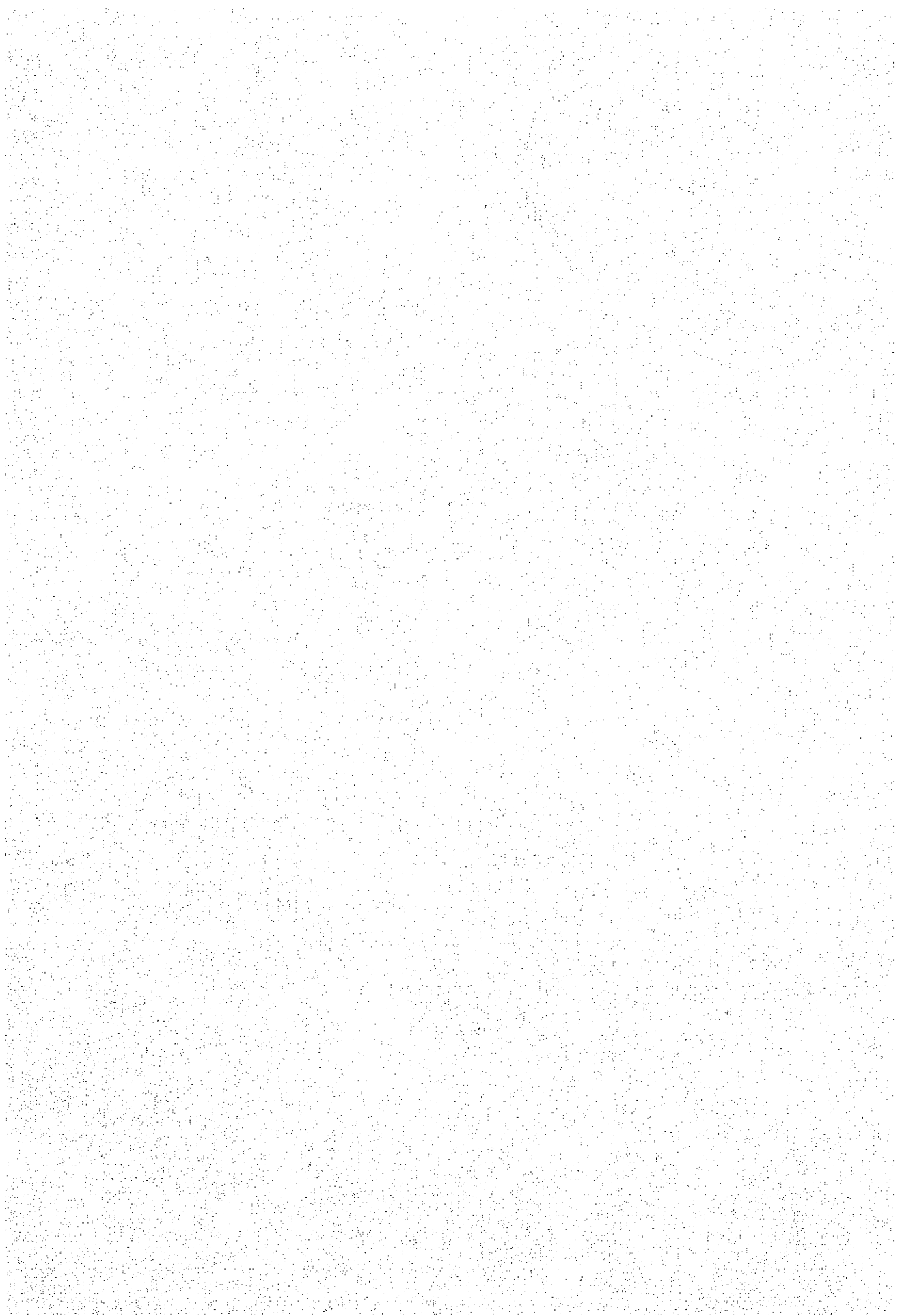


PRELIMINARY SURVEY REPORT
FOR
IMPROVEMENT OF OPERATIONS
OF
THERMAL POWER PLANTS

JULY 1982

JAPAN INTERNATIONAL COOPERATION AGENCY



マイクロ
フィッシュ作成

PRELIMINARY
SURVEY REPORT
FOR
IMPROVEMENT OF OPERATIONS
OF
THERMAL POWER PLANTS

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JULY, 1982

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to a request of the Government of the Republic of the Philippines, the Government of Japan decided to conduct a preliminary survey on Improvement of Operation of Thermal Power Plants in Manila and entrusted the survey to the Japan International Cooperation Agency (JICA).

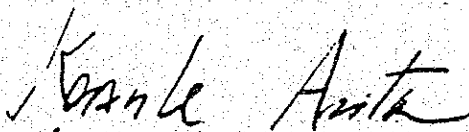
The JICA dispatched to the Philippines a survey team headed by Mr. K. Iimura from 10 to 29 May, 1982.

The survey team had a series of discussions with the officials concerned of the Government of the Philippines and conducted an extensive field survey and data analyses, and has prepared the present report.

I hope that the report will serve as a basic reference for developing a stable power supply in the Metro Manila.

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

July, 1982

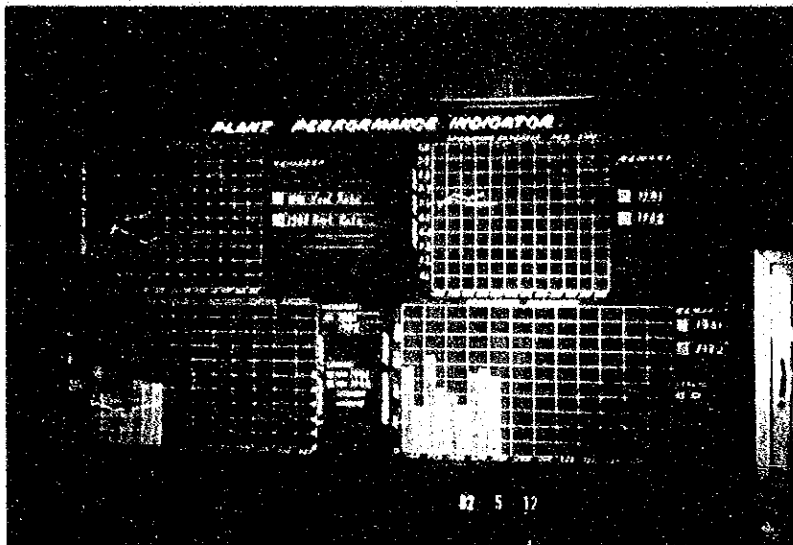


Keisuke Arita

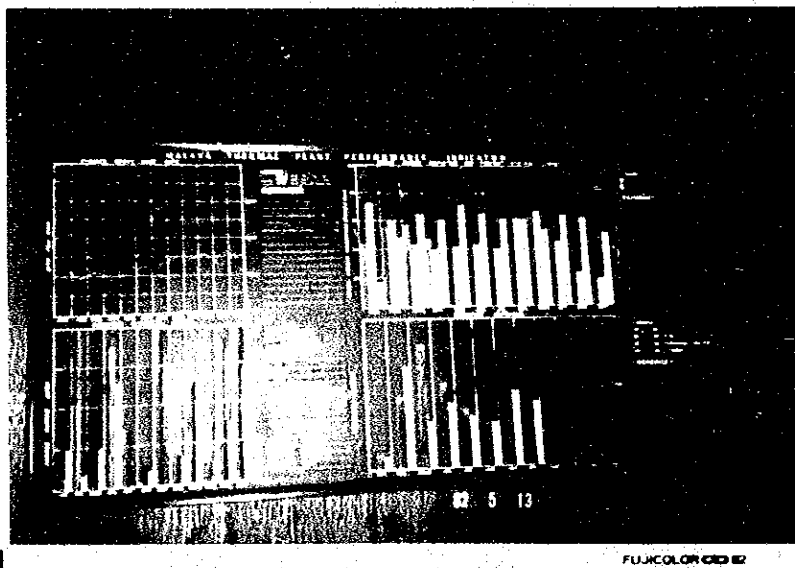
President

Japan International Cooperation Agency

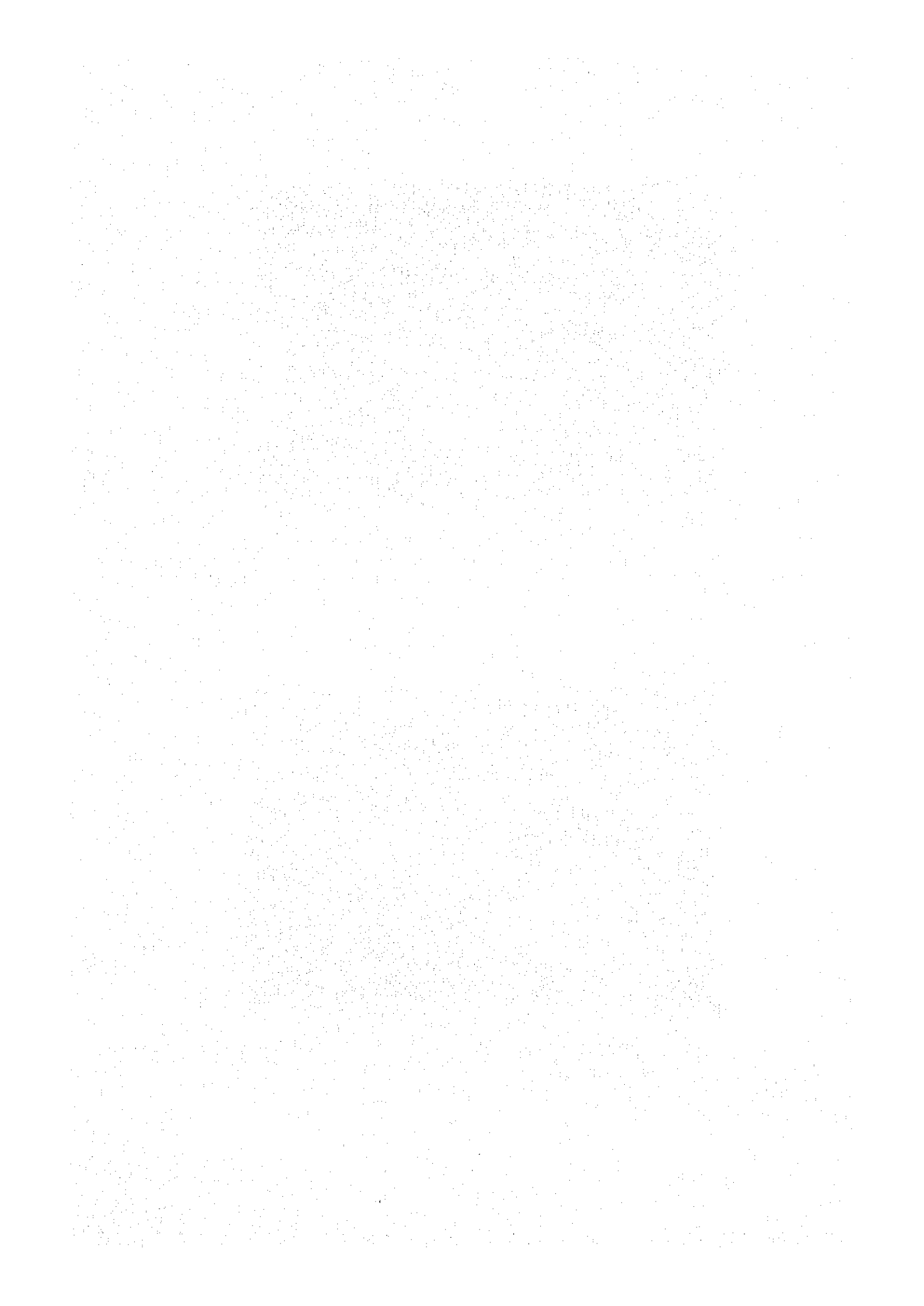
PHOTOGRAPHS



Plant Performance Table located at Service Building of Gardner/Snyder Thermal Power Plant.



Plant Performance Table located at Service Building of Malaya Thermal Power Plant.



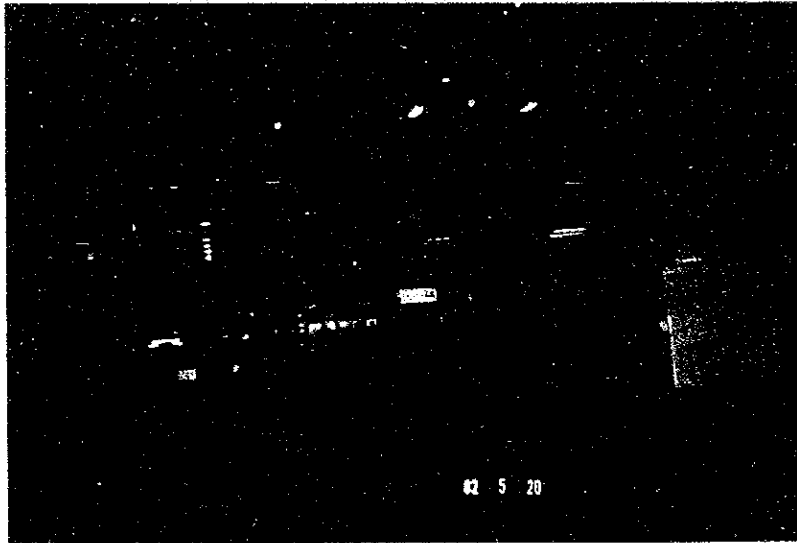
**TABLE OF ORGANIZATION
MALAYA THERMAL POWER PLANT**

PERSONNEL

PLUJONG 08/08/82

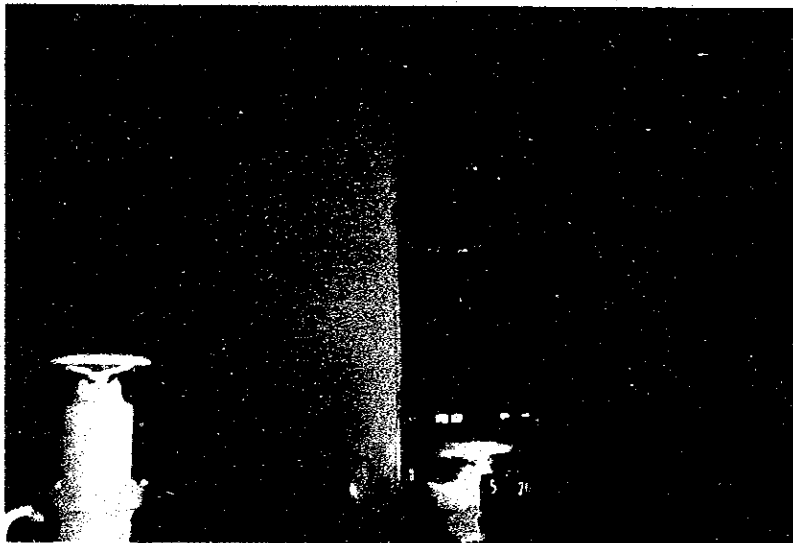
Personnel Organization Table of Malaya Thermal Power Plant (Blank shows vacancy.)

BFP Booster Pump Planetary Gear Turbine-driven BFP



FUJICOLOR C100 82

Malaya Thermal Power Plant (No. 1 Unit)
100% x 1 Boiler Feed Water Pump (Turbine-driven)
located at Turbine-Generator Floor

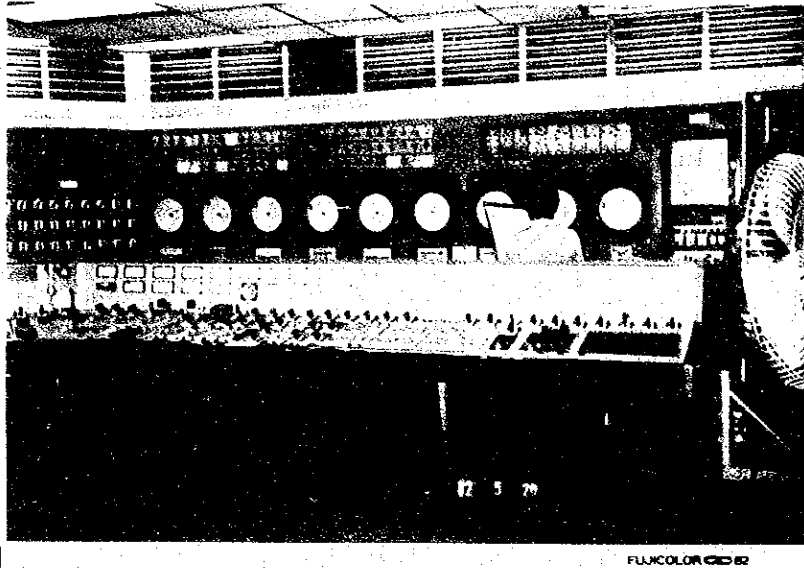


Cross-Over
Pipe

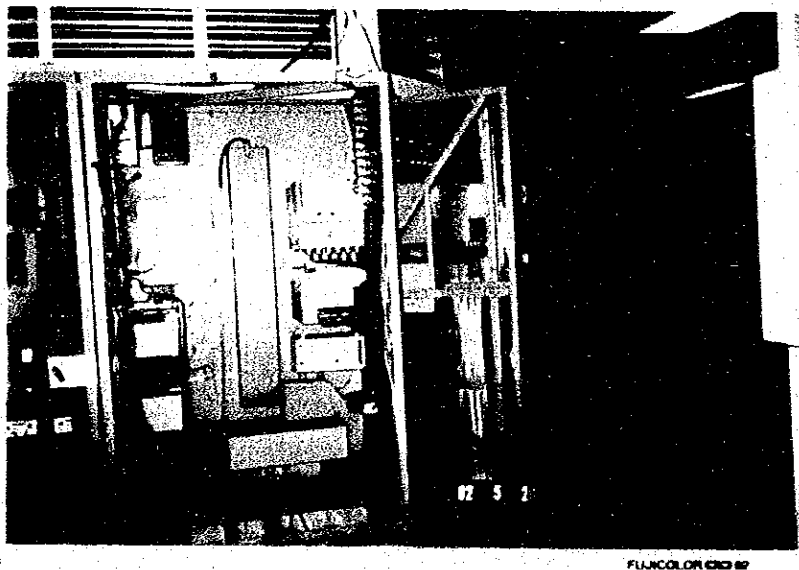
FUJICOLOR C100 82

Malaya Thermal Power Plant (No. 1 Unit)
IP and LP Turbines: Overheating of LP Stage was
experienced by expansion crack in LP turbine.

Energied alarm lamps (Some of them are lit by malfunction.)



Malaya Thermal Power Plant Unit No.1, No. 2
Front Part of Central Control Board
(BTG Control Board)



Malaya Thermal Power Plant Unit No. 1, No. 2
Rear Part of Central Control Board

There is no cover and dust is accumulated on the terminal, etc.



Gardner/Snyder/Malaya Thermal Power Plant
(No.1,2) (No.1,2) (No.1)

Valve Handles for Extraction Stop Valves

Valve handles located at turbine floor to manually close after closed by spring

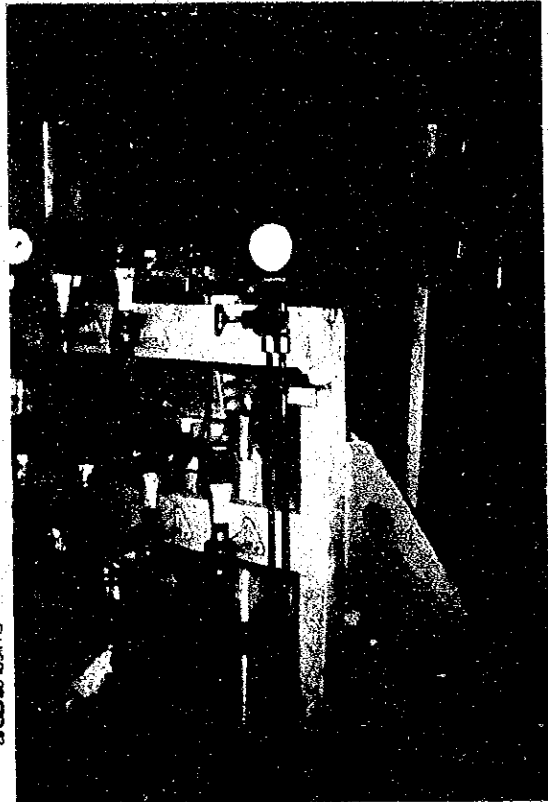
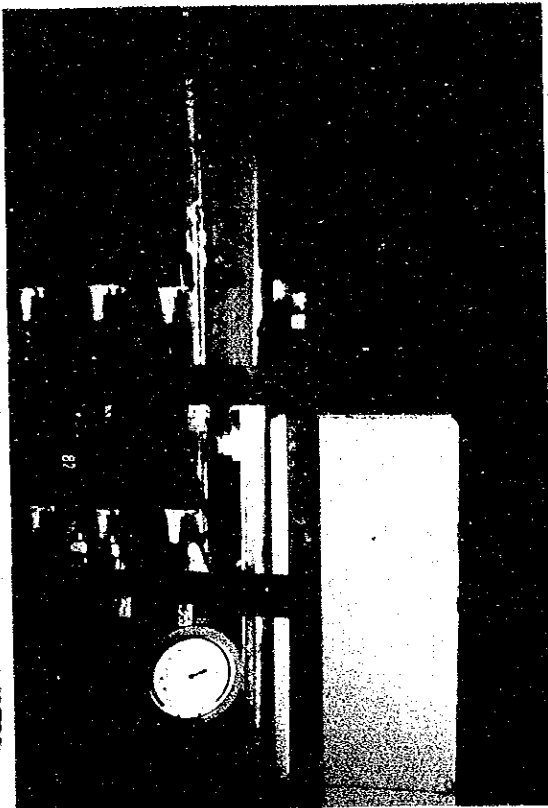


Valve spindle
connected to valve
handle at turbine
hall

Spring for closing
(small)

Gardner/Snyder/Malaya Thermal Power Plant
(No.1,2) (No.1,2) (No.1)

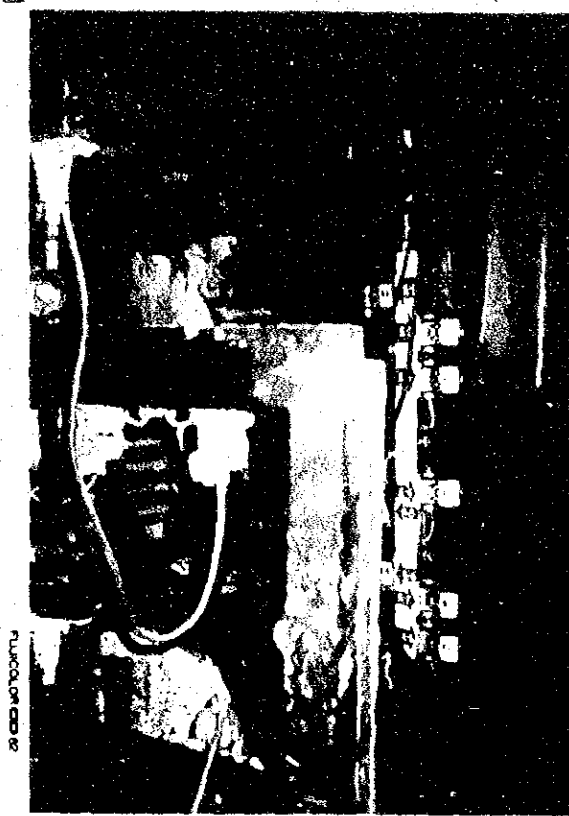
Extraction Stop Valve (Hydraulically-opened,
spring-closed)



Gardner/Snyder/Malaya Thermal Power Plant
(No.1) (No.1,2) (No.1)

Instrumentation Around Main Turbine

Bare cabling without protection by conduit and flexible tube



Remained cable is
not treated.

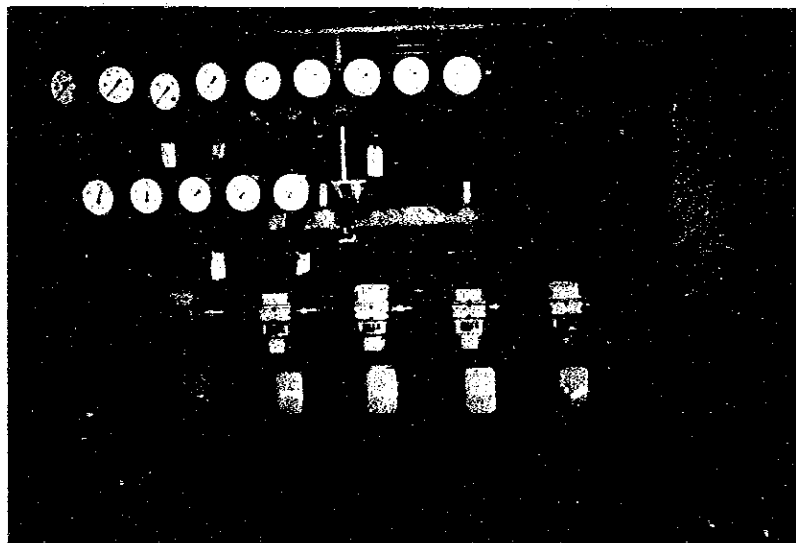
Gardner/Snyder/Malaya Thermal Power Plant
(No.1,2) (No.1,2) (No.1)

Cabling around T/G Bearing is partially protected by
flexible tube.



Gardner/Snyder/Malaya Thermal Power Plant
(No.1,2) (No.1,2) (No.1)

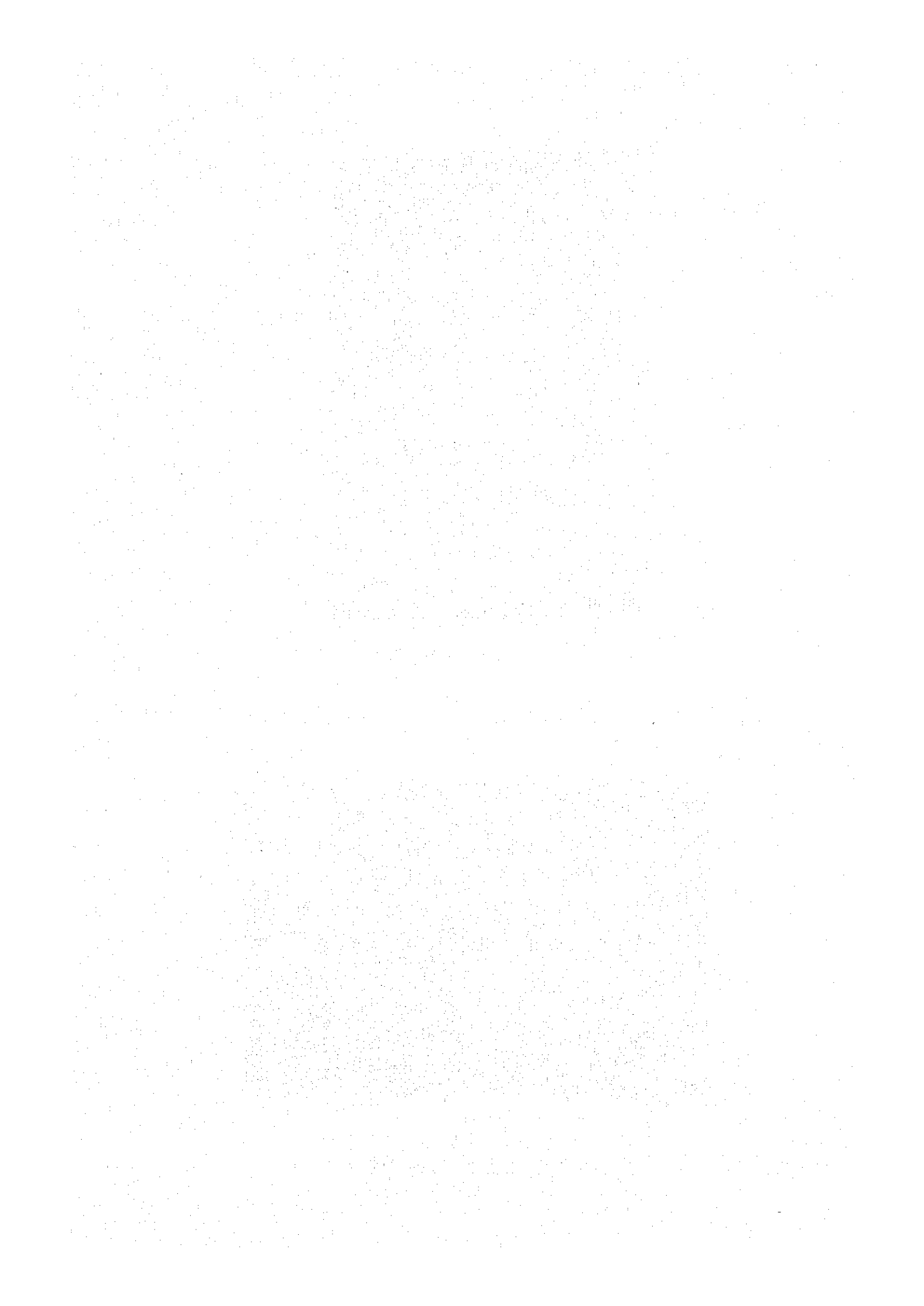
Instrumentation around Main Turbine
Terminal box around turbine bearing

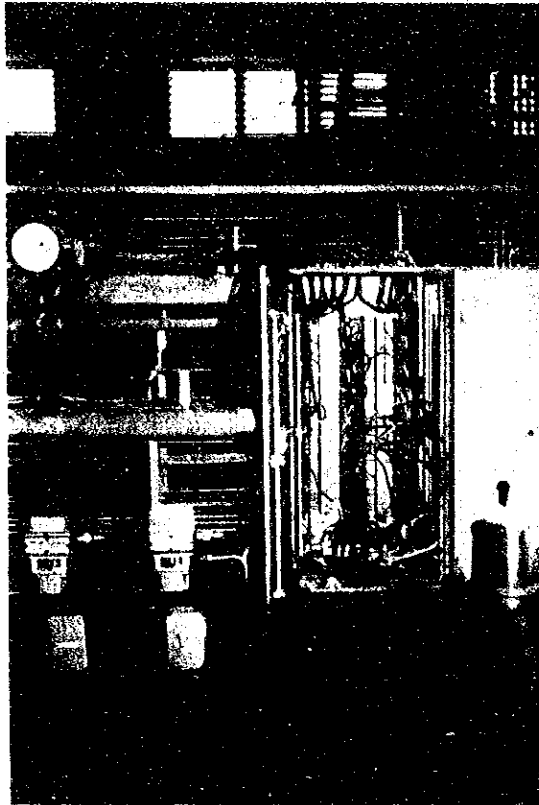


Malaya Thermal Power Plant No. 1 Unit

Instrumentation around Main Turbine

Bare local rack of protection instrument for
main turbine



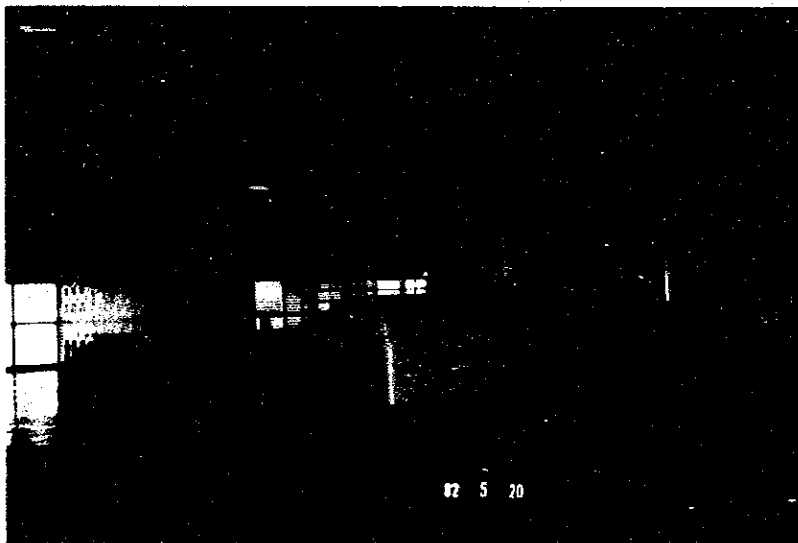


Bare cabling

Remained cable

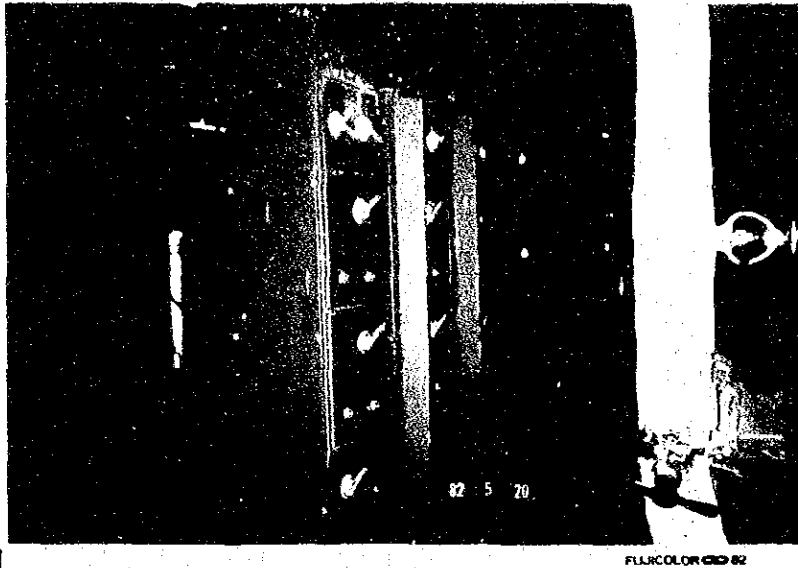
Malaya Thermal Power Plant Unit No. 1
Instrumentation around Main Turbine
 (Inside of Terminal Box)

Soot, dust and remained cable are remarkable.



Gardner/Snyder/Malaya Thermal Power Plant
 (No.1,2) (No.1,2) (No.1)

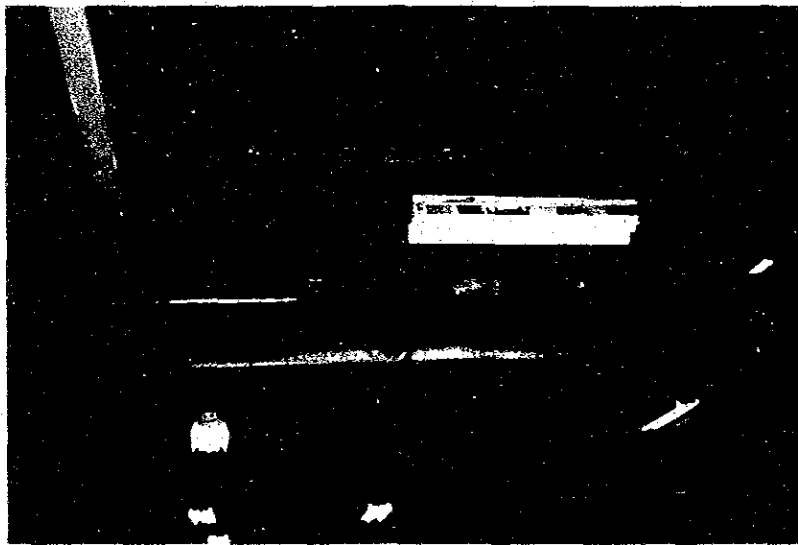
Instrumentation around Main Turbine
 Instrument and control panel for AVR



Gardner/Snyder/Malaya Thermal Power Plant
(No.1,2) (No.1,2) (No.1)

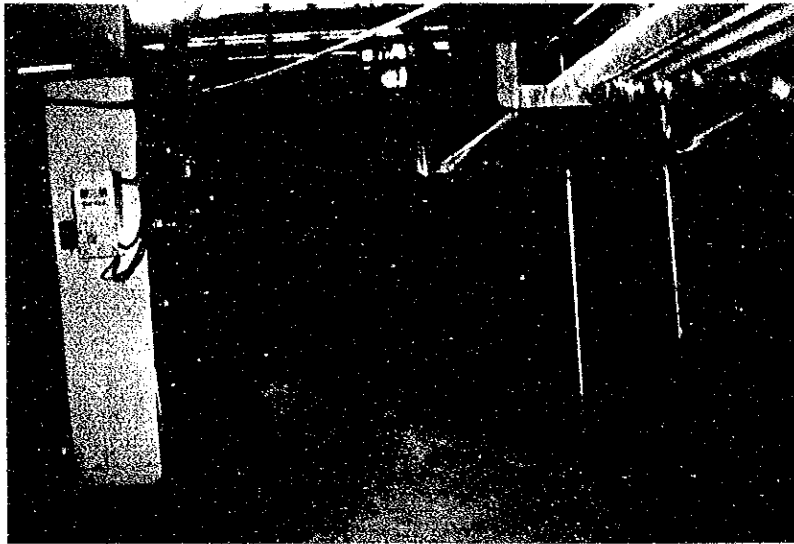
Motor Control Center

Pipe eroded by leakage from upper pipe



Gardner/Snyder/Malaya Thermal Power Plant
(No.1,2) (No.1,2) No.1)

Motor Control Center

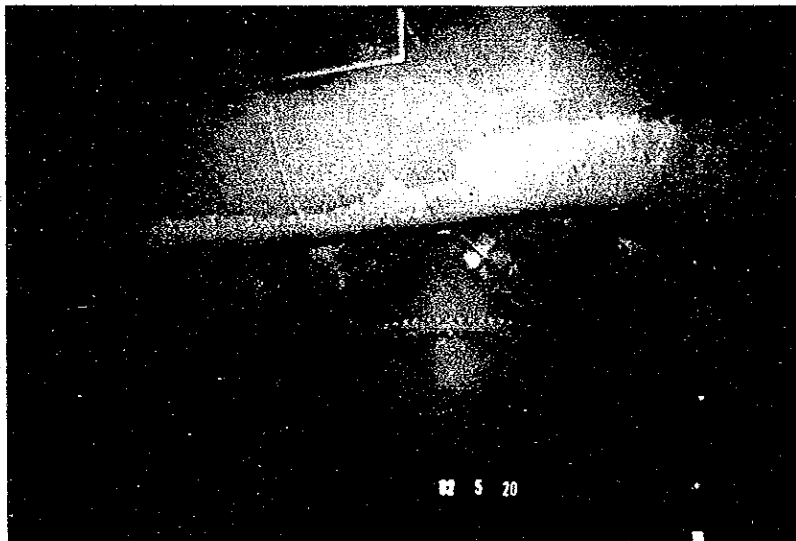


FUJICOLOR C100 52

Gardner/Snyder/Malaya Thermal Power Plant
(No.1,2) (No.1,2) (No.1)

Motor Control Center

Standing water by leakage of piping and disorderly cabling are striking.



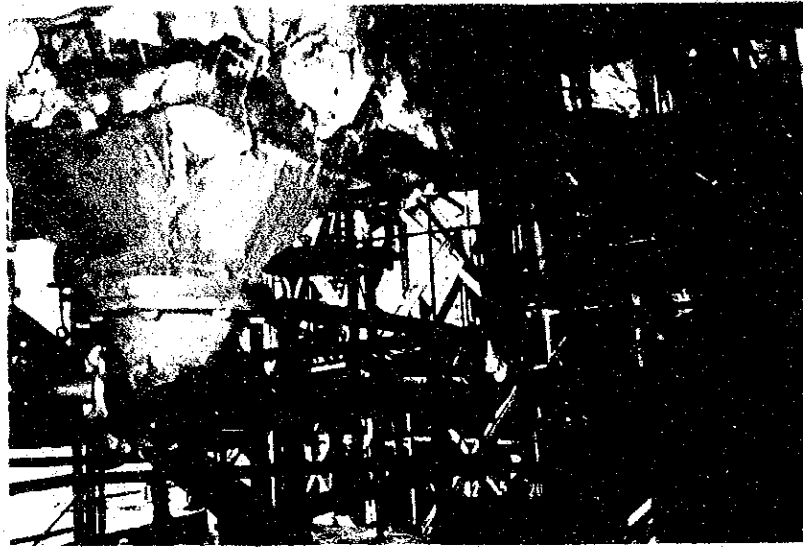
02 5 20

FUJICOLOR C100 52

Malaya Thermal Power Plant Unit No. 1

Pond inside under circulating water pipings

Since sump pump is not available, water cannot be discharged.



FUJICOLOR 35 82

Malaya Thermal Power Plant Unit No. 1, 2
Ash Handling Equipment

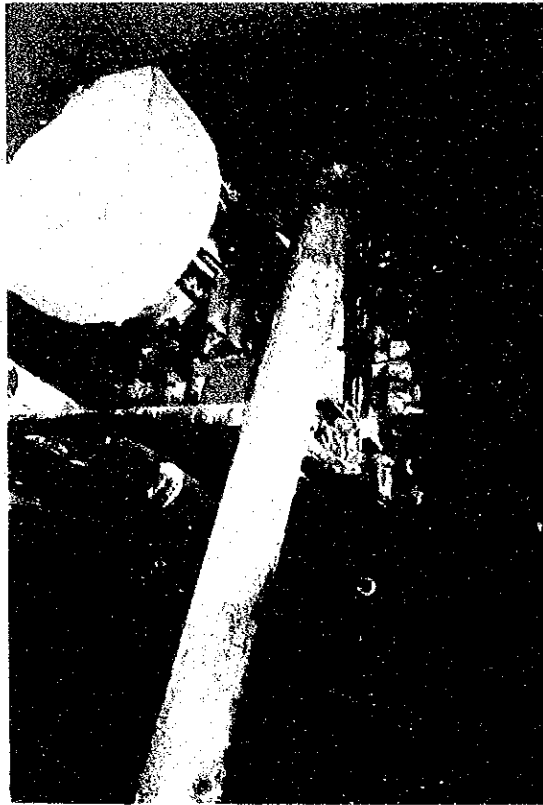
Pipings are corroded badly.
(Impossible to use from trial operation)



FUJICOLOR 35 82

Malaya Thermal Power Plant Unit No. 1, 2
Ash Handling Slurry pump

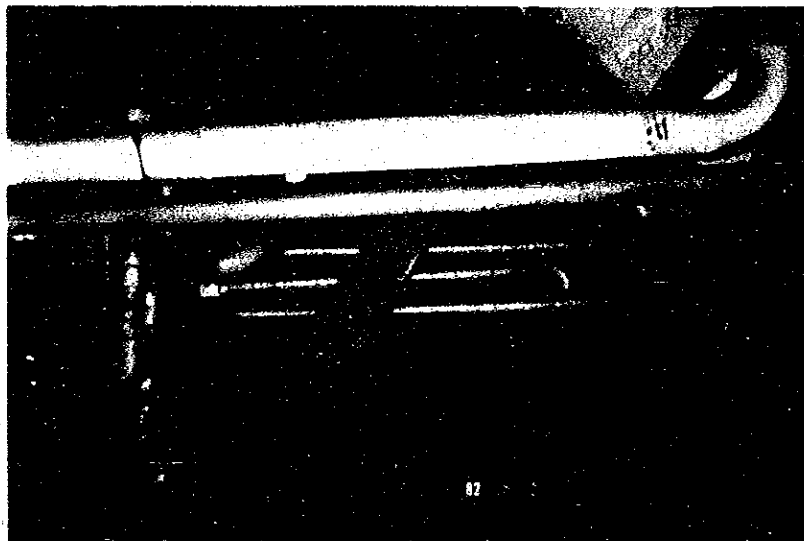
Pump is under water (unusable).



Snyder Thermal Power Plant Unit No. 2

Main Steam Pipe and Support

Added support for excessive power to turbine by thermal expansion of main pipe (insufficient support strength)



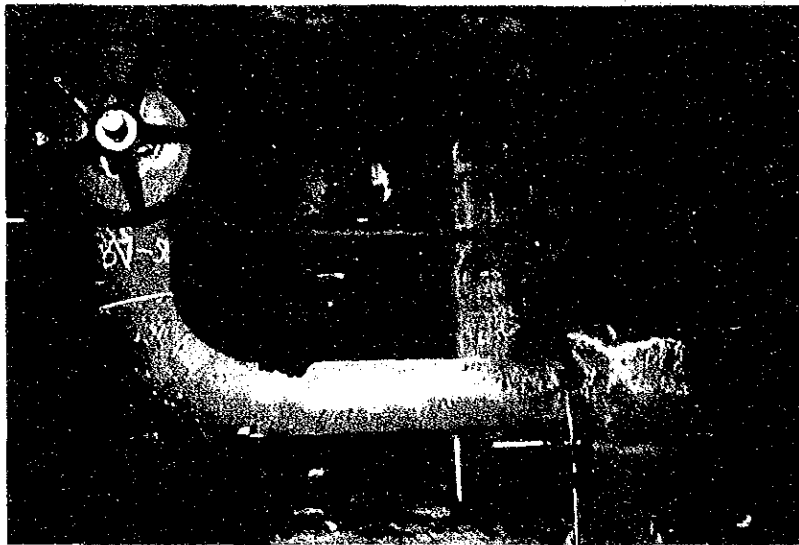
Snyder Thermal Power Plant Unit No. 2

Low Temperature Reheater Pipe Drain System

(Incomplete drainage)



Snyder Thermal Power Plant Unit No. 2
Low Temperature Reheater Steam Pipe
Weight for piping bend



FUJICOLOR G13 B2

Malaya Thermal Power Plant Unit No. 1

Start-up By-pass Valve

(Many traces of maintenance)

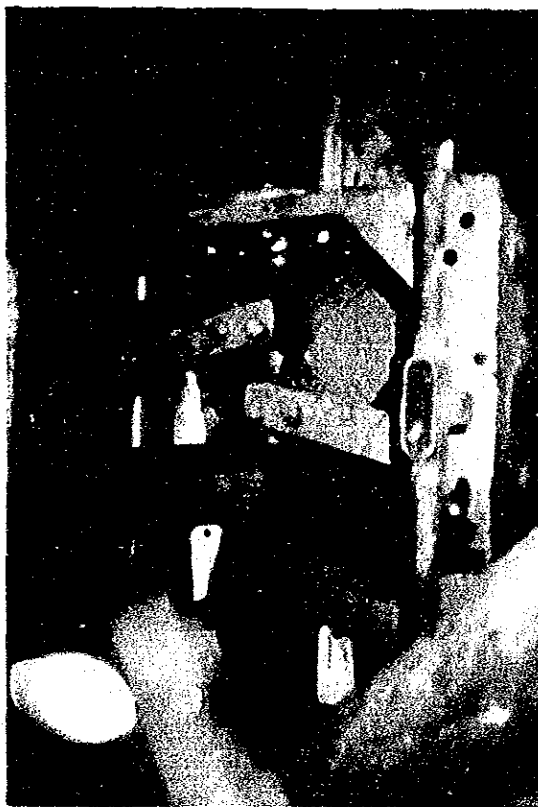
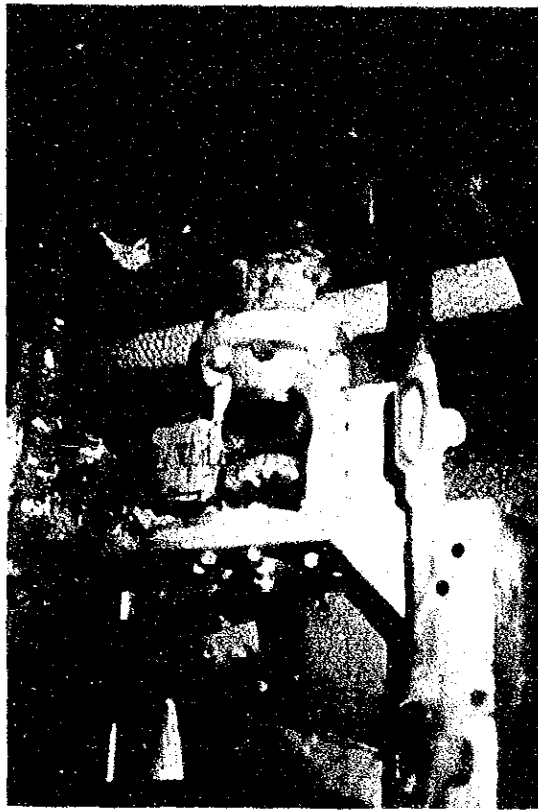


FUJICOLOR G13 B2

Snyder/Gardner Thermal Power Plant

Turbine MSV

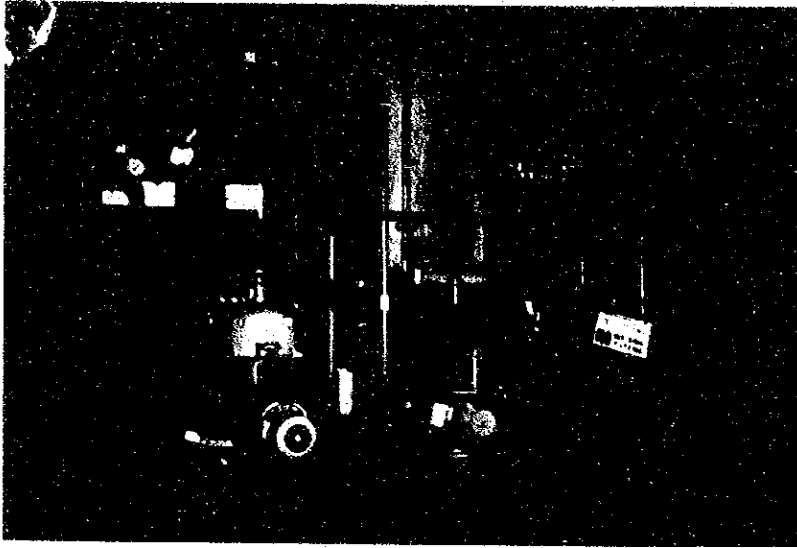
Fire was experienced by lube oil leak because of poor heat insulation.



Gardner/Snyder/Malaya Thermal Power Plant
(No. 1, 2) (No. 1, 2) (No. 1)

Drain Valve around Turbine

One motor/one arm actuates several valves, but tight shut is impossible.



FLUCCOLOR 420 82

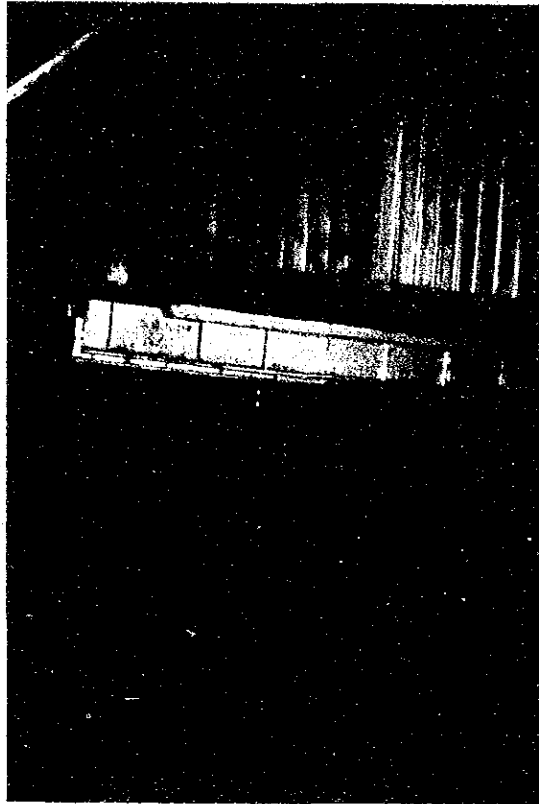
Malaya Thermal Power Plant Unit No. 1
Turbine Oil Purifier
Insufficient capacity



FLUCCOLOR 420 82

Gardner/Snyder/Malaya Thermal Power Plant
(No.1,2) (No.1,2) (No.1)

Boiler Casing and Gas Duct
(considerably corroded)



Standing water by
boiler tube leakage

Gardner/Snyder/Malaya Thermal Power Plant
(No.1,2) (No.1,2) (No.1)

Boiler Casing and Gas Duct



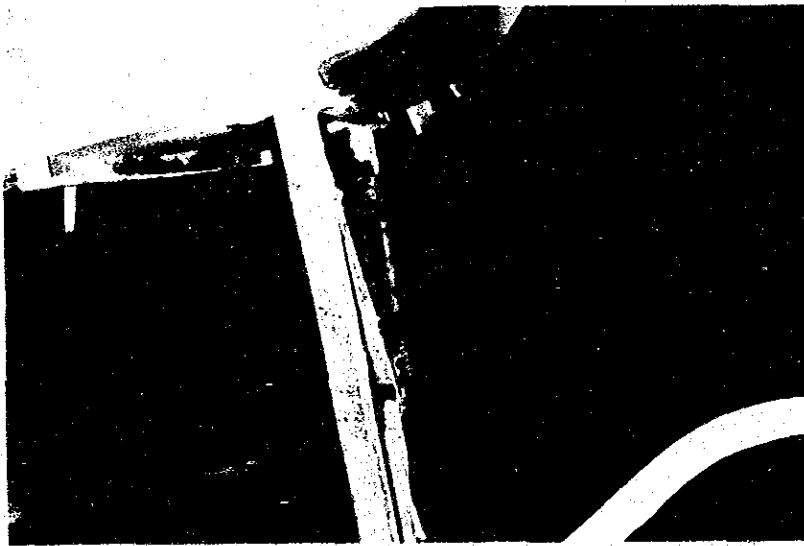
Fuel oil leakage
from above floor

Replaced expansion
due to corrosion

Corroded part

Gardner/Snyder/Malaya Thermal Power Plant
(No.1,2) No.1,2) (No.1)

Economizer Outlet Gas Duct



FUJICOLOR CIB 82

EDF Damper Control Arm

Gardner/Snyder/Malaya Thermal Power Plant
(No.1,2) (No.1,2) (No.1)

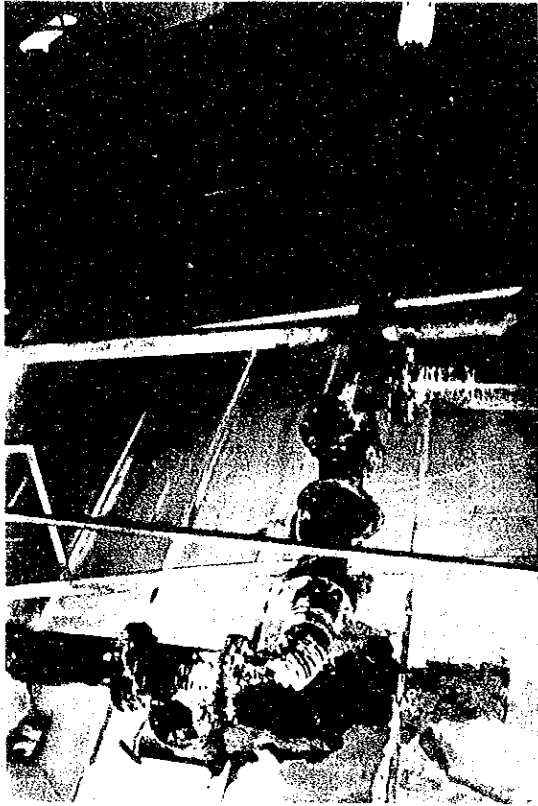


FUJICOLOR CIB 82

Not-working Actuator unit of EDF Damper
under operation
Control Arm

EDF Drive Unit

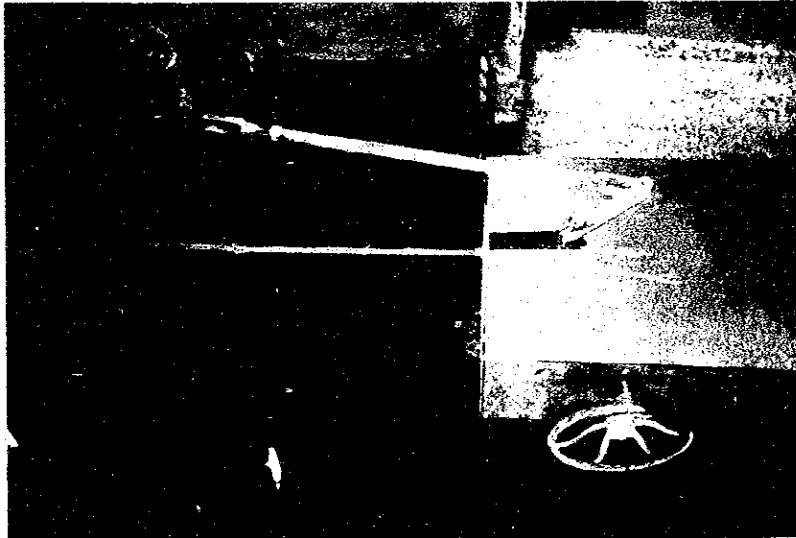
PH - 21



FUJICOLOR 613 82

Snyder Thermal Power Plant Unit No. 2
Power House Wall

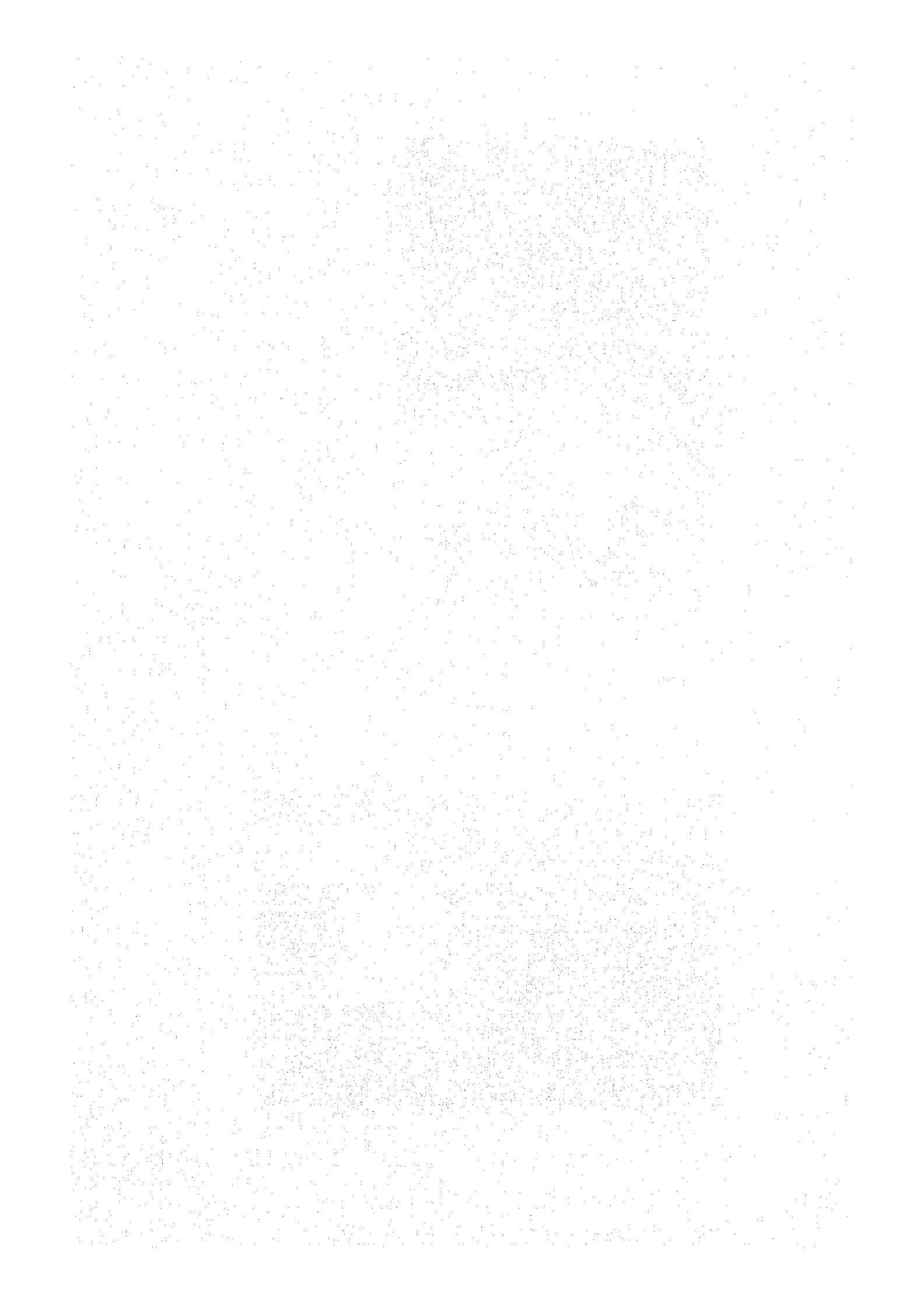
Power house
wall badly
corroded by
leakage

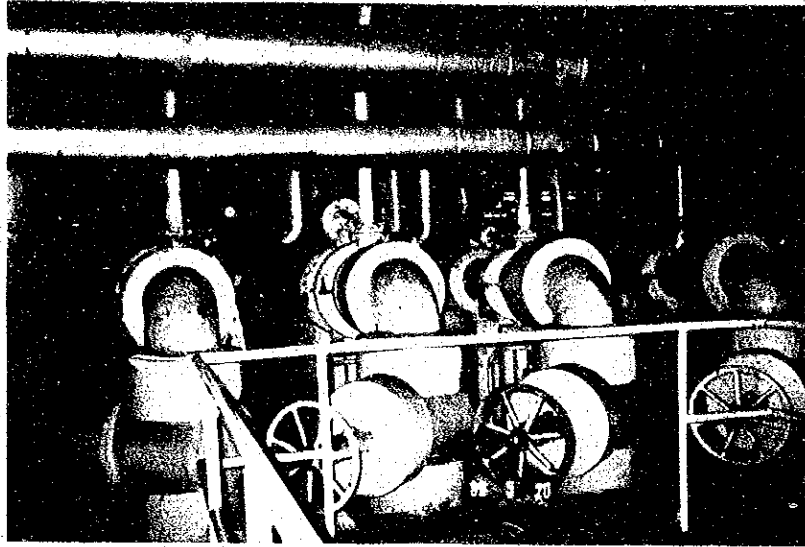


FUJICOLOR 613 82

Too small damper drive unit

Snyder Thermal Power Plant Unit No. 2
FDM Damper Drive Unit





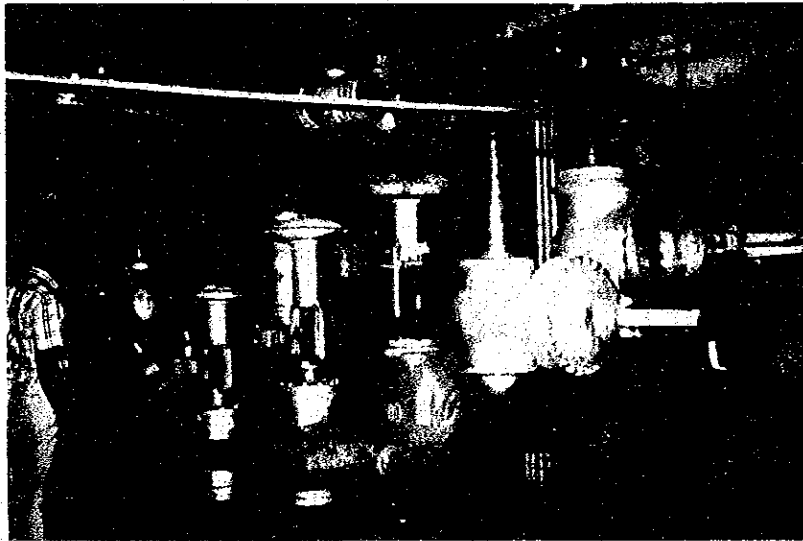
FUJICOLOR Q13 82

Malaya Thermal Power Plant Unit No. 2

Air Extractor

Flow direction and valve identifications are not marked.

By-pass Valve (difficult operation)

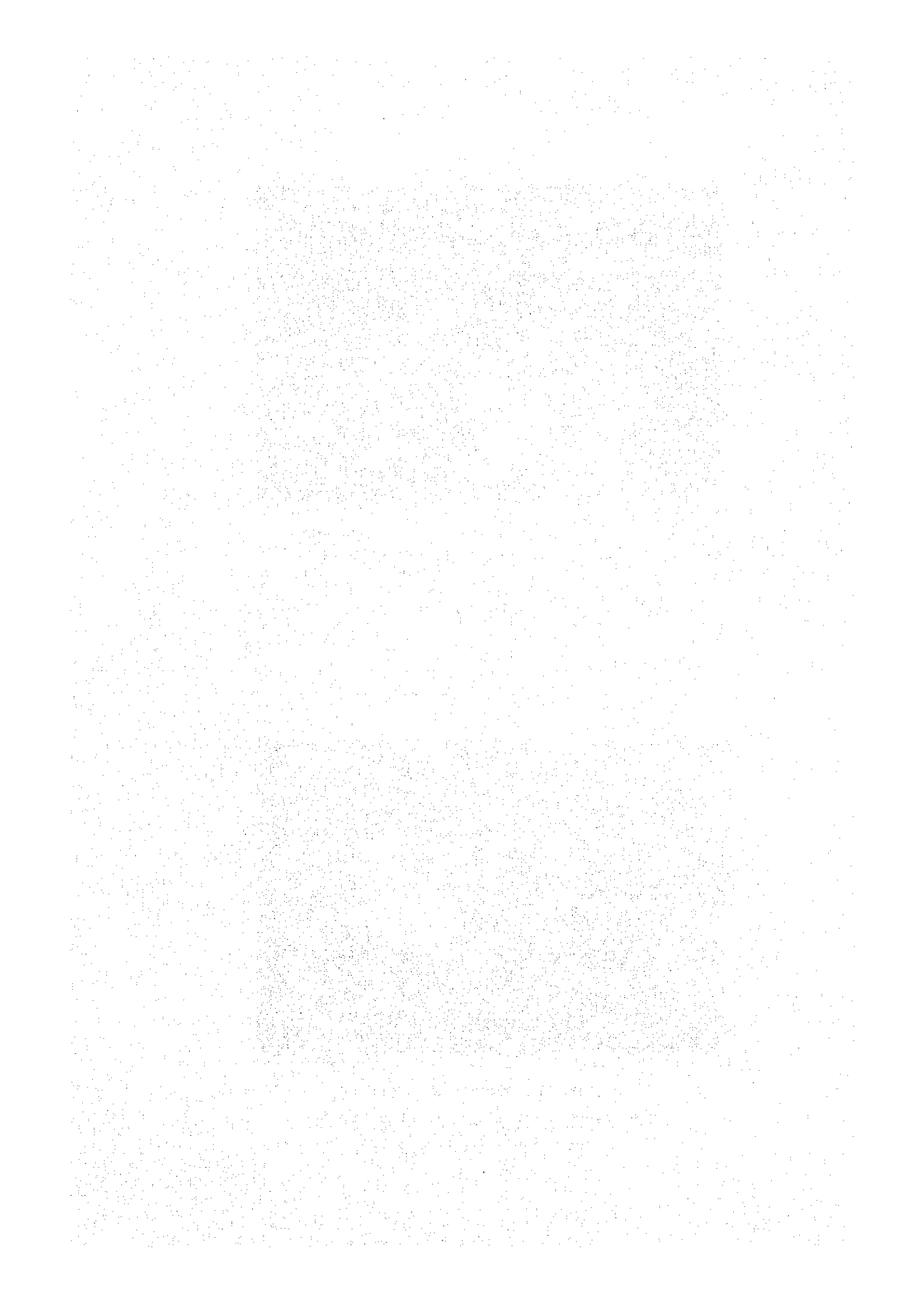


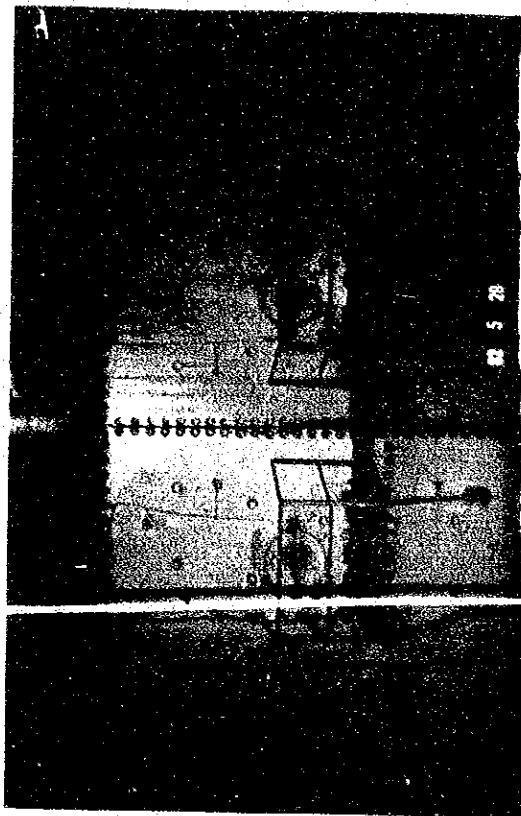
FUJICOLOR Q13 82

Malaya Thermal Power Plant Unit No. 1

Condenser Hot Well Level Control Valves

(Unsuitable rangeability)

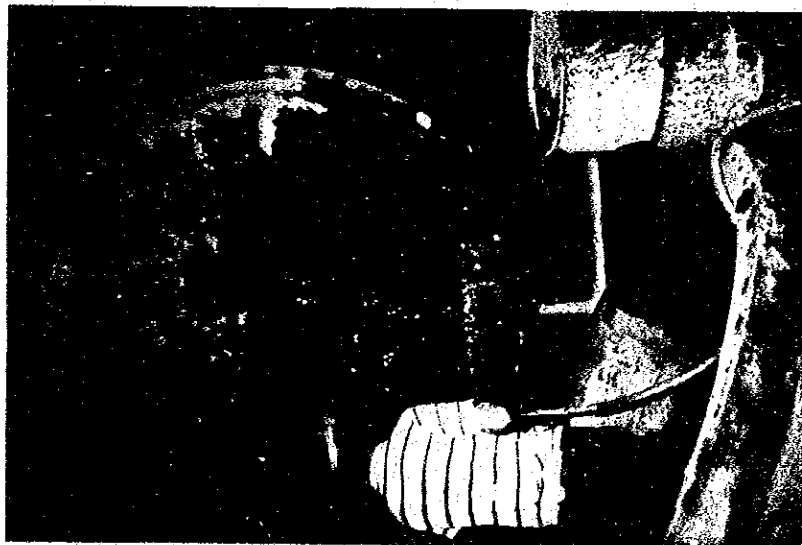




FUJICOLOR 620 12

Malaya Thermal Power Plant Unit No. 1

Cabling for Cathodic Protection Equipment
Bare cabling on condenser water box

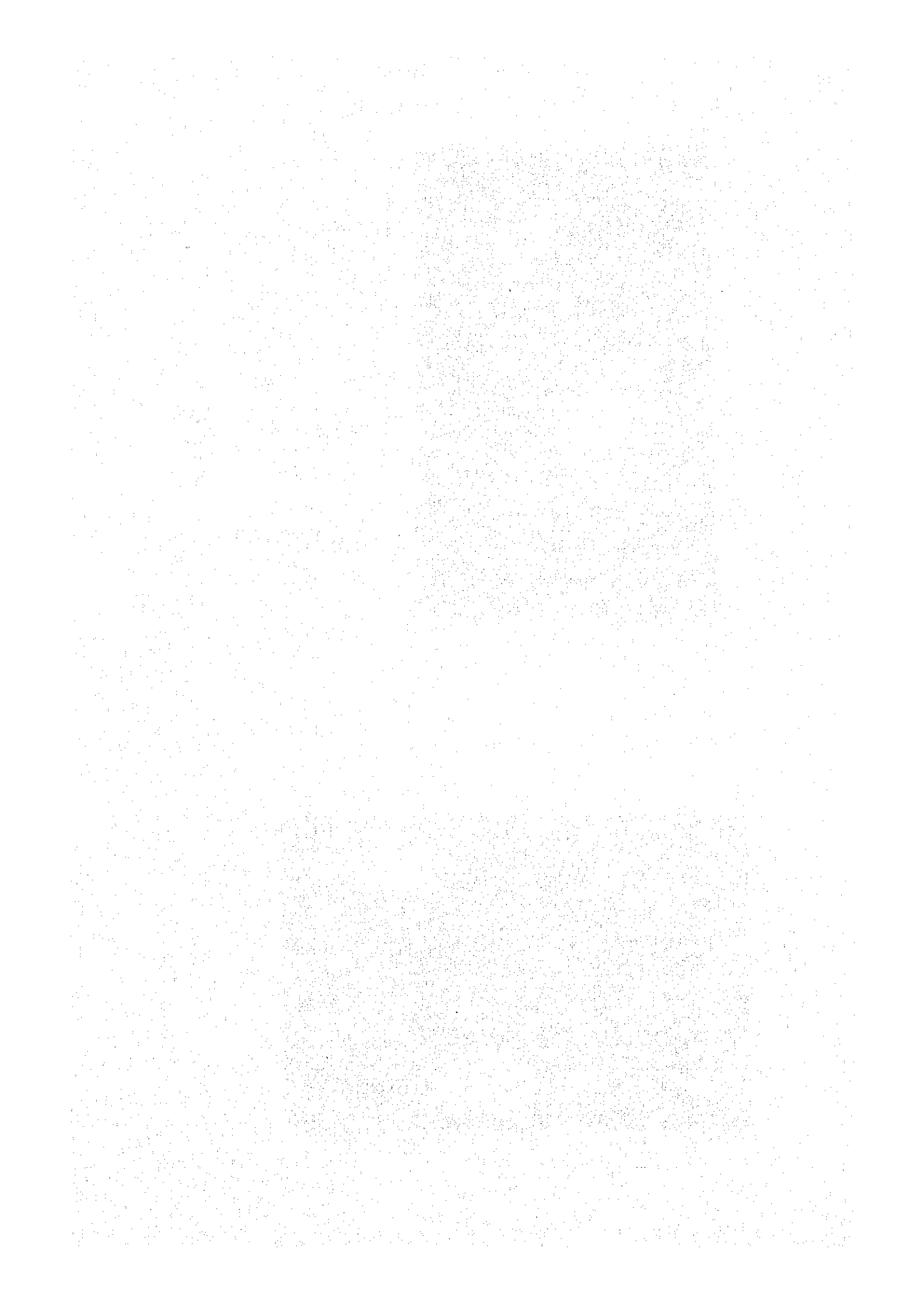


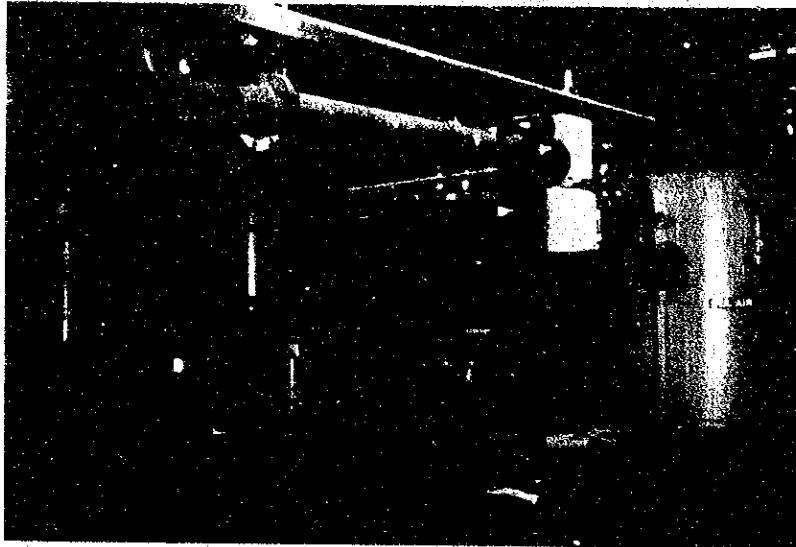
FUJICOLOR 620 12

Water box cover Mud

Many tubes are plugged due to tube leakage.

Fresh Water Cooler





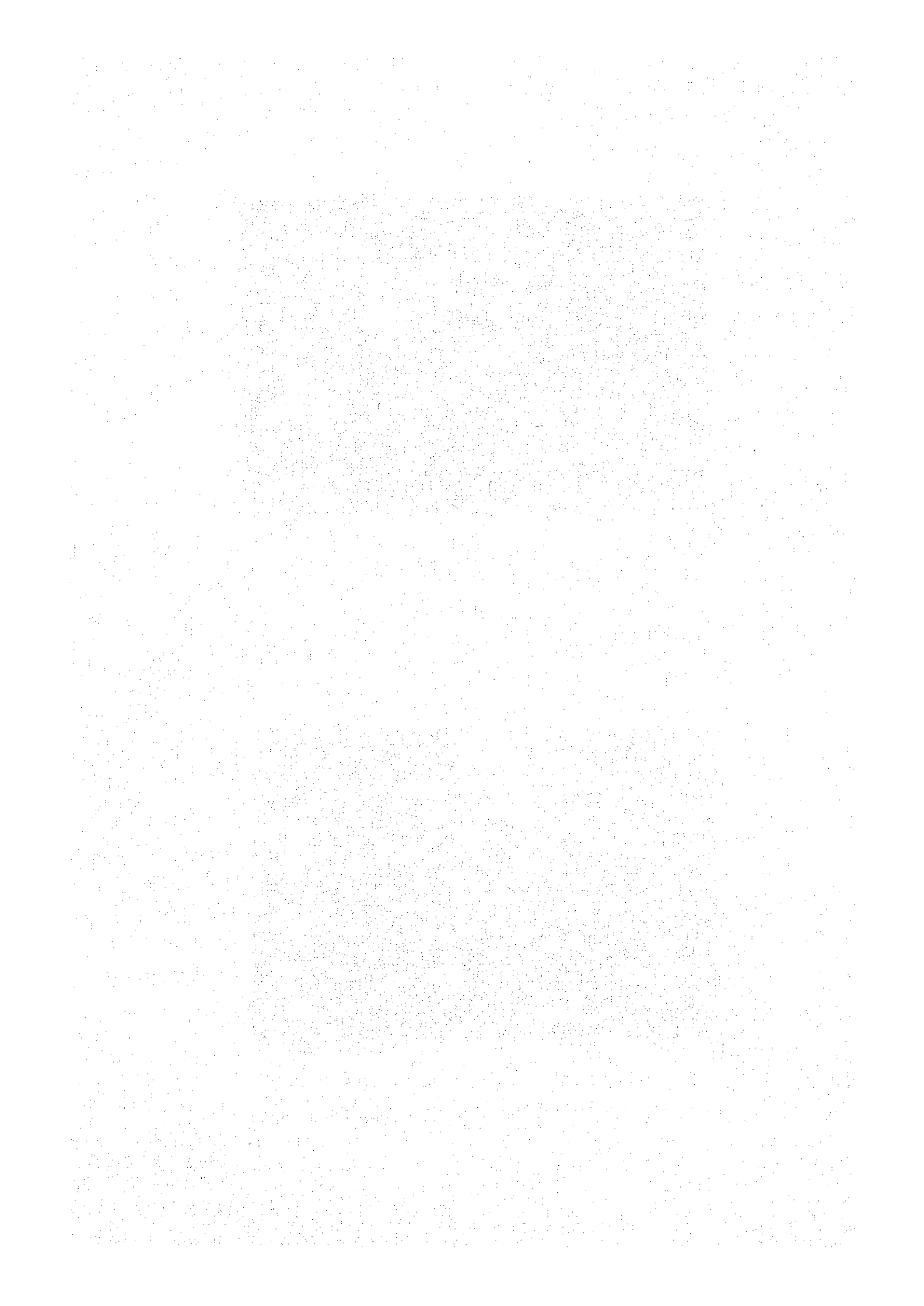
Gardner/Snyder/Malaya Thermal Power Plant
(No.1,2) (No.1,2) (No.1)

Air Control System

Insufficient capacity and number of unit,
Dehumidifier and filter are not installed.



Malaya Thermal Power Plant Unit No. 1
Lightning Arrester Broken to Pieces by Thunder Bolt



EXECUTIVE SUMMARY

The short power supply situation as felt in the Luzon Grid today is due mainly to the short fall in capability of the bigger units presently installed in the system. Japan International Cooperation Agency (JICA), through the request of Minister G. Velasco, had dispatched to Manila a preliminary survey team composed of seven (7) experts to conduct a thorough study of available data and actual observation of the generation facilities of NAPOCOR, with the view of finding both short and long-term solutions to the problem. Furthermore, this was made possible through mutual and close cooperation between JICA, NAPOCOR and MECO personnel concerned.

As the basis of classification, the areas of concern was segregated into technical matters involving design concept, maintenance, and operation standards, as well as procurement/warehousing actual practices. The report takes into account also the utmost concern on human behavior, on which the success of the technical rehabilitation and improvement of the units will depend very much.

The team, through observation of actual start-ups of the plants and interviews with NAPOCOR and MECO personnels, has found that the skills and knowledge of the present operation complement are adequate in spite of the incomplete control and instrumentation systems. However, performance of daily measures that involve actions have to greatly be improved. Additionally, to reinforce the organization of the power stations, the optimum system of recruitment and continuous and adequate training program for present and new personnel are hereby recommended.

In this report two-tiered system of rehabilitation program is recommended mainly for four (4) thermal power stations provided with once-through type boilers. One is a short-term program coping with the brownouts frequently encountered recently in Metro Manila, and the other a long-term program towards establishing a more comprehensive Technical, Procurement and Financial Management program for a reliable

The following text is a scan of a document page. It contains several paragraphs of text, which are mostly illegible due to extreme blurriness and low resolution. The text appears to be a formal document or report, possibly containing a list or table of contents, but the specific content cannot be discerned. The page is numbered '1' in the top right corner.

1

supply of electricity. The staff member seems to have little time to spare for this long-term program because of the current brownouts, so that new members should be involved in this long-term task.

A. For a short-term program, the "Emergency Task Force" should be set up in NAPOCOR in a close cooperation with transmission and distribution companies under the administrative guidance of the Ministry of Energy. The purposes of the Task Force are:

- (a) to establish Procurement and Delivery Policy for the emergency situation, for rehabilitation and overhauling plant equipments, already started partially within NAPOCOR, based on a more accurate assessment of the existing conditions of power plants;
- (b) to establish the re-training program for the operator;
- (c) to oversee implementation of rehabilitation and overhauling; and
- (d) to control the costs of the rehabilitation and overhauling expense.

We recommend the following steps:

- (1) Diagnosis on the state-of-the-art of each individual equipment and component including instrumentation; identification of manufacturers, gathering data on cost, availability, and life expectancy of equipment, for the preparation of a comprehensive list covering every parts of the power plants;
- (2) Prescription with preferential order for replacement and overhaul of each part according to the degree of its contribution to the total recovery of specific power plant;
- (3) Upgrading of design philosophy in addition to (b); for example, the introduction of back-up systems for the improvement of reliability of a system as a whole, as well as the automation of all critical operations.

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For the implementation of the above steps, coordination among various manufacturers and cooperation between Technical, Procurement and Financial Departments are required within NAPOCOR.

- B. For a long-term program another Task Force named "Planning Task Force" should be set up in NAPOCOR in the Ministry of Energy. The target for this task force is focused on a long-term planning on project management, organization planning, and personnel administration together with the improvement of regulatory framework.

(1) Adoption of critical path method

Beginning with the comprehensive list mentioned above (1) in A, the so-called critical-path method technique utilizing computers should be adopted as a tool of project management for efficient implementation of plant construction/preventive maintenance, rehabilitation and replacement of parts.

- (2) On-the-job training for the existing engineers and technicians and more efforts to recruit a new manpower, or redeploy others from existing plants and substations

- Set up of a new re-training program for the existing technical personnel in various levels to give a higher capability to operate power plants in normal condition and also to cope with the shutdown situation; event tree analysis based on possible various failures and training personnel on the job, and also through simulator system may be recommended.
- New pool of technical personnel: Considering the current situation of manpower drain abroad, we recommend NAPOCOR to make a pool of reserves of engineers and technicians trained to a certain level as an insurance for such drain of manpower.

(3) New philosophy in Procurement Policy

- Coordination of cost principle and reliability consideration

The lowest total cost based on the simple cost summation

of each part is not always the best measure for procurement, when the operation cost after rehabilitation and difficulty in control caused by the increase in the number of manufacturers are taken into account. Due to this reason, we recommend procurement from suppliers who have already proven good product quality. And further, good cooperation between technical and financial department in NAPOCCR is definitely required in the procurement of equipment.

(4) Mobility between engineers and the general management

Personnel with an engineering experience should have an opportunity to take part in the financial decision making process.

(5) Review of regulatory framework.

Review should be exercised on the regulatory system as for the approval of construction plan and inspection, ministerial ordinance for technical standards of operation, reliability and security and reporting system of the power plants.

(6) Contracted services.

Contracting with the manpower service firms with skilled workers/engineers will help to solve such problems as the lack of personnel and poor productivity of present personnel.

The further rehabilitation items (except existing rehabilitation items) to be taken care immediately by NAPOCOR should be given the top priority in the current emergency situation.

The items marked by are to be more urgently implemented than those marked by . And if NAPOCOR understands that JICA's technical advices are necessary, NAPOCOR will be kindly requested to send the detailed items and contents/conditions to JICA.

<u>Actions to be Taken</u>	<u>Priority</u>
1. General	
1) Adoption of double wall central control room (Addition wall, window, a.r conditions)	○
2) Replace/addition of ventilation system	○
2. Boiler	
1) Re-check and test of all equipments in accordance with recommended periodical inspection check sheet (See APPENDIX-II)	◎
3. Turbine, Generator	
1) Addition of HP heater bypass	◎
2) Addition of non-return valves on blade steam line for deaerator (G1, 2, S1, 2, M1)	○
3) Calibration, loop check for local control system	◎
4) Re-balancing and re-alignment of T/G	○
5) Re-check and test all equipments in accordance with the check sheet for periodical inspection (See APPENDIX-II)	◎
6) Addition of auxiliary steam back up system including pressure reducing-attemperator station	○
4. Control System	
1) Re-check of boiler trip interlock system (Inst. and Circuit)	◎
2) Re-check of turbine protection system (Inst. and Circuit)	◎

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that proper record-keeping is essential for transparency and accountability, particularly in the context of public administration and financial management. The text notes that without reliable records, it is difficult to track the flow of funds and ensure that resources are being used as intended.

2. The second part of the document addresses the challenges associated with data collection and analysis. It highlights that gathering comprehensive data from various sources can be a complex and time-consuming process. However, the benefits of having a robust data set are significant, as it allows for more informed decision-making and the identification of trends and patterns. The document suggests that investing in data management systems and training staff can help overcome these challenges.

3. The third part of the document focuses on the role of technology in modernizing operations. It discusses how digital tools and platforms can streamline processes, reduce errors, and improve communication. For example, the use of cloud-based systems can facilitate data sharing and collaboration across different departments. The text also mentions the importance of ensuring that any technology adopted is secure and compliant with relevant regulations.

4. The fourth part of the document discusses the need for continuous improvement and innovation. It argues that organizations should regularly evaluate their current practices and seek out new ways to enhance efficiency and effectiveness. This can involve experimenting with different approaches, learning from failures, and staying up-to-date with the latest industry developments. The document encourages a culture of learning and adaptability, where employees are empowered to suggest and implement improvements.

5. The fifth part of the document concludes by summarizing the key points and reiterating the importance of the discussed topics. It emphasizes that a combination of strong record-keeping, effective data management, the strategic use of technology, and a commitment to continuous improvement are all necessary for achieving long-term success and sustainability. The document ends with a call to action, urging all stakeholders to work together to address the challenges and opportunities outlined.

<u>Actions to be Taken</u>	<u>Priority</u>
3) Addition of adequate instrument air dryer/dehumidifier	○
4) Reconsideration and improvement of operation method	○
5) Practice of automatic operation	○
6) Re-check and improvement of pressure switches and temperature switches	○
7) Re-check and improvement of EHC system including assistant with the aid of original manufacturer	○
8) Alarm and annunciation system reset	○
9) Re-wiring for defective wiring specially bare wiring around main turbine supervisory devices	○
5. Water Treatment Facilities	
1) Replace/repair of sampling system	○
2) Replace/repair of continuous water quality monitoring system	○
3) Practice and follow-up of checking especially during unit start-up in accordance with the allowable limitation	○
4) Addition of adequate dissolved O ₂ meter and practice of continuous monitoring/checking	○
5) Addition of re-generation facilities for each unit respectively	○
6) Practice of immediate unit shutdown or emergency appropriate action in case of condenser leakage	○
7) Addition of continuous conductivity meter	○

THE HISTORY OF THE

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Actions to be Taken

Priority

- 6. Sub-station/transmission system
 - 1) Overall relay tests at generator/
transmission line shutdown
 - 2) Lead wire checking at generator/
transmission line shutdown
 - 3) Cleaning surface of lightning
arrester at transformer shutdown

- 7. Personnel Affairs
 - 1) Invitation of manufacturer's supervisor
for the above checking/improvement/
replacement work

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1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that proper record-keeping is essential for ensuring transparency and accountability in financial operations. This section also highlights the role of internal controls in preventing fraud and errors.

2. The second part of the document focuses on the implementation of a robust risk management framework. It outlines the various risks that an organization may face, including financial, operational, and reputational risks. The document provides guidance on how to identify, assess, and mitigate these risks effectively.

3. The third part of the document addresses the need for continuous monitoring and reporting. It stresses that organizations should regularly review their financial performance and risk levels to ensure they remain aligned with their strategic objectives. This section also discusses the importance of clear communication and reporting mechanisms.

4. The fourth part of the document discusses the role of technology in enhancing financial management and risk control. It highlights how modern software solutions can streamline processes, improve data accuracy, and provide real-time insights into an organization's financial health.

5. The fifth part of the document concludes by emphasizing the importance of a strong corporate governance structure. It notes that a well-defined governance framework is crucial for ensuring that all activities are conducted in a fair, ethical, and transparent manner. The document also mentions the need for regular audits and reviews to maintain the integrity of the organization's financial records.

CHAPTER 1. INTRODUCTION

1-1. BACKGROUND AND OBJECTIVE

1) Background

The electricity service in the Luzon Grid has been suffering serious interruptions since January 1, 1982, deriving much difficulty in the social and industrial activities.

The service interruptions were mainly due to the unreliability of four (4) thermal plants in Metro Manila area. These power plants are Tegen, Gardner-Snyder and Malaya Power Stations near Manila in Sucat, Paranaque, Metro Manila and Pililla, Rizal. The unit capacities are: T-1, T-2: 100 MW each; G-1: 150 MW; G-2: 200 MW; S-1: 200 MW; S-2: 300 MW; M-1: 300 MW; M-2: 350 MW, and total rating is 2700 MW, and sub-critical once-through boilers are applied to G-2, S-1, S-2 and M-1. Recently, in August 1979, after assessing the poor conditions of these plants, National Power Corporation (NAPOCOR) launched a rehabilitation program with the services of technical personnel from the two major equipment suppliers, KWU, turbine manufacturer, and HITACHI, boiler manufacturer. But the rehabilitation program at this time has not shown remarkable improvement on the plant performance originally expected.

Under these circumstances NAPOCOR decided to request Japanese government to dispatch a group of experts in power plant operation, design and maintenance for the assistance in solving the problems of these power plants, because some of the Japanese electric utility companies have been successful in operation on the power plants with once-through boilers of similar type.

The government of Japan, in response to the request of the NAPOCOR through the government of the Republic of the Philippines (hereinafter called "The Philippines") has decided to undertake the study of the actual situation and

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rehabilitation scheme of these power plants for Metro Manila stable power supply (hereinafter called "the scheme") through the Japan International Cooperation Agency (hereinafter called "JICA").

2) Objective of the Preliminary Survey

In May 1982, JICA dispatched a preliminary survey team headed by Mr. Keiji Iimura to work out the proposed investigation with NAPOCOR and other relevant agencies.

Detailed discussion for the objective of the preliminary survey had been held on 11th May 1982, between President G. Y. Itchon and NAPOCOR officials concerned and JICA team.

In this discussion the objective of the preliminary survey had been clarified as follows:

- a) To collect and review the existing data for said power plants such as design drawings, plant system and equipment and material specifications, plant and equipment layout, operation and maintenance manuals, etc.;
- b) To verify the current situations of the plant operation and maintenance, to review the past operations and maintenance records and to clarify the problems to be solved; and
- c) To provide appropriate recommendations on the current situations and the rehabilitation program.

3) Objective Area of the Preliminary Survey

The objective area of this preliminary survey is mainly within the following existing power station compounds and the relevant transmission lines, substations and distribution networks.

Power Plants:	Tegen	1 - 100 MW
		2 - 100 MW
	Gardner	1 - 150 MW
		2 - 200 MW

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that proper record-keeping is essential for transparency and accountability, particularly in financial reporting and compliance with regulatory requirements. The text notes that incomplete or inconsistent records can lead to misunderstandings, disputes, and potential legal consequences.

2. The second section addresses the role of technology in modern record management. It highlights how digital tools and software solutions have revolutionized the way data is stored, accessed, and analyzed. These technologies not only improve efficiency but also enhance the security and integrity of records. However, the document also cautions against over-reliance on technology, stressing the need for robust backup and recovery procedures to prevent data loss.

3. The third part of the document focuses on the human element of record management. It discusses the importance of training and education for staff involved in handling records. Properly trained personnel are better equipped to understand the significance of their work and to follow established protocols. The text also touches upon the need for clear communication and collaboration between different departments to ensure that records are maintained consistently across the organization.

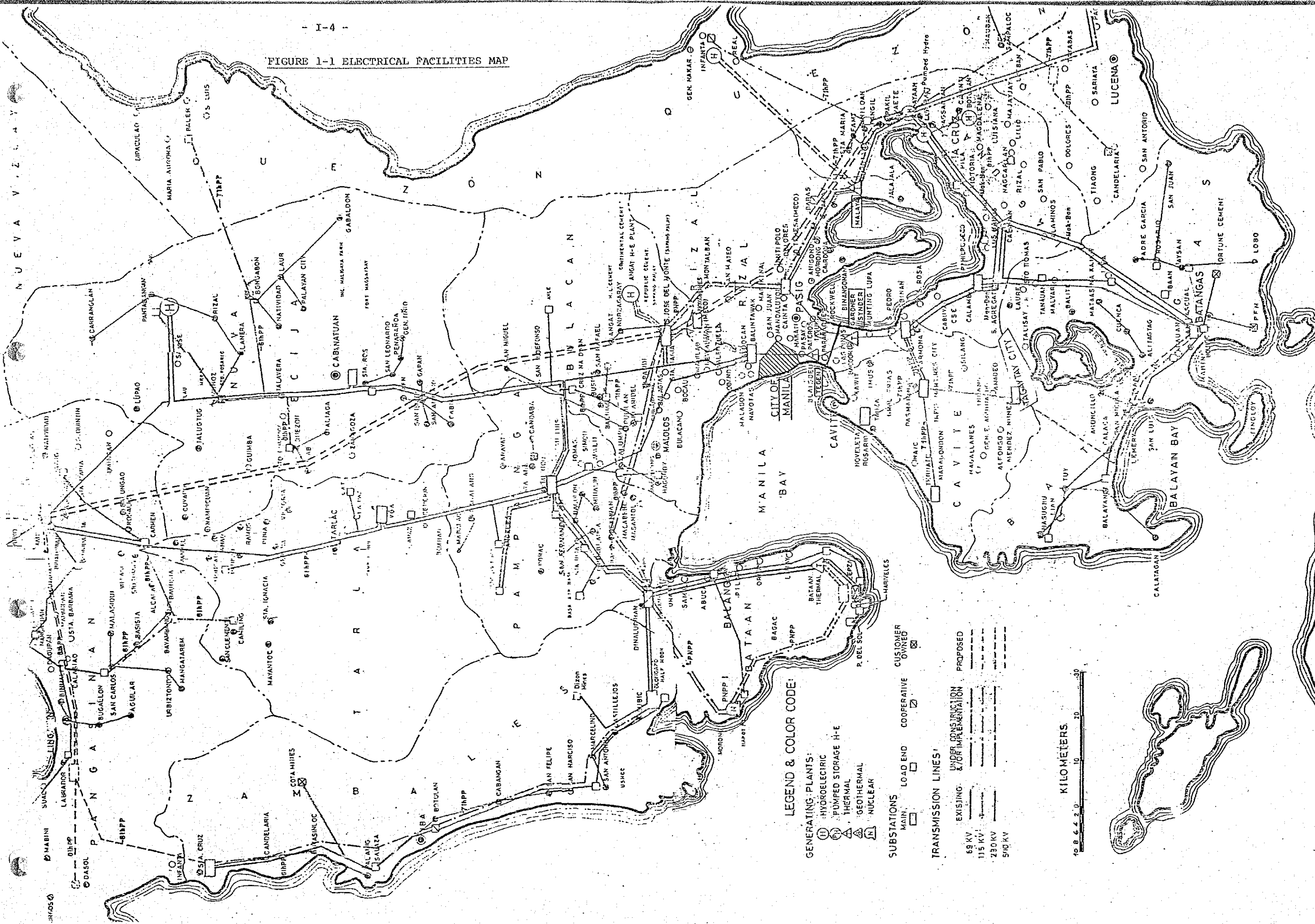
4. The final section of the document provides a summary of key takeaways and offers practical advice for implementing effective record management practices. It encourages organizations to regularly review and update their record management policies to stay current with changing regulations and technological advancements. The document concludes by reiterating the long-term benefits of a well-maintained and accessible record system, including improved decision-making and operational efficiency.

Snyder 1 - 200 MW
 2 - 300 MW
Malaya 1 - 300 MW
 2 - 350 MW

The locations of the above-mentioned power plants are shown in Figure 1-1 on the next page.

During this survey, it has come to JICA team's attention that the most major situations are common to all the power stations and JICA team settled up the survey report hereunder mainly on Gardner/Snyder and Malaya; however, the survey report will also be applied to Tegen in principle.

FIGURE 1-1 ELECTRICAL FACILITIES MAP



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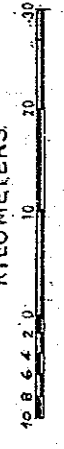
- GENERATING PLANTS:
- (H) HYDROELECTRIC
 - (P) PUMPED STORAGE H-E
 - (T) THERMAL
 - (G) GEOTHERMAL
 - (N) NUCLEAR

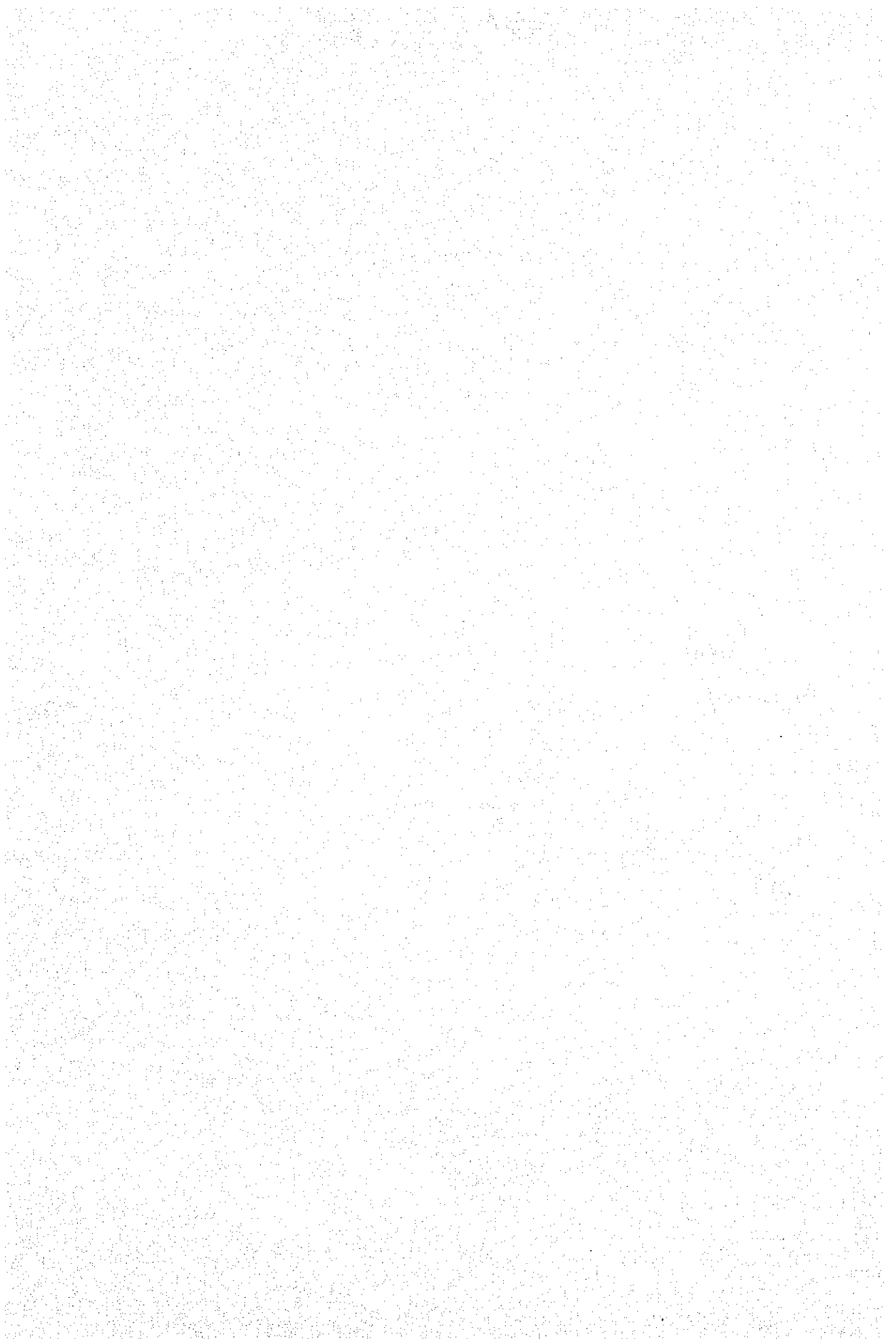
- SUBSTATIONS
- MAIN
 - LOAD END
 - COOPERATIVE OWNED

TRANSMISSION LINES

- EXISTING:
- 69 KV
 - 115 KV
 - 230KV
 - 500 KV
- UNDER CONSTRUCTION &/OR IMPLEMENTATION
- PROPOSED

KILOMETERS





1-2. MEMBERS OF NAPOCOR AND MECO CONCERNED, AND SURVEY TEAM

The NAPOCOR and MECO
Concerned

JICA Team

NAPOCOR:

- Mr. G. Y. Itchon
President
- Gen. M. S. Bocanegra
Acting Sr. Vice President
- Mr. J. U. Jovellanos
Special Assistant to
the Chairman
- Mr. H. C. Gaerlan
Vice President
Human Resources and
General Services

- Team Leader - Mr. K. Iimura
Head of Natural Resources
Survey Division, JICA
- Mr. S. Kurihara
Deputy Director
Thermal Power Division
Public Utilities Dept.
MITI
 - Mr. M. Tajima
Power Plant System
 - Mr. S. Hirokawa
Power Plant Facility

TASK FORCE TEAM:

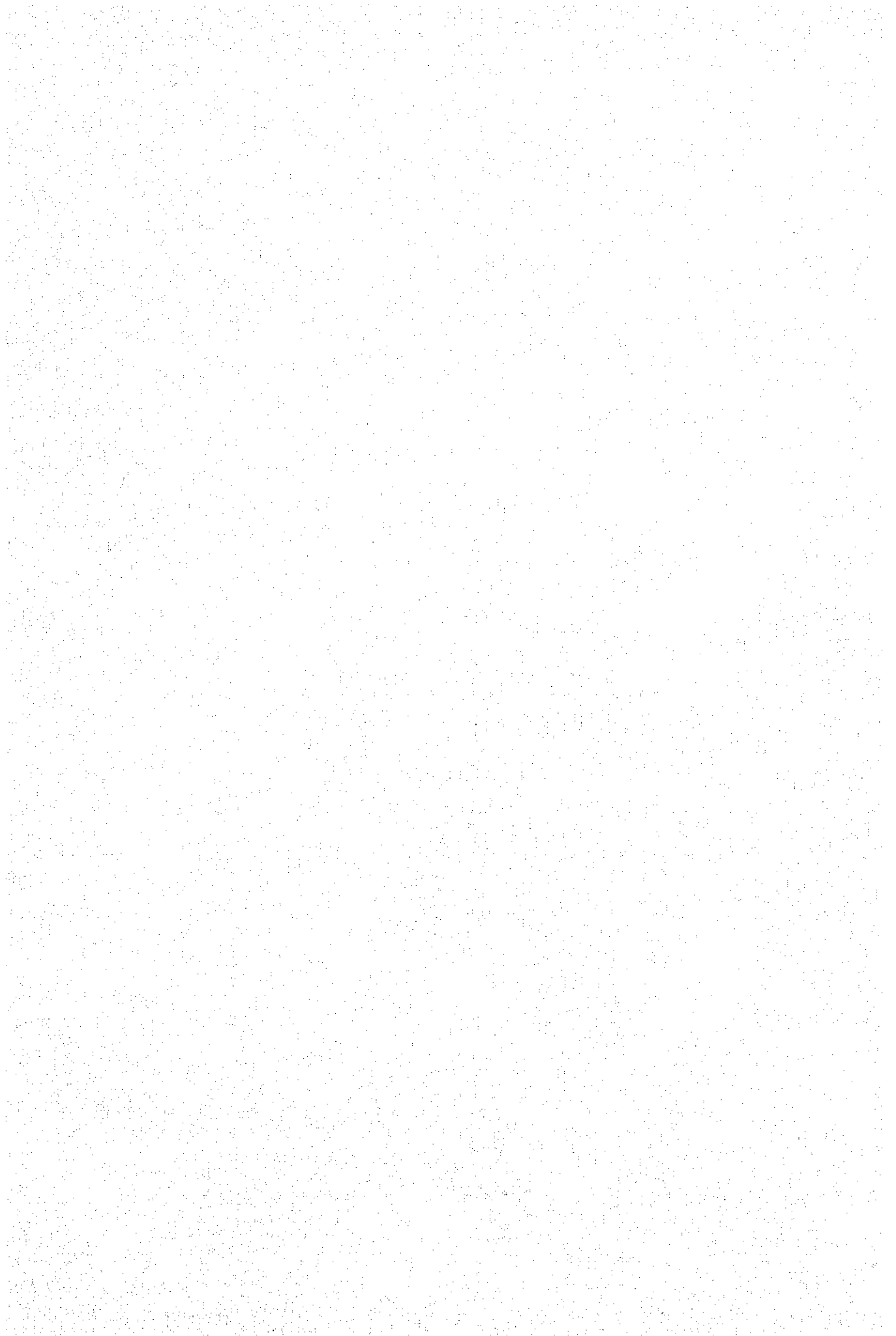
Chairman:

- Mr. T. H. Calasanz
Vice President
Utility Operations

Members:

- Mr. L. F. Osilla
Manager
Quality Assurance Group
- Mr. A. P. Estiandan
Plant Manager
- Mr. S. A. Piedad
Manager
Technical Services Div.
- Mr. E. A. Besana
Superintendent B
Mechanical Section
Technical Services Div.
- Mr. C. S. Estrellado
Superintendent B
Chemical Section
Technical Services Div.
- Mrs. P. SJ. Madic
Executive Assistant

- Mr. K. Matsumoto
S/S, Transmission Line
- Mr. S. Suwa
Monitoring/Control
System
- Mr. Y. Yuasa
Chemical Management



CONFERENCE:

NAPOCOR Gardner/Snyder Thermal Plant:

- Mr. J. G. Villanueva
Plant Manager

- and Plant Staff

NAPOCOR Malaya Thermal Plant:

- Mr. A. V. Raflores
Plant Manager

- and Plant Staff

MECO:

- Mr. L. Toma Cruz
Assistant Vice-President
Operations Dept.

- Mr. Antonio C. Coronel
Sr. Manager,
Systems Operation Div.

EMBASSY OF JAPAN:

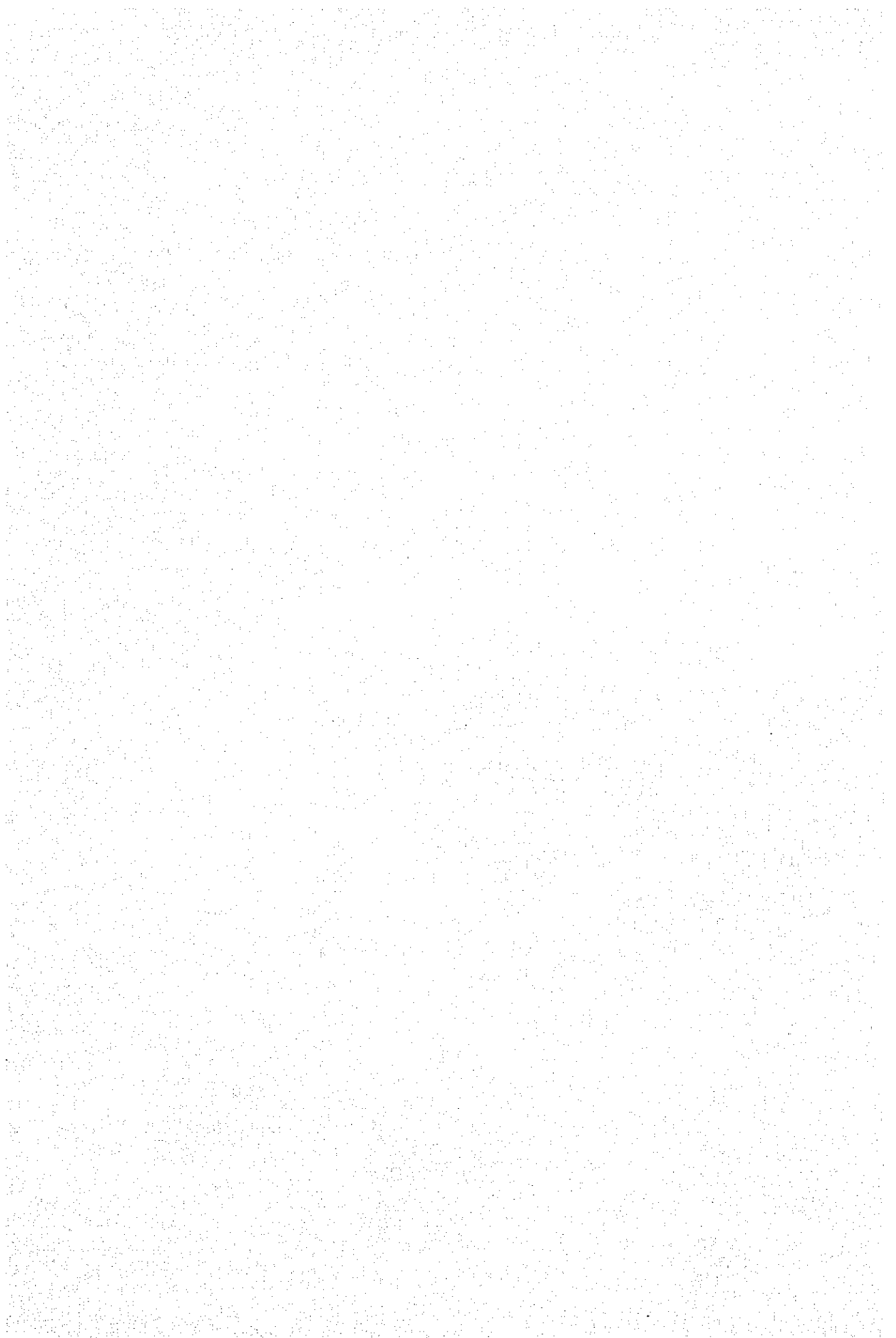
- Mr. J. Hashimoto
First Secretary &
Commercial Attache

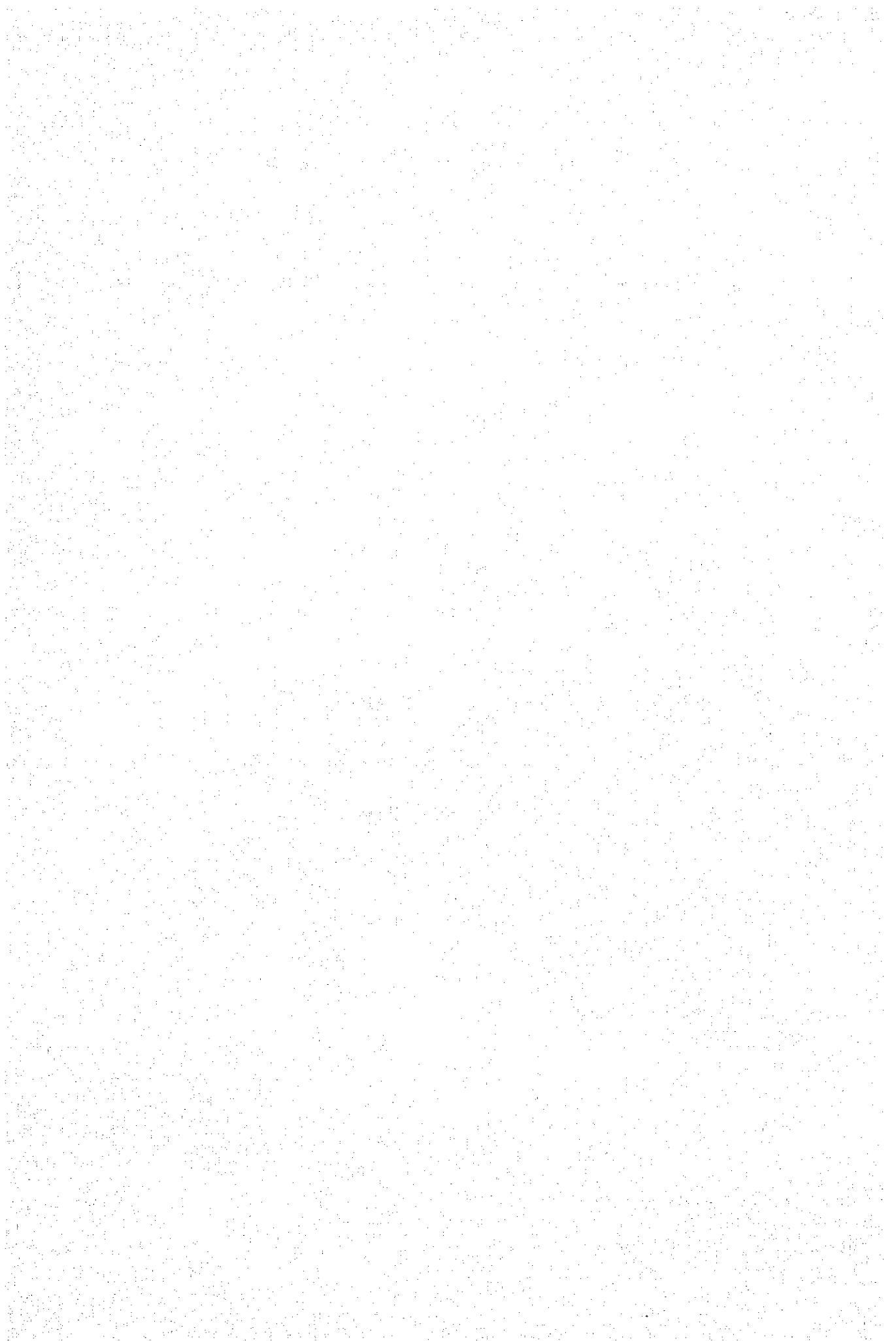
JICA, Manila Office:

- Mr. M. Nakamura

1-3. SCHEDULE OF SURVEY

The survey has been carried out from May 10, 1982 to May 28, 1982 with sincere cooperation of the counterparts of NAPOCOR to clarify the problems and difficulties concerning general matters and respective items of each power station as shown in Figure 1-2.





CHAPTER 2: TECHNICAL SURVEY RESULTS AND RECOMMENDATIONS

2-1. OVERALL EVALUATION OF POWER PLANT

In relation to the overall power plant system, JICA team really feels that it is very difficult to resolve those existing problems on the existing plant completely in short term.

Each machinery, facility, equipment and control system of power plant are closely related with each other and overall coordination is indispensable for whole plant. Some of the causes of existing problems seems to be appeared in original plant planning, engineering and design stage.

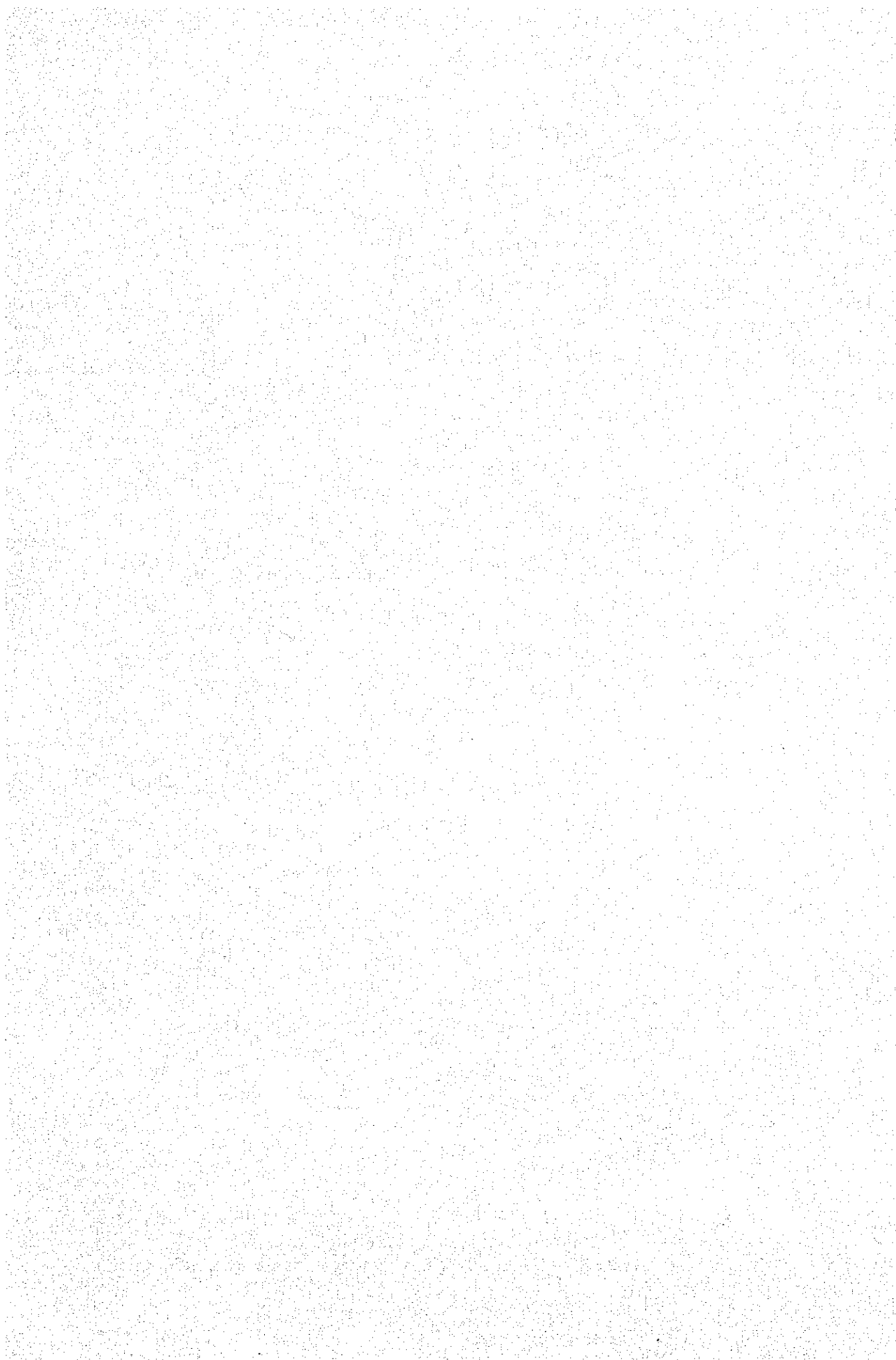
Besides, in case that one failure occurs in the plant system, the influence affects the other portion of the plant systems. The interference extends to great range, and the failure results in whole plant system failure and severe deterioration if the small failure is not eliminated, or recovered immediately.

As a matter of fact, it has come to our attention that the said plants have been deteriorated in considerably long time due to the above-mentioned causes both physical and mental matters.

At this stage, serious attention has been paid by NAPOCOR itself and the investigation and actual practices by NAPOCOR will be highly appreciated and evaluated; however, further improvement work will be required continuously without interruption for both fields of physical and mental rehabilitation and improvement.

JICA team tried its best effort to analyze the existing problems and causes, and to give recommendations/comments as much as possible in this section in the very short time.

However, since the problems/causes extend to very wide range, it will be impossible to give complete way of improvement at this moment. The further recommendation, comment and education will be given through the further assistance, e.g., training and education of NAPOCOR personnel.



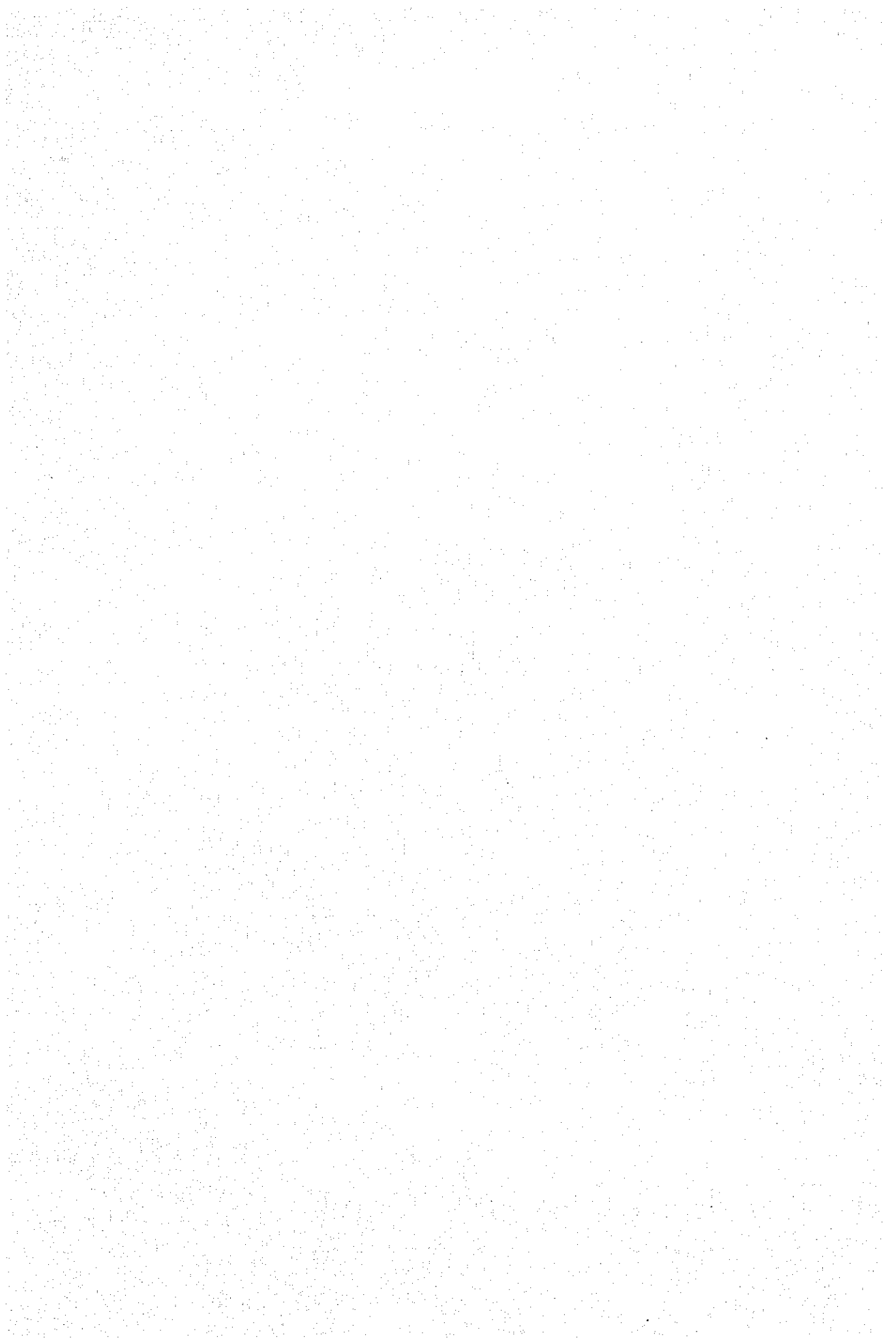
2-1.1. TROUBLES COMMON TO POWER PLANTS

From the power plants' past records and actual site survey, it has come to our attention that there is less peculiar trouble to each plant and a large part of the troubles are common to all relating plants.

JICA team classified the troubles into typical groups in this section to grasp typical characteristics of trouble and causes of the trouble including physical and mental backgrounds, and itemized matters will be mentioned in Section 2-1.2.

There will be some unavoidable causes on the basis of existing overall power generation/transmission system; however, proper and steady improvement must be taken to eliminate the complicated causes one by one thoroughly.

"Typical trouble" is based on past plant histories and "supposed relating cause" is mentioned generally on the basis of actual plants investigation and it will be reflected whether the cause is applicable or not to each plant since the cause is complex one but not simple one.



<u>Typical Trouble</u>	<u>Supposed Relating Cause</u>	<u>Remarks</u>
1. Generator directional RY (67) action	<ul style="list-style-type: none"> a. Function of the RY itself b. Too low load operation c. Inadequate initial load at synchronizing d. Inadequate plant controllability or control in low load operation 	
2. System disturbance high/low frequency	<ul style="list-style-type: none"> a. Inadequate unit capacity comparing with overall grid capacity b. Inadequate, insufficient system coordination between power generation and transmission/distribution 	
3. Uncontrollable steam temperature	<ul style="list-style-type: none"> a. Defect/inadequate maintenance and operation of end sensor and automatic boiler control system b. Insufficient B-T and auxiliaries coordination c. Inadequate environmental protection of control system installation e.g. high temperature, high dust and poor maintenance 	<ul style="list-style-type: none"> a. Out of order parts will be replaced in coming re-habilitation b. Automatic control system for start-up operation is under study/consideration
4. Boiler trip interlock action	<ul style="list-style-type: none"> a. Function of each part of the system itself - Same as Item 3 	- Same as Item 3.a
5. High conductivity of feedwater	<ul style="list-style-type: none"> a. Tube leakage in condenser b. Insufficient number of preventive sensor c. Inadequate material selection of condenser d. Function of conductivity meter and poor maintenance of cation filter resin e. Overloading of CPP due to tube damage/piping leakage and erratic operation of hotwell level regulator f. Insufficient maintenance/operation of service-regeneration of CPP g. Insufficient capacity of water demineralizing and storage equipments due to 	<ul style="list-style-type: none"> a. Additional regeneration tower will be installed in coming re-habilitation b. Complete retubing for Malaya No. 2 will be done during coming overhaul. Awaiting for delivery of condenser tubes

<u>Typical Trouble</u>	<u>Supposed Relating Cause</u>	<u>Remarks</u>
	too many plant start-ups and shut-downs	
	h. Imperfect drainage, sump arrangement around condenser, defective sump pump and insufficient maintenance	
6. Feedwater Chloride contamination	- Same as Item 5	
7. BTI by low economizer	a. Tube/piping leakage b. Inadequate working steam system design for BFP-Turbine and auxiliary	a. Deactivated due to sliding pressure operation as well as reduced pressure operation due to weak boiler tubes
8. Water induction on turbine, heater drain	a. Inadequate turbine blade steam system design b. Tube leakage in heaters c. Insufficient interlock and annunciation system and insufficient interconnections of heater drain level and turbine protection d. Defective level controller and level switch e. Overloading of heater drain system due to large amount of heater tube leakage f. Lack in knowledge and action for emergency case g. Insufficient feedwater heater bypass system h. Inadequate extraction non-return valve	a. Defective heater will be replaced in coming rehabilitation b. Additional feedwater bypass system are now in installation or in consideration. But the relating valves are not forced actuated one
9. Main and auxiliaries sw-gear, motor C/C failure	a. Bad circumstances for those electrical equipment-high temperature, high dust, pipe leakage b. Insufficient layout engineering, design of building ventilation system c. Insufficient maintenance	

