THE STUDY REPORT ON RENOVATION

OF

THE CEPU OIL AND GAS TRAINING CENTRE

IN

THE REPUBLIC OF INDONESIA

JANUARY 1986

JAPAN INTERNATIONAL COOPERATION AGENCY

TOKYO, JAPAN

PREFACE

In response to the request of the Government of the Republic of Indonesia, the Government of Japan decided to conduct a study on the Cepu Oil Refinery Renovation Project and enstrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Indonesia a survey team headed by Mr. Susumu Nakagawa from 1 to 21 July 1985.

The team had discussions on the Project with the officials concerned of the Government of Indonesia and conducted a field survey in the project-related areas, including Cepu and Jakarta. After the team returned to Japan further studies were made and the present report has been prepared.

I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the team.

Tokyo, January 1986

Keisuke Arita

Keisuke ARITA

President

Japan International Cooperation Agency

MAP OF INDONESIA

ABBREVIATIONS

AKAMIGAS	Akademi Minjak dan Gas Bumi; Oil and Gas Academy
APC	ASEAN Pacific Countries
API	American Petroleum Institute
ASTM	American Society for Testing and Materials
BOD	Batching oil distillate
CTC	Cepu Training Centre
HGO	Heavy gas oil
JICA	Japan International Cooperation Agency
JCCP	Japan Cooperation Centre for Petroleum Industry Development
JIS	Japan Industrial Standards
LCV	level control valve
LGO	Light gas oil
LPG	Liquefied petroleum gas
NBP	Normal boiling point
OJT	On-the-Job training
PERTAMINA	Pertambangan Minyak dan Gas Bumi Nasional; National oil and Natural Gas Mining
PH Solar	Paraffin high content solar
PID	Proportional, integral and derivative
PPT, MIGAS	Pusat Pengembangan Teknologi, Directorate Jenderal Minyak Dan Gas Bumi; Oil and Gas Manpower Development Centre
PPTMGB "LEMIGAS"	Pusat Pengembangan Teknologi Minyak dan Gas Bumi; Oil and Gas Research and Technology Development Centre
RPM, rpm	Revolution per minute
TBP	True boiling point
TCDC	Technical Cooperation among Developing Countries
TRC	Temperature record controller
UNDP	United Nations Development Programme

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PART I

INTRODUTION

Part I INTRODUCTION

Chapter 1 Background, Objectives and Scope of the Study

This study on renovation of the Cepu Oil and Gas Training Centre is based on the matter officially requested by the Government of Indonesia under the registration number CTA-159 at the Annual Meeting on Technical Cooperation between the two countries held in August 1984. This request was a package of technical assistance which consisted of the following four major study items:

(1) Feasibility study on enhanced recovery programme of crude oil (secondary and tertiary recovery) from Kawengan field located near Cepu in the Central Java.

(2) Study on renovation of the existing refinery, and related facilities, workshop machine and laboratory equipment of the Cepu Oil and Gas Training Centre (the Centre).

(3) Technical assistance programme project for training of teaching staff and instructors of the Cepu Training Centre.

(4) Supply of equipment and materials to the Centre.

In response to the above request, the Japan International Cooperation Agency (JICA), after a series of discussions with relevant government organizations of Japan, decided to take up the above item (2) on the study of renovation for the refinery and other facilities and equipment of the Centre, as possible study item capable of being handled under the present organizational framework of JICA. Based on this decision, the pre-mission organized by JICA was despatched to Indonesia in March 1985, and reached an agreement accordingly with the Directrate General of Oil and Gas, Ministry of Mines and Energy.

For reference, the Terms of Reference for the proposed renovation study is attached as Annex I-1-1.

The principal objective of the proposed renovation study is to diagnose the existing refinery and related facilities, workshop and laboratories of the Centre,

to discuss and analyse possibilities for their renovation from the technical, economic and training points of view, and to formulate the most suitable/appropriate renovation plan for the facilities and training activities of the Centre so as to satisfy the growing need raised from the oil and gas industry in Indonesia and ASEAN-Pacific region as well.

Enumerated below are the major study components stipulated in the agreed Terms of Reference:

a) Policy and basic idea of the Government of Indonesia for the Centre and its renovation

b) Study on the organization and management of the Centre

c) Technical diagnosis of the existing refinery and related facilities

d) Study on refining process

e) Study on the training activities

f) Formulation, analysis and evaluation of renovation plans

g) Conclusions and recommendations.

Chapter 2 Study Procedures

In accordance with the agreement made between the two countries on March 6, 1985 JICA has undertaken the proposed study, and despatched the study team[1/] headed by Mr. Susumu Nakagawa and consisting of 8 experts to Indonesia to perform its field work during three weeks from July 1 to July 21 (from July 4 to July 19 in Cepu).

During the stay in Indonesia, the JICA study team carried out the following major activities supported with the assistance and colaboration given by teh counterpart team[2/] organized by the Cepu Oil and Gas Training Centre for this purpose, and consisting of the staff members of the Centre.

(1) Discussions on the operation and maintenance of the existing refinery and related facilities of the Cepu Oil and Gas Training Centre, the organization and management, and training activities, as well as on the necessity of renovation and future renovation plans.

(2) Inspection and diagnosis of the existing facilities and equipment of the oil fields, crude pipeline, refinery and related offsite, laboratory and workshop, and AKAMIGAS. Especially as for the refinery, both onstream inspection and shutdown/open inspection were carried out.

(3) Collection and review of relevant data and information.

(4) Inquiry to and interview with, the Training Department of PERTAMINA and the top management/ senior staff of the Centre as to the training needs to, and training effectiveness of, the Centre's activities.

Notes: 1/ A list of JICA study team members is attached as Annex I-2-1.
2/ A list of the counterparts team members is given as Annex I-2-2.

The study report has been prepared based on results of the thus made field work in Indonesia and also through a detailed analysis and check up in Japan of the data and information collected with the participation of and interchange of opinions with, the three counterpart experts of the Centre (Ir. Santosa Suparma, Ir. Mustakim, and Ir. Sunarhadiyanto) in Japan for 4 weeks in October 1985.

The JICA team wishes to express its sincere gratitude to Mr. Muchtisar DP., Director of the Cepu Oil and Gas Training Centre and all the members of the counterparts team for their valuable assistance and cooperation extended for the completion of the proposed study.

PART II

FACTFINDING ON THE CEPU OIL AND GAS TRAINING CENTRE

Part II FACTFINDING ON THE CEPU OIL AND GAS TRAINING CENTRE

Chapter 1 General

This Part II of the report presents the present situation of the Cepu Oil and Gas Training centre, and points out and discusses the following major study items based on the findings and observations obtained through the field survey in Indonesia.

(1) Policy and basic idea of the Government of Indonesia as to the Cepu Training Centre and its renovation.

(2) Organization and management of the Centre

(3) Training needs to the Centre

(4) AKAMIGAS (regular training courses)

(5) Existing facilities and equipment (refinery and related facilities, laboratory, workshop and other surface facilities)

The results of this Part II as well as those of the subsequent Part III "Diagnosis and Countermeasures" shall form the basis for the formulation and discussions of renovation plans of the Cepu Training Centre.

Chapter 2 Basic Idea of the Government of Indonesia for the Cepu Oil and Gas Training Centre and Its Renovation, and Organization and Management of the Centre

2.1 Basic Idea of the Government of Indonesia for the Cepu Oil and Gas Training Centre and its Renovation

Through a series of discussions and mutual exchange of opinions with the top management and senior staff of the Centre, it is clarified that the fundamental necessity for the renovation of the Centre consists fundamentally of the following three points:

(1) Development of knowledge and skill of the teaching staff and instructors of the Centre, especially professional knowledge in various fields of oil and gas industry. Development of teaching skill and profession.

(2) Development and adoption of more effective and efficient training method in order to reduce and minimize training cost and time.

(3) Improvement and modernization/renewal of educational and training facilities, equipment and aids.

At the same time, it is also understood that the basic idea of the Government for the Centre consists primarily of the following two points:

(1) The Cepu Oil and Gas Training Centre is an important and indispensable institution within the framework of the domestic educational and training system in the oil and gas industry.

(2) And at the same time, the Centre should be requested to strengthen and establish a solid position as a regional training centre for ASEAN-Pacific.

In line with such necessity and idea, it is strongly desired that the Cepu Oil and Gas Training Centre be equipped with all the necessary and enough training facilities and equipment and, as a result, be self-sufficient in its educational and training activities.

2.2 Organization and Management of the Cepu Oil and Gas Training Centre

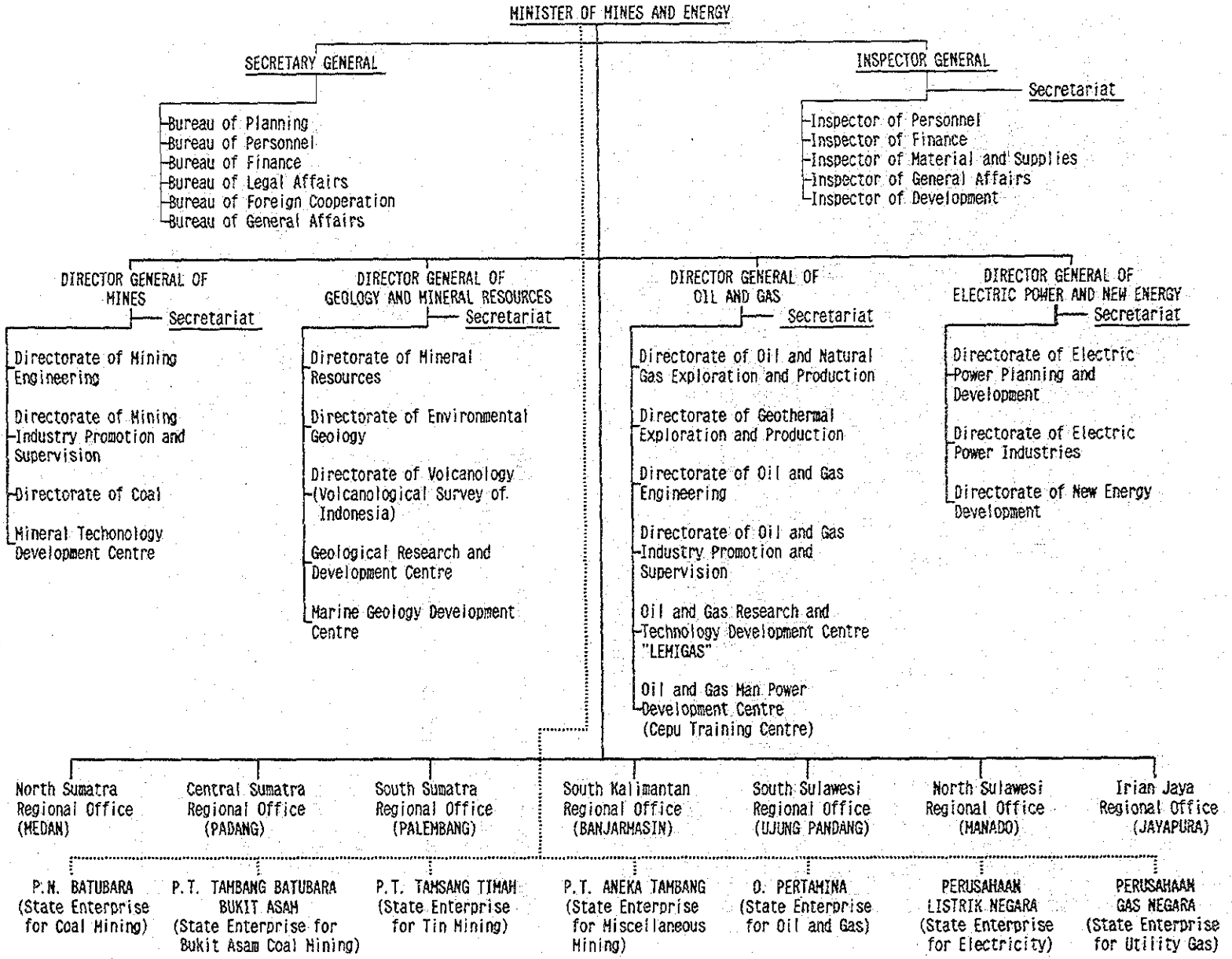
The Oil and Gas Technology Research and Development Centre (LEMIGAS), the mother's body of the Cepu Oil and Gas Training Centre, was established in Cipulia of Jakarta, in 1965 by the Indonesian decree. One year later, the oil fields near Cepu already reaching the end of its commercial life at that time, were transfered to LEMIGAS together with the Cepu refinery, as training facilities, and the Cepu Oil and Gas Training Centre (called PPT MIGAS in the Indonesian language) was established there for the purpose to educate and train engineers and technicians working in the Indonesian oil and gas industry. As stated above, the Cepu Training Centre was traditionally a part of the organization of LEMIGAS. However, in line with the modification of the institutional structure of the Government of Indonesia (Figure II-2-1 indicates the organizational structure of the Ministry of Mines and Energy as of April 1985) carried out in 1984, it was separated from LEMIGAS and became an independent and parallels Governmental institution of LEMIGAS within the Ministry of Mines and Energy. Figure II-2-2 shows an organization chart of the Oil and Gas Training Centre (hereinafter referred to as "The Centre"). As of July 1985, the total number of employees of the Centre amounts to 1,417.

The Centre comprizes 5 Divisions, 1 Department and 1 Functional Group. An outline of the Centre's activities is summarized below:

(1) Administration department (MDU)

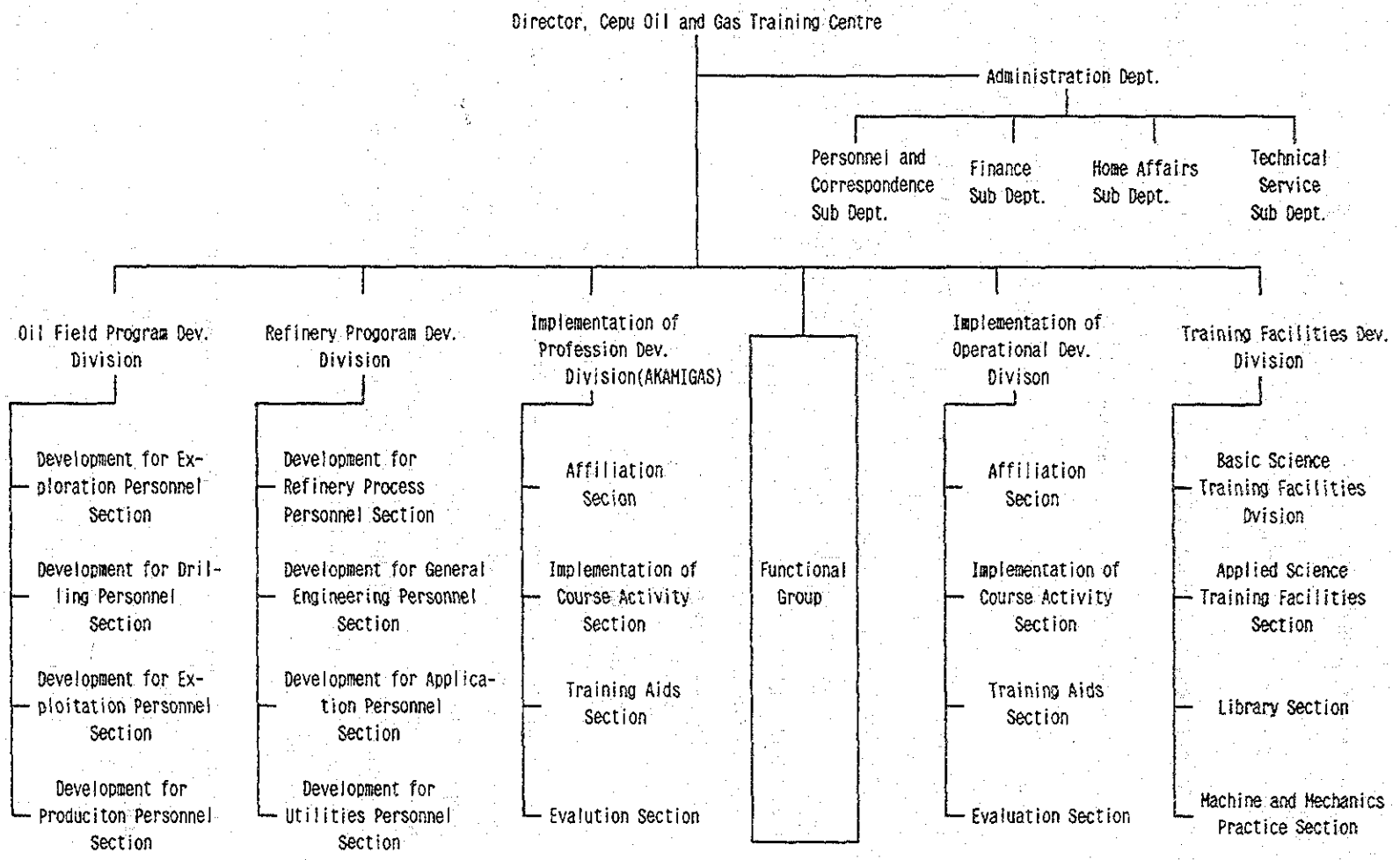
This administration department consists of 4 subdepartments, takes cares of personnel affairs, correspondence, travel and transportation of staff members and students etc., housing problems, purchasing, financial matters, inventory and inventory control, administration and management of student dormitories, security and other general affairs, as well as repair and maintenance of the facilities, and supports the Centre's activities from general administration point of view.

Figure II-2-1 ORGANIZATION CHART OF MINISTRY OF MINES AND ENERGY INDONESIA



(as of 1985)

Figure Ⅱ-2-2 ORGANIZATIONAL STRUCTURE OF CEPU OIL AND GAS TRAINING CENTRE



(as of July. 1985)

a) Personnel and Correspondence Subdepartment (MDU 01)

b) Finance Subdepartment (MDU 02)

c) Home Affairs Subdepartment (MDU 03)

d) Technical Service Subdepartment (MDU 04)

(2) Oil field programme development division (MDL)

This division consists of the following 4 sections:

a) Exploration personnel development section (MDL 01)

This section takes care of the planning and evaluation of training programme about exploration, geology, topography, etc. for the regular and short courses, keeps contact with PERTAMINA in the formulation of draft curriculum, and manages and operates laboratory and equipment for the geological survey.

b) Drilling personnel development section (MDL 02)

This section takes care of the planning and evaluation of training programme for the drilling, keeps contact with PERTAMINA in the preparation of draft curriculum for the regular and short courses. It is also in charge of the effective utilization of drilling rigs and simulators. However, it is noted that spare parts for the equipment is handled by the Training Facilities Development Division, and that the drilling section takes care of only software side.

c) Exploitation personnel development section (MDL 03)

This section takes care of the planning and evaluation of training programme on petroleum engineering and science, and drafts curriculum for the regular and short courses. It also organizes effective utilization of logging unit, and prepares manual for that.

d) Production personnel development section (MDL 04)

This section is in charge of the planning and evaluation of training programme for the production facilities, and manages the oil and gas fields.

(3) Refinery programme development division (MDK)

This division consists of the following 4 sections:

a) Refinery personnel development section (MDK 01)

This section is in charge of the planning and evaluation of training programme for process technology and science, and manages the refinery, use of utilities, and the refinery laboratory. It also prepares draft curriculum on the refining, gas processing and process engineering.

b) General engineering personnel development section (MDK 02)

This section is in charge of the planning and evaluation of training programme for civil, mechanical, electric, instrumental and general engineering, and when necessary, prepares design for buildings, roads, and bridges, etc. of the Centre.

c) Application personnel development section (MDK 03)

This section is in charge of the planning and evaluation of the training programme for market, marketing and handling of petroleum products including usage, storage, gathering, etc. from refinery to the end users. It also handles subjects on environmental problems and countermeasures for pollutions.

d) Utilities personnel development section (MDK 04)

This section is in charge of the planning and evaluation of training programme for the generation and supply of utilities, and manages the utilities facilities (power generation plant, water treatment, drinking

water, boiler and steam supply, compressed air system, and communication system) as well as the fire fighting system of the Centre. It also prepares draft of curriculum and syllabus for such subjects mentioned above. At present, the working load of this section is very heavy, the job and duty for the fire fighting is tentatively and unofficially transferred to the Technical Service Subdepartment within the Administration Department.

(4) Implementation of profession development division (MDA) - AKAMIGAS

This division (AKAMIGAS) handles regular courses and consists of the following 4 sections:

a) Affiliation section (MDA 01)

This section is in charge of the investigation and absorption of the clients' needs, preparation of curriculum and syllabus, admission and acceptance of new students/trainees, explanation and propaganda of training courses to the clients, keeping close contact and relation with PERTAMINA and other oil and gas contractors operating in Indonesia, and other companies and institutions, and as a result, assists in the smooth implementation of the Centre's training programme.

b) Training aids section (MDA 03)

This section is in charge of the provision and administration of all the necessary supplies for the execution of the training programme including the supply of training aids, desks and chairs, copies, papers, teaching materials, etc.

c) Evaluation section (MDA 05)

This section is in charge of the evaluation of training effectiveness, distribution of inquiries and their analyses, study on the rating/grading system, and evaluation of lecturers and students, etc.

(5) Implementation of operational development division (MDT)

The organizational structure of this division is similar to that of AKAMIGAS. The major difference is that this division handles only short courses and regional and international educational/traing programme and activities.

(6) Training facilities devlopment division (MDS)

a) Basic science training division (MDS 01)

This section manages the following laboratories and buildings:

Oil laboratory
Physical experimentation laboratory
Chemical laboratory
Civil/hydraulic laboratory
Instrument laboratory
Electric and electronic laboratory
Soil laboratory, etc.

b) Applied science training facilities section (MDS 02)

This section carries out such services as design and engineering, etc. and manages process simulators and pilot plants.

c) Library section (MDS 03)

This section manages magazines, books, theses, audiovisual aids, language laboratory, etc.

d) Machine and mechanics practice section (MDS 04)

This section manages training workshop.

(7) Functional group

As a pool of teaching staff and instructors, there is a functional group, in which 19 functional positions are set up.

To sum up, the function of the Centre can be summarized as classified below:

a) Planning and evaluation of the training

b) Implementation/accomplishment of the training

c) Technical Support to the training activities

d) Administration and finance of the training.

The Centre, as noted before, is an important governmental institution assuming responsibility to report directly to the Minister of Mines and Energy through the director General of Oil and Gas, and at the same time, acts as a servicing institution to PERTAMINA in terms of education and training. On the basis of the fundamental necessity and basic idea stated before the Centre has been stepwisely making great efforts for the improvement of the existing training facilities and equipment, and increase of training effectiveness within a very limited amount of budget and funds actually available to the Centre.

It has to be noted, however, that apparently, the existing training facilities and equipment are insufficient and most of them are already technically behind or have become as out-of-date as almost impossible to be utilized more. It has to be emphasized that this fact constitutes the biggest obstacle for the Centre's carrying out more effective training activities. It is very clear that the existing training facilities and equipment can never properly/ adequately meet and correspond to, the growing training needs arising from the modern oil and gas industry. Taking this critical situation into account, the Centre is trying to undertake and implement renovation/improvement of the existing facilities and equipment with special attention to the refinery (atomospheric distillation unit), workshop machine, and laboratory equipment.

The discussions and interviews with the top management and senior staff of the Centre, findings and observations during the field survey in Indonesia, and investigation and check-up of relevant data and information, all of these have resulted in a conclusion that the organization of the Centre is properly functioned and the management is reliable, surely supported with its long history and abundant experience.

As for the management aspects of the Centre, it has to be only pointed out that there are still rooms for improving the organization and management for maintenance. It has to be clearly noted that the maintenance plan and its execution being applied to the existing refinery of the Centre does not totally reach even minimum permissible standard required for industrial plants, and that this problem brings to the operation of the refinery of the Centre a great danger (fire and explosion). Although this can not be attributable to the organization and management of the Centre, but should instead be attributed to lack of sufficient budget allocated so far to renewal of the refinery. In any case, the Centre should pay highest attention to the maintenance and safety aspects. Detailed discussions on this problem will be made in Chapter 5. In relation to the organization and management aspects of the Centre, brief descriptions are given in Annex II-2-1 for financial situation of the Centre.

Chapter 3 Training Needs

The clients for the training courses offered by the Centre can be classified into the following five groups: i) PERTAMINA, the national petroleum company, ii) foreign oil contractors operating in Indonesia under the contract with PERTAMINA (eg. BADAK, HUFFCO, ASAMERA, PTSI, etc.), iii) oil and gas related companies (eg. P.T. ARUN, etc.), iv) oil and gas related institutions (eg. Ministry of Mines and Energy, Ministry of Industry, and their research institutions, etc.), and v) developing countries, especially in ASEAN-Pacific region.

The training need can be considered to be the most fundamental factor constituting the market for educational and training activities and business. In this respect, it is essential for the Centre to know and understand the present and future trends in the training need from the potential clients of the Centre, especially for the purpose to manage, develop and improve its training activities and facilities.

The training need can be divided into quantitative need and qualitative needs. The quantitative need indicates trends in training volume/numbers of persons to be educated/trained, while the qualitative need consists of fields of specialization in which training is needed as well as requirements for contents of training, training facilities and equipment, etc.

In order to substantiate such training need raised by the clients and carry out the training, it is indispensable to have a good reputation and confidence as a training institution. In this sense, it is greatly appreciated that the Centre has already established and have a highly reputable confidence of the clients and other relevant organizations in the country and abroad as well. It is therefore considered that a solid foundation has already been established for further development in the future of the Centre in line with the basic policy and idea stated in the previous section 2.1.

3.1 Quantitative Training Needs

As of 1985, PERTAMINA employs approximately 50,000 persons, and the foreign oil contractors together with the oil and gas related industries in Indonesia employ additional 50,000 persons. Therefore, at present, a total of 100,000 persons are engaged in the Indonesian oil and gas industry. According to the Training Department of PERTAMINA, the total number of persons requiring training is estimated at about 11,000 persons each year, taking into account future development plans for the industry and also trends in new recruitment and retirement of employees.

On the other hand, the Centre can accept only 600 to 700 students each year for the regular courses (AKAMIGAS) because of lack of sufficient accommodation and facilities. The AKAMIGAS regular training courses are principally utilized as a means of carrier development programme for PERTAMINA employees. However, the training demand from PERTAMINA can not be covered only by the regular courses and therefore, four additional regular AKAMIGAS courses are set up within the curriculum of the short courses in order to supplement partly the AKAMIGAS regular courses.

It is basically impossible to absorb extensive and excessive training demand/volume raised by the Centre's clients. In parallel with the AKAMIGAS regular courses, 20 to 30 short courses for different subjects are offered each year. Yet, however, the Centre can accept only 500 to 1,000 short course students from PERTAMINA, and can not cover the potential training demand even only from PERTAMINA.

It is a basic idea of PERTAMINA that, so far as possible, it wishes to despatch as many students/trainees as possible to the Centre, while reducing and stopping the corresponding training activities being implemented internally within PERTAMINA.

A good reputation of the Centre as a training institution in the fields of oil and gas technologies is increasingly being recognized also in the abroad, thanks to its steady and continuous efforts made so far for the development of training activities. Reflecting this situation, the training need is also arising in foreign countries. Under such circumstance, TCDC programme was held in Cepu in 1984 under the financial assistance from UNDP. For the basic drilling technology

course held in Cepu in 1984, under the TCDC programme, a total of 17 foreign students attended from such countries as Nigeria, the Philippines, Thailand, Republic of Korea, Bangladesh, Brunei, Tanzania and Senegal. The growth of training need to the Centre from developing countries requires the continuation of this TCDC programme training every year. In 1985, also, the first ASEAN-Pacific training programme is opened in the Centre. Therefore, the Centre is requested not only to be an indispensable institution within the framework of domestic educational/training system, but at the same time to strengthen, in its nature, important role as a regional training centre.

3.2 Qualitative Training Needs

AKAMIGAS is now offering 15 regular courses, each of which consists of three different levels[1/] called Grade-I, Grade-II and Grade-III. Historical performance of the regular courses shows that the highest training need exists in such fields of technologies as mechanical, petroleum refining, and instrumentation and electrical technolgoies.

As for the level and grade of courses, the greater demand is in Grade-I, followed by Grade-II and Grade-III in descending order of training need. According to PERTAMINA, the education/training in AKAMIGAS is most appropriate to undergraduate students. The AKAMIGAS courses is insufficient for the training purpose of postgraduate students, for whom more modern facilities and equipment would be required together with higher levels of curriculum.

Among different subjects for the short courses, courses for computers and management related subjects will be in a growing demand. In addition, to the present subjects of the short courses, an increasing demand is found in the following new subject:

Note: 1/ Some courses do not have three different levels.

- Facilities and equipment inspection
- Firefighting
- Basic production
- Hydrocarbon distribution system
- Shipping operation

a) Inspection course:

Inspection and diagnosis technology for mainteance of plant equipment. It requires a higher technology and inspection equipment.

b) Fire fighting course:

According to PETAMINA, there is a training need of 1,200 persons each year. This course has been carried out by PERTAMINA itself with a total training capacity of only 600 persons/year.

c) Basic production course:

This is requested as an ASEAN Pacific programme. The training/education will have to be conducted in English.

d) Hydrocarbon distribution system course:

This is requested as a TCDC programme. The education/ training will have to be conducted in English.

e) Shipping operation course:

At present, there are 7,000 seagoing people in PERTAMINA. The training needs for obtaining a special certification are very high.

f) Basic material science:

The growing needs are arising in the technologies related to corrosion and its protection for plant and equipment, materials of construction, especially as related to the offshore structural materials.

In order to implement these new courses, additional funds are required for obtaining training equipment and materials in addition to the preparation of software as curriculum, syllabus and instruction manuals, etc.

Naturally, the Centre's execution of training activities both in the regular and short courses requires adequate training facilities and equipment. Nevertheless, most of the existing facilities and equipment, especially, the existing refinery and equipment and machine installed in the workshop and laboratories, are already technolgoically behind and too old/out-of-date to be used any longer properly for their purposes. It is clearly noted that the introduction/adoption of modern sophisticated equipment has been seriously delayed due to lack of sufficient budget. The Training Department of PERTAMINA has, in this respect, great concerns with the improvement of the training facilities and equipment as well as the increase of the accommodation capacity of the Centre, with its desire that PERTAMINA would despatch more students to the Centre.

Summing up the above discussions, there is an increasing demand for the training on new subjects in line with the development of the oil and gas industry in Indonesia, and at the same time, the renewal of the existing old equipment and the introduction and adoption of modern equipment needed for the practice and experiment of advanced technologies (especially, various instrumental analyzers, and inspection equipment) are indispensable for suitably meeting the training need arising from the industry to the Centre.

Chapter 4 AKAMIGAS

4.1 Background and Outline of AKAMIGAS

AKAMIGAS (belonging to the Cepu Oil and Gas Training Centre) is an educational and training institution which belongs to the Directrate General of Oil and Gas, the Ministry of Mines and Energy, and was established with the principal purpose to contribute the development of the oil and gas industry and ultimately of the national economy of Indonesia through the increase of knowledge and skill of those who are working in the oil and gas industry.

With this objective, AKAMIGAS was officially opened in 1967 within the area of the Cepu Oil and Gas Training Centre. It forms the main part of the Centre as can be called "the brain" for the educational and training functions of the Centre, and can be considered as a semi-academic college.

Of many aspects, the site/location of Cepu is ideal for a training centre in the fields of oil and gas technologies. There are oil and gas fields, a small and actually operating refinery (though it is very old) and its related facilities which can be utilized as training facilities. The production of crude oil and training activities are compartible in Cepu. In addition, there are various laboratories and workshop.

AKAMIGAS initiated its education/training activities in 1967 by 28 teaching staff and instructors offering four regular courses to 67 students.

During the five or six years thereafter, teaching staff/instructors and students has sharply increased. At present, the full time teaching staff and instructors amount to 133 with approx. 600 students for 15 to 17 regular courses.

In line with the increasing needs from the oil and gas industry, year by year, short courses have also been established in parallel with the regular courses in order to meet special requirements raised from the industry.

The regular courses of AKAMIGAS originally started as an academy of three successive years of training. However, in 1977, the training system of AKAMIGAS was changed from the old system to the present sandwich system, in which the training in Cepu and the working in the industry should be switched over every each year.

4.2 Training Organization and Activities, and Outline of Teaching Staff/Instructors

As described in Chapter 2, both of the Oil Field Programme Development Division and the Refinery Programme Development Division have field facilities, produces crude oil and operate the refinery, and organize on-the job training of AKAMIGAS students. These divisions also discuss the curriculum and syllabus for each course with the teaching staff and instructors belonging to the functional group. The Implementation of Profession Development Division mainly takes care of the regular courses, while the Implementation of Operational Development Division handles the short courses including TCDC and APC programme. The Training Facilities Development Devision is in charge of the practice training in the laboratories and workshop and the management of the library.

The Technical service Subdepartment belonging to the Administration Department takes care of repair and maintenance of the facilities and equipment. However, as the maintenance of facilities and equipment of special technologies requires professional knowledge and skill, it is usually done with assistance of specialists engaged in each section. The work order for maintenance is issued from the Training Facilities Development Division.

Principal staff members of each division and section of the Centre assume at the same time the position of the teaching staff/ instructors of AKIMIGAS. Some of them hold a position of lecturers/ instructors for the short courses. As of 1985, there are 133 teaching staff/instructors of AKAMIGAS, of which 97 members are the lecturers and the rest, 36 members, are the instructors (mostly, instructors for the training practice). If the lecturers hired from outside of the Centre are included, the total number of the teaching staff/instructors reached 198 members. (See Table II-4-1).

4.3 Historical Trends and Present Situation of Course Formation

In order to meet the training needs of the clients, the Centre is offering two types of the educational and training programme, that is, regular courses and short courses.

Table Ⅱ－4－1　NUMBERS OF LECTURER/INSTRUCTOR IN AKAMIGAS (1985)

Home Post	Numbers	
PPT. MIGAS CEPU	133	*1
PPTMGB"LEMIGAS" JAKARTA	17	
Department of Defense	4	
PERTAMINA	17	
University GAJAHMADA Yogyakarta	11	
Institute Technology Surabaya	7	
PT. PAL SURABAYA (shipping Co.)	1	
PT. SEMEN GRESIK (cement Co.)	2	
Others	6	*2
Total	198	

Note : *1 Full-time lecturers/instructors, of which 97 persons are lecturers and 36 are instructors.
*2 Lecturers of religeous subjects

(1) Present situation of regular courses

At present as of 1985, the regular courses of AKAMIGAS comprizes 15 courses (diciplines), each of which has three different levels from Grade-I to Grade-III. These regular courses are formulated basically for the purpose to improve knowledge and skill of those who are working in the Indonesian oil and gas industry. Actually, however, they are most utilized as a carrier development programme by PERTAMINA, the biggest client to the Centre.

New students entering AKAMIGAS usually have 1 to 2 years of experience in the industry (on-the-job). The training level and objective consists of the following three grades, each of which has its own entrance examination for new students.

Grade-I: Training of operator level personnel
Grade-II: Training of foreman level personnel
Grade-III: Training of supervisor level personnel

Within the present training system of AKAMIGAS, a student who has completed one year course of Grade-I, has to return to the company from which he was despatched to the Centre, in order to have at least one year's working experience (called industrial training). In order to enter Grade-II, he has to receive and pass the entry test. A student who has completed Grade-II has to follow the same step as mentioned above. Therefore, the total training programme continues five years until the completion of Grade-III.

Only those who have completed Grade-III are called the graduate of AKAMIGAS, while upon completing each grade, the certificate of Diploma-I, Diploma-II and Diploma-III can be obtained. Table II-4-2 shows the regular courses presently offered by teh Centre, with the numbers of students for each grade. Table II-4-3 indicates the numbers of students by the companies and institutions from which they are despatched. It is observed that approximately 80% of students are those despatched from PERTAMINA.

Table Ⅱ－4－2　REGULAR COURSE AND NUMBERS OF STUDENT (1985)

No.	Course	Numbers of Student			Total
		Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	
1	Topography	8	-	-	8
2	Geology	12	-	-	12
3	Drilling	-	15	-	15
4	Exploration	17	11	14	42
5	Production	11	21	11	43
6	Refining	38	21	16	75
7	Refining Laboratory	14	12	-	26
8	Utilities	22	18	14	54
9	Instrumentation & Electronics	39	24	14	74
10	Oil Field Mechanical Engineering	26	15	16	57
11	Refinery Mechanical Engineering	23	21	13	57
12	Electrical Engineering for Petroleum Industry	23	-	13	36
13	Civil Engineering for Petroleum Industry	-	-	17	17
14	Logistics	30	-	20	50
15	Accounting for Petroleum Industry	18	11	12	41
Total		281	166	160	607
Percentage		47%	27%	26%	100%

Table Ⅱ－4－3　HOME ORGANIZATION OF STUDENT DESPATCHED

Home Organization	'84/'85		'82/'83	
(1) PERTAMINA	473	78%	549	80.7%
(2) Foreign Contractor	49	8	44	6.5
(3) Directorate General MIGAS	6	1		
(4) Ministry of Mines & Energy	2	0.3		
(5) PPT LEMIGAS	18	3	15	2.2
(6) PPT MIGAS	59	9.7	72	10.6
T o t a l	607	100%	680	100%

(2) Present situation of short courses

a) Short courses

As in the case of the regular courses, these courses are implemented for those employees and staff members who are engaged in PERTAMINA, foreign oil contractors, and various other companies and government institutions. Moreover, there are some foreign participants (eg. TCDC programme).

These courses are usually held for a period of 1 - 4 weeks. depending on the clients' requirements, however, longer term courses are also arranged. Some courses which are called "regular sourses" within the category of the short courses, are mostly utilized as a carrier development programme for the employees of PERTAMINA. The number of participants in the short courses offered in 1984/1985 is indicated in Table II-4-4.

b) Special courses

These courses are primarily implemented for the purpose of training of supervisory level people coming from any companies and institutions. They are held for 3 months to 1 year duration. The participants are mostly university graduates.

Although the duration is relatively short, the training is implemented intensively. After finishing the courses, the participants are expected to work in supervisory positions.

c) Crash programme courses

This progamme is executed for the clients which would necessitate urgent training of manpower for new projects or special purposes. The duration is 6 months in average and the participants are generally high school graduates. Because of the short term duration, sufficient training as in the case of AKAMIGAS can not be executed. It is generally utilized as preparatory training before new recruitment in order to provide necessary practical knowledge.

Table II-4-4 SHORT COURSES AT OIL & GAS TRAINING CENTRE, CEPU
(January 1984 - April 1985)

No.	Title	Duration	Participants	Remarks
1.	Basic Administrative Management	8 weeks	23	1st batch
2.	Introductory to Exploration	2 weeks	11	
3.	English (Advanced)	24 weeks	34	5 groups
4.	Boilers Operators	2 weeks	14	
5.	Block Station Operators	2 weeks	17	
6.	Continuous Gas Lift	2 weeks	15	
7.	Field Geology	4 weeks	15	
8.	Laboratory Geology	3 weeks	15	
9.	Well Testing	2 weeks	14	
10.	Net Work Planning	1 week	22	1st batch
11.	Net Work Planning	1 week	24	2nd batch
12.	Job Analysis	3 weeks	26	
13.	Intermittent Gas Lift	2 weeks	12	
14.	Evaluation Technique for Skill Training	3 weeks	19	1st batch
15.	Intermediate Administrative Management	10 weeks	30	
16.	Fire & Safety	3 days	90	6 groups
17.	Explosive Prevention & Security	2 days	47	
18.	Evaluation Technique for Skill Training	4 weeks	18	2nd batch
19.	Teaching Technique of Special Skill	4 weeks	17	2nd batch
20.	Self Defence	5 days	37	3 groups
21.	Evaluation Technique for Skill Training	4 weeks	10	3rd batch
22.	Basic Administrative Management	8 weeks	23	2nd batch
23.	Natural Gas Engineering	2 weeks	15	
24.	Building Construction Supervision	3 weeks	17	
25.	Water Treatment	4 weeks	12	
26.	AC & Refrigeration	6 weeks	11	
27.	Fire Fighting	4 weeks		all employees
28.	Introductory to Computer	4 weeks	24	
29.	English (Intensive)	8 weeks	82	8 groups
30.	Quality Control Analysis Supervision	4 weeks	24	

Source: UNDP Report

d) TCDC Programme and ASEAN-Pacific Programme

A growing demand for training is arising from developing countries, reflecting the good reputation of the Centre as a training centre in the field of oil and gas industry. In order to meet such training needs the Centre started TCDC programme from 1984 under the assistance of UNDP. This programme is of short course and executed in English. In addition, an ASEAN-Pacific programme will be commenced from 1985 by the Centre playing an important role as regional training centre.

(3) Historical trends in implementation of regular courses

It has been already 18 years since the commencement of the regular courses in Cepu in 1967. Table II-4-5 shows trends of regular courses and numbers of students since the year 1977, when AKAMIGAS adopted the present sandwich system for training.

In 1977/1978, there were 11 regular courses with the number of students of 465, while in 1984/1985 there are 15 regular courses with a total of 607 students reflecting a steady increase and expansion of its training activities during the corresponding period. The trends in the students numbers for each of the regular courses show the existence of relatively higher training needs for the following fields of specialization:

a) Mechanical Engineering Course[1/]

b) Refining course

c) Logistics Course

d) Instrumentation Course

e) Electrical Engineering Course[2/]

Note: 1/ Incld. oil field and refinery mechanical engineering course.
2/ Including electrical engineering for petroleum industry course.

Table Ⅱ－4－5　TREND OF NUMBERS OF REGULAR COURSE STUDENT ('77/'78 ～'84/'85)

Course	Grade	'77/'78	'78/'79	'80/'81	'81/'82	'82/'83	'83/'84	'84/'85	Total
Topography	Ⅰ				14		10	8	32
	Ⅱ						13	1	14
	Ⅲ								
	Total				(14)		(23)	(9)	(46)
Exploration/Geology	Ⅰ			14		7		11	32
	Ⅱ								
	Ⅲ								
	Total			(14)		(7)		(11)	(32)
Drilling	Ⅰ	7	10	1					18
	Ⅱ	7	11	9	12		16	15	70
	Ⅲ				17	10	12		39
	Total	(14)	(21)	(10)	(29)	(10)	(28)	(15)	(127)
Exploitation	Ⅰ	12	17	14				15	58
	Ⅱ			17	10	21	16	11	75
	Ⅲ					13	9	13	35
	Total	(12)	(17)	(31)	(10)	(34)	(25)	(39)	(168)
Production	Ⅰ	15	19	25	24	18	26	10	137
	Ⅱ	19	15	22	19	20	18	19	132
	Ⅲ				12	15	16	12	55
	Total	(34)	(34)	(47)	(55)	(53)	(60)	(41)	(324)

(Continued)

Course	Grade	'77/'78	'78/'79	'80/'81	'81/'82	'82/'83	'83/'84	'84/'85	Total
Refining	Ⅰ	50	47	38	1*	40	26	37	239
	Ⅱ	25	25	29	30	53	14	22	198
	Ⅲ			11	34	22	7	17	91
	Total	(75)	(72)	(78)	(65)	(115)	(47)	(76)	(528)
Refining Laboratory	Ⅰ		17	21		19	9	13	79
	Ⅱ					19		11	30
	Ⅲ								
	Total		(17)	(21)		(38)	(9)	(24)	(109)
Utilities	Ⅰ	25	13	19	18	25	17	21	138
	Ⅱ			13	9	24	7	18	71
	Ⅲ							14	14
	Total	(25)	(13)	(32)	(27)	(49)	(24)	(53)	(223)
Instrumentation & Electronics	Ⅰ	30	28	24	45	40	23	39	229
	Ⅱ		12	18	20	16	12	21	99
	Ⅲ				13	14		14	41
	Total	(30)	(40)	(42)	(78)	(70)	(35)	(74)	(369)
Mechanical Engg.	Ⅰ	64	52	52		17			185
	Ⅱ	26	28	50	74	40			218
	Ⅲ				26	34			60
	Total	(90)	(80)	(102)	(100)	(91)			(463)

(Continued)

Course	Grade	'77/'78	'78/'79	'80/'81	'81/'82	'82/'83	'83/'84	'84/'85	Total
Mechanical Engg. (Oil Field)	Ⅰ						39	25	64
	Ⅱ					13	29	16	58
	Ⅲ						28	15	43
	Total					(13)	(96)	(56)	(165)
Mechanical Engg. (Refinery)	Ⅰ						28	21	49
	Ⅱ					26	21	20	67
	Ⅲ							13	13
	Total					(26)	(49)	(54)	(129)
Electrical Engg.	Ⅰ	24	38	40			21	《23》*1	146
	Ⅱ	15	20	21	28	25	28		137
	Ⅲ					36		《13》	49
	Total	(39)	(58)	(61)	(28)	(61)	(49)	《36》	(332)
Civil Engg.	Ⅰ	23	48	24			17	1	113
	Ⅱ			20	32	27	26		105
	Ⅲ						19	17	36
	Total	(23)	(48)	(44)	(32)	(27)	(62)	(18)	(254)
Logistics	Ⅰ	54	43	30			21	29	177
	Ⅱ	33	33	33					99
	Ⅲ	12	16	16	30	21	24	21	140
	Total	(99)	(92)	(79)	(30)	(21)	(45)	(50)	(416)

Note:* 1 《 》shows change of the name of the course from Electrical Engineering to Electrical Engineering for Petroleum Industry

(Continued)

Course	Grade	'77/'78	'78/'79	'80/'81	'81/'82	'82/'83	'83/'84	'84/'85	Total
Oil Accounting	Ⅰ				21	14	34	18	87
	Ⅱ				11	15		7	33
	Ⅲ					11		10	21
	Total				(32)	(40)	(34)	(35)	(141)
Marketing Operation ('77/'78)	Ⅰ	24							24
	Ⅱ								
	Ⅲ								
	Total	(24)							(24)
Total	Ⅰ	328	332	302	123	180	271	271	1807
	Ⅱ	125	144	232	245	299	200	161	1406
	Ⅲ	12	16	27	132	176	115	159	637
	Total	(465)	(492)	(561)	(500)	(645)	(586)	(591)	(3850)

As for the number of students by grade/level, the participation in the Grade-I is highest, followed by Grade-II and Grade-III in descending order of the number of students, with the exception of the year 1982/1983. In other words, the training needs to the Centre exist more in Grade-I, followed by Grade-II and Grade-III in descending order of training volume, being related to a pyramide type of manpower structure in PERTAMINA and other institutions and companies. For example, Figure II-4-1 presents a manpower pattern of PERTAMINA.

Among the regular courses so far having been implemented with established curriculum, the marketing operation course has lost its training needs since 1978/1979. Both the topography and exploration courses became specialized in 1980/1984 into the mechanical engineering course for oil fields and refining. Also, the electrical engineering course was transformed to the electrical engineering for petroleum industry in 1984/1985. Table II-4-6 indicates numbers of courses, students and lecturers/ instructors since the establishment of AKAMIGAS in 1967. For reference, Table II-4-7 is given here in order to show an outline of the five year programme planned by the Centre at the end of 1979. The steady increase in those numbers every year since the establishment proves that the Centre has been contributing to the development of the Indonesian oil and gas industry, and at the same time, has solidified its foundation as a training instituion.

Of course, some difference is observed between the five year programme planned by the Centre in the year 1979 and the actual performance presented above, however, this should primarily be attributed to the lack of sufficient budget and funds.

Figure II-4-1 MAN POWER PATTERN

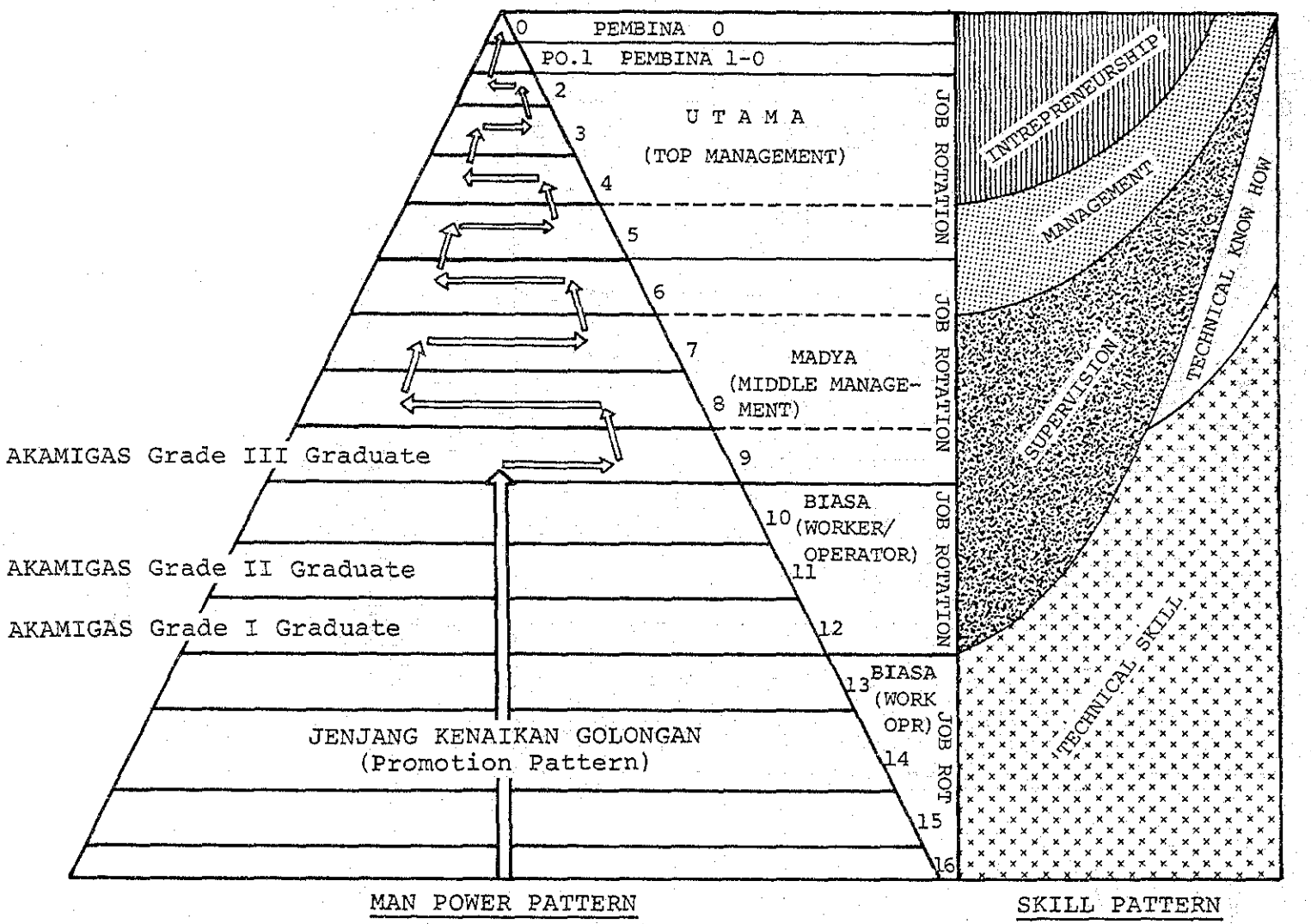


Table Ⅱ－4－6　　TRENDS OF NUMBER OF COURSE, STUDENT, LECTURER AND INSTRUCTOR

Year	Course	Student	Lecturer/Instructor
'67/'68	4	67	28
'68/'69	6	109	57
'69/'70	6	205	86
'70/'71	10	243	94
'71/'72	10	260	97
'72/'73	10	276	140
'73/'74	12	276	140
'77/'78	11	465	
'78/'79	11	492	
'80/'81	12	561	
'81/'82	12	440	
'82/'83	15	658	187
'83/'84	15	573	
'84/'85	15	607	198

Notes: 1. Data from '67/'68 to '73/'74 were taken from UNDP Report.
2. Data from '74/'75 to '76/'77 are not available (NA).

Table II-4-7 FIVE YEAR PLAN

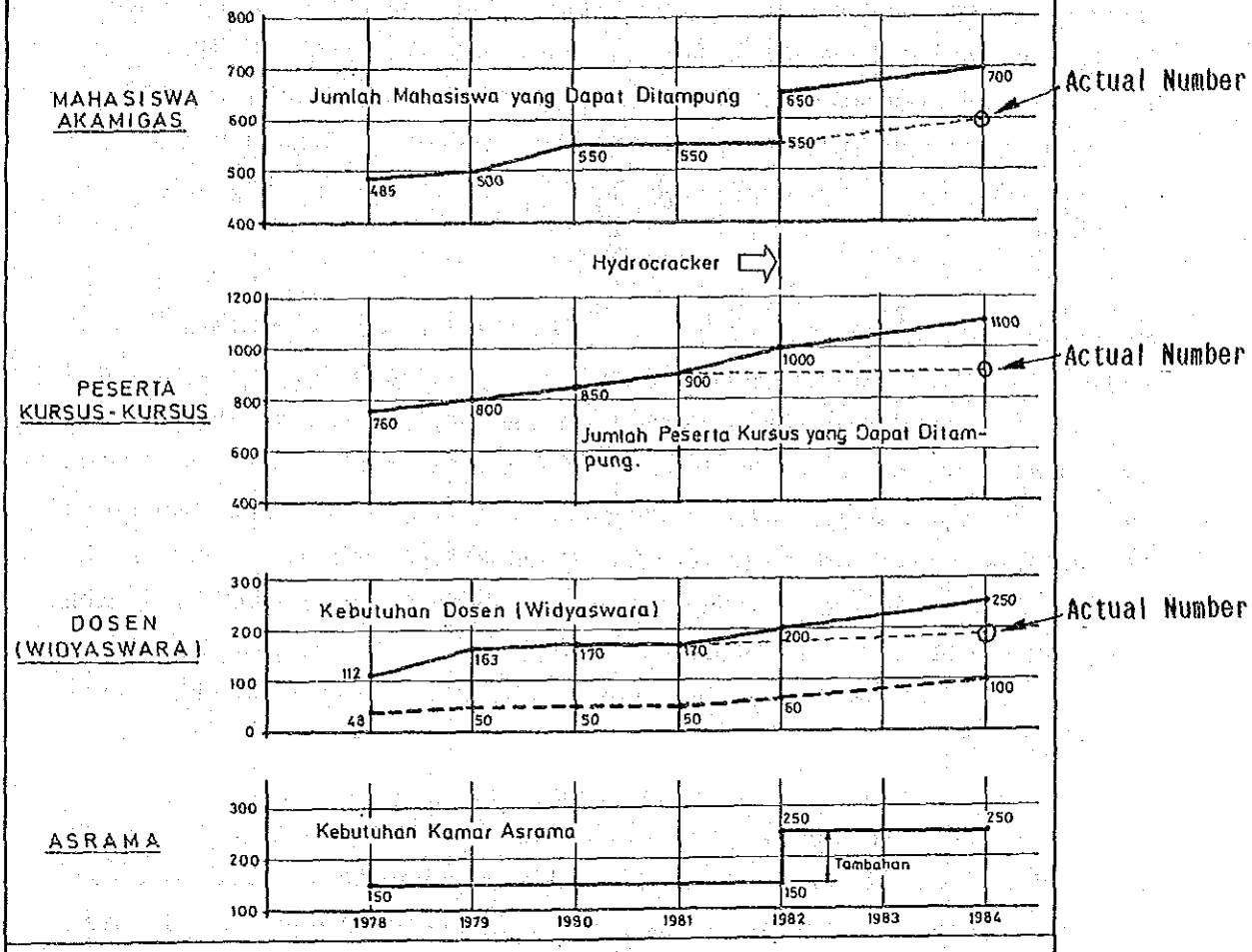
PPTMGB "LEMIGAS"
BIDANG DIKLAT
Jln. Sorogo Telp. 77
CEPU - JATENG

DAYA TAMPUNG DAN PROGRAM DIKLAT 5 TAHUN

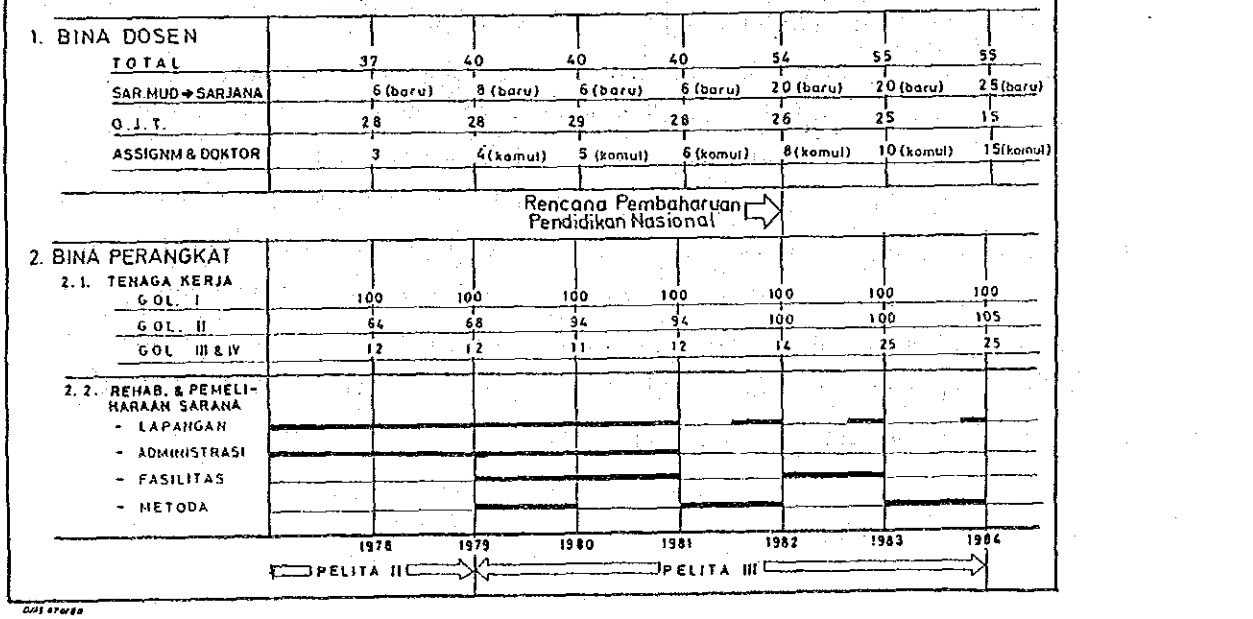
No. : 002 | Kur | Gen | Aka | 79

Tanggal: 22 | 12 | 1979

Tahun Ajaran: 19 / 19



PROGRAM - PROGRAM POKOK



(4) Historical trends in implementation of the short courses and future programme

Table II-4-8 and Table II-4-9 indicate numbers of the short courses and special courses implemented by the centre, and numbers of participants during the period from 1979/1980 to March 1985. Table II-4-10 shows implementation programme of courses, time and duration from April 1985 to March 1986. In addition, Table II-4-11 presents fields of specialization and numbers of courses supposed to be implemented for the coming five years upto 1989.

In parallel with the regular courses implemented by AKAMIGAS, it is understood that a large number of short courses have been, are being, and will be, implemented by the Centre. Among very popular courses in which many people participated are those for the principles of national leadership such as the State philosophy and Pancasila in which the women's association of the Centre and other group of associations participate. As for the courses of technologies and supervision, numbers of participants for each course are generally 20 to 30 persons, mostly those who are despatched from PERTAMINA and foreign oil contractors, and staff members of the Centre and LEMIGAS.

It is understood that such a great number of short courses can not be easily implemented without continuous efforts made by all those who are concerned with this matter so as to try to satisfy the increasing training needs arising from the oil and gas industry, by utilizing a very limited funds available for the Centre. Such efforts should really be appreciated.

Although the subjects of the short courses are mostly of a wide range of technology fields, courses regarding management are recently being increased, reflecting a growing training needs for such subjects. There are also some training courses implemented fittingly as for the teaching staff/instructors of AKAMIGAS concerning teaching method and skill, and method of evaluation of educational/training mastery, etc. for the purpose to improve their training capacity and system. Growing attention is also paid to courses for English and computers.

Table II－4－8　TRENDS OF SHORT COURSE

Year	Number of courses conducted	Number of participant			
		PERTAMINA	LEMIGAS (PPT.MIGAS)	Others	Total
'79/'80	23	194	170	29	393
'80/'81	49	152	1168	468	1788
'81/'82	28	17	725	177	919
'82/'83	47	229	789	115	1133
'83/'84	10	11	309	2719	3039
Total	181	634	3283	3535	7452

Table Ⅱ－4－9　SHORT COURSE : TRENDS OF SPECIAL COURSE

Year	Numbers of Course Conducted	Numbers of Participants
'80/'81	7	203
'81/'82	6	109
'82/'83	4	81
'83/'84	10	135
'84/'85	2	48
Total	29	576

Table Ⅱ－4－10　PLANNED SHORT COURSES FOR '85/'86

	Course	Time	Period
1	Advanced Topography	'85-May	3 weeks
2	Seismic Shooter	〃 Aug	3 weeks
3	Seismic Observer	〃 Aug-Sep	4 weeks
4	Field Geology	〃 Apr	4 weeks
5	Geology Laboratory	〃 June	3 weeks
6	Advanced Micropaleontology	〃 Nov	2 weeks
7	Exploratoion Draeing	'86-Feb	2 weeks
8	Blowout Prevention and Well control Rotary Helper Level	'86-Jan	3 weeks
9	Drilling	'85-Apr →'86-Mar	1 year
10	Oil & Gas Basic Drilling Technology	'85-Aug-Oct	8 weeks
11	Sucker Rod & Reda Pump	'85-Apr	4 weeks
12	Reservoir Engineering	'85-May-June	5 weeks
13	Reservoir Simulation	'85-June	3 weeks
14	Civil Engg.Programme	'85-Apr-May	4 weeks
15	Construction Supervision	'85-May-June	6 weeks
16	Development Supervision	'85-May-June	6 weeks
17	Employee Administration	'85-Jun-Aug	8 weeks
18	Accounting Management	'85-Aug-Oct	10 weeks
19	Purification of Water	'85-Apr-Jun	8 weeks
20	Basic Cooling Technique	'85-Apr-Jun '85-Jun-Sep	8 weeks 8 weeks
21	Advanced Cooling Technique	'85-Apr-Jun '85-Jul-Sep	8 weeks 8 weeks
22	Administration & Management for middle-to-Top management	'85-Nov-Dec	8 weeks
23	Administration & Management for Middle Management	'85-Nov-Dec	6 weeks
24	Administration & Management for lower Management	'85-Jul-Aug	8 weeks
25	Job Analysis & Job Evaluation	'85-Oct-Nov	8 weeks
26	Engineering Economic	'86-Jan-Feb	6 weeks
27	Introduction to Oil Industry Activities	'85-Apr-May	6 weeks

(Continued)

Course	Time	Period
28 Technique Teaching method	'85-Apr-May	8 weeks
	'86-Jan-May	10 weeks
29 Teaching method for Skill	'85-May-Jun	6 weeks
	'85-Dec-'86-Jan	6 weeks
30 Logic Mathematic	'85-Apr-Jun	12 weeks
	'86-Jan-Mar	12 weeks
31 Education Evaluation Technique	'85-Oct-Nov	6 weeks
32 Intermediate English (course)	'85-Nov-'86-Feb	12 weeks

Table Ⅱ－4－11　PLANNED SHORT COURSES FOR '85/'89

Exploration	16
Drilling	6
Production	4
Exploitation	10
Civil Eng.	5
Refinery	1
Management	6
Operation (including Utility)	5
Instrumentation & Electronics	11
Administration	16
General(Teaching method,Evaluation Technique, etc)	9
	89

As stated before, according to the future programme for short courses to be implemented for the coming 5 years, planned by the Centre taking into account the clients' needs, it is observed that those courses related to exploration, drilling, production, and exploitation of crude oil are in the greatest training needs.

4.4 Educational/Training System and Method of AKAMIGAS

(1) Curriculum and Syllabus

a) Curriculum and Syllabus of Regular Courses

As described before, 15 regular courses ranging from topography to oil acconting are being implemented in the academic year 1984/985 (Table II-4-1). Each of the courses consists of three different levels/grades: Grade-I, Grade-II and Grade-III. Each grage of the courses lasts one year that is divided into two semesters. Each semester comprizes 17 weeks. In addition to this, at the end of second semester of each grade, a 7 weeks' field work training is implemented. Therefore, a total training period for each grade amounts to 41 weeks. Table II-4-12 indicates an overall curriculum schedule for the year 1984/1985. Syllabi written in the Indonesian language are available for all the courses. There are about 760 syllabi, if those for the short courses are included.

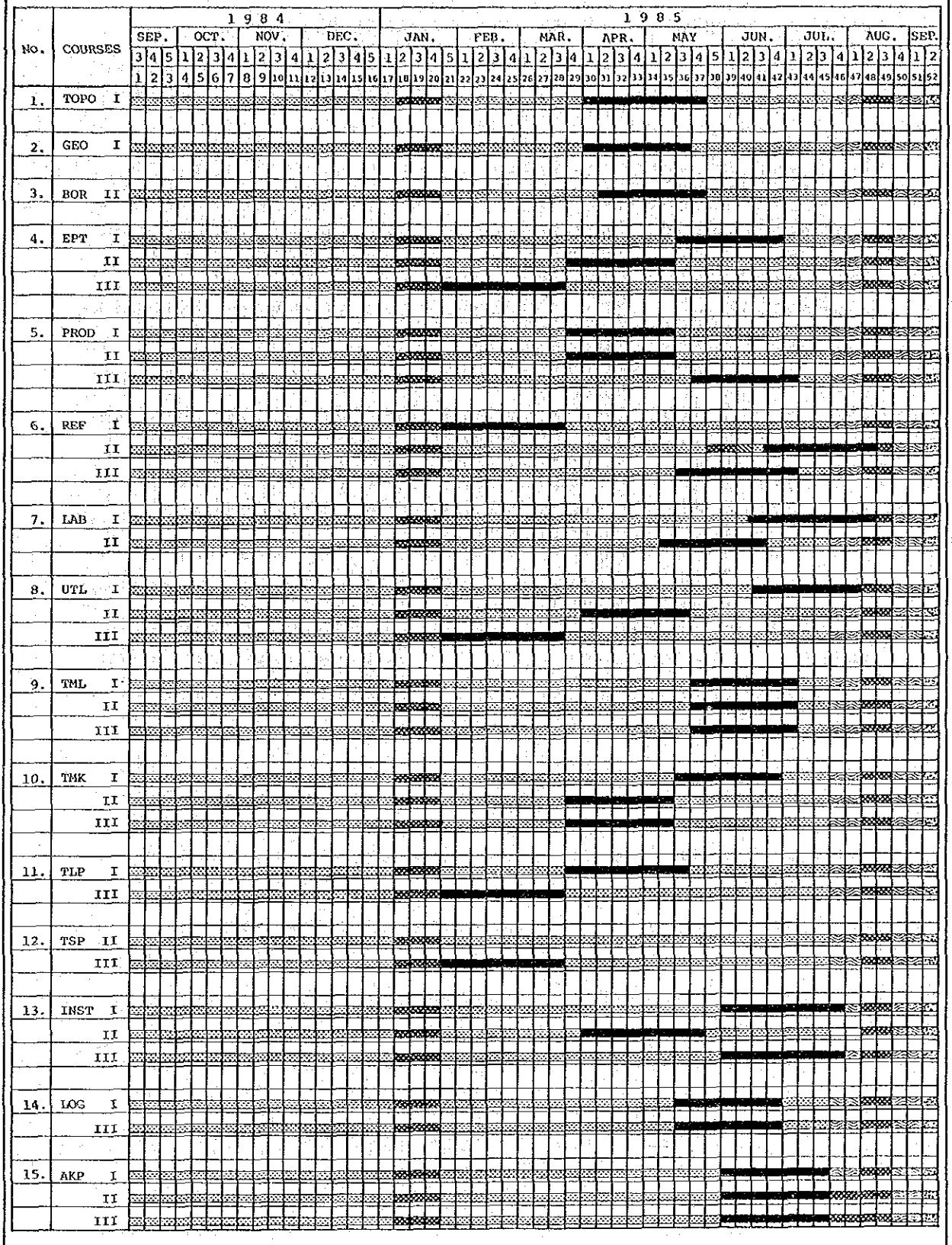
The syllabus is composed of the followings:

- Industrial and Applied Subjects
- Basic Subject
- General Subject/Leadership

The industrial and applied subjects are utilized as a guide for professional fields and technologies of related fields, the basic subjects is utilized as a guide for basic science such as mathematics, physics, and chemistry, and the general subject/leadership is utilized as a guide for civics and English language. In addition, as a guide for determining the depth/extent of education/study and learning, three levels (General Idea, Moderate, and Intensive) are given for each of the studies.

Table II-4-12 AKAMIGAS CURRICULUM SCHEDULE

PPT "MIGAS" CEPU



Note for Table II-4-12

No.	Code	Course
1	TOPO	Topography
2	GEO	Geology
3	BOR	Drilling
4	EPT	Exploitation
5	PROD	Production
6	REF	Refining
7	LAB	Refinery Laboratory
8	UTL	Utilities
9	INST	Instrumentation & Electronics
10	TML	Oil Field Mechanical Engineering
11	TMK	Refinery Mechanical Engineering
12	TLP	Electrical Engineering for Petroleum Industry
13	TSP	Civil Engineering for Petroleum Industry
14	OPS	Marketing Operation
15	LOM	Logistics
16	LOA	Transportation Logistics
17	AKP	Accounting for Petroleum Industry

In Grade-I, the students receive instructions with emphasis on craft subjects such as machine tool use and maintenance. This is considered desirable for the purpose to train those technicians who would work by their own hands in factories and oil/gas fields.

In case of refinery related courses such as engineering, emphasis is laid upon the subjects such as electrical engineering, pump and compressors, prime movers and technical drawings, repeatedly from Grade-I to Grade-III. It is considered that such subjects, even despite some overlapping among three grades, must be very useful for the increase of technology level of students, because they contain indispensable knowledge and technology required for the operation and maintenance of process plants.

English course as a general subject is also given to all levels/grades of students during the three years in the Centre. This is mainly for the reason that since the Indonesian oil and gas industry has a close connection with foreign technologies and companies and English is an international language, it is essential for those who are working in this field of industry. The development of the Centre as a regional training centre also requires the increase of knowledge in English for the teaching staff/instructors.

b) Curriculum and syllabus of short courses

As in the regular courses, the short courses having been so far implemented by the Centre are equipped with curricula and syllabi. There are some syllabi for the short courses written in English in accordance with the requirements from the clients. Since there are a variety of needs and requests for the short courses from the clients, the preparation/formation of curriculum schedule is made every year through close cooperation, consultation and discussions with the clients.

c) Establishment and improvement of curriculum and syllabus

Curriculum and syllabus play an important role as software material for training activities by AKAMIGAS. For this reason, curriculum should be formulated and established through close cooperation and discussions

between the Centre and the Clients, followed by the approval of the Director General of Oil and Gas.

The Centre's present curricula and syllabi are authorized by the letter of intent from the Director General titled "The Establishment of the Curriculum of AKAMIGAS Terminal Behavior Programme, Centre for Oil and Gas Personnel Development in Cepu". This letter of intent also points out that because curriculum is a dynamic document, it will have to be modified so as to meet future needs and technological development of the oil and gas industry. The modification of curriculum should be made by taking into account various factors, among which are enumerated below:

- Change in education/training purpose
- Change in technology application
- Change in course schedule
- Change in education/training system
- Change in training method.

The Centre has been continuously undertaking the review and modification/improvement/renewal of curriculum and syllabus in association with the clients (mainly with PERTAMINA) and with the assistance of foreign consultants (eg. consultants from UNDP). In the past, major modification/renewal was done at the time of change in the Centre's training system from the old system to the present sandwich system also in 1979/1980. The Committee members for this review of curriculum consist of AKAMIGAS teaching staff/lecturers, officers of the Training and Personnel Development Department of PERTAMINA, and university professors, etc. In accordance with advises[1/] of UNDP consultants, an inquiry was made to those who graduated from AKAMIGAS, with the purpose to reflect their needs and opinions in the modification/improvement of curriculum.

Note 1/ UNDP report prepared by Mr. John L.R. Kirkalday in May 1985, and by Mr. David John Allen-Butler in May 1983.

(2) Training System and Method

a) System for classroom lecture/practice/On-the-job training

The teaching/learning method adopted in AKAMIGAS can be classified into the following three elements:

- Lecture on theory in the classroom
- Laboratory and workshop practice in order to strengthen and complement knowledge obtained from the classroom lecture.
- On-th-job training in different fields of specialization.

Time presently allocated to the lecture and practice by each grade is as follows:

	Grade-I	Grade-II	Grade-III
Lecture/Practice(%)	40/60	50/50	60/40

It is observed that more time is allocated to lower grades, while higher grades have more time for the classroom lecture on theory. This fact suggests that lower grades are designed to enable the students to obtain more definite knowledge and skill through verification of theory and simulation, and that in higher levels/grades, more emphasis is given to the teaching/ learning of supervision and management principles.

The practice training is made every day in each specialized laboratory and workshop, usually after the classroom lecture time. Instructors being assigned to each laboratory and workshop takes care of demonstration work, followed by the practice and experimental work by students themselves. There are, however, some laboratories, in which a sufficient demonstration can not be made because of excessive load of such instructors. Instruction notes and/or manuals used for the practice are not always sufficiently made available.

Apparently, one of the biggest advantages of the Centre is one that on-the job training can be implemented at the site of Cepu. Those students for the refining course, for example, can receive on-the-job training in the existing refinery and its related facilities within the Centre. This

refinery is not only a production plant but also a training facility which makes it possible to implement such training for operation and inspection/maintenance which can not be made available in an ordinary commercial plant. As for the safety, of course, the same extent of attention as in the case of commercial plant should be also paid. However, in case of Grade-III refining course, the existing old refinery in Cepu is no longer useful as a medium for teaching higher and modern process plant technologies. Therefore, the students for Grade-III refining course have to go to other refineries of PERTAMINA as Cilacap, and Palembang refineries for their on-the-job training. Other Grade-III courses have more or less similar situations and problems.

The execution of on-the-job training at sites other than Cepu requires additional expenditures and time for the movement and lodging of the students/trainees. In order to save such costs and time, the management of the Centre is eager for the improvement of the training facilities and equipment so that the Centre would become capable of implementing most of the on-the-job training at the site of Cepu. The new installation of several simulators and pilot plants reflects the Centre's efforts in line with such desire and intention. It has to be emphasized that the Centre is an ideal training centre specializing in the fields of oil and gas technologies, in view of its location and site where the classroom lessons on theory, experimental work and practice in the laboratories and in workshop, and on-the-job training in the field, all of these three training elements can be made at the same site.

b) Teaching Method

In the education and training in AKAMIGAS, practical aspects are usually emphasized. However, its teaching method is considered rather "teachers oriented". This is especially observed in the classroom lessons.

It is a common pattern that the lecturers/teachers talk to the students/trainees about classroom lessons, while the students/trainees take notes. It is considered recommendable to introduce case studies, discussions in exercise, and questions and answers, which promote the participation of the students and, at the same time, the development of

their potential capabilities. As the training in AKAMIGAS emphasizes on the practical aspects of technologies, such teaching materials as figures, tables, illustrations and cut models are utilized during the classroom lessons. For more effective training, however, more frequent use of such audiovisual training aids as video, slide films, and overhead projectors is recommended. The present use of such audiovisual aids is not necessarily considered satisfactory. It is considered that the major problems are encountered in lack and insufficiency of such training/learning aids and materials, and software. The preparation of such aids and software requires much time and efforts. However, after once prepared, they will apparently contribute to the reduction of teaching load of AKAMIGAS staff and to the improvement of training effectiveness, because they are repeatedly utilized by appealing to the visual and auditory senses of the students and trainees.

Video films are especially effective for the training and learning of operation and management of plant, operation and practice in the laboratories and workshop. It is hopeful the instructors to prepare and gradually accumulate such materials in cooperation with students during the time for practice.

c) Evaluation of educational/training mastery

- Tests and Examinations

At the end of Semester-I and Semester-II of the regular courses, examinations are given to students. Those who have obtained a passing grade in the examination of the Semester-II, can receive state examination which is an essay test. The state examination is prepared for each of Grade-I, Grade-II and Grade-III students, who are supposed to obtain Diploma-I, Diploma-II and Diploma-III, respectively, after passing the corresponding test.

For the practice and experimental work in the laboratories and workshop, the students are requested to submit reports for the evaluation by instructors. Reports are requested for the on-the-job training, for which students' attitude and skill is also evaluated.

In case of the short courses, there is no regular examination as in the regular courses, and instead, evaluation is made through some tests and reports to be prepared by the students/trainees.

In the regular courses, those who have not passed the examination at the end on the semester-I can not be permitted to move up the semester-II, and have to return to their mothers' body from which they have been despatched. In addition, if a student does not get a passing grade of the examination given at the end of semester-II, he can not receive the state examination, and therefore without obtaining Diploma, he has to return to his company/institution. Despite such strict academic conditions and circumstances, almost all students usually pass all such examinations. It is noted that for example, in case of the semester-I examination in the academic year 1984/85, only 2 of 607 students failed in passing the examination at the end of semester-I of the academic year 1984/85. On the contrary, it has to be noted that, in case of the entrance examination of the same academic year, 607 of the total of 800 applicants were permitted to enter AKAMIGAS a passing rate of 75%.

- Measurement and evaluation of academic achievement

Evaluation is made in terms of knowledge, skill and attitude, which are commonly called "KSA". The following grading and marking system is used in AKAMIGAS.

Marks	Letters	Meanings
76 - 100	A	Excellent
66 - 75	B	Good
56 - 65	C	Ordinary/Fair
45 - 55	D	Not Good/Poor
- 44	E	Failure

The letter A, B, and C mean passing grades, while D and E mean a failure. But for the students who have the letter D, another opportunity for re-examination is given.

On the basis of the above system, AKAMIGAS making efforts to maintain and confirm entry behavior level of the students, to regularly evaluate and judge the educational and training mastery, and to reflect and feed back the results to further development of its training programme.

d) Course pattern

As described repeatedly, the present course pattern of AKAMIGAS consists of what is called "sandwich system" in which the students repeat, each year, one year training in Cepu, and one year industrial training/ working in his mother's body/company.

The features and advantages of this system are as follows:

- It is possible to learn/master relatively continuously technological knowhow and skill by applying results of learning for one year to the actual working situation of industry.

- It is possible for those who can hardly leave their home town, especially, those married, to make home-leave possible every one year.

On the other hand, it is noted that the isolation from the academic circumstance for one year seems to let those who are not always eager for the study/learning and not good at their assigned courses of diciplines, feel difficult to move up to a higher grade of course. In addition, as the industrial training for the period of working in the mother's body/company of their students depends totally upon the company's intention, there seems to be a weak point in this system that an overall educational and training programme for the total five years period can hardly be established due to lack of control under a continuous, consistent educational and training principle and philosophy. It is informed that, in PERTAMINA, the greatest clients of the Centre, the present sandwich training system is being reevaluated.

Nevertheless, it has to be clearly noted that it has been already 8 years since the establishment of this system, and that the recent inquiry made to a number of graduates of Cepu which include those of the old system, resulted in giving a large majority of opinions indicating that the present sandwich system is much superior to the old system. Although there are, of course, advantages and disadvantages, observed in both systems, it is considered that the present sandwich system is more effective, so far as appropriate programme is set up for the students to be trained in the mother's body/company and, at the same time, to be promoted to a higher grade of course through the cooperation between the Centre and clients. (See Annex II-3-1).

4.5 Development of the Teaching Staff's Capacity

Educational/training effects are influenced by various factors, among which, above all, are by the nature of teaching staff.

There are 133 regular teaching staff members, of which about 100 members have either "Sarjana Degree"[1/] or/and "Sarjana Muda Degree"[2/], and the rests are non-graduates.

Non regular lecturers are being invited from PERTAMINA and universities, who are professionals in different fields.

Average teaching load of AKAMIGAS teaching staff is usually 20 hours a week. It has to be noted that since most of the teaching staff have additional tasks and duties such as the management of the Centre and operation of the existing plants and facilities, in addition to the teaching duty, they can not always afford to allocate sufficient time to their own study and capacity development.

In view of the potential needs for the teaching staff's capacity development and as a training centre, it seems that efforts are made to give them a relatively frequent training opportunities.

Among such opportunities are short-term despatch of the staff to the universities and professional institutions in the country. Some of the short courses implemented in the Centre, for example, about teaching technique course, in which approx. 75% of the present teaching staff members have already participated, provide another opportunity for the trainers training, in addition to the two regular short courses which are "A Level Supervisory Course" and "B Level Supervisory Course", managed by the Centre and provided for the development of the staff's supervisory capacity.

Note: 1/ It means such degrees as Ir., Drs. and Dra. given to those graduates from 5 years universities.
2/ It means such degree as Bsc. give to those graduated from 4 years collages.

Among other important opportunities are the participation in training fellowship in foreign countries. This programme aims principally at the increase and development of professional knowledge of technologies and of teaching skill, but, sometimes, aims at the development of management capacity and skill.

This programme is implemented mostly under the sponsorship of UNDP, JCCP, USAID, Colombo Plan, etc. in which approx. 50 teaching staff have already participated. The largest number is shared by the participants in UNDP programme, followed by JCCP in which 22 staff has participated so far. The training programme by JCCP is properly appreciated by the Centre and desired to be continued also in the future. Knowledge and skill gained through such opportunities for the trainers training, especially through the training fellowship, has been playing an important role for, and contributing to, the improvement and development of the Centre's training system and programme and, as a result, for the increase of effectiveness of training provided by the Centre.

4.6 Training Facilities and Equipment, and Training Aids

(1) Major Training Facilities and Equipment

Training facilities and equipment of the Centre consists of the followings:

ALAMIGAS: Classrooms for the regular and short courses including language laboratory.

Laboratory: Training laboratory integrated with different laboratories of specialization in addition to some separate and new laboratories.

Workshop: Repair workshop for plant facilities, and training workshop.

Operational Facilities: Refinery, utilities facilities, oil transport and storage, drilling rig, and oil fields.

Given below are descriptions principally on AKAMIGAS, laboratory, dormitories of AKAMIGAS as supporting facilities.

(a) Outline and situation of facilities

1) AKAMIGAS

Figure II-4-2 presents a layout for the classrooms and library of AKAMIGAS.

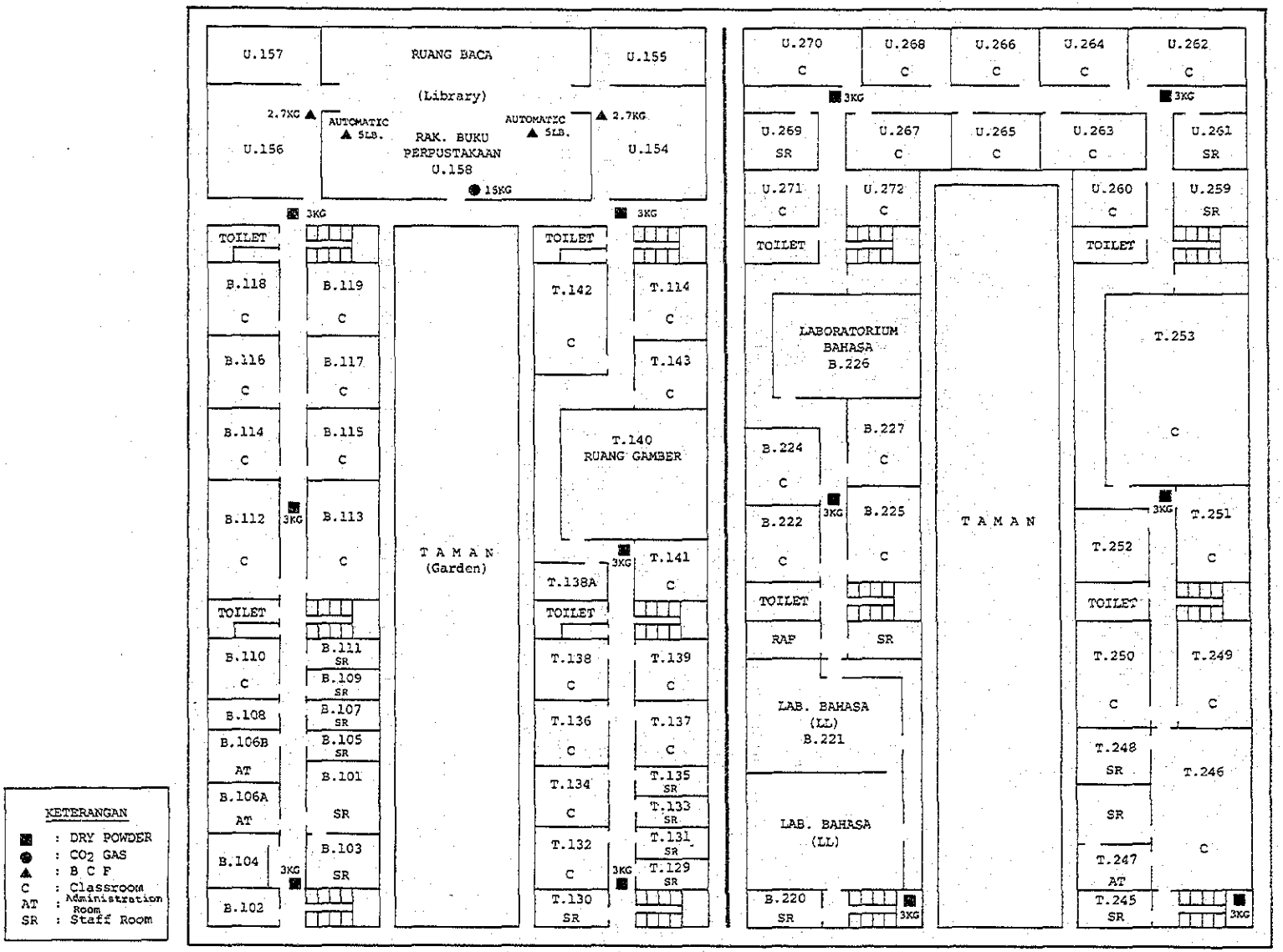
- Classroom

There are 40 classrooms in total, of which 33 rooms are utilized for the regular courses, and the rest for the short courses. In addition, the short courses have 6 additional rooms within the laboratory and workshop. Most of the classroom are designed to accommodate 20 students, and there are some smaller and larger rooms. These classrooms have a large blackboard with electrical connections for the use of video/films and slides. chairs and desks are well arranged. The rate of utilization of classrooms are estimated at as high as 90% for the regular courses and at about 80% for the short courses, and therefore, it is considered that the present numbers of students for the regular courses, which are around 600 students, are a limit of total accommodation capacity of AKAMIGAS.

- Drafting/drawing room

There are only drawing tables for the use of the students and the staff in the drafting/drawing room. It is considered necessary to provide drafters and light stands for each drawing table for the practice of technical drawings as adopted as one of major subjects in the curriculum of the regular course. The space of the drawing room seems also to be insufficient.

Figure II-4-2 LAYOUT OF AKAMIGAS



- English language laboratory

By the assistance from UNDP, two language laboratories have recently been completed, each consisting of 32 learning desks with a central operating unit of equipment. There is another language laboratory room made of West Germany, which is very old and no longer used. These new language laboratories are extensively and effectively utilized for the practice of English of AKAMIGAS students, and for the implementation of short courses of English.

- Library:

There is a library with 80 reading sets of book stacks. Various kinds of text books, reference books, magazines, and some periodical publications are stored. Papers and theses by the graduates of each course, and essays prepared at the time of the state examination are also compiled and reserved. The numbers of books are as follows:

Text books:	16,291 (5,187 topics)
Reference book:	7,813 (2,024 topics)
Total:	24,104 (7,211 topics)

In addition, reports written by AKAMIGAS students at the time of practice are stored with 3,185 topics.

The following indicates the classification of the books in terms of fields of specialization:

Classification	No. of topics	Share(%)
Religion and Philosophy	291	4.0
Politics, Economics and Sociology	979	13.6
Liguistics and Literature	771	10.5
Medicine and Health	104	1.4
Technology and Industry	2,415	33.5
Management and Organization	1,112	15.4
History, Art and Sports	154	1.9
Geography, and Knowledge about the world	1,206	16.7
Miscellaneous	179	2.8
Total	7,211	100

The library is well arranged, and the administration system for the registration and rental service of books is also properly functioned. However, the size of library in terms of collection of books and their contents is apparently unsatisfactory for this type of training institution.

- Students dormitory

Near the AKAMIGAS schoolhouse, there is a students dormitory which can accommodate 400 students. There is another dormitory capable of accommodating 200 students, located apart from the AKAMIGAS schoolhouse within the area of the Centre. Within the dormitory, there is a well administered clean dining room. It is arranged that six students stay in an area of approx. $20m^2$ with three sets of two-stage beds. Therefore, living area per head is very small. Corresponding to the

limitation (existing) in the classroom capacity of AKAMIGAS, the present maximum accommodation capacity of the dormitories is limited to around 600 students. Expecting an increase of students in accordance with the coming programme for the short courses in the near future, construction of a new additional dormitory is being planned.

- Other facilities

Adjacent to the AKAMIGAS schoolhouse, there is an administration office, where printing and copying functions of various documents and teaching materials are equipped. A little apart from the schoolhouse, there is a hall which is usually used for several meetings and conference and sometimes for implementing some short courses offered to a large group of people (eg. training courses concerning Pancasila, religion, and regulations).

Those buildings and facilities of AKAMIGAS mentioned above are well maintained and properly managed based on reliable system established through the Centre's long experience. There is no special technical problem encountered in the repair and maintenance, which is generally conducted according to work order, by workforce of the Technical Service Subdepartment of the Administration Department.

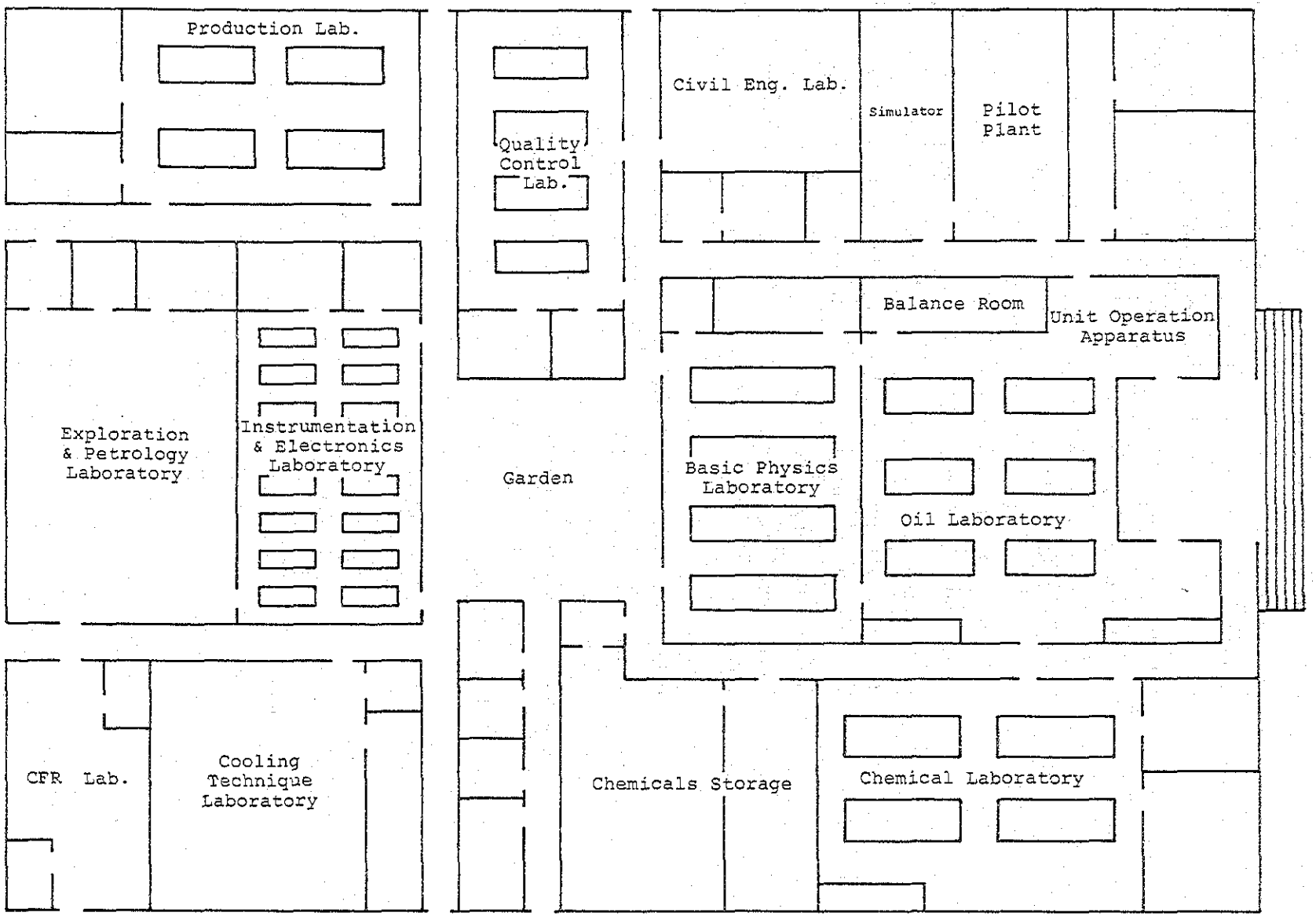
2) Laboratory

A variety of laboratories for experimental work and practice of AKAMIGAS are integrated together into one building that is generally called "Training/Education Laboratory" or simply called "Laboratory". In addition, there are some additional laboratories having been installed in line with transition of time.

- Training laboratory

Figure II-4-3 shows a plot plan of the training laboratory, which consists of the following specialized laboratories:

Figure II-4-3 LAYOUT OF EDUCATION/TRAINING LABORATORY



. Oil laboratory
. Chemical laboratory
. Basic physics laboratory
. Instrumentation & electronics laboratory
. Cooling technique laboratory
. CFR laboratory
. Geology laboratory
. Production laboratory
. Quality control laboratory
. Civil engineering laboratory
. Pneumatic control simulator laboratory
. Pilot plant laboratory

- Other laboratories located apart from the training laboratory

. Electrical engineering laboratory
. Mechanical engineering laboratory . Drilling laboratory
. Drilling rig simulator room laboratory
. Engine and welding laboratory
. Drilling rig laboratory

As noted above, the Centre is, in a general sense, equipped with laboratories of many fields of specialization. However, all of these laboratories were not installed at the same time, but added and renewed in accordance with the change of needs from time to time. Such laboratories as Geology, Drilling, Drilling Rig Simulator, Electrical Engineering, and Process Simulator & Pilot Plants Laboratory belong to the latter category. It is clearly understood that despite lack of enough budget and funds, the Centre has been making self-relief efforts. The capacity of a group of students doing same experimental practice and its frequency depends upon the type of laboratory. Usually, a group consists of 10 to 20 students and most of the laboratories can accommodate 20 students. Relatively higher frequency of the practice is found in such fundamental subjects of curriculum as instrumentation & electronics, mechanical engineering, and electrical engineering laboratory. It is observed that the rate of capacity utilization is 80 to 90% in most of the laboratories. In general, therefore, it is considered that the space of

laboratory is sufficient, with the exception of the instrumentation & electronics laboratory whose instruction load is very high and therefore whose space is insufficient. In addition, the chemical laboratory which handles three subjects as physical, analytical and organic chemistry, lacks, both in quantity and quality, experimental and practice instruments and equipment and therefore necessitates considerable renewal and supplement of the equipment which in turn requires additional space in the near future. Quite recently (June, 1985), a new building has been constructed for installing process simulators and pilot plants (From July 1985, installation of simulators is being commenced). Since this new building has as wide space as that of the training laboratory, it is considered that additional space will be utilized for various other purpose.

(2) Training Aids and Equipment

a) Training aids

Presently, the following training aids with their numbers of units are used in AKAMIGAS:

Training Aids	Regular Course	Short Course
Overhead Projector	7 units	2 units
Slide Projector	1	1
Film Projector	2	—
Video camera·TV etc.	1 set	—
Typewriter	30	8
Copy machine	2	1

Among these training aids, overhead projectors and slide projectors are apparently in short supply in view of the training contents and numbers of classrooms. It is basically desired that each classroom should have a set

of overhead and slide projector always available, taking into account their effectiveness that, once materials are prepared, they are repeatedly utilized to reduce the teaching load of the staff and at the same time to increase the training/learning effects.

b) Equipment for laboratory practice

- Laboratory equipment

In each of the laboratories of AKAMIGAS, there are various kinds of training equipment installed for the training practice of the students. It is however observed that most of the equipment is old and already technically behind, or out of use. In order to show up such critical situation, lists of equipment with its present condition have been presented as for Instrumentation & Electronics Laboratory (Annex II-4-2), Cooling Technique laboratory (Annex II-4-3), Production Laboratory (Annex II-4-4), Chemical Laboratory (Annex II-4-5), and Oil Laboratory (Annex II-4-6).

In these tables, the present condition of equipment is expressed as represented as % figures, in which 100% means a complete condition as in the case of new equipment, 50% means a narrowly usable condition, and less than 50% signifies an unusable or broken condition.

These tables clarify that except a small number of relatively new equipment, a large majority of equipment is in a poor condition. This is especially observed in the Instrument & Electronics Laboratory, and production Laboratory.

Among the equipment installed in the Instrument Laboratory, there is some used equipment provided mainly by PERTAMINA for the purpose of training model and demonstration.

In the Drilling Laboratory and other laboratories, some used equipment donated by PERTAMINA is also utilized as teaching material.

Attention should be given to some equipment installed in the Cooling Technique Laboratory. In addition to an unit of refrigeration system purchased for training purpose, there are two similar units prepared by the students under the guidance of the laboratory's instructors which are practically being in use. This is also an example of the centre's efforts to cover the lack of available funds. At the same time, however, it should not be forgotten that the process and procedure for making such equipment by the students themselves is of significant meanings from the educational and training point of view. Reflecting such positive attitude, it is observed that this laboratory is very well arranged (See also Annex II-4-3).

The Chemical and Oil Laboratory are in a quite unsufficient and unsatisfactory condition in view of the necessary and essential equipment for the practice and experiment related to the modern petroleum refining industry. The large majority of equipment is already out of date and technologically already behind. Especially, the present list of equipment of the chemical laboratory is, whithout any doubt, more that insufficient, both in terms of quantity and quality, when considered its role for treating the three fundamental subjects as analytical chemistry, physical chemistry and organic chemistry.

It is highly desirable that the Chemical Laboratory be equipped with such instrumental analysers as gas chromotography, spectrophotometer, photoelectric colorimeter, and colorimeter, commonly used in the modern chemical industry, as well as such physical chemical instruments and equipment used for measurements and determination of physical properties and for the understanding of basic principles.

- Simulator, pilot plant, and unit operation equipment

  As a medium for training of operation of the commercial plant, simulators and pilot plants are being installed and utilized in the Centre. These media can display similar effects to those of on-the-job training in an actual facility, and also used as practical training to connect the classroom lessons with on-the-job training.

The followings are the simulators under utilization or supposed to be utilized soon in the Centre:

. Drilling Simulator (Simtron/USA)
. Instrument Process Simulator (Plint/UK)
. Process Control Simulator (Auto Dynamic/USA)

The drilling simulator has recently been installed and is being utilized effectively both in the regular and short courses.

The process control simulator (for petroleum refining) are being installed at present and scheduled to be used from the end of 1985. The instrument process simulator is already located in the training laboratory, and effectively utilized as training medium in order to teach how to operate the control instruments for such fundamental variables of chemical process as temperature, pressure, flow rate, and liquid level, etc.

The following is a list of pilot plants to be installed in the Centre:

. Electrostatic Desalter
. Catalytic Reformer
. Thermal Cracker
. Crude Distillation unit
. Hydrodesulphurization and Hydrocracking

Among these pilot plants, the electrostatic desalter is already installed in the training laboratory and being utilized for training. The other four different units are scheduled to be installed by the end of 1985 and commenced to be used in the new building together with the process control simulator.

Enumerated below is a list of training equipment for unit operation, which was prepared by the staff members and students themselves and installed in the training laboratory:

. Filtration (filter press)
. Heat Transmission (heat exchanger)

. Distillation
. Fluidization (fluidization tester)
. Flow and Pressure Drop (tester)

With unit process, unit operation shares an important role in the basic process plant technologies. In this respect, it is highly appreciated that the training equipment for unit operation has been made/prepared by the Centre's teaching staff themselves for the use of training. As a training equipment/media of the students for unit operation just before entering into on-the-job training, nevertheless, the present unit operation equipment of the Centre is considered still insufficient in its capacity and extent of instrumentation. It is desirable that the students should enter into on-the-job training after grasping a feeling of operation in an unit operation equipment of as similar size to actual plant as possible, because on-the-job training takes with a certain extent of danger.

The installation of relatively expensive simulators and pilot plants, and unit operation equipment Centre can be considered attributable to the Centre's basic needs and principles that the practical training is emphasized and, at the same time, modern technologies should be mastered more in depth and more widely. Taking into account an appropriate balance between the training in unit process and unit operation, it is recommendable to introduce a larger size of package unit operation equipment, which can be installed in remaining available space of the new building constructed for the pilot plants.

c) Drilling rig

Within the Centre's area, an old drilling rig is installed for the purpose of demonstration to the students without being no longer actually utilized. The Centre has a strong desire to introduce a new drilling rig actually operable for the purpose of on-the-job training and also for the commercial production of natural gas in Cepu.

d) Computer

At present, there are following four small personal computers in the Centre, which are being used for teaching the Grade-II and Grade-III students basic principles and use of computers:

- Apple II-e (USA)
- Radio Shack (USA)
- Convergen (USA)
- Sharp (Japan)

These computers are being also utilized for the office administration of the Centre. However, the utilization of computers for the administration and control of oil flow in the refinery and operation control, and inventory control, is a future task of the Centre. Because of small capacity and difficulty in maintenance of the present computers (they are donated without afterservice), the introduction of a large capacity computer is being studied to establish a centralized computer system with the purpose to respond to future needs.

Chapter 5 Cepu Training Centre, Its Facilities, Operation and Technical Considerations

5.1 Refinery

5.1.1 Its History and Situation

The oil-field near Cepu had been discovered by Dorucheck Oil company from 1893 to 1909 and was developed by BPM (Bataafscke Petroleum Maatschappii), an co-ordinating Company of Royal Dutch Shell in Indonsia. The Cepu refinery was constructed by BPM in 1920's to refine the crude oil produced in the vicinity of Cepu. However the capacity for processing crude oils at that time is unclear now.

Immediately before the World War II, Dutch and American Oil companies in Indonesia destroyed the oil wells and refineries to prevent the use by the Japanese Forces; however the oil development was advanced thereafter by Oil Engineer Corps in the Japanese Forces.

The oil-field near Cepu and refinery could not be exceptions, and the topping unit of the refinery also was restored to be operated by the Forces.

When BPM came back to the Cepu refinery in 1948 after the War, they found their refinery having been destroyed again. The Cepu refinery restored by BPM was transferred to PN PERMIGAN (Perusahaan Negara Pertambangan Minyak dan Gas Nasional: State Company National Oil Mining) in 1961, the 12 years after Indonesian Independence. And then the refinery came to be utilized as an education headquarters of PN PERMINA (Perusahaan Negara Pertambangan Minyak Nasional: State Company National Oil Mining) in 1966.

This is the Cepu Oil and Gas Manpower Development Center, PPT MIGAS, so called Cepu Training Center under the direct control of MIGAS, or Directorate Jenderal Minyak dan Gas Bumi under the Minister of Mines and Energy.

The Training Center has been expanded and reinforced step by step since 1966, and the production facilities in the Cepu refinery and oil field have been oriented as one of the important education medium at present.

However the major facilities and equipments estimated to be manufactured in 1920s still constitute the base of the present production facilities, notwithstanding the two times renovations on the facilities in recent years and also two times destructions and restorations repeated since the War.

The facilities are historically important because of their obsolete installations: from the point of view of the training for the personnel to be employed in the updated production facilities in PERTAMINA (Pertambangan Minyak dan Gas Bumi Nasional; National Oil and Natural Gas Mining), the contents of the facilities should be considered inadequate, and it is clear that they are in needs for remodelling or the replacement of most of the facilities and equipments.

5.1.2 Outline of Facilities

(1) Oil flow

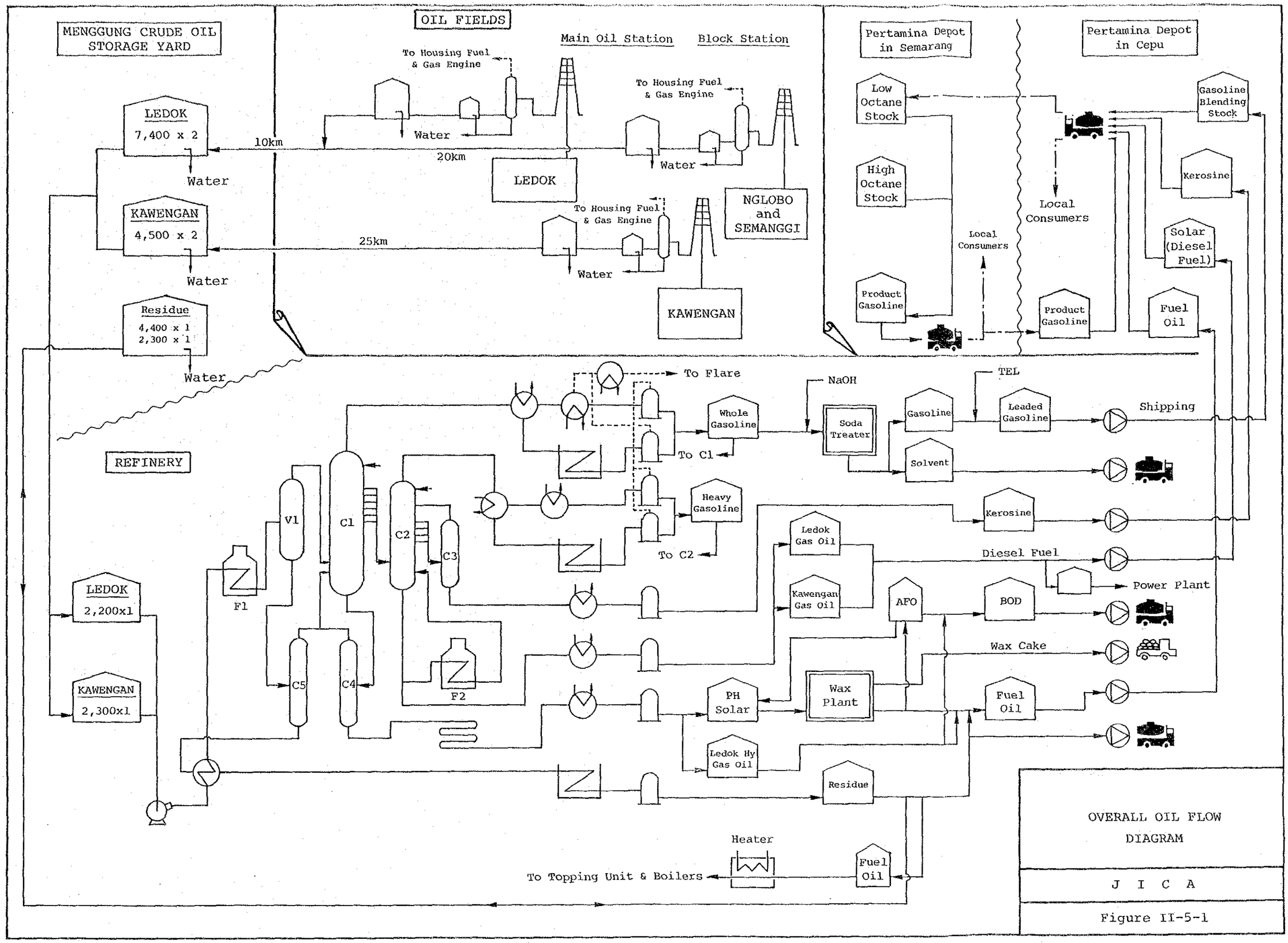
The production facilities of the Center are composed of crude oil production facilities in the oil-field of up stream, the Topping unit and their support facilities of down stream in the refinery, the pipelines connecting these up stream with down stream facilities, and so on.

The products of these facilities are delivered to Cepu Depot of PERTAMINA and local industries, and transferred to the former through pipelines and to the latter by tank lorries. The overall oil flows are summarized in Fig. II-5-1.

(2) Outline of facilities in the refinery

Production facilities at the time of June, 1985 in the Center are outlined as follows:

Name of Plant, Facilities	Capacity and Others
Topping Unit	2000 BPSD
Wax Plant	60 KL/D
Storage Tanks	Crude oil tank 2 unit, Product intermediate tank 34 units, Other tanks 6 unit



OVERALL OIL FLOW DIAGRAM

J I C A

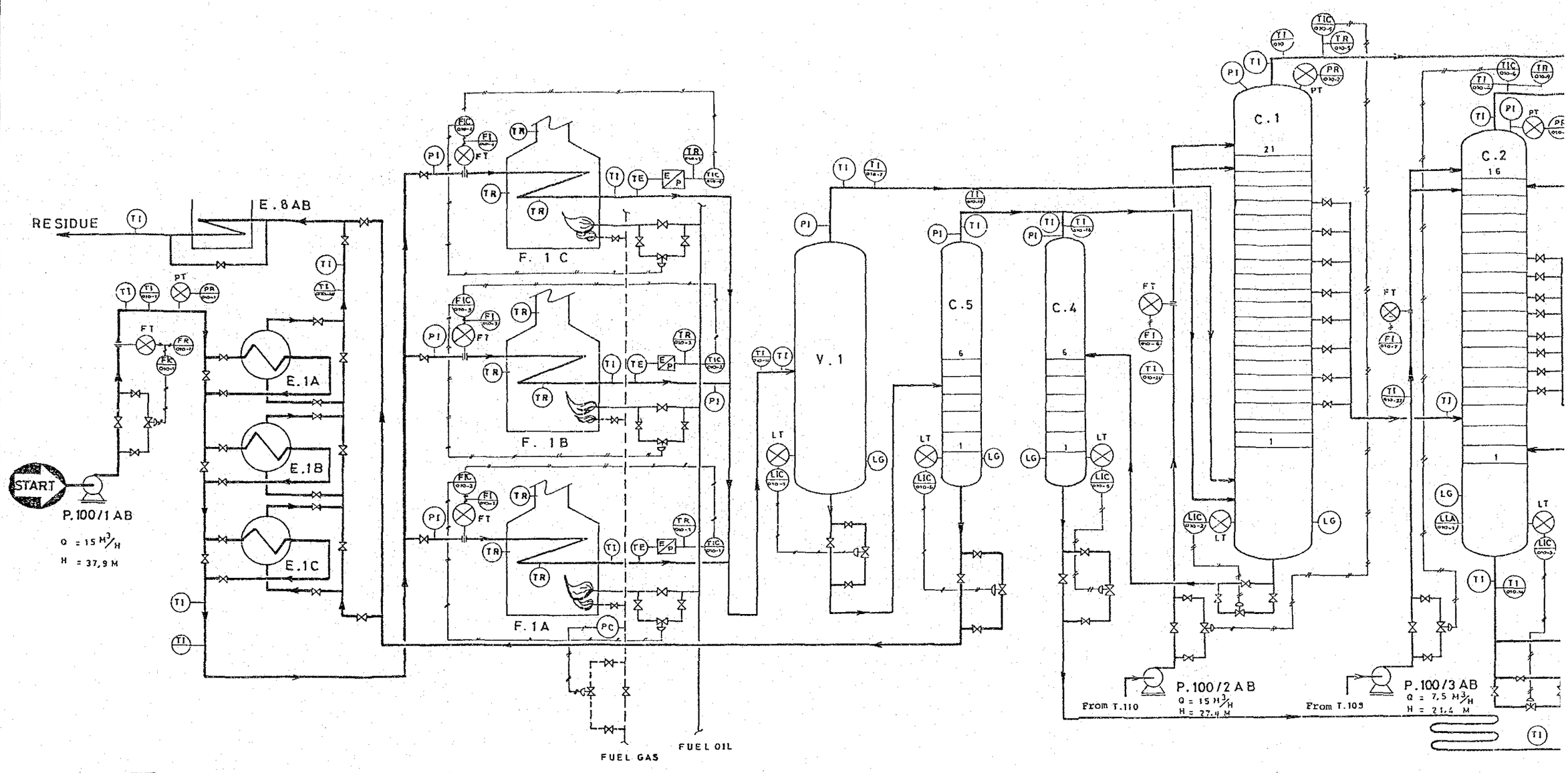
Figure II-5-1

Transportation Facilities	Pipelines (Gasoline, Kerosine, Diesel fuel oil and Fuel oil) 4 series Tank Lorries (Solvent, BOD, Residue) 3 series
Boiler	6 T/H x 3 unit (Smoke-tube Type)
Power Plant	820 KVA x 3 unit (Diesel Engine driven)
Water Treatment Facilities	Cooling water, Boiler feed, Fire fighting water, Drinking water: 4 series Cooling tower (for Topping unit and Wax plant): 2 series
Fire Fighting Facilities	Foam chamber for storage tanks 2 series, Fire truck 1 set, Portable fire engine 2 sets
Oil Sperarators	CPI oil separator 1 set, Conventional Oil separator 2 sets
Testing facilities	Oil laboratory and Analytical laboratory
Workshop	Repair work shop, Construction workshop, Foundry, Pipe shop
Others	Gasoline washing facilities 1 set Leading facilities 1 set Fuel oil system 1 set Fuel gas system 1 set

(3) Topping unit and its support facilities

a) General description of process flows

The Process flows of Topping unit are shown in Figure II-5-2.



LEGEND

P.100/1AB = Feed Pump
P.100/2AB = Reflux Pump C.1
P.100/3AB = Reflux Pump C2
P.100/4AB = Reboiler Pump
V 1 = Evaporator

F 1ABC = Feed Furnace
F 2 = Reboiler Furnace
C.1 = Fractionator Column (Hekman 1)
C 2 = Fractionator Column (Hekman 2)

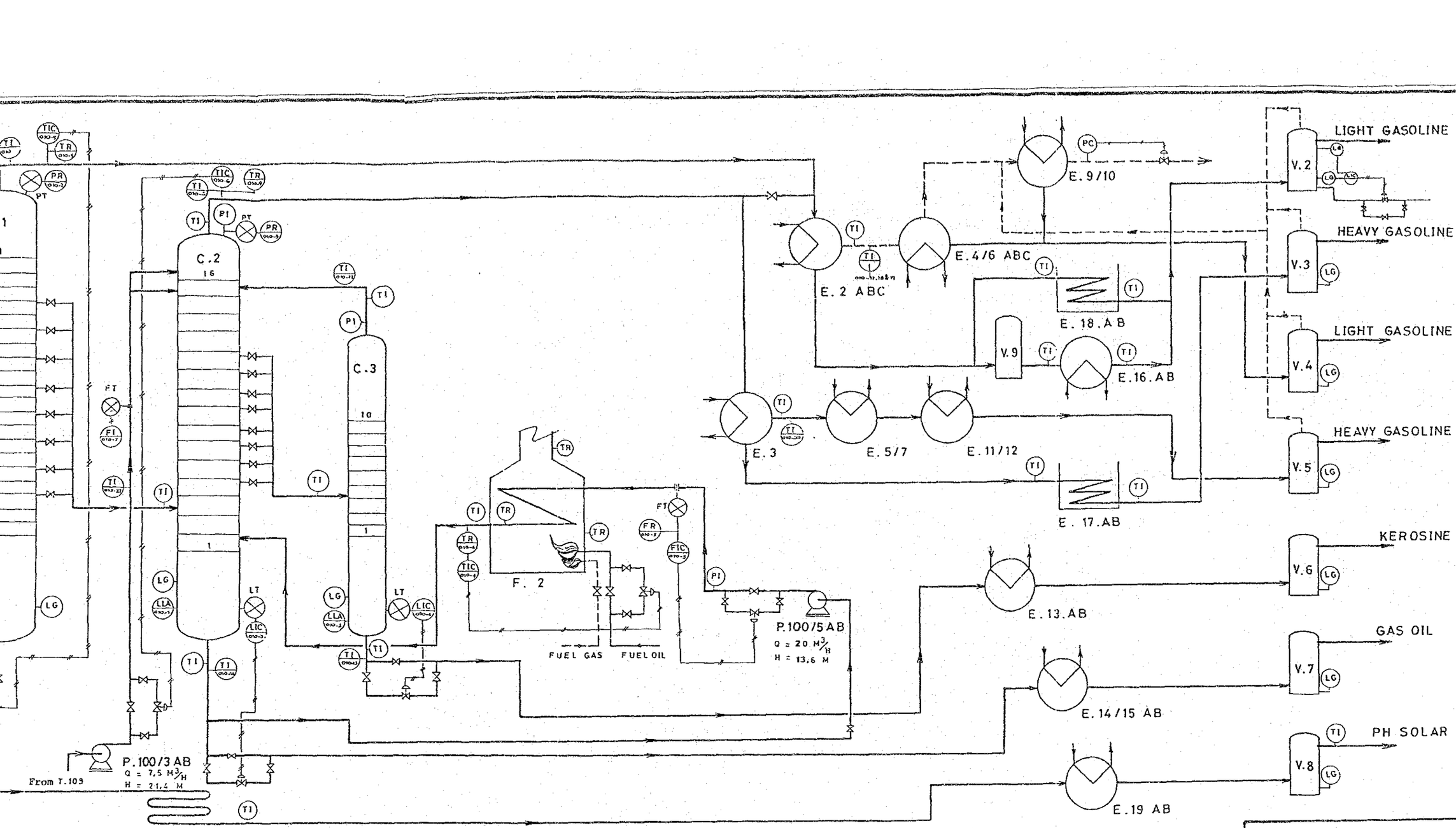
C 3 = Kero Stripper
C 4 = Solar Stripper
C 5 = Residue Stripper
E 1ABC = Feed/Residue
E 2ABC = Condenser

E 4/6 ABC = Condenser
E 9/10 = Condensor
E 17-18AB = Box Cooler
E 16 AB = Alco Cooler
E 3,5,7,11 12,13,14, 15 & 19 = Cooler

S 1s/d 8 = Separator
E/P = Electrical/Pneumatic

◯ = Local Mounted Instrument
⊖ = Board Mounted Instrument
TI = Temperature Indicator
TR = Temperature Recorder
TIC = Temperature Indicator Controller

PR = Pressure Recor
PC = Pressure Contr
PI = Pressure Indic
PT = Pressure Tran
FT = Flow Transmitt



ted Instrument
ted Instrument
e Indicator
e Recorder
Indicator Controller

PR = Pressure Recorder
PC = Pressure Controller
PI = Pressure Indicator
PT = Pressure Transmitter
FT = Flow Transmitter

FR = Flow Recorder
FI = Flow Indicator
FIC = Flow Indicator Controller
LT = Level Transmitter
LI = Level Indicator

LIC = Level Indicator Control
LLA = Low Level Alarm

CTC INDONESIA

FLOW DIAGRAM OF TOPPING UNIT

J I C A

Figure II-5-2

There are 2 crude oil tanks for Ledok crude oil and Kawengan crude oil respectively and these crude oils are subjected to blocked operation in the Topping unit to be fed.

The crude oil is heated up to appr. 90°C through heat exchangers with the residue in the residue stripper (C5), and is further heated up to the prescribed temperature (outlet temp.: 300°C for Ledok crude, 350°C for Kawengan crude) to be caused to flash in the Evaporator (V1) for gas-liquid separation and the liquid is transferred to the residue stripper and the gas to C1 column.

In the C1 column, whole gasoline is separated from the top, and heavy gasoline, kerosine, gas oil distillates from the side, and wax distillate (PH Solar) from the bottom. The operation control is performed by adjusting the reflux quantities via a gasoline recirculating tank, targetting to a prescribed tower top temperature (115°C for Ledok crude, and 120 - 125°C for Kawengan crude). The flow shown in Fig. II-5-2 are separated into light gasoline and heavy gasoline; however in actual operation the whole gasoline is all removed from the C1 top and the heavy gasoline from the C2 top is all used for reflux purpose. This is understood to achieve a clear cut between gasoline and kerosine.

On the other hand, the operating pressure at the tower top is 0.2 -0.3 Kg/cm^2G, because the gas-balance lines are connected to the flare line without any prossure control (PC) valve.

Wax distillate is transferred to a tank after stripping of light fractions through a gas oil stripper (C4).

Side distillates (heavy gasoline, kerosine and gas oil) are mixed to be fed to the C2 column, heavy gasoline is taken out from the top, kerosine from the side, and gas oil from the bottom. The top temperatur of the C2 column is controlled by adjusting the heavy gasoline reflux flow, and by recirculating a part of the bottom oil to be heated through the reboiler furnace (F2).

The kerosine fraction of the side cut is fed to the kerosine strippor (C3) and its flash point is adjusted to the specification.

b) Towers and vessels

The major towers and vessels are listed in Table II-5-1. There are 2 units of C1 columns (C1-A and C1-B): however only C1-B is used at present.

A certain information reports that the two unit were formerly operated in series, though it could not be confirmed. To obtain a clear cut between gasoline and kerosine, all the top oil of the C2 column (C2) is refluxed, Fig. II-5-3 illustrates the specific gravities and ASTM distillations test charateresties for Kawengan and Leodok crude oils and, from these results, it is observed that some good clear cuts between the present gasoline and kerosine are given occasionally.

There is not any sufficient data to judge what are the causes of these facts. In the future some measures should be taken to get clear analysis on the relationships between these fact and overhhauls and cleanings of towers and vessels, repairs of trays or other maintenances and product quality control.

c) Furnaces

There are provided 3 units of crude furnaces (F1A, B, C) and 1 unit of reboiler furnace or 4 units in total, and all of them are the box type furnaces of the same size, and have no center walls.

Particularly in the 3 unit of F1, the switching between them is made possible in the header section at the outlet and inlet. Now 2 units are used in parallel and F1B remains as a spare unit. For your reference, Table II-5-2 shows an equipment list for furnaces prepared on the basis of the drawings available from the Centre.