme, we have seen what appears to be a marginal increase in refiners' performance. This is probably best illustrated by the score frequencies for 1984, and 1985 (*Table 1*) which are shown as histograms in *Figure 1*.

The performance figures are clouded since more refiners participated in 1984 than in 1983, and not all the original 19 refiners took part in 1984, due to plant closures.

To prevent an element of bias in the scores, each refiner is assessed by a different team of two officers in succeeding inspections.

In order to maintain impartiality in the award of a Certificate to a successful refiner, decisions on each are made by the Institute's Certificate of Competency Committee(CCC). No assessing officer sits on this Committee, which comprises the Director-General and all Divisional Directors.

Evidence that overseas buyers can see some merit in the scheme is the fact that major buyers in the USA will not qualify a refiner as one of their suppliers, unless they possess one of the Institute's Certificate.

The scheme is being further tightened up in that participation in the Annual Analytical Cross

Check exercise organized by the Institute's Chemistry Department has been made obligatory, with the performance result of that being incorporated into the marking system.

The Institute and the industry feel that this scheme is assisting the refiners to produce a product which is more saleable.

Whereas in the past, inspections have been at the convenience of the refiner, several are now actively suggesting that we undertake surprise inspections. This is under active consideration.

TABLE 1. DISTRIBUTION OF SCORES IN CERTIFICATE TEST (number of participants).

Range of percentage scores	1983	1984	1985
65-69	2	1	2
69.1-73	2	3	1
73.1-77	6	5	3
77.1-81	2	3	4
81.1-85	1	6	2
85.1-89	3	0	2
89.1-93	2	2	4
93.1-97	1	2	2
Total	**19**	**22**	**20**
Average percentage score	**78.9**	**80.1**	**82.2**

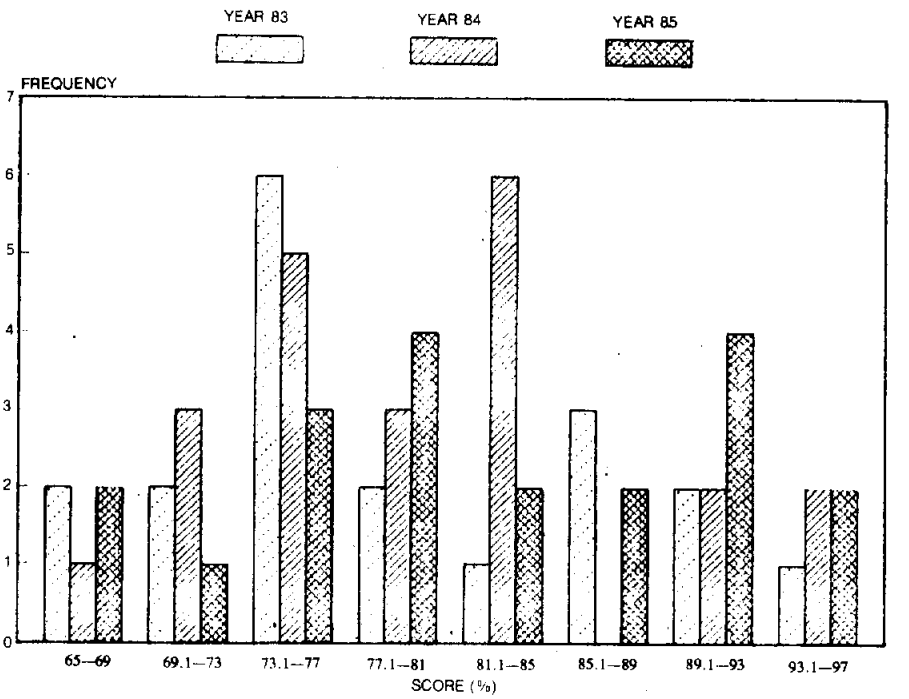

Figure 1. Certificate of Competency Score Distribution for 1983/1984/1985

CERTIFICATE OF COMPETENCY OF REFINERS **APPENDIX**
DRAFT MARK SHEET

	Points	Remarks

1. GENERAL APPEARANCE

A) HYGIENE
- a) Is factory generally clean
- b) Are accumulations of debris evident
- c) Are operators provided with such cleaning tools as are necessary
- d) Effluent Treatment Effectiveness

B) OPERATOR'S EFFICIENCY.
- a) Is operator's appearance satisfactory
- b) Are operators knowledgeable
- c) Are operating log sheets filled in punctually
- d) After compilation are those sheets used:
  i) Frequently? ii) sometimes? iii) what sheets?
- e) Is plant supervisor knowledgeable
- f) How do operators respond to process alarm
  - i) Quickly and confidently
  - ii) Quickly but panic stricken
  - iii) Cancel siren then phone for assistance
  - iv) Cancel alarm and do nothing

2. QUALITY CONTROL

A. Laboratory
- a) Is laboratory well organised.
- b) Is laboratory well equipped, equipment functioning, well maintained and often used
- c) What is oldest date on a standard solution
- d) In the laboratory how are samples stored
  - i) while awaiting analysis
  - ii) during analysis
  - iii) after analysis

  Cool and dark
  On bench in sunlight
- e) What are routine analyses performed:
  - i) Crude
    - Colour
    - M & I
    - FFA
    - P & Fe
    - DOBI
    - IV
  - ii) Part Processed
    - M & I
    - FFA
    - P & Fe
    - IV
    - PV
  - iii) Finished
    - Colour
    - FFA
    - M & I
    - IV

B. LABORATORY FACTORY INTERACTION

Points **Remarks**

a) How do laboratory and production department interact
   i) Ofter
   ii) Sometimes
   iii) Occasionally
   iv) Never
b) Do chemists draw their own samples:
   Or leave it to plant operators;
   Plant Foreman;
   Tanker drivers.
c) Is transmission of information to plant expeditious
d) Is plant reaction to laboratory information good
e) Is plant reaction to laboratory good on all shifts
f) How well has laboratory performed in cross check tests
g) Does laboratory concern itself with other aspects of plant operation e.g.
   i) water treatment ii) boiler operation iii) raw packaging material
   iv) effluent, on request or routinely.

3. FACTORY OPERATIONS

a) Is operation of oil pretreatment correct;
   Is it adjusted according to CPO quality
b) What is maximum deodoriser temperature during previous 7 days:
   i. 240°C — 270°C _____
   ii. 270°C — 275°C _____
   iii. Above 275°C _____
c) What is stated error on deodoriser thermometer
d) What is Δ temperature (TF boiler - deodoriser maximum)
e) What is plant vacuum:
   i. 0 -- 5 torr _____
   ii. Above 5 torr _____

4. PROPOSAL OF PRODUCTS

a) Are packaging machines clean (outsides)
   i) Yes
   ii) No
   Inside:
   i) Yes
   ii) No
b) Are blends made up effectively
c) How are blends made up:
   i) weight ii) volume
   iii) dip iv) blend IV
d) Are end-product storage, handling and transport system satisfactory?

5. STORAGE CONDITIONS

a) Are tanks for crude oil coated
   i) Yes
   ii) No
b) Are agitators fitted
   i) Yes
   ii) No
c) Temperature controllers fitted
   i) Yes
   ii) No

d) What is the steam supply pressure — **Points** — **Remarks**
   i) higher than 40 psig
   ii) between 30 — 40 psig
   iii) between 20 — 29 psig
   iv) lower than 20 psig
e) How often are tanks cleaned out
   i) frequently
   ii) sometimes
   iii) never

6. MAINTENANCE

I) Is the plant maintenance
a) planned completely
   i) Yes
   ii) No
b) planned partially (only certain items)
   i) Yes
   ii) No

II) If preventive maintenance is scheduled, what is overhaul cycle for:-

	3 months	6 months	12 months
Pumps	NA	5	2
Compressors	NA	5	2
Thermocouples	5	3	0
Flowmeters	NA	5	2
Deodoriser/Stripper	NA	5	0

III) Can the cycles advised be verified
   i) Yes
   ii) No

Maximum Total : 276

Suggested Pass Mark : 65%

Marks obtained :

Total Possible Maximum :

% Mark obtained

Comments