

August 9, 1979.

Mr. Tammachart Sirivadhanakul,
Director of Regulatory Division,
National Energy Administration.

Dear Mr. Tammachart,

Re: LPG PRODUCTION FROM NATURAL GAS

I study LPG production from 100% of natural gas (from well head), and whether Thailand can export LPG to Japan or not.

I do not use computer, but the calculation is based on Fluor's report and Chiyoda's estimation, so the result is not so much different.

When LPG is manufactured from 100% of natural gas (from well head), the dew point control unit is unnecessary. Therefore, the cost of dew point control operation must be minused from the cost of LPG unit. I suppose that the cost of dew point control unit is 15-30% on the cost of LPG unit. In my report, I apply for 15% of that.

I LPG PRODUCTION QUANTITY IN THAILAND

Natural Gas Production	LPG Production			
	T/Y		Total	
	C ₃ LPG	C ₄ LPG		
350 MMscf/D (in 1983)		196.2	107.8	304.0
500 MMscf/D (after 1984)	In 1984	272.5	150.0	422.5
700 MMscf/D (after 1988)	In 1988	360.0	199.1	559.1
LPG From Refinery	In 1979			181.0

I suppose that LPG production from the refinery after the expansion and new refinery completion, LPG from these refineries is excess for domestic requirement, because these refineries will

have a lot of cracking units. Thai LPG demand in 1982 will be 244 MT, so Thailand could not export before the completion of the expansion and new refinery.

Accordingly, the most of LPG from natural gas should be exported to Japan (Japan is the best LPG market for Thailand), to obtain foreign currency, but after the completion of the expansion and new refinery.

After 1983, Thailand will be available to export for $300 \times 10^3 \text{T/Y}$ and after 1988 for $560 \times 10^3 \text{T/Y}$.

II LPG USAGE

Every countries are saving crude oil, therefore, they are going to substitute petroleum products (from crude oil) to natural gas and LPG.

New usage of LPG for Thailand

1. Motor car
2. Gas turbine fuel for electric generators of EGAT in province.
3. Others (such as refrigerator)

III. MARKETING RESEARCH IN JAPAN

Thai LPG Production from Natural Gas

in 1983	$304 \times 10^3 \text{ T}$
after 1988	$559 \times 10^3 \text{ T}$

Japanese LPG Domestic Production and Import

Domestic in 1983	$5,917 \times 10^3 \text{ T}$	33.8 %
Import in 1983	$11,589 \times 10^3 \text{ T}$	66.2 %
<hr/>		
Total	$17,506 \times 10^3 \text{ T}$	100.0 %

Japan is very good LPG market for Thailand.

IV FEASIBILITY STUDY

FOB Price of C₃ LPG and C₄ LPG

	C ₃ LPG \$/T	C ₄ LPG \$/T
1979 Jan..	133	111
1989 Jan.	125.5	115.50
1989 April	126.50	127.50
1989 July	160.00	180.00
Price on Spot		
1989 July	200.00	300.00

Latest FOB price of C₃ LPG is 160 \$/T and C₄ LPG is 180 \$/T (before the 2nd oil crisis), the price up is according to tight of all over the world LPG market.

The FOB price of them will be going up very rapidly.

THAI LPG COST VS LPG FOB PRICE

Unit: \$.

Natural Gas Price (from pipeline) \$/MMBTU	C ₃ LPG \$/T 160	168	177	187	192
	C ₃ LPG \$/T 180	189	199	210	216
1.50	+12.26	+20.16	+30.16	+40.16	+45.16
1.70 ^{*1}	+ 1.96	+ 9.86	+19.86	+29.86	+84.86
1.78	- 9.11	- 1.21	+ 8.79	+18.79	+23.79
2.06 ^{*2}	-30.70	-22.80	-10.80	- 0.8	+ 4.2

Note: *1. 1.70 \$/MMBTU may be current natural gas price including transportation fee.

*2 Fuel oil 1,200" equivalent price on calorific value.

Natural gas production is 500 MMscf/D.

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 reporting.

2. The second part of the document outlines the various methods and techniques used to collect and analyze data. It highlights the need for consistent and reliable data collection processes to ensure the validity of the results.

3. The third part of the document describes the different types of data that are collected and analyzed. It includes information on both quantitative and qualitative data, as well as the various sources and methods used to obtain this information.

4. The fourth part of the document discusses the various statistical methods and techniques used to analyze the data. It covers topics such as descriptive statistics, inferential statistics, and regression analysis, among others.

5. The fifth part of the document discusses the various ways in which the results of the analysis can be presented and communicated. It includes information on the use of tables, graphs, and charts, as well as the importance of clear and concise communication.

6. The sixth part of the document discusses the various ways in which the results of the analysis can be used to inform decision-making. It includes information on the use of the results to identify trends, patterns, and areas for improvement, as well as the importance of using the results to guide future actions.

7. The seventh part of the document discusses the various ways in which the results of the analysis can be used to evaluate the performance of an organization. It includes information on the use of the results to identify areas of strength and weakness, as well as the importance of using the results to guide future actions.

8. The eighth part of the document discusses the various ways in which the results of the analysis can be used to improve the quality of an organization's products and services. It includes information on the use of the results to identify areas for improvement, as well as the importance of using the results to guide future actions.

9. The ninth part of the document discusses the various ways in which the results of the analysis can be used to improve the efficiency of an organization's operations. It includes information on the use of the results to identify areas for improvement, as well as the importance of using the results to guide future actions.

10. The tenth part of the document discusses the various ways in which the results of the analysis can be used to improve the overall performance of an organization. It includes information on the use of the results to identify areas for improvement, as well as the importance of using the results to guide future actions.

From the above mentioned table, at present status, if C_3 LPG FOB price is 192 \$/T and C_4 LPG FOB price is 216 \$/T, the profit is nearly zero. In other word, FOB LPG price should be higher than equivalent price of fuel oil 1,200". Anyhow, C_3 and C_4 FOB price will be immediately going up.

So, NGOT should watch a movement of LPG FOB price.

V SALES NATURAL GAS IS DECREASED ACCORDING TO LPG PRODUCTION INCREASE

When LPG production is 100% from natural gas (from well head), the sales natural gas is decreased. Fluor LPG production is not from 100% of natural gas (from well head).

Unit: MMscfd

	1981	1982	1983	1984	1985
Decreased Sales Natural Gas	18.20	31.91	36.00	52.02	46.42
Sales Natural Gas For Existing Industry (50%)	8.77	18.55	30.57	42.66	55.23
	1986	1987	1988	1989	1990
Decreased Sales Natural Gas	52.64	46.16	51.61	44.45	36.97
Sales Natural Gas For Existing Industry (50%)	58.17	59.17	62.13	64.47	66.80

VI LOCATION OF NATURAL GAS PROCESSING UNIT

Thailand has many water ways. LPG transportation cost by water is very cheap. And Thailand has possibility to export LPG to Japan. Therefore, the location of natural gas processing unit should not be far from sea-shore.

If LPG is increased production, NGOT can not supply sales natural gas to the existing industry even if 50% on total consumption,



bccause sales natural gas is decreased according to LPG production
increase.

I appreciate if my report is useful for you.

Sincerely yours,

Y. Kawase

LPG PRODUCTION FROM NATURAL GAS

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1. The first part of the text discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is crucial for ensuring transparency and accountability, particularly in financial reporting and auditing. The text notes that without proper record-keeping, it becomes difficult to track expenses, revenues, and other key financial metrics, which can lead to errors and discrepancies.

2. The second part of the text focuses on the role of internal controls in preventing fraud and mismanagement. It highlights that a robust system of internal controls is essential for safeguarding an organization's assets and ensuring the integrity of its financial statements. The text suggests that these controls should be designed to minimize the risk of errors and to detect any irregularities as early as possible.

3. The third part of the text addresses the need for regular audits and reviews. It states that periodic audits are necessary to verify the accuracy of the records and to ensure that the internal controls are effectively implemented and maintained. The text also mentions that audits can provide valuable insights into areas where improvements can be made, helping to enhance the overall efficiency and effectiveness of the organization's operations.

4. The fourth part of the text discusses the importance of maintaining up-to-date and accurate financial statements. It notes that these statements are a key source of information for stakeholders, including investors, creditors, and regulatory bodies. The text emphasizes that any inaccuracies or omissions in these statements can have significant negative consequences, such as loss of trust and potential legal liabilities.

5. The fifth part of the text concludes by reiterating the overall importance of these practices for the long-term success and sustainability of an organization. It encourages management to take a proactive approach to financial management, ensuring that all necessary steps are taken to maintain accurate records, implement effective internal controls, and conduct regular audits and reviews.

LPG PRODUCTION FROM NATURAL GAS

I FOREWORD

I study LPG production from natural gas. Flour Ocean Services International Inc. reported LPG production from natural gas but not 100% of the gas from pipeline, only 61% in 1990. LPG production from refineries which will be included LPG from the expansion and new refinery is guessed larger than domestic requirement, but nobody can estimate because plants of the expansion and new refinery are not decided. It is evident that the expansion and new refinery should have much cracking units, so LPG production should be large.

Accordingly, whole or mostly of LPG which will be produced from natural gas should be exported, to get foreign currency, but LPG production should make much profit.

Another way to utilize LPG must be developed to increase domestic consumption, such as (1) motor car fuel (2) industrial use (3) small gas turbine of EGAT in province.

II DEFINITION OF LPG

C_3 LPG is liquefied propane and propene, and C_4 LPG is liquefied butanes and butenes, and ordinary LPG is mixture of C_{3s} and C_{4s} which is propene, propane, butanes and butenes. Actually, C_{3s} and C_{4s} cuts can not be perfectly separated to pure C_{3s} and C_{4s} , always mixed a small quantity of before and after cuts. For instance, C_3 LPG is mainly C_{3s} and a small quantity of C_2 and C_4 cut are mixed.

III PHYSICAL PROPERTY OF LPG

Physical property of LPG must be very important, when composition of LPG is changed. TABLE-1 (ATTACH.1) shown the physical property of LPG for recalculation.

Vapor pressure of LPG is very important, because pressure test of LPG vessel is very important when components are changed. Vapor pressure of C_2 , C_3 , C_4 , C_5 mixture is calculated by vapor-liquid

equivalent calculation. This calculation takes long time without computer, but from Fig.1 VAPOR PRESSURE OF PROPANE AND PROPYLENE (ATTACH.2) and Fig.2 VAPOR PRESSURE OF BUTANES AND BUTENES (ATTACH.3), we can know outline.

When highest temperature of Thailand is 44.5 °C at Uttradit province on April 27, 1960, C_{3S} and C_{4S} vapor pressure at 44.5 °C is as follows:

44.5 °C	=	112.1 °F
		Vapor Pressure at 44.5 °C
Propene	17.8	atm.
Propane	14.5	atm.
i-Butane	5.6	atm.
c-Butane	3.5	atm.

When C₃ percentage of C₃ and C₄ mixed LPG is high, LPG vapor pressure is closed to 17.8 atm., and if C₄ percentage of C₃ and C₄ mixed LPG is high, LPG vapor pressure is closed to 3.5 atm. Maximum vapor pressure difference which is according to composition of C₃ and C₄ is nearly 17.8 - 3.5 atm. And when C₄ LPG is used, heating for vaporisation is needed, so vapor pressure of C₄ vapor pressure is higher than ordinal temperature.

The LPG specification of Thailand is 30% propane and 70% butanes, but LPG composition from natural gas is about 35.5% butanes and about 64.5% propane, thus vapor pressure of natural gas LPG is very higher than it of refinery LPG, but difference of vapor pressure is less than 14.3 atm. the pressure test of LPG vessel must be checked.

IV LPG SPECIFICATION

Thai industrial specification of LPG is shown in TABLE-2 (ATTACH.4). And Japanese industrial specification is shown in TABLE-3 (ATTACH.5).

Difference of LPG (C₃ and C₄ mixed LPG for household) between Thailand and Japan is big. Rate of C₃ and C₄ component in Thailand is 30 : 70, in Japan 80 : 20 in winter and 70 : 30 in summer.

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 highlights that records should be maintained in a clear, organized, and accessible manner, ensuring that all relevant information is captured and preserved for future reference.

2. The second part of the document addresses the challenges associated with record-keeping, such as the volume of data, the complexity of information, and the risk of data loss or corruption. It suggests that implementing robust data management systems and protocols can help mitigate these risks and ensure the integrity and security of the records. Additionally, the text stresses the importance of regular audits and reviews to verify the accuracy and completeness of the data.

3. The third part of the document focuses on the role of technology in enhancing record-keeping processes. It discusses how digital tools and software solutions can streamline data collection, storage, and retrieval, making the process more efficient and cost-effective. The text also mentions the importance of ensuring that these technologies are secure and compliant with relevant regulations and standards.

4. The fourth part of the document discusses the importance of training and education for staff involved in record-keeping. It emphasizes that staff should be equipped with the necessary skills and knowledge to handle data accurately and securely. Regular training sessions and workshops can help keep staff updated on the latest best practices and technologies in the field.

5. The fifth part of the document concludes by reiterating the overall importance of record-keeping and the need for a comprehensive and integrated approach. It calls for a commitment to high standards of data management and transparency, ensuring that all records are maintained in a way that supports the organization's goals and objectives.

Standard specification of LPG imported in Japan is shown in TABLE-4 (ATTACH.6).

V LPG DEMAND FORECAST

LPG demand forecast in Thailand (NEA), JAPAN (MITI) are shown in TABLE-5 (ATTACH.7). And it of Mitsui's estimation is shown in TABLE-6 (ATTACH.8).

In Japanese statistics (TABLE-5 and 6, ATTACH.7 and 8), LPG demand forecast and each service as break-down are shown. As TABLE-5 (ATTACH.7) LPG demand in Thailand is very small compared with Japan. Moreover in Japan, town gas which is very similar to LPG consumption is very big, but Thailand has no town gas. So, Thailand must be developed the utilization of LPG for household, commerce and industry.

VI LPG USAGE

LPG usage in Japan is shown in Japanese specification of TABLE-3 (ATTACH.5) and LPG demand forecast of TABLE-5 and 6 (ATTACH.7 and 8). I explain the use of LPG more detail as follows :

VI.1 Household and Commerce

LPG is used as room heating, cooking, hot water and refrigerator for household and commerce.

VI.2 Industry

Butane utilization for industry has been increased recently.

Fuel of coal, fuel oil (kerosene, gas oil, fuel oil) have been replaced by LPG because of an economical point, preventing air pollution (low sulfur content) and no ash and soot (products are not contaminated by ash and soot), moreover, heating value is high, temperature control and handling are very easy.

- Metal industry (melting decarbonizing, gas reforming, hardening, quenching, annealing, cutting and scarfing forging)

The first part of the paper discusses the importance of the
 \mathcal{L}^2 norm in the context of the problem. It is
 shown that the \mathcal{L}^2 norm is a natural choice
 for the norm in this context, and that it is the only
 norm that is invariant under the action of the
 $SO(2)$ group. The second part of the paper
 discusses the properties of the \mathcal{L}^2 norm,
 and shows that it is a Hilbert norm. The third part
 of the paper discusses the properties of the
 \mathcal{L}^2 norm, and shows that it is a Hilbert
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 it is a Hilbert norm. The eighth part of the paper
 discusses the properties of the \mathcal{L}^2 norm,
 and shows that it is a Hilbert norm. The ninth part
 of the paper discusses the properties of the
 \mathcal{L}^2 norm, and shows that it is a Hilbert
 norm. The tenth part of the paper discusses the
 properties of the \mathcal{L}^2 norm, and shows that
 it is a Hilbert norm.

- Ceramic industry (pottery, tile, whetstone, lime calcining, glass melting and molding work)
- Textile industry (gassed thread, plastic thread, plastic treating and dyeing)
- Foodstuffs (cake, ham, bread).
- Printing and Painting

VI.3 Agriculture Industry (drying of tobacco leaf, grain, pasture, and ageing of fluts, and green house, and poultry farming and pig raising)

VI.4 Town Gas

C_3 and C_4 are mixed with coal gas to increase calorific value.

VI.5 Internal Combusion Engine

- Taxis in big city are using LPG, octane number of C_3 is 96, and it of C_4 is 90.

- Tractor
- Forklift

VI.6 Petrochemical

- Raw material of ethylene, ammonia, hydrogen and synthetic gas.

polyethylene (resin)
 styrene butadiene (rubber)
 polystyrene (resin)
 Tetoron (polyester fiber)
 polyester (resin)
 surface active gent (detergent)
 ethanol (solvent, raw material)
 pol.vinyl chloride (resin)
 pol.vinylidene resin & fiber

Ethand -----

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is crucial for ensuring transparency and accountability, particularly in the context of public administration or financial reporting. The text suggests that such records should be kept in a secure and accessible format, allowing for easy review and audit.

2. The second part of the document addresses the need for regular communication and reporting. It states that stakeholders should be kept informed of progress and any challenges encountered. This involves providing clear, concise reports that highlight key findings and recommendations. The document also notes that effective communication is essential for building trust and fostering a collaborative environment.

3. The third part of the document focuses on the importance of continuous improvement. It argues that organizations should regularly evaluate their processes and performance to identify areas for enhancement. This can be achieved through the implementation of feedback loops and the adoption of best practices. The text encourages a culture of innovation and learning, where employees are empowered to suggest and implement improvements.

4. The final part of the document concludes by reiterating the overall goals and objectives of the project or initiative. It stresses the importance of staying focused on these goals and ensuring that all activities are aligned with them. The document also provides a summary of the key points discussed and offers some final thoughts on the path forward.

4-ethyl lead (additive)
dioctyl phthalate (plasticizer)
butyl acetate (solvent)
acetic acid (raw material)
ethyl acetate (solvent, raw material)
pentacrythritol (resin)
higher alcohols (detergent, plasticizer)

iso propyl alcohol (solvent)
acetone (solvent)
methacrylic resin
epoxy resin
urethane foam
acrylic fiber
detergent
butyl rubber
polypropylene glutamic acid (ajinomoto)

Propylene -----

C₄ cuts
n-butene
butadiene
isobutene

methylethylketone (solvent)
polyester resin
polybutene (rubber)
styrene butadiene rubber
nitrile butadiene rubber
polybutene 1 (rubber)
polybutadiene (rubber)
Nylon 66 (fiber)
butyl gum
polyisoprene rubber

VII MARKETING RESEARCH IN JAPAN

VII.1 Japanese LPG Import by Supply Sources

Japan imported LPG from Middle East (Saudi Arabia, Kuwait, Iran), Australia, Canada and Venezuela as TABLE-7 (ATTACH.9) and about a half of total import is from Saudi Arabia which is shown in FIG.3 (ATTACH.10).

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is crucial for ensuring transparency and accountability, particularly in the context of public administration or financial management. The text suggests that such records should be kept in a secure and accessible format, allowing for easy retrieval and verification.

2. The second part of the document addresses the need for regular audits and reviews. It states that these processes are essential for identifying any discrepancies or irregularities in the data. The document further explains that audits should be conducted by independent parties to ensure objectivity and fairness. It also mentions that the results of these audits should be used to improve internal controls and prevent future issues.

3. The third part of the document focuses on the role of technology in record-keeping. It highlights how digital systems can significantly enhance the efficiency and accuracy of data management. The text discusses various software solutions and tools that can be used to store, organize, and analyze large volumes of information. It also notes that while technology offers many benefits, it is important to ensure that the systems are secure and that data is protected from unauthorized access.

4. The fourth part of the document discusses the importance of training and education for staff involved in record-keeping. It suggests that regular training sessions should be organized to keep employees updated on the latest practices and technologies. The document also emphasizes the need for clear guidelines and procedures to be established, so that all staff are aware of their responsibilities and the standards they must adhere to.

5. The fifth and final part of the document concludes by reiterating the overall importance of maintaining high standards of record-keeping. It states that this is not just a matter of administrative convenience, but a fundamental requirement for good governance and public service. The document ends with a call to action, urging all relevant parties to take the necessary steps to ensure that their records are accurate, complete, and secure.

VII.2 LPG Import Quantity of Each Company in Japan

LPG import quantity of each company in Japan is shown in TABLE-8 (ATTACH.11), and share of LPG import in Japan is shown in FIG.4 (ATTACH.12).

VII.3 Import Terminal Capacity in Japan

LPG import terminal in Japan is spreaded in mainland and Kyushu Island which is shown in FIG.5 (ATTACH.13).

LPG import terminal capacity by area is shown in TABLE-9 (ATTACH.14) and by company in TABLE-10 (ATTACH.15).

VII.4 LPG Sales Quantity of Each Company in Japan

LPG sales quantity of each company in Japan is shown in TABLE-11 (ATTACH.16), and share of LPG sales in Japan is shown in FIG.6 (ATTACH.17).

VII.5 LPG Supply and Demand Forecast in Japan

LPG supply and demand forecast was shown in TABLE-6 (ATTACH.8). In Japan, LPG demand is very big but domestic production is small.

	1978	1979	1980	1981	1982	1983
Supply						
Domestic %	36.2	34.7	35.8	34.3	34.4	33.8
Import %	63.8	65.3	64.2	65.7	65.6	66.2
Total	100.0	100.0	100.0	100.0	100.0	100.0

Japan is big LPG importing country, and LPG domestic production is growing up corresponding to crude oil throughput but LPG demand is growing up year by year more than LPG domestic production. Thus, domestic production percentage was 36.2% on demand in 1978 and will be 33.8% in 1983.

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.

2. The second part of the document outlines the various methods and techniques used to collect and analyze data. It highlights the need for consistent and reliable data collection processes to support effective decision-making.

3. The third part of the document focuses on the analysis and interpretation of the collected data. It discusses the various statistical and analytical tools used to identify trends, patterns, and anomalies in the data.

4. The fourth part of the document discusses the importance of communication and reporting in the context of data analysis. It emphasizes the need for clear and concise communication of findings to stakeholders and the importance of providing actionable insights.

5. The fifth part of the document discusses the challenges and limitations of data analysis. It highlights the need for careful consideration of the quality and reliability of the data and the potential for bias and error in the analysis process.

6. The sixth part of the document discusses the future of data analysis and the role of emerging technologies. It highlights the potential of artificial intelligence and machine learning to revolutionize the way data is analyzed and interpreted.

7. The seventh part of the document discusses the ethical implications of data analysis. It emphasizes the need for transparency and accountability in the use of data and the importance of protecting individual privacy and security.

8. The eighth part of the document discusses the importance of ongoing education and training in the field of data analysis. It highlights the need for professionals to stay up-to-date on the latest developments and techniques in the field.

9. The ninth part of the document discusses the importance of collaboration and teamwork in data analysis. It emphasizes the need for professionals to work together to share knowledge and expertise and to address complex data analysis challenges.

10. The tenth part of the document discusses the importance of continuous improvement and innovation in data analysis. It emphasizes the need for professionals to constantly seek out new and better ways to analyze and interpret data.

VII.6 Japan Petroleum Development Corporation (JPDC)

Japanese Government has 100% share of JPDC, he assists a half of investment for exploratory drilling in country and foreign countries. And when crude oil and natural gas is discovered and commercial production is commenced, the fund is returned to JPDC, and if well is dry, the fund is not necessary returned to JPDC. But, the fund is tax from nation thus if Thailand excess product from natural gas and wants to export, Japanese Government expects that Thailand export them to Japan in proportion to share hold.

VIII MATERIAL BALANCE OF C₃ AND C₄ LPG (FROM NATURAL GAS)

C₃ and C₄ cuts in the gas from pipeline is shown in TABLE-12 (ATTACH.18). As was noted previously, C₃ and C₄ cuts separation (yield) must be estimated by computer, and 100% of them can not be recovered, so, I assume that C₃ yield is 90% on total C₃ in natural gas, and C₄ yield is 98% on total C₄ in natural gas (see TABLE-12, ATTACH.18).. These yields are based on Chiyoda's information.

I calculate material balance and heat balance of C₃ and C₄ LPG which are met the standard of specification of LPG imported in Japan (see TABLE-4, ATTACH.6), are shown in TABLE-13-1 and -2, (ATTACH.19-1 and -2). (13)-(19) of TABLE-13-2 shows calculation of heating value of C₃ LPG and C₄ LPG. These physical data are applied from TABLE-14-1 and -2 (ATTACH.20-1 and -2). SOURCE: DATA BOOK ON HYDROCARBONS), afterward I will use data from same tables.

Then, I calculate production of C₃ and C₄ LPG, and show in TABLE-15 (ATTACH.21) as Lb/H.

C₃ and C₄ LPG production is shown in TABLE-16 (ATTACH.22) as ton.

C₃ and C₄ LPG value and their average value are shown in TABLE-17 (ATTACH.25).

Note: When I calculated heating value, it is gross heating value not net heating value, because natural gas price is based on gross heating value. And T means MT and \$ means US\$.

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 government operations. The text notes that such records should be accessible to the public and should be maintained in a secure and organized manner.

2. The second part of the document addresses the issue of data privacy and security. It highlights the need for robust security measures to protect sensitive information from unauthorized access, disclosure, or loss. The text suggests that organizations should implement comprehensive security protocols, including encryption, access controls, and regular security audits, to ensure the integrity and confidentiality of their data.

3. The third part of the document focuses on the importance of regular audits and reviews. It states that periodic audits are necessary to identify any discrepancies, errors, or areas for improvement in the organization's operations. The text recommends that audits should be conducted by independent parties to ensure objectivity and fairness. Additionally, it suggests that the results of these audits should be used to inform decision-making and to implement corrective actions where necessary.

4. The fourth part of the document discusses the role of technology in enhancing organizational efficiency and effectiveness. It notes that the adoption of modern technologies, such as cloud computing, artificial intelligence, and data analytics, can significantly improve the way organizations operate. The text encourages organizations to invest in technology and to provide training for their employees to ensure they are equipped to use these tools effectively.

5. The fifth and final part of the document concludes by emphasizing the importance of continuous improvement and innovation. It states that organizations should strive to stay up-to-date with the latest trends and developments in their industry. The text suggests that organizations should foster a culture of innovation and encourage their employees to think creatively and propose new ideas for improving the organization's performance.

IX LPG FOB BANGKOK PRICE (EXPORT LPG)

LPG price in Thailand (domestic LPG price) is very high, so LPG from natural gas is to make much profit according to Mr. Shishido's report last year.

LPG (CIF) price which was imported to Japan about 2 months ago was \$143/T, if freight rate between Thailand and Japan is assumed as about \$15/T, FOB Thailand might be \$128/T.

FOB price of Kuwait D/D LPG is shown in FIG.7 (ATTACH.23) C₃ price was higher than C₄ price, but recently both prices have been closed, because C₄ LPG demand has been grown up.

- o The Nippon Economic Newspaper reported as following :

Dated on June 24, 1979

Kuwait FOB Price (price in April - June in 1979)

C ₃ LPG	126.5 \$/T	Note: See the above mentioned \$128/T.
C ₄ LPG	127.5 \$/T	

Price on spot at Houston, USA

C ₃ LPG	150 \$/T
C ₄ LPG	300 \$/T

- o The same newspaper

Dated on July 5, 1979

Kuwait FOB Price (in July 1979)

C ₃ LPG	160 \$/T
C ₄ LPG	180 \$/T

Price on spot

C ₃ LPG	200 \$/T
C ₄ LPG	300 \$/T

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is crucial for ensuring transparency and accountability in the organization's operations.

2. The second part of the document outlines the various methods and tools used to collect and analyze data. It highlights the need for consistent data collection practices and the use of advanced analytical techniques to derive meaningful insights from the data.

3. The third part of the document focuses on the role of technology in data management and analysis. It discusses how modern software solutions can streamline data collection, storage, and processing, thereby improving efficiency and accuracy.

4. The fourth part of the document addresses the challenges associated with data management, such as data quality, security, and privacy. It provides strategies to mitigate these risks and ensure that the data remains reliable and secure.

5. The fifth part of the document discusses the importance of data governance and the role of various stakeholders in ensuring that data is used ethically and responsibly. It emphasizes the need for clear policies and procedures to guide data handling practices.

6. The sixth part of the document concludes by summarizing the key findings and recommendations. It stresses the importance of continuous monitoring and improvement of data management processes to stay ahead in a rapidly changing business environment.

o FOB Persian Gulf (Mitsui & Co.estimated)

April - June in 1979		July - Sept. in 1979	
C ₃ LPG	C ₄ LPG	C ₃ LPG	C ₄ LPG
125 - 126.5	123 - 127.5	159 - 160	177 - 180

Freight of Persian Gulf to Japan may be 22 - 25 \$/T.

Freight of Siam Gulf to Japan may be 15 \$/T.

All over the world, LPG is very tight, because C₄ is mixed in gasoline and used as petrochemical raw material (substituted naphtha).

The LPG price is risen in July 1979, being caused by LPG shortage not by crude oil price up. Change of crude oil standard price is shown in FIG.8 (ATTACH.24).

I calculate average price of C₃ and C₄ LPG produced from Siam Gulf natural gas (the gas from pipeline), and show it in TABLE-17 (ATTACH.25).

Ratio of C₃ LPG and C₄ LPG of produced from the gas from pipeline is 64.5 : 35.5 (wt), and average price is 167.1 \$/T when C₃ LPG price is 160 \$/T and C₄ LPG price is 180 \$/T.

According to Mr. Shishido's report (in 1978), exrefinery price of LPG in Thailand is as follows : (For your reference)

$$\begin{aligned} \text{Exrefinery Price} &= 3.1397 \text{ \$/Kg}^* \\ &= 154.096 \text{ \$/T} \end{aligned}$$

Note: * Exrefinery price of LPG was not changed before July 1979.

The price of LPG in Thailand (in June 1979) was higher than the LPG of FOB Kuwait price (April and June 1977).

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is essential for ensuring transparency and accountability in the organization's operations.

2. The second part of the document outlines the various methods and tools used to collect and analyze data. It highlights the need for consistent data collection procedures and the use of advanced analytical techniques to derive meaningful insights from the data.

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4. The fourth part of the document addresses the challenges associated with data management, such as data quality, security, and privacy. It provides strategies to mitigate these risks and ensure that the data remains reliable and secure.

5. The fifth part of the document concludes by summarizing the key findings and recommendations. It stresses the importance of ongoing monitoring and evaluation to ensure that the data management processes remain effective and up-to-date.

X CASE-1 EXPENDITURE AND REVENUE IN CASE OF NATURAL GAS PRICE
1.50\$/MMBTU, C₃ LPG PRICE 160\$/T AND C₄ LPG PRICE 180 \$/T
(500 MMscf/D)

X.1 Operation Cost

X.1.1 Production

In Mr. Shishido's report "THE PRELIMINARY ECONOMIC STUDY
OF LPG RECOVERY FROM NATURAL GAS", LPG production was estimated
as follows :

C ₃	220,000	T/Y
C ₄	160,000	T/Y
Total	380,000	T/Y

My calculation of LPG production (in case of 500 MMscf/D
natural gas production schedule) is as follows: (in 1987)

C ₃ LPG	272.52	MT/Y
C ₄ LPG	149.88	MT/Y
Total	422.40	MT/Y (see TABLE-16, ATTACH.22)

X.1.2 Construction Cost of LPG Production

Construction cost was estimated by Chiyoda Chemical
Engineering and Construction Company based on 380,000 T/Y LPG
production.

Designed recovery ratio is as follows:

C ₃	:	more than	90%
C ₄	:	more than	98%

CO₂ removal unit is necessary when natural gas charge to
LPG plant, CO₂ content must be less than 1%, because turboexpand
is applied :



	Chiyoda Estimate	Correction of Production rate	Correction 1979 Plant Cost	Plant Cost per Ton
	MM \$	MM \$	MM \$	\$/T
LPG Unit	70			
CO ₂ Removal Unit	16			
Total	86	92.610^{*1}	98.112	232.27^{*3}

- Note: *1 $86.000 \text{ MM\$} \times \left(\frac{422,400 \text{ T/Y}}{380,000 \text{ T/Y}} \right)^{0.7} = 92.610 \text{ MM\$}$
- *2 $92.610 \text{ MM\$} \times 1.07 \% = 98.112 \text{ MM\$}$
7% up/year of construction cost
- *3 $98.112 \text{ MM\$} \div 422.40 \text{ MT} = 232.27 \text{ \$/T}$

Fluor's estimation of gas plant (the end of 1979)

200 MMscf/D 68,301 MM\$

500 MMscf/D x

$x = 68,301 \text{ M\$} \times \left(\frac{500}{200} \right)^{0.7} = 129,714$

$129,714 \text{ M\$} \times \left(1 + \frac{0.07}{2} \right) = 134,254$

$\frac{134,254 \text{ M\$}}{98,112 \text{ M\$}} = 1.37 \text{ (37\% higher than Japan)}$

The difference could not be clarify, it might be caused by different process and price of machine and equipment. And it is contained the cost of the dew point control unit.

X.1.3 Dew Point Control Unit

When LPG recovery is from 100% natural gas (the gas from pipeline), the dew point control unit is unnecessary. Thus, LPG recovery acts as dew point control duty, the duty is not for LPG production. Thus, the operation cost of dew point control must be eliminated from the cost of LPG production.

The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry should be supported by a valid receipt or invoice. This ensures transparency and allows for easy verification of the data.

In the second section, the author outlines the various methods used to collect and analyze the data. This includes both primary and secondary data collection techniques. The primary data was gathered through direct observation and interviews, while secondary data was obtained from existing reports and databases.

The third section provides a detailed description of the data analysis process. This involves identifying trends, patterns, and anomalies within the dataset. Statistical tools and software were used to facilitate this process, ensuring that the results are both accurate and reliable.

Finally, the document concludes with a summary of the findings and their implications. It highlights the key insights gained from the study and offers recommendations for future research and practice. The author notes that while the current study provides valuable information, there are still several areas that require further investigation.

The cost of dew point control can not calculate at this stage. I assumed for 15% of total operation cost of LPG production.

X.1.4 Operation Cost \$/T of LPG Production

Expense

A. Natural gas price is 1.5 \$/MMMBTU

	% on Construction Cost	\$/T
(1) Depreciation (20 years)	5	11.61
(2) Interest for Construction Cost	5	11.61
(3) Tax and Insurance	2	4.65
(4) Maintenance	3	6.97
(5) Administration	2	4.65
(6) Overhead	2	4.65
Total	19	44.14

Note: Construction cost is 232.27 \$/T

B. Interest of working capital

C_3 and C_4 LPG average price is 167.1 \$/T (from TABLE-17, ATTACH.25)

$$167.1 \text{ $/T} \times 422,400 \text{ T/Y} = 70.58 \text{ MM $/Y}$$

$$70.58 \text{ MM $/Y} \times \frac{1.5 \text{ Mon.}}{12 \text{ Mon.}} = 8.82 \text{ MM $/Y}$$

$$8.82 \text{ MM $/Y} \times 8\% = 0.71 \text{ MM $/Y}$$

8% is interest.

$$0.71 \text{ MM $/Y} \div 422,400 \text{ T/Y} = 1.68 \text{ $/T}$$

C. Utility

Natural gas consumption is :

For LPG plant 9 MMscf/D

Cor CO₂ plant 18 MMscf/D

Total 27 MMscf/D



(Heating value of the natural gas was assumed as 1,050 BTU/scf by Mr. Shishido).

Natural Gas Price

Mr. Shishido's Estimation	1.555 ¢/MMBTU (compressor station at off-shore)
	1.544 ¢/MMBTU (compressor station at on-shore)
Fluor's Report	1.50 ¢/MMBTU
In the report, 2 natural gas prices were applied	1.75 ¢/MMBTU
My Calculation	1.50 ¢/MMBTU

The price is not included the transportation charge from the natural gas processing unit to end user. So, I apply for 1.50 ¢/MMBTU of natural gas charge.

$$27 \text{ MMscf/D} \times 1,050 \text{ BTU/scf} \times \frac{1.50 \text{ ¢}}{1 \text{ MMBTU}} = 42.525 \text{ ¢/D}$$

$$= 15.52 \text{ MM¢/Y}$$

$$15.52 \text{ MM¢/Y} \times \frac{422,400 \text{ T/Y}}{380,000 \text{ T/Y}} \div 422,400 = 40.84 \text{ ¢/T}$$

D. Labor cost

$$15 \text{ persons} \times 4 \text{ shifts} = 60 \text{ persons}$$

Salary and other expense is assumed as 200 ¢/Mon. Month

$$200 \text{ ¢/Mon month} \times 60 \text{ persons} \times 12 \text{ months} = 0.144 \text{ MM¢/Y}$$

$$0.144 \text{ MM¢/Y} \div 422,400 \text{ T/Y} = 0.34 \text{ ¢/T}$$

E. Operation cost

	¢/T
(1) Expense	44.14
(2) Interest for Working Capital	1.68
(3) Utility	40.84
(4) Labor Cost	0.34
<hr/>	
Total	87.00

The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry should be supported by a valid receipt or invoice to ensure transparency and accountability.

In the second section, the author outlines the various methods used for data collection and analysis. This includes both primary and secondary research techniques, as well as the use of statistical software to process large datasets.

The third section provides a detailed overview of the findings from the study. It highlights key trends and patterns observed in the data, as well as the implications of these findings for the industry and future research.

Finally, the document concludes with a series of recommendations based on the research results. These suggestions are aimed at improving operational efficiency, enhancing customer satisfaction, and addressing any identified gaps in the current processes.

F. Operation cost minus the cost of dew point control unit

$$87.00 \text{ \$/T} \times (100 - 15)\% = 73.95 \text{ \$/T}$$

X.2 Cost of Natural Gas Charge

$$50.92 \text{ MMBTU/T}^* \times \frac{1.5 \text{ \$/MMBTU}}{\text{MMBTU}} = 76.38 \text{ \$/T}$$

Note: * is come from TABLE-20 (ATTACH.28).

TABLE-20 (ATTACH.28) is calculated from TABLE-18 and -19 (ATTACH.26 and 27).

X.3 Expenditure

	\\$/T
Cost Natural Gas Charge	76.38
Operation Cost	73.95
<hr/>	
Total	150.33

Selling charge (including shipping) is assumed as 3% on total expenditure.

Expenditure is as follows :-

$$150.33 \text{ \$/T} \times (1 + 0.03) = 154.84 \text{ \$/T}$$

X.4 Revenue

C₃ and C₄ LPG average FOB Bangkok price is 167.1 \\$/T which is from TABLE-17-7 (ATTACH.25).

X.5 Profit or Loss

$$167.1 \text{ \$/T} - 154.84 \text{ \$/T} = +12.26 \text{ \$/T}$$

$$12.26 \text{ \$/T} - 154.84 \text{ \$/T} \times 100 = + 7.9\%$$

In this case, profit is 12.26 \\$/T.

(see TABLE-21, ATTACH.29)

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X' CASE-1' EXPENDITURE AND REVENUE IN CASE OF NATURAL GAS PRICE 1.70 \$/MMBTU, C₃ LPG PRICE 160 \$/T AND C₄ LPG PRICE 180 \$/T (500 MMSCF/D)

In X, I applied 1.50 \$/MMBTU of natural gas, but actual natural gas price in 1979 may be 1.70 \$/MMBTU, so I calculate in case of 1.70 \$/MMBTU as follows :

X'.1 Utility

$$27 \text{ MMscf/H} \times 1,050 \text{ BTU/scf} \times \frac{1.70 \text{ \$}}{1 \text{ MM}} = 48,195 \text{ \$/D}$$

$$= 17.59 \text{ MM\$/Y}$$

$$17.59 \text{ MM \$/Y} \times \frac{422,400 \text{ T/Y}}{380,000 \text{ T/Y}} \div 422,400 \text{ T/Y} = 46.29 \text{ \$/T}$$

X'.2 Operation Cost

	\$/T	
(1) Expense	44.14	no change
(2) Interest for Working Capital	1.68	no change
(3) Utility	46.29	
(4) Labor Cost	0.34	no change
<hr/>		
Total	92.45	

$$92.45 \text{ \$/T} \times (100 - 15)\% = 78.58 \text{ \$/T}$$

X'.3 Cost of Natural Gas Charge

$$50.92 \text{ MMBTU/T} \times \frac{1.7 \text{ \$}}{\text{MMBTU}} = 86.56 \text{ \$/T}$$

X'.4 Expenditure

	\$/T
Cost of natural gas charge	86.56
Operation cost	78.58
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Total	165.14

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XI.5 Profit and Loss

$$167.14 \text{ ¢/T} - 165.14 \text{ ¢/T} = + 1.96 \text{ ¢/T}$$

$$1.96 \text{ ¢/T} \div 165.14 \text{ ¢/T} = + 1.2\%$$

In this case, profit is 1.96 ¢/T.

XI CASE-2 EXPENDITURE AND REVENUE IN CASE OF NATURAL GAS PRICE EQUIVALENT TO FUEL OIL PRICE (2.063 ¢/MMBTU) (500 MMSCF/D)

XI.1 Natural Gas Price Equivalent to Fuel Oil 1,200"

$$\text{Fuel Oil 1,200"} \quad 1.6157 \text{ ¢/lit (May 1, 1978)}$$

$$1.6157 \text{ ¢/lit} = 0.0792 \text{ ¢/lit}$$

$$1 \text{ ¢} = 20.4 \text{ ¢}$$

Heating value (Gross)

400"	9,371 Kcal/lit		
		1,200"	9,675 Kcal/lit (assumed)
1,500"	9,826 Kcal/lit		
	9,675 Kcal/lit	=	38,392.86 BTU/lit
	1 Kcal	=	3.96825 BTU

$$0.0792 \text{ ¢/lit} - 38,392.86 \text{ BTU/lit} \times \text{MMBTU} = 2.063 \text{ ¢/MMBTU}$$

XI.2 Utility

$$27 \text{ MMscf/D} \times 1,050 \text{ BTU/scf} \times \frac{2.063 \text{ ¢}}{\text{MMBTU}} = 58,486 \text{ ¢/D}$$

$$= 21.35 \text{ MM¢/Y}$$

$$21.35 \text{ MM¢/Y} \times \frac{422,400 \text{ T/Y}}{380,000} \div 422,400 \text{ T/Y} = 56.18 \text{ ¢/T}$$

XI.3 Operation Cost

	¢/T	
(1) Expense	44.14	no change
(2) Interest for Working Capital	1.68	no change
(3) Utility	56.18	
(4) Labor Cost	0.34	no change
<hr/>		
Total	102.34	

1. The first part of the document discusses the importance of maintaining accurate records of all transactions.

2. It also emphasizes the need for regular audits to ensure the integrity of the financial data.

3. Furthermore, the document highlights the role of transparency in building trust with stakeholders.

4. The final section concludes by stating that these practices are essential for the long-term success of any organization.

5. In addition, the document provides a detailed overview of the various financial reporting standards.

6. It also includes a list of key metrics that should be monitored on a regular basis.

7. The document further explores the challenges associated with implementing these practices.

8. Finally, it offers several practical tips and recommendations for organizations looking to improve their financial reporting.

9. The document is intended to serve as a comprehensive guide for anyone involved in financial management.

10. It is hoped that this information will be helpful and informative to all readers.

11. The document is available for download at the following link: [\[Link\]](#)

12. For more information, please contact our support team at [\[Email\]](#).

13. We appreciate your interest in our work and look forward to serving you in the future.

14. Thank you for your time and attention.

Total operation cost minus the cost of dew point control unit.

$$102.34 \text{ \$/T} \times (100 - 15)\% = 86.99 \text{ \$/T}$$

XI.4 Cost of Natural Gas Charge

$$50.92 \text{ MMBTU/T} \times \frac{2.063 \text{ \$}}{\text{MMBTU}} = 105.05 \text{ \$/T}$$

XI.5 Expenditure

	\\$/T
Cost Natural Gas Charge	105.05
Operation Cost	86.99
<hr/>	
Total	192.04

Selling charge (including shipping) is assumed as 3% on total expenditure.

$$192.04 \text{ \$/T} \times (1 + 0.03)\% = 197.80 \text{ \$/T}$$

XI.6 Revenue

C₃ and C₄ LPG average FOB Bangkok price is 167.1 \\$/T which is come from TABLE-17 (7) (ATTACH.25).

XI.7 Profit and Loss

$$167.1 \text{ \$/T} - 197.80 \text{ \$/T} = -30.7 \text{ \$/T}$$

$$-30.7 \text{ \$/T} \div 197.80 \text{ \$/T} = -15.5\%$$

In this case, loss is 30.7 \\$/T.

XII CASE-3 EXPENDITURE AND REVENUE IN CASE OF NATURAL GAS PRICE IS MIDDLE OF CASE-1 AND CASE-2 (1.78 \\$/MMBTU) (500 MMscf/D)

XII.1 Natural gas price

CASE-1	1.50	\\$/MMBTU
CASE-2	2.063	\\$/MMBTU
CASE-3	1.78	\\$/MMBTU

Average of CASE-1 and CASE-2 is 1.78 \\$/MMBTU.

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XII.2 Utility

$$27 \text{ MMscf/D} \times 1,050 \text{ BTU/scf} \times \frac{1.78 \text{ \$}}{\text{MMBTU}} = 50,463 \text{ \$/D}$$
$$= 18.42 \text{ MM \$/Y}$$

$$18.42 \text{ MM\$/Y} \times \frac{422,400 \text{ T/Y}}{380,000 \text{ T/Y}} \div 422,400 \text{ T/Y} = 48.47$$

XII.3 Operation Cost

	\$/T	
(1) Expense	44.14	no change
(2) Interest for Working Capital	1.68	no change
(3) Utility	48.47	
(4) Labor Cost	0.34	no change
<hr/>		
Total	94.63	

Total operation cost minus the cost of dew point control unit

$$94.63 \text{ \$/T} \times (100 - 15)\% = 80.44 \text{ \$/T}$$

XII.4 Cost of Natural Gas Charge

$$50.92 \text{ MMBTU/T} \times \frac{1.78 \text{ \$}}{\text{MMBTU}} = 90.64 \text{ \$/T}$$

XII.5 Expenditure

Cost Natural Gas Charge	90.64 \\$/T
Operation Cost	80.44 \\$/T
<hr/>	
Total	171.08 \\$/T

Selling charge (including shipping) is assumed as 3% on total expenditure.

$$171.08 \times (1 + 0.03)\% = 176.21 \text{ \$/T}$$

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 auditing. The text notes that incomplete or inaccurate records can lead to significant errors and discrepancies, which may have legal and financial consequences.

2. The second part of the document outlines the various methods and tools used for data collection and analysis. It mentions the use of spreadsheets, databases, and specialized software to manage large volumes of information. The text also discusses the importance of data security and privacy, highlighting the need for robust protocols to protect sensitive information from unauthorized access and breaches.

3. The third part of the document focuses on the integration of data from different sources and the use of analytics to derive meaningful insights. It describes how data from various departments and systems can be combined to provide a comprehensive view of organizational performance. The text also touches upon the challenges of data integration, such as ensuring data consistency and quality across different platforms.

4. The fourth part of the document addresses the role of technology in modern data management and analysis. It discusses the impact of cloud computing, big data, and artificial intelligence on the way organizations handle their data. The text notes that these technologies have significantly increased the capacity and efficiency of data processing, but also introduced new risks and complexities that must be managed carefully.

5. The fifth part of the document concludes by summarizing the key points and emphasizing the ongoing nature of data management. It states that as technology continues to evolve, organizations must stay updated with the latest trends and best practices to remain competitive and effective in their operations. The text also encourages a culture of data-driven decision-making and continuous improvement.

XII.6 Revenue

C₃ and C₄ LPG average FOB Bangkok price is 167.1 \$/T which is come from TABLE-17 (7) (ATTACH.25).. -

XII.7 Profit and Loss

$$167.1 \text{ \$/T} - 176.21 \text{ \$/T} = -9.11 \text{ \$/T}$$

$$-9.11 \text{ \$/T} \div 176.21 \text{ \$/T} = -5.2 \%$$

In this case, loss is 9.11 \$/T.

XIII RESULT OF CASE-1, CASE-1', CASE-2 AND CASE-3 (500 MMSCF/D)

When C₃ LPG price is 160 \$/T and C₄ LPG price is 180 \$/T, average 167.1 \$/T, natural gas price must be 1.66 \$/T at profit zero point which is shown in FIG.9 (ATTACH.30). These calculations are based on 272.52×10^3 T/Y of C₃ LPG production, and 149.88×10^3 T/Y of C₄ LPG production in 1984 (see TABLE-16, ATTACH.22).

In FIG.9 (ATTACH.30) another 4 lines of 175 \$/T, 185 \$/T, 195 \$/T, 200 \$/T for C₃ and C₄ LPG average price are as following :

Natural gas price vs C₃ and C₄ LPG average price is as under :

Natural gas production 500 MMscf/D

NATURAL GAS PRICE \$/MMBTU	C ₃ and C ₄ LPG AVERAGE PRICE (\$/T) *				
	167.1	175	185	195	200
	PROFIT OR LOSS (\$/T)				
CASE-1 1.50	+12.26	+20.16	+30.16	+49.16	+45.16
CASE-1' 1.70	+ 1.96	+ 9.86	+19.86	+29.86	+34.86
CASE-2 2.063	-30.7	-22.80	-10.80	- 0.80	+ 4.2
CASE-3 1.78	- 9.11	- 1.21	+ 8.79	+18.79	+23.79

Note: * FOB Bangkok price

Then C₃ and C₄ LPG price is 167.1 \$/T and natural gas price is 1.50 \$/MMBTU (CASE-1), profit is 12.26 \$/T, but when these are 1.78 \$/T (CASE-3) and 2.063 \$/MMBTU (CASE-2) of natural gas price, all are loss. Namely, even if fuel oil equivalent 2,063 \$/MMBTU and C₃ and C₄ LPG 1.95\$/T, profit is still not so big (see FIG.9, ATTACH.30).³

In the above table, C₃ and C₄ average price is indicated, their average prices are breakdown as follows but approximately.

		C ₃	C ₄
		LPG	LPG
Line	165.9 \$/T	160 \$/T	180 \$/T
Line	175 \$/T	168 \$/T	189 \$/T
Line	185 \$/T	177 \$/T	199 \$/T
Line	195 \$/T	187 \$/T	210 \$/T
Line	200 \$/T	192 \$/T	216 \$/T

Note: Data of calculated. above number are approximately.

Natural gas price is 2.063 \$/MMBTU which is equivalent to fuel oil 1,200", when C₃ LPG and C₄ LPG prices are going up to 192 \$/T and 216 \$/T individually (price is going up about 40 \$/T higher than the present price of C₃ LPG and C₄ LPG), but it is almost no profit and loss.

As a consequence, NGOT will not able to produce C₃ and C₄ LPG at present price, but C₃ and C₄ LPG price will be going up rapidly in near future according to C₃ and C₄ LPG market is becoming tight.

XIV CASE-4 EXPENDITURE AND REVENUE IN CASE OF NATURAL GAS PRICE 1.50 \$/MMBTU, C₃ LPG PRICE 160 \$/T C₄ LPG PRICE 180 \$/T (700 MMSCF/D)

LPG production which was noted above is from 500 MMscf/D, LPG production from bigger size is cheaper than from smaller size.

XIV.1 Construction Cost

$$\begin{aligned} 380,000 \text{ T/Y} & \qquad \qquad 86 \text{ MM}\$ \\ 86 \text{ MM}\$ \times \left(\frac{559.15 \text{ T/Y}}{380,000 \text{ T/Y}} \right)^{0.7} & = 112.70 \text{ MM}\$ \\ & = 120.59 \text{ MM}\$ \quad 7\% \text{ up} \\ 120.59 \text{ MM}\$ - 559.15 \text{ T} & = 215.67 \text{ \$/T} \end{aligned}$$

Note: * come from TABLE-15 (ATTACH.21)

$$63.83 \text{ Kg/H} \times 24 \text{ h} \times 365 \text{ days} = 559.15 \text{ T/Y}$$

XIV.2 Operation Cost

XIV.2.1 Natural gas price 1.5 \\$/MMBTU

	% on Construction Cost	\\$/T
1) Depreciation (20 years)	5	10.78
2) Interest for Construction	5	10.78
3) Tax and Insurance	2	4.31
4) Maintenance	3	6.47
5) Administration	2	4.31
6) Overhead	2	4.31
<hr/>		
Total	19	40.96

Note: Construction cost is 215.67 \\$/T

XIV.2.2 Interest of working capital

Same as X.1.4, B

Namely, it is 1.68 T/Y.

XIV.2.3 Utility

Same as X.1.4, C

Namely, it is 40.84 \\$/T.

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. This section also highlights the role of internal controls in preventing errors and fraud, and the need for regular audits to ensure the integrity of the data.

2. The second part of the document focuses on the implementation of robust risk management strategies. It outlines the process of identifying, assessing, and mitigating various risks that could impact the organization's operations and financial stability. This includes the development of risk registers, the establishment of risk appetite, and the implementation of control measures to reduce the likelihood and potential impact of adverse events. The document also discusses the importance of communication and reporting in risk management, ensuring that all stakeholders are aware of the organization's risk profile and the actions being taken to address them.

3. The third part of the document addresses the need for continuous improvement and innovation. It stresses that organizations must regularly evaluate their performance and processes to identify areas for enhancement and to stay competitive in a rapidly changing market. This involves the adoption of new technologies, the implementation of best practices, and the fostering of a culture of innovation and learning. The document also discusses the importance of stakeholder engagement and collaboration in driving positive change and achieving long-term success.

4. The final part of the document provides a summary of the key findings and recommendations. It reiterates the importance of the measures discussed throughout the document and provides a clear action plan for the organization to follow. This includes the assignment of responsibilities, the establishment of timelines, and the implementation of monitoring and reporting mechanisms to track progress and ensure that the organization is on track to achieve its goals. The document concludes by expressing confidence in the organization's ability to implement these measures and achieve sustained success.

XIV.2.4 Labor cost

$$16 \text{ persons} \times 4 \text{ shifts} = 64 \text{ persons}$$

Salary and other expense is assumed as 200 \$/Man.Month.

$$200 \text{ $/Man. Month} \times 64 \text{ persons} \times 12 \text{ months} \div 559.150 \text{ T/Y} = 0.27 \text{ $/T}$$

XIV.2.5 Operation cost

	\$/T	
(1) Expense	40.96	(change)
(2) Interest for Working Capital	1.68	
(3) Utility	40.84	
(4) Labor Cost	0.27	(change)
<hr/>		
Total	83.75	

XIV.2.6 Total operation cost minus the cost of the dew point control unit

$$83.75 \text{ $/T} \times (100 - 15)\% = 71.19 \text{ $/T}$$

XIV.3 Cost of Natural Gas Charge

$$50.94^* \text{ MMBTU/T} \times \frac{1.5 \text{ \$}}{\text{MMBTU}} = 76.41$$

Note: * come from TABLE-20 (ATT:CH.28)

XIV.3 Expenditure

	\$/T
Cost of Natural Gas Charge	76.41
Operation Cost	71.19
<hr/>	
Total	147.6

Selling charge (including shipping) is assumed as 3% on total expenditure.



Expenditure is as follows :

$$147.6 \text{ \$/T} \times (1 + 0.03)\% = 152.03 \text{ \$/T}$$

XIV.5 Revenue

Same as X.5

Namely, it is 167.1 \\$/T

XIV.6 Profit and Loss

$$167.1 \text{ \$/T} - 152.03 \text{ \$/T} = 15.07 \text{ \$/T}$$

$$15.07 \text{ \$/T} \div 152.03 \text{ \$/T} = 9.0\%$$

In this case, profit is 15.07 \\$/T.

XV COMPARISON OF LPG PRODUCTION FROM 500 MMSCF/D AND 700 MMSCF/D (NATURAL GAS PRICE 1.50 \\$/MMBTU)

	Expenditure \$/T	Revenue \$/T	Profit \$/T	Profit %
From 500 MM/D Natural Gas	155.59	167.1	+10.31	6.6
From 700 MM/D Natural Gas	152.20	167.1	+15.07	9.9

LPG from 700 MMscf/D natural gas is 4.59 \\$/T more profit, but
LPG production unit can not be bigger than 700 MMscf/D unit.

XVI CONCLUSION

(1) Export LPG State

When LPG is exported, LPG must be separate C₃ LPG and C₄ LPG.
And LPG state is not high pressure and atmospheric temperature must
be low.

(2) Expected LPG Production and LPG to Export to Japan

When Thailand intends to export the products and by products
(energy) from Siam Gulf natural gas, Japan expects to import the
products and by products on proportion to the share hold.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is crucial for ensuring transparency and accountability in the organization's operations.

2. The second part of the document outlines the various methods and tools used to collect and analyze data. It highlights the need for consistent data collection procedures and the use of advanced analytical techniques to derive meaningful insights from the data.

3. The third part of the document focuses on the role of technology in data management and analysis. It discusses how modern software solutions can streamline data collection, storage, and processing, thereby improving efficiency and accuracy.

4. The fourth part of the document addresses the challenges associated with data management, such as data quality, security, and privacy. It provides strategies to mitigate these risks and ensure that the data remains reliable and secure.

5. The fifth part of the document discusses the importance of data governance and the role of various stakeholders in ensuring that data is used ethically and in compliance with relevant regulations.

6. The sixth part of the document provides a detailed overview of the data lifecycle, from data collection to data archiving and deletion. It emphasizes the need for clear policies and procedures to manage the data throughout its entire lifecycle.

7. The seventh part of the document discusses the role of data in decision-making and the importance of providing timely and accurate information to management. It highlights how data-driven insights can lead to better strategic decisions and improved organizational performance.

8. The eighth part of the document discusses the future of data management and the emerging trends in the field, such as artificial intelligence, machine learning, and big data. It provides a glimpse into the opportunities and challenges that will shape the data landscape in the coming years.

9. The ninth part of the document provides a summary of the key findings and recommendations of the study. It emphasizes the need for a holistic approach to data management that integrates technology, processes, and people.

10. The tenth part of the document provides a list of references and sources used in the study. It includes books, articles, and other publications that provide further information on the topics discussed in the document.

Thai natural gas production from 700 MMscf/D natural gas from pipeline and quantity of imported LPG in Japan are as follows :

Thai LPG Production from Natural Gas (from pipeline)

in 1983	3,040 x 10 ³ T
(after 1988	5,590 x 10 ³ T)

Japanese LPG Domestic Production and Import

Domestic in 1983	5,917 x 10 ³ T	33.8 %
Import in 1983 (forecast)	11,589 x 10 ³ T	66.2 %
Total	17,506 x 10 ³ T	100.0 %

Japanese import LPG will be grown up every year.

Japanese LPG market is good for Thailand.

(3) LPG price

I estimate the Thai LPG cost from natural gas as of 1979 before the 2nd oil crisis.

Calculation conditions of Thai LPG cost from natural gas CASE-2 are as follows :

Natural gas production	500 MMscf/D
Natural gas price	2.063 \$/MMBTU
C ₃ LPG price	160 \$/T
C ₄ LPG price	180 \$/T
C ₃ LPG : C ₄ LPG	64.5 : 35.5

Results are as follows :

C ₃ LPG and C ₄ LPG average FOB price	167.1 \$/T
Thai LPG selling price (cost) from natural gas	197.8 \$/T
Loss	30.7 \$/T

Note: *1 come from XI.7

*2 come from TABLE-17 (7) (ATTACH.25)



According to the above table, the price of natural gas from pipeline is very high compared with other natural gas produced country, so Thai LPG cost from natural gas is very high.

In accordance with circumstances of Thai economics, the export LPG price must be higher than fuel oil price based on calorific power. If export LPG price is lower than fuel oil price, LPG can not export, because of big loss money.

As the above table, at present status, Thailand can not produce and export LPG from natural gas.

(4) Possibility of LPG export

LPG FOB Kuwait price has been going up rapidly.

in 1979

	April - June	July	on Spot
C ₃ LPG	126.5 \$/T	160 \$/T	150 - 200
C ₄ LPG	127.5 \$/T	180 \$/T	300

The above mentioned price up is not according to crude oil price up, to tight of LPG market.

Therefore, it seems that LPG price will be going up more than 200 \$/T in very near future.

(5) Export port condition

In case of Japan, the port condition and vessel are as follows :

1. Port condition

75,000 M³ cargo is acceptable.

2. Tanker size

50,000 DWT

LOA (length over all) 225 M

Draft 12 M

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 matters. The text notes that without clear records, it becomes difficult to track expenses, revenues, and overall performance over time.

2. The second part of the document addresses the challenges associated with data collection and analysis. It highlights that gathering large amounts of data can be a complex and time-consuming process. However, once collected, this data provides valuable insights into trends and patterns. The document suggests that utilizing advanced analytical tools and techniques can help in processing and interpreting this information more effectively.

3. The third part of the document focuses on the role of technology in modern business operations. It discusses how digital tools and automation have revolutionized various aspects of the business, from customer service to production. The text argues that embracing technology is not just a competitive advantage but a necessity for staying relevant in today's market. It also touches upon the importance of cybersecurity in protecting sensitive data and systems.

4. The fourth part of the document explores the concept of sustainability and its impact on long-term business success. It defines sustainability as the ability to meet the needs of the present without compromising the ability of future generations to meet their own needs. The document stresses that sustainable practices, such as reducing waste, conserving resources, and supporting ethical supply chains, can lead to cost savings and enhanced brand reputation.

5. The fifth and final part of the document discusses the importance of human resources and employee engagement. It states that a motivated and skilled workforce is the backbone of any successful organization. The text provides insights into various strategies for attracting, retaining, and developing talent. It also emphasizes the need for a positive work environment and effective communication channels to foster a sense of belonging and productivity among employees.

3. Cargo lot : about 43,000 T

43,000 T of one LPG lot is following days production.

in 1982	62 days
in 1984	37 days
in 1990	28 days

4. Flight from Bangkok

Bangkok to Japan 15 \$/T

Comments

(1) If NGOT exports LPG to Japan, he negotiates export port conditions with Japanese importer to fit production scale and port condition of Thailand.

(2) According to NGOT plan, the gas processing unit is about 20 Km far from sea-shore. It is too far for low temperature and very low pressure LPG transportation by pipeline. It is better that the gas processing unit is very close to sea-shore.

Even if, LPG is not exported, LPG must be transported by tanker in inland, tanker transportation fee is cheaper than other way.

(3) C_4 LPG export price is higher than C_3 LPG export price, so C_4 LPG from the refineries is exported and C_3 LPG from natural gas is back to the refineries on same heating value. Therefore, Thai LPG specification is needed to change when more C_4 LPG is exported.

(4) I assumed that the cost of dew point control is 15% on LPG production expense, it has big influence on LPG cost, so the cost of dew point control must be calculated exactly.

Summary

(1) Present LPG FOB price is not feasible for Thai LPG production from natural gas, but in near future LPG FOB price would be going

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 government operations. The text notes that without reliable records, it becomes difficult to track expenditures, assess performance, and ensure that resources are being used effectively and efficiently.

2. The second part of the document addresses the challenges associated with data collection and analysis. It highlights that while modern technology offers powerful tools for gathering and processing information, the quality and consistency of the data can vary significantly. The text suggests that organizations should invest in training and infrastructure to ensure that data is collected systematically and analyzed using standardized methods. This approach helps to minimize errors and biases, leading to more accurate and actionable insights.

3. The third part of the document focuses on the role of leadership in driving organizational success. It argues that effective leaders are those who can inspire and motivate their teams, set clear goals, and provide the necessary support and resources. The text also discusses the importance of communication and collaboration, as these factors are crucial for ensuring that everyone is working towards the same objectives. Leaders are encouraged to foster a culture of innovation and continuous improvement, where team members feel empowered to share their ideas and take ownership of their work.

4. The final part of the document discusses the importance of ethical considerations in decision-making. It notes that leaders and organizations have a responsibility to act in a fair and just manner, and to consider the impact of their actions on all stakeholders. The text emphasizes that ethical behavior is not only the right thing to do, but it also leads to long-term success and sustainability. Organizations should establish clear ethical guidelines and ensure that they are followed consistently across all levels of the organization.

up and it will become feasible. NGOT should be watched a movement of LPG FOB price.

(2) Natural gas processing unit should be moved to sea-shore.

end.

E

F

G

H

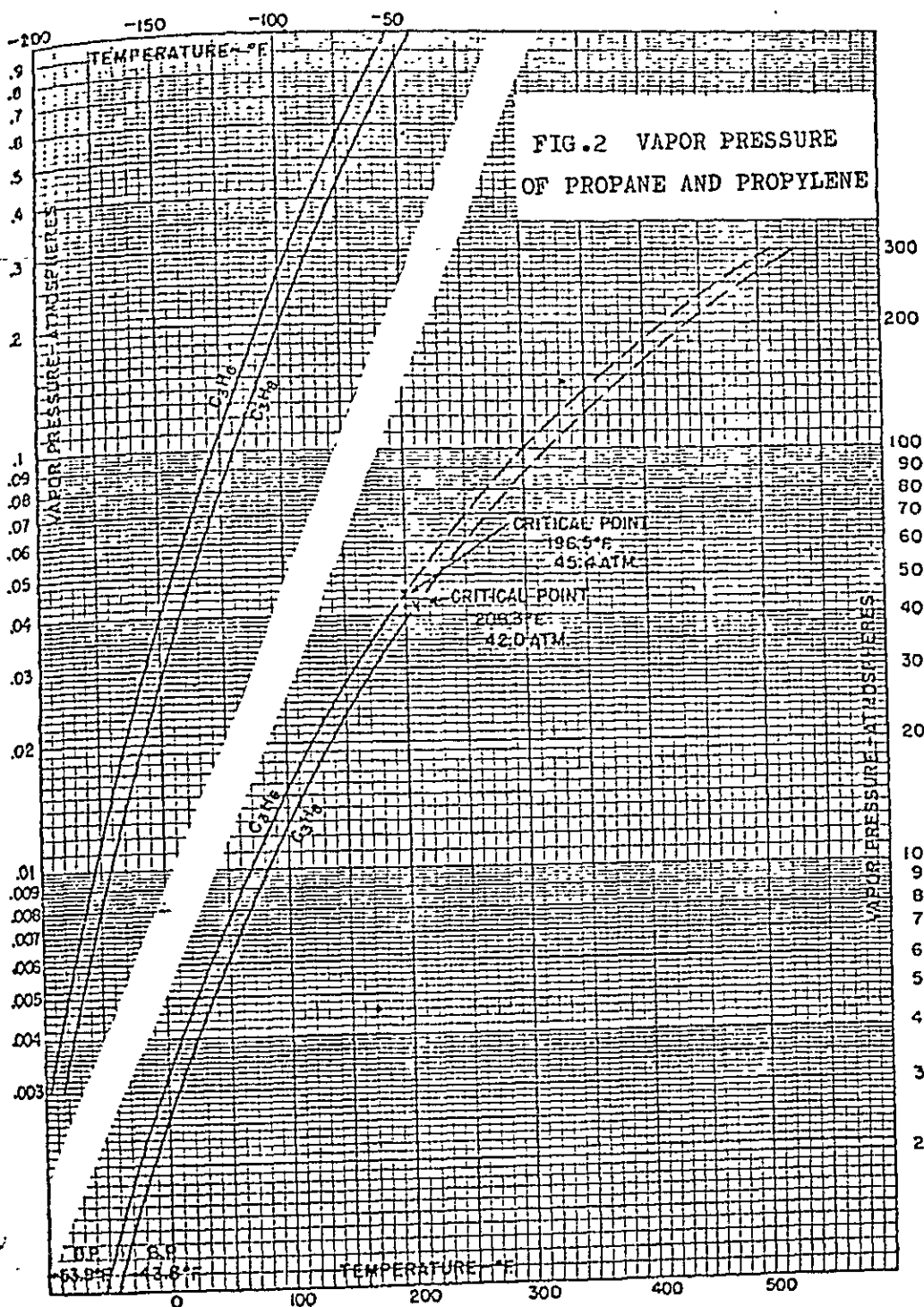
TABLE-1

PHYSICAL PROPERTY OF LPG

ATTACH:1

	Propane	(Propylene) Propene	n-Butane	i-Butane	(i-Butylene) i-Butane	j-But. ne	t-Butene	c-Butene
Molecular Formular	C_3H_8	C_3H_6	C_4H_{10}	C_4H_8	C_4H_8	C_4H_8	C_4H_8	C_4H_8
Molecular Weight	44.1	42.1	58.1	56.1	56.1	56.1	56.1	56.1
Boiling Point (1 atm) ($^{\circ}C$)	-42.1	-47.1	-0.5	-11.7	-6.3	-6.9	0.9	3.7
Melting Point (1 atm) ($^{\circ}C$)	-187.7	-185.3	-138.4	-159.6	-185.4	-140.4	-105.6	-138.9
Specific Gravity Liquid (15 $^{\circ}C$) (g/ml)	0.508	0.523	0.585	0.563	0.601	0.601	0.610	0.627
Gas (15 $^{\circ}C$) (Kg/m^3)	1.895	1.805	2.538	2.529	2.443	2.442	-	2.442
Vapor Pressure (37.8 $^{\circ}C$) (Kg/cm^2A)	13.4	15.9	3.6	5.0	4.4	4.4	3.5	3.2
Gross Heating Value (25 $^{\circ}C$) (Kcal/Kg)	12,020	11,690	11,830	11,800	11,580	11,510	11,530	11,550
(15.6 $^{\circ}C$) ($Kcal/m^3$)	22,830	21,120	30,050	29,850	28,300	28,110	28,170	28,210
(60 $^{\circ}F$) (BTU/lb)	21,650	21,040	21,290	21,240	20,840	20,720	20,750	20,780
Net Heating Value (25 $^{\circ}C$) (Kcal/Kg)	10,930	10,940	10,890	10,840	10,830	10,760	10,780	10,800
(15.6 $^{\circ}C$) ($Kcal/m^3$)	21,000	19,750	27,730	27,540	26,450	26,260	26,330	26,360
(60 $^{\circ}F$) (BTU/Kg)	19,930	19,690	19,670	19,610	19,490	19,370	19,400	19,430
Latent Heat (B.P. 1 atm) (Kcal/Kg)	101.8	104.6	92.1	87.6	93.4	94.2	96.9	99.5
Sensible Heat Gas) (25 $^{\circ}C$) (Kcal/Kg $^{\circ}C$)	0.399	0.368	0.401	0.398	0.365	0.380	0.374	0.336
Sensible Heat Liquid (25 $^{\circ}C$) (Kcal/Kg $^{\circ}C$)	0.602	0.611	0.575	0.582	0.549	0.558	0.544	0.537
Explosion Limit (in air) (vol %)	2.1 - 9.5	2.0 - 10.0	1.8 - 8.4	1.8 - 8.4	1.6 - 9.3	-	-	-
Ignition Temperature (in air) ($^{\circ}C$)	481	548	441	544	443	443		
Gas Specific Gravity (15.6 $^{\circ}C$, 1 atm) (air = 1)	1.550	1.477	2.076	2.068	1.998	1.997	-	1.997

Year	Population	Area	Population Density
1950	100,000	100 sq km	1,000
1955	120,000	100 sq km	1,200
1960	150,000	100 sq km	1,500
1965	200,000	100 sq km	2,000
1970	250,000	100 sq km	2,500
1975	300,000	100 sq km	3,000
1980	350,000	100 sq km	3,500
1985	400,000	100 sq km	4,000
1990	450,000	100 sq km	4,500
1995	500,000	100 sq km	5,000
2000	550,000	100 sq km	5,500
2005	600,000	100 sq km	6,000
2010	650,000	100 sq km	6,500
2015	700,000	100 sq km	7,000
2020	750,000	100 sq km	7,500



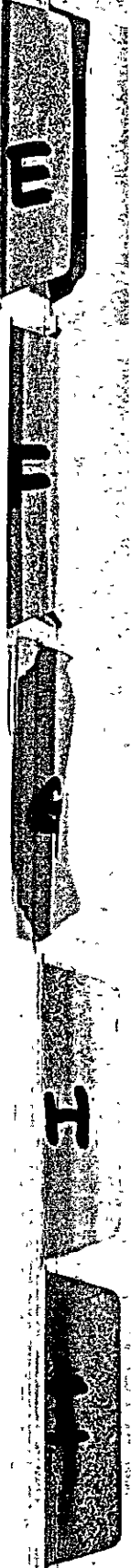
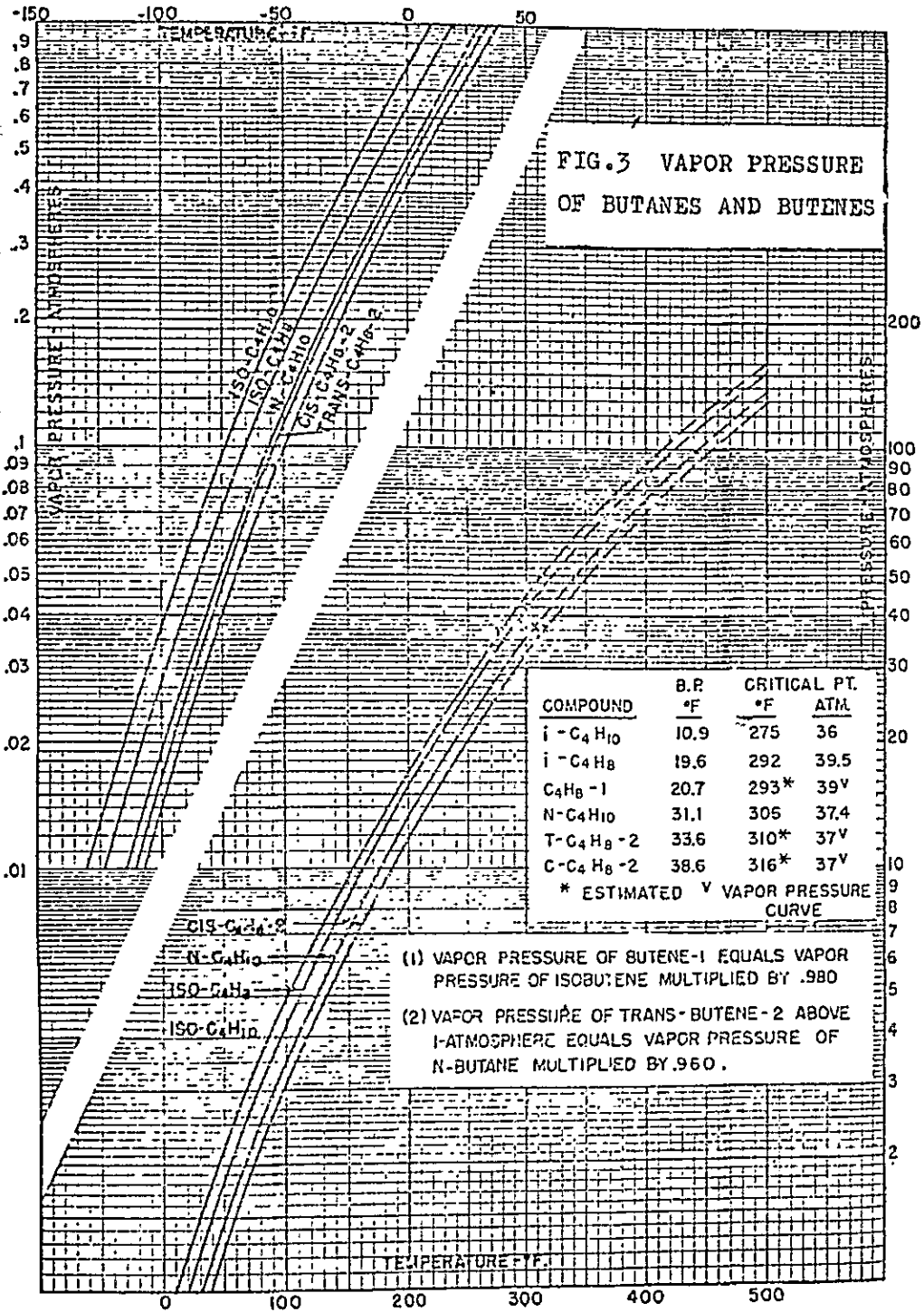


TABLE-2 THAI INDUSTRIAL SPECIFICATION OF LPG

LIQUEFIED PETROLEUM GAS		LIMITS	TEST METHODS
VAPOR PRESSURE @ 37.8°C	MIN	4.22	ASTM-D-1267
95% BOILING POINT °C	MAX	2.2	ASTM-D-1837
PENTANE AND HEAVIERS VOL % (VAPOR)	MAX	2	ASTM-D-2163
COPPER STRIP CORROSION	MAX	COPPER NO.1	ASTM-D-1838
TOTAL SULPHUR GRAINS/m ³	MAX	0.05	ASTM-D-1266
RESIDUE AFTER EVAPORATION 100 ml	MAX	0.05	ASTM-D-2158
NO WATER			
ODOR		MARKETABLE	

$$C_{3s} : C_{4s} = 3 : 7 \text{ (by volume)}$$

TABLE-3

LIQUEFIED PETROLEUM GAS

JIS K2240 - 1972

Item No.	Vapor Pressure (40 °C) (Kg/cm ²)	Sulfur wt. %	Component (Mol %)				Usage
			Ethane + Ethylene	Propane + Propylene	Butanes + Butenes	Butadienes	
1	15.8 Max.	0.02 Max.	-	90 Min.	-	-	Industry, Motor car, and Others.
2	15.8 Max.	0.02 Max.	-	50 Min. 90 Max.	-	-	
3	12.7 Max.	0.02 Max.	-	-	40 Min. 90 Max.	-	Industry, Motor car, and Others.
4	5.3 Max.	0.02 Max.	-	-	90 Min.	-	
R	15.6 Max.	0.015 Max.	3 Max.	60 Min. 80 Max.	-	2 Max.	Household (General use)
C	15.6 Max.	0.015 Max.	8 Max.	80 Min.	-	2 Max.	Household (for very cold weather area in winter)

ATTACH.5



TABLE-4 STANDARD OF SPECIFICATION OF LPG
IMPORTED TO JAPAN

	C ₃ LPG Mol%	C ₄ LPG Mol%
C ₂	2.0 Max.	-
C ₃	96.0 Min.	-
C ₄	2.5 Max.	95.0 Min.
C ₅		2.0 Max.

TABLE-5 LPG DEMAND FORECAST IN THAILAND AND JAPAN (MILLI ESTIMATION)

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
IN THAILAND											
10 ³ KL	147	195	188	197	223	240	292	317	356	396	444
10 ³ T	84*	112	108	123	128	138	167	182	204	227	254
IN JAPAN											
10 ³ T											
Household	4,208	4,616	4,833	4,990	5,265	5,275	5,453	5,690	5,937	6,195	6,461
Industry	1,586	2,009	2,131	2,438	2,750	3,067	3,627	4,093	4,328	4,592	4,853
Town gas	407	401	493	563	692	674	777	981	1,070	1,163	1,345
Motor Car	1,506	1,495	1,448	1,558	1,655	1,677	1,707	1,736	1,753	1,769	1,786
Petrochemical Raw Material	1,087	1,194	1,069	866	806	932	977	1,030	1,034	1,038	1,041
Export	30	50	10	8	5	1	8	8	8	8	8
Total	8,824	9,765	9,990	10,423	11,173	11,626	12,549	13,538	14,130	14,765	15,494

Note: * Specific gravity C_{3s} 0.5155 x 30% = 0.15465
 C_{4s} 0.5978 x 70% = 0.41846
 147 x 0.573 = 84
 0.573



1. The first part of the document is a list of names and titles, including the names of the authors and the titles of their respective works.

2. The second part of the document is a list of names and titles, including the names of the authors and the titles of their respective works.

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TABLE-6 LPG SUPPLY/DEMAND OF AN (1978-1983)
(ESTIMATED BY NIPPI)

(UNIT: 1,000 M³/Y)

SUPPLY/DEMAND	YEAR	1978		1979		1980	1981	1982	1983
		1st half	2nd half	Total					
SUPPLY									
DOMESTIC		4,668	2,320	2,610	4,930	5,244	5,683	5,785	5,917
IMPORT		8,232	4,545	4,714	9,259	9,413	10,486	10,922	11,589
TOTAL		12,900	6,865	7,324	14,189	14,657	15,969	16,657	17,506
DEMAND									
HOUSEHOLD USE		5,240	2,404	3,128	5,532	5,712	5,898	6,090	6,288
INDUSTRIAL FUEL		3,316	1,765	1,833	3,618	3,790	4,010	4,216	4,430
ELECTRIC POWER		344	330	135	465	508	966	1,243	1,485
TOWN GAS		942	451	726	1,177	1,341	1,438	1,597	1,623
AUTOMOBILE FUEL		1,721	849	876	1,725	1,748	1,776	1,795	1,814
CHEMICAL FEEDSTOCK		1,271	614	750	1,554	1,471	1,522	1,553	1,576
EXPORT		41	20	20	40	40	40	40	40
TOTAL		12,975	6,433	7,488	13,921	14,621	15,630	16,537	17,265
INVENTORY		970	1,402	1,238	1,238	1,274	1,593	1,713	1,954

ATTACH.8

TABLE-7 JAPANESE LPG IMPORT BY SUPPLY SOURCES.

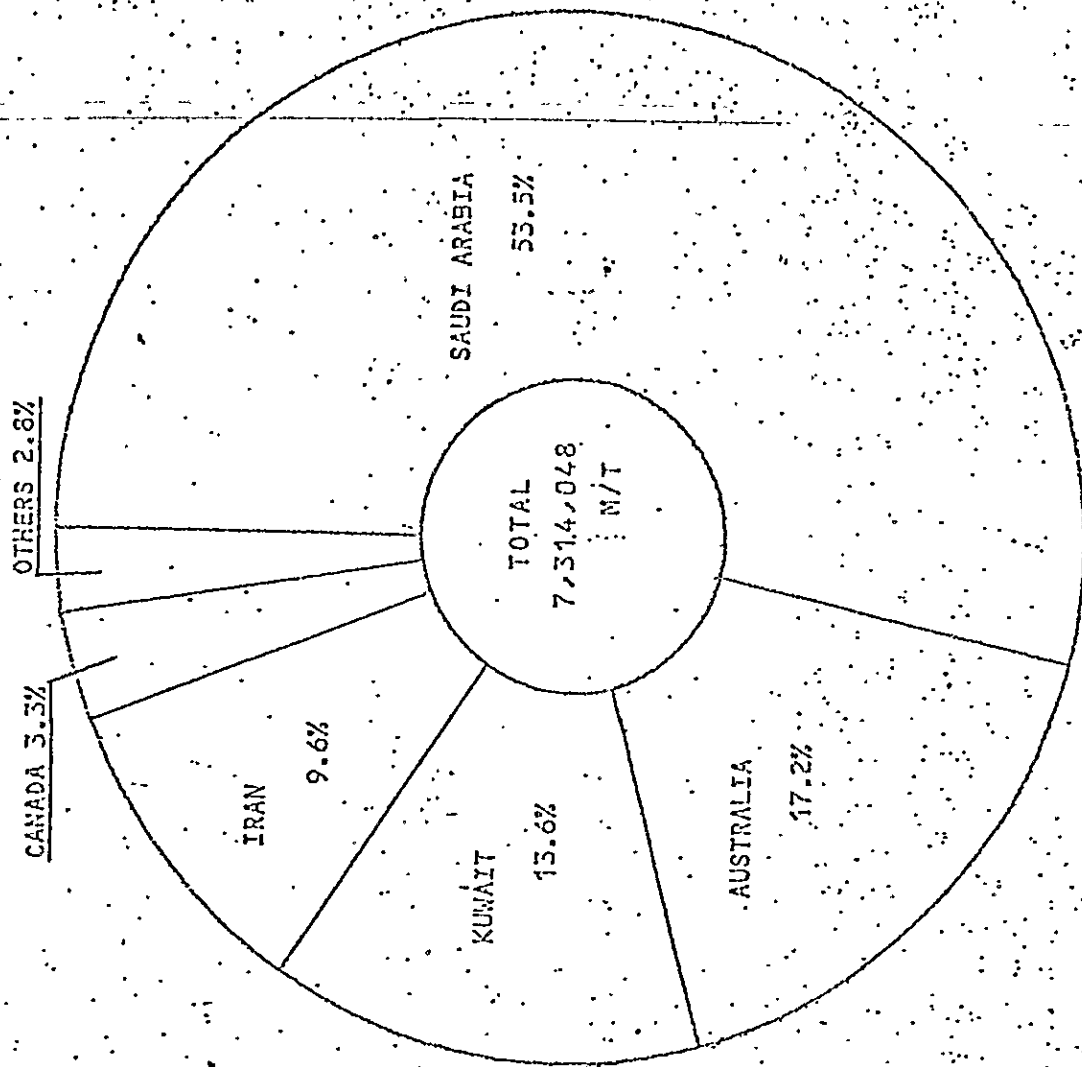
(UNIT: 1,000M/T)

COUNTRY \ YEAR	1971	1972	1973	1974	1975	1976	1977
SAUDI ARABIA	1,003	1,101	1,750	2,654	2,799	3,464	3,911
AUSTRALIA	553	741	1,029	1,008	1,097	1,084	1,255
KUWAIT	1,158	1,249	1,303	929	823	853	997
IRAN	575	678	771	767	703	708	704
CANADA	250	267	224	223	232	249	241
VENEZUELA	71	259	103	27	25	-	26
OTHERS	11	150	34	70	232	212	180
TOTAL	5,621	4,425	5,214	5,676	5,911	6,570	7,314

ATTACH.9



FIG.3 SHARE OF JAPANESE LPG IMPORT BY SUPPLY SOURCES
(AS OF 1977)



COMPANY	1972	1973	1974	1975	1976	1977
NIPPON PET. GAS	681	771	1,155	1,332	1,385	1,563
mitsui & BRIDGESTONE LIQ. GAS GROUP	1,326	1,464	1,473	1,146	1,297	1,338
IDEMITSU SEKIYU	293	372	652	658	673	919
MITSUBISHI LIQ. GAS	511	598	494	452	572	859
GENERAL SEKIYU	191	227	335	348	530	565
MARUZEN SEKIYU	217	181	278	468	501	495
KYODO SEKIYU	455	616	543	474	411	429
ESSO	150	201	147	286	364	397
SHELL	119	225	200	227	307	379
NIKKO LIQ. GAS	283	311	286	252	250	242
OTHERS	195	212	237	328	398	274
TOTAL	4,421	5,178	5,780	5,911	6,688	7,260

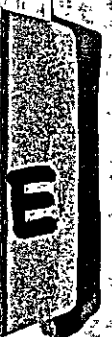
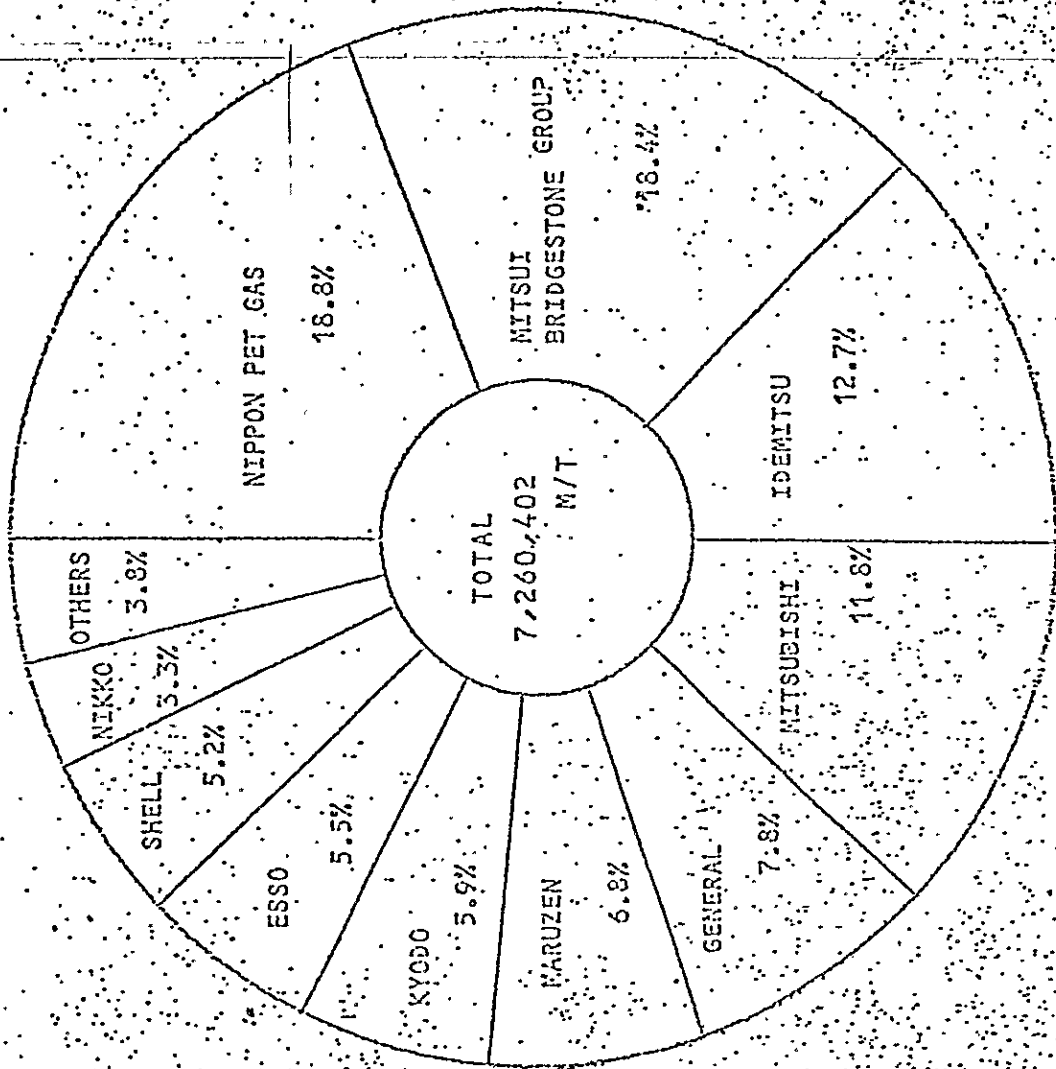
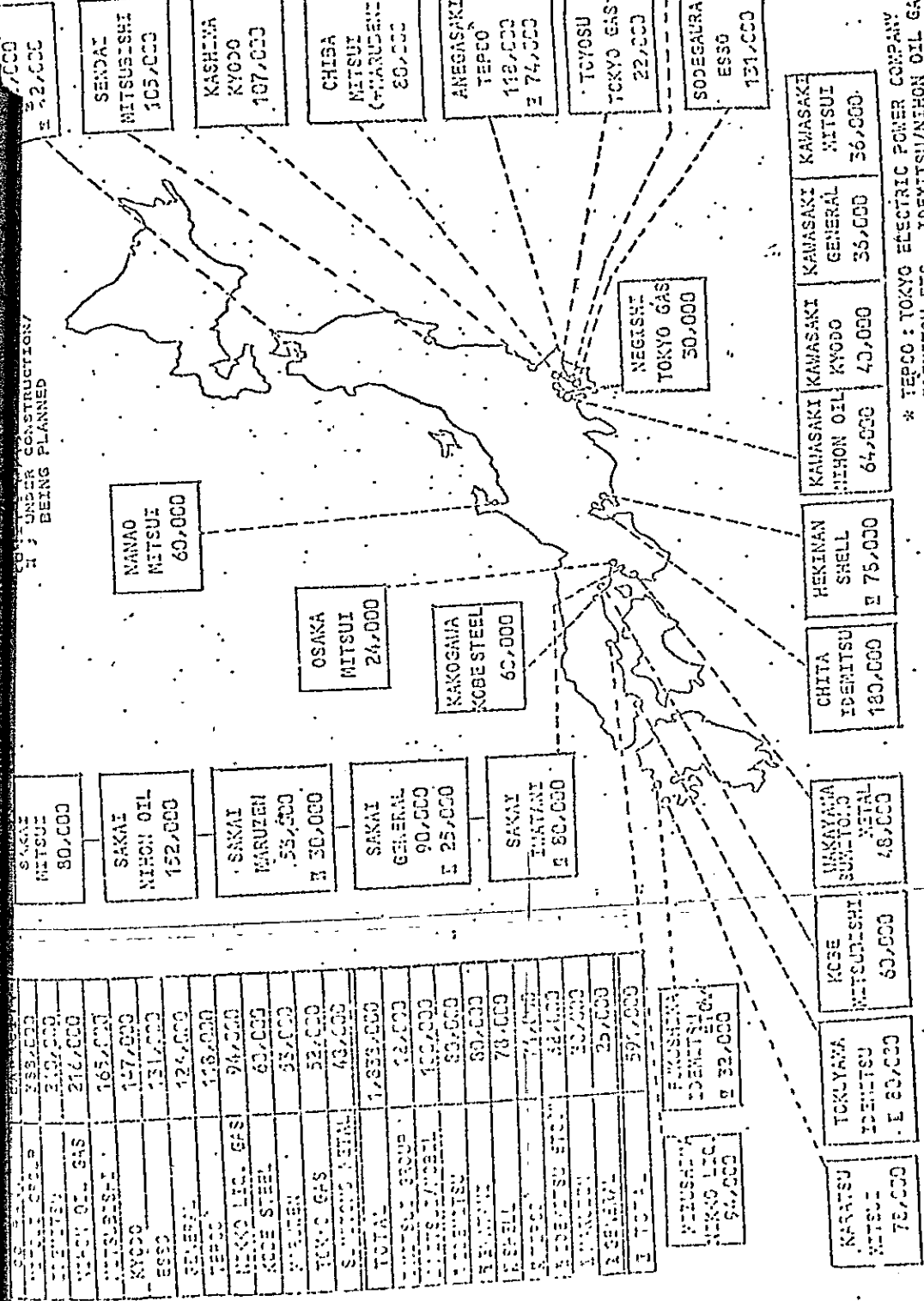


FIG.4 SHARE OF LPG IMPORT IN JAPAN (AS OF 1977)



EX.

(LOCATION)
(COUNTRY)
(CAPACITY)



SAKAI MITSUI	90,000
SAKAI NIPPON OIL	152,000
SAKAI MARUZEN	55,000
SAKAI GENERAL	90,000
SAKAI GENERAL	25,000
SAKAI INKAWA	80,000
SAKAI	1,835,000
SAKAI GROUP	12,000
SAKAI STEEL	150,000
SAKAI	80,000
SAKAI	80,000
SAKAI	78,000
SAKAI	11,000
SAKAI	32,000
SAKAI	30,000
SAKAI	25,000
TOTAL	597,000
SAKAI	50,000
SAKAI	32,000

SAKAI
MITSUI
NIPPON OIL
MARUZEN
GENERAL
INKAWA

KARATSU
MITSUI
78,000

TOKUYAMA
MITSUI
80,000

KCSE
MITSUI
60,000

WAKAYAMA
SUMITOMO
METAL
48,000

CHITA
MITSUI
180,000

HEKINAN
SHELL
75,000

KAWASAKI
NIPPON OIL
64,000

KAWASAKI
KYODO
40,000

KAWASAKI
GENERAL
36,000

KAWASAKI
MITSUI
36,000

MANAO
MITSUI
60,000

OSAKA
MITSUI
24,000

KAKOGAWA
KOBELCO
60,000

NEGISSI
TOKYO GAS
50,000

SODEGAURA
ESSO
131,000

ICHIHARA
MITSUI
185,000

TOYOSU
TOKYO GAS
22,000

ANEGASAKI
TEPCO
112,000

CHIBA
MITSUI
(MARUZEN)
80,000

CHIBA
MITSUI
60,000

KASHIWA
KYODO
107,000

SENDAI
MITSUBISHI
105,000

1,000
2,000

* TEPCO : TOKYO ELECTRIC POWER COMPANY
** NIPPON OIL : NIPPON OIL GAS/DANKYO ETC.

Tokyo Area (Kei-Yo Area)		Osaka Area (Ken-Hanshin Area)	
Chiba (Mitsui + Marubeni)	80,000	Osaka (Mitsui)	24,000
Chiba (Idemitsu)	60,000	Kakegawa (Kobe Steel)	60,000
Anegasaki (Tokyo Electric Power Co.)	74,000 (under construction)	Sakai (Mitsui)	80,000
Toyosu (Tokyo Electric Power Co.)	22,000	" (Nihon Oil)	152,000
IchiHara (Mitsui/Mobil)	180,000 (under construction)	" (Maruzen)	53,000
Sodegaura (ESSO)	131,000	" (General)	30,000 (under construction)
Negishi (Tokyo Gas)	30,000	" (Iwatani)	90,000
Kawasaki (Mitsui)	36,000	Wakayama (Sumitomo Metal)	25,000 (under construction)
" (General)	36,000	Kobe (Mitsubishi)	80,000 (under construction)
" (Kyodo)	40,000		48,000
" (Nihon Oil)	64,000		60,000
Total	753,000	Total	702,000
Nagoya Area (Chukyo Area)		Others	
Hekinan (Shell)	78,000 (under construction)		716,000
Chita (Idemitsu)	180,000	Grand Total	2,429,000
Total	258,000		

ATTACH.14



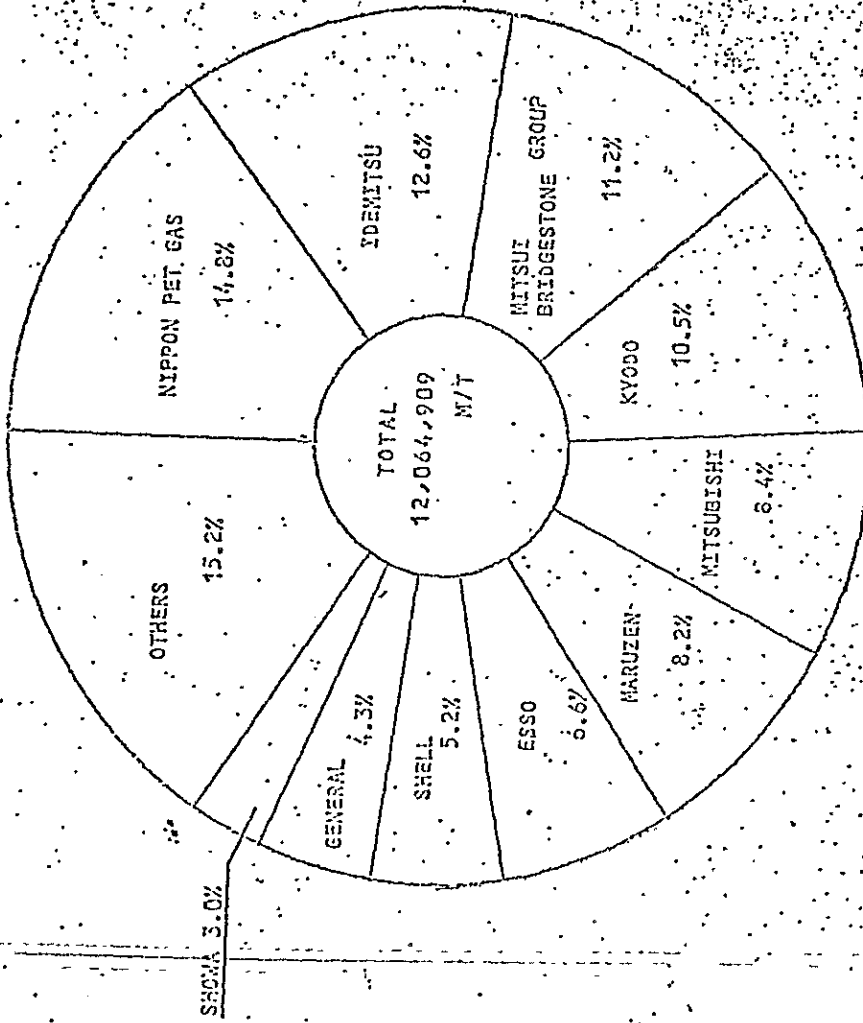
Handwritten text, possibly bleed-through from the reverse side of the page. The text is extremely faint and illegible due to low contrast and blurring. It appears to be organized into several vertical columns, possibly representing a list or a table of entries.

TABLE-10 L & MPORT TERMINAL CAPACITY BY COMPANY

	T
Mitsui Group	388,000
	12,000 (under construction)
Mitsui/Mobil	120,000 (" ")
Idemitsu	240,000
	80,000 (under construction)
Idemitsu etc.	32,000 (" ")
Nohon Pet Gas	216,000
Mitsubishi	165,000
Kyodo	147,000
ESSO	131,000
General	126,000
	25,000 (under construction)
Tokyo Electric Power Co.	118,000
	74,000 (under construction)
Nikko Liq. Gas	94,000
Kobe Steel	60,000
Karuzen	53,000
	30,000 (under construction)
Tokyo Gas	52,000
Sumitomo Metal	48,000
Iwatani	80,000 (under construction)
Shell	78,000 (" ")
Total	2,429,000

COMPANY	1972	1973	1974	1975	1976	1977
NEPPON PET GAS	1,031	1,178	1,416	1,612	1,790	1,783
IDEMITSU	1,193	1,209	1,219	1,214	1,345	1,521
NETSU BRIDGESTONE GROUP	1,298	1,437	1,326	1,174	1,157	1,348
KYODO	815	999	1,092	1,092	1,317	1,273
NETSUISHI	767	775	793	852	912	1,012
MARUZEN	740	761	788	921	975	986
ESSO	761	851	814	783	712	794
SHELL	360	422	465	561	602	631
GENERAL	422	400	422	488	490	523
SONAX	205	205	200	250	303	365
OTHERS	1,794	1,940	1,978	1,542	1,851	1,829
TOTAL	9,366	10,177	10,511	10,769	11,454	12,065

FIG. 6 SHARE OF LPG SALES IN JAPAN (AS OF 1977)



	C ₃				C ₄					
	(1)	(2)	(3)	(4)	(5)	(1')	(2')	(3')	(4')	(5')
	Gas From Pipeline Lb-Mol/H	(1)x379÷10 ³ 10 ³ scf/H	(2)x90% [*] 10 ³ scf/H	(3)-379x44.094 ² 10 ³ Lb/H	(4)÷2.2 T/H	Gas From Pipeline Lb-Mol/H	(1')x379÷10 ³ 10 ³ scf/H	(2')x98% 10 ³ scf/H	(3')÷379x58.12 ² 10 ³ Lb/H	(4')÷2.2 T/H
1981	595.7	225.8	203.2	23.6	10.7	239.3	90.7	88.9	13.6	6.2
1982	993.4	376.5	338.9	39.4	17.9	404.9	153.5	150.4	23.1	10.5
1983	1,191.6	451.6	406.4	47.3	21.5	484.8	183.5	179.8	27.6	12.5
1984	1,655.7	627.5	564.8	65.7	29.9	674.8	255.7	250.6	38.4	12.9
1985	1,655.7	627.5	564.8	65.7	29.9	674.8	255.7	250.6	38.4	12.9
1986	1,920.6	727.9	655.1	76.2	34.6	785.0	297.5	291.6	44.7	20.3
1987	1,920.6	727.9	655.1	76.2	34.6	785.0	297.5	291.6	44.7	20.3
1988	2,186.2	828.6	745.7	86.8	39.5	895.4	339.4	332.6	51.0	23.2
1989	2,186.2	828.6	745.7	86.8	39.5	895.4	339.4	332.6	51.0	23.2
1990	2,186.2	828.6	745.7	86.8	39.5	895.4	339.4	332.6	51.0	23.2

Note: *1 Fluor's report

*2 Molecular Weight

*3 Yield of C₃ and C₄ recovery

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Specification	Adjusting	Molecular	(2) x (3)	(4) x 0.4536 ^{*1}	(2) x 379 ^{*2}	(6) x 0.0267 ^{*3}	BTU/lb	(4) x (8)	(9) ÷ (6) x 10 ⁶
Mol %	Mol %	Weight	lb	Kg	scf	MM ³	(Gross)	MM BTU	BTU/scf
C ₃ LPG	1.8	30.068	54.12	24.55	682.2	18.2	22,300	1.21	
C ₃	96.0	44.094	4,233.02	1,920.10	36,384.0	971.4	21,650	91.64	
C ₄	2.2	58.120	127.86	58.00	833.8	22.3	21,265 ^{*4}	2.72	
Total	100.0		4,415.00	2,002.65	37,900.0	1,011.9		95.57	2,522
C ₄ LPG	98.0	58.120	5,695.76	2,583.60	37,142.0	991.7	21,265 ^{*4}	121.12	
C ₅	2.0	72.146	144.29	65.45	758.0	20.2	21,020 ^{*5}	3.03	
Total	100.0		5,840.05	2,649.05	37,900.0	1,011.9		151.15	3,988

Note: data from TABLE-14-1 and-2 (ATTACH.20-1 and-2).

*1 1 lb = 2.2046 *2 1 lb mol = 379 ft³

*3 1 scf = 0.0283 x $\frac{460}{460 + (60 - 32)}$ = 0.0267

*4 Butanes (21,290 + 21,240) ÷ 2 = 21,265

*5 Pentanes (21,070 + 21,030 + 20,960) ÷ 3 = 21,020

TABLE-13-1 MATERIAL AND HEAT BALANCE OF C₃ AND C₄ LPG (FROM PURVAL CANS)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Specification	Adjusting Mol %	Molecular Weight lb	(2) x (3) lb	(4) x 0.4536 ^{*1} Kg	(2) x 379 ^{*2} scf	(6) x 0.0267 ^{*3} NM ³	BTU/lb (Gross)	(4) x (8) MM BTU	(9) ÷ (6) x 10 ⁶ BTU/scf (Gross)
C ₃ LPG									
C ₂	2.0 Max.	30.068	54.12	24.55	682.2	18.2	22,300	1.21	
C ₃	96.0 Min.	44.094	4,233.02	1,920.10	36,384.0	971.4	21,650	91.64	
C ₄	2.5 Max.	58.120	127.86	58.00	833.8	22.3	21,265 ^{*4}	2.72	
Total	100.0		4,415.00	2,002.65	37,900.0	1,011.9		95.57	2,522
C ₄ LPG									
C ₄	95.0 Min.	58.120	5,695.76	2,583.60	37,142.0	991.7	21,265 ^{*4}	121.12	
C ₅	2.0 Max.	72.146	144.29	65.45	758.0	20.2	21,020 ^{*5}	3.03	
Total	100.0		5,840.05	2,649.05	37,900.0	1,011.9		151.15	3,988

Note: data from TABLE-14-1 and-2 (ATTACH.20-1 and-2).

- *1 1 lb = 2.2046 *2 1 lb mol = 379 ft³
- *3 1 scf = 0.0283 x $\frac{460}{460 + (60 - 32)}$ = 0.0267
- *4 Butanes (21,290 + 21,240) ÷ 2 = 21,265
- *5 Pentanes (21,070 + 21,030 + 20,960) ÷ 3 = 21,020

TABLE-13-2 MATERIAL AND HEAT BALANCE OF C₃ AND C₄ LPG (FROM NATURAL GAS)

(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
BTU/lb (Net)	(4) x (11) MMBTU	(12) ÷ (6) x 10 ⁹ BTU/scf (Net)	(9) ÷ (4) BTU/lb (Gross)	(12) ÷ (4) BTU/lb (Net)	(14) x 0.5556 ^{*8} Kcal/kg (Gross)	(15) x 0.5556 ^{*8} Kcal/kg (Net)	(16) x 0.5083 ^{*9} Kcal/lit (Gross)	(17) x 0.1746 ^{*9} Kcal/lit (Net)
C ₂ 20,420	1.11							
C ₃ 19,930	84.36							
C ₄ 19,640 ^{*6}	2.51							
Total	87.98	2.321	21,647	19,928	12,027	11,072	6,113	6,362
C ₄ 19,640 ^{*6}	111.86							
C ₅ 19,429 ^{*7}	2.80							
Total	114.66	3,025	25,882	19,634	14,308	10,909	7,309	5,545

Note: *6 Butanes (19,670 + 19,610) = 19,640 BTU/Lb *7 Pentanes (19,500 + 19,450 + 19,330) ÷ 3 = 19,427 BTU/Lb

*8 1 BTU/Lb = 0.5556 Kcal/Kg

*9 Specific Gravity

Ethylene 0.374

Propane 0.508

C₂ .24.55 x 0.374 = 9.182

C₃ 1,920.10 x 0.508 = 975.441

C₄ .58.00 x 0.5735 = 33.263

2,002.65 mean 0.5083

Butanes 0.584

0.563

0.5735

C₄ 2,583.60 x 0.5735 = 1,481.695

C₅ 65.45 x 0.6177 = 40.428

2,649.05 mean 0.5746

Pentanes 0.631

0.625

0.577

0.6177

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 matters. The text notes that without clear documentation, it becomes difficult to track expenses and revenues, which can lead to misunderstandings and disputes.

2. The second part of the document addresses the need for regular communication and reporting. It states that stakeholders should be kept informed of progress and any challenges that arise. This involves providing timely updates and being open to feedback. The text suggests that effective communication is key to ensuring that everyone is on the same page and working towards common goals.

3. The third part of the document focuses on the importance of collaboration and teamwork. It highlights that no single individual can accomplish all the tasks required for a project. Instead, it is necessary to leverage the strengths of the entire team. The text encourages a culture of mutual support and shared responsibility, where team members help each other overcome obstacles and achieve better results.

4. The fourth part of the document discusses the importance of flexibility and adaptability. It notes that plans and schedules often change due to unforeseen circumstances. Being able to adjust to these changes without losing sight of the overall objectives is crucial. The text advises that a flexible mindset and the ability to pivot when necessary are essential for long-term success.

5. The fifth part of the document concludes by emphasizing the importance of continuous learning and improvement. It suggests that reflecting on past experiences and identifying areas for growth can lead to more effective performance in the future. The text encourages a growth mindset, where challenges are seen as opportunities to learn and develop new skills.

TABLE-14-1 PHYSICAL CONSTANTS OF HYDROCARBONS

FORMULA	MOLEC. WT.	BOILING POINT °F	MELTING POINT °F	DENSITY			CRITICAL CONSTANTS			HEAT OF COMBUSTION @ 60°F-370/1b	
				API	Sp Gr 160°/160°	Lb/ft ³	t °F	P Atm	D G/ml	Gross	Net
NORMAL PARAFFINS											
Methane.....	16.0	-258.9	-296.5	340	0.30	2.50	-110.3	45.8	0.182	23,800*	21,500*
Ethane.....	30.1	-129.0	-297.8	247	.508	3.11	+ 90.1	48.2	.203	22,300*	20,420*
Propane.....	44.1	-43.8	-305.7	147	.584	4.23	209.3	42.0	.226	21,650*	19,930*
Butane.....	58.1	+ 31.1	-210.9	111	.661	4.86	306	37.4	.225	21,200*	19,670*
Pentane.....	72.1	90.9	-201.5	82.7	.722	5.25	366.5	32.0	.232	21,070*	19,500*
Hexane.....	86.2	155.7	-139.5	61.6	.768	5.43	455.0	27.4	.231	20,740	19,240
Heptane.....	100.2	209.2	-131.1	44.2	.808	5.73	512.5	25.8	.231	20,570	19,160
Octane.....	114.2	253.2	-70.3	28.6	.841	5.99	565	24.6	.233	20,600	19,100
Nonane.....	128.2	303.4	-61.5	23.2	.868	6.22	612.0	23.2	—	20,530	19,050
Decane.....	142.2	345.2	-21.5	18.4	.888	6.41	658.0	22.2	—	20,480	19,020
Undecane.....	156.3	384.4	-14.1	14.7	.903	6.57	703.0	20.8	—	20,450	19,000
Dodecane.....	170.3	421.3	+ 14.7	11.2	.914	6.71	747.0	19.5	—	20,420	18,950
ISO-PARAFFINS											
Isobutane.....	58.1	10.9	-255.0	130	.503	4.69	275	35	.234	21,240*	19,810*
2-Methylbutane (Isopentane).....	72.1	82.2	-255.5	94.9	.625	5.20	309.5	32.4	.234	21,030*	19,450*
2,2-Dimethylpropane (Neopentane).....	72.1	49.0	+ 2.1	103	.597	4.97	329*	35*	—	20,960*	19,330*
2-Methylpentane (Isobrevinc).....	86.2	140.5	-245	83.5	.658	5.48	437*	31*	—	20,750	19,210
3-Methylpentane.....	86.2	145.9	-180	80.0	.669	5.57	443*	30*	—	20,760	19,220
2,2-Dimethylbutane (Neohexane).....	86.2	121.5	-147.0	84.9	.634	5.41	415*	31*	—	20,700	19,160
2,3-Dimethylbutane (Diisopropyl).....	86.2	130.4	-198.5	81.0	.666	5.51	441	31	.241	20,740	19,200
3-Methylhexane (Isocetane).....	100.2	194.1	-163.8	75.7	.681	5.65	490	28*	—	20,650	19,140
2-Methylhexane.....	100.2	197.5	-162.0	73.0	.692	5.70	501	28.5*	—	20,660	19,150
3-Ethylhexane.....	100.2	200.2	-181.5	69.8	.703	5.85	508*	28.5	—	20,670	19,160
2,2-Dimethylpentane.....	100.2	174.0	-100.6	77.2	.678	5.61	475*	29.5	—	20,600	19,090
2,3-Dimethylpentane.....	100.2	198.0	—	70.6	.700	5.83	495*	29	—	20,610	19,130
2,4-Dimethylpentane.....	100.2	170.9	-183.1	77.2	.678	5.61	472	28.5*	—	20,600	19,110
3,3-Dimethylpentane.....	100.2	180.9	-211.0	71.2	.695	5.81	457*	28*	—	20,620	19,110

ATTACH.20-1

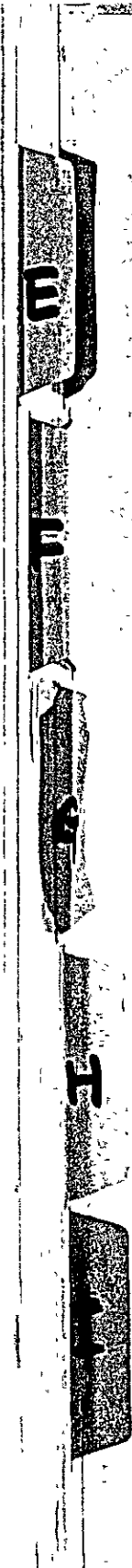


TABLE-14-2 PHYSICAL CONSTANTS OF HYDROCARBONS

2,2,3-Trimethylbutane (Triptane)	C ₇ H ₁₆	100.2	177.8	-13.0	72.1	0.695	5.78	480*	29.5	—	20,820	19,110
2-Methylheptane (Isodotane)	C ₈ H ₁₈	114.2	243.8	-165.1	70.1	.702	5.84	540*	25*	—	20,570	10,080
3-Ethylhexane	C ₈ H ₁₈	114.2	245.4	—	65.6	.718	5.98	551*	25*	—	20,570	10,080
2,5-Dimethylhexane (Diisobutyl)	C ₈ H ₁₈	114.2	228.4	-130	71.2	.698	5.81	530	25	0.237	20,550	19,080
2,2,4-Trimethylpentane ("Isooctane")	C ₈ H ₁₈	114.2	210.0	-101.2	71.8	.696	5.79	515*	27*	—	20,540	19,050
OLEFINS												
Ethylene	C ₂ H ₄	28.0	-184.7	-272.5	273	.35	2.91	50	51	.22	21,610*	20,290*
Propylene	C ₃ H ₆	42.1	-53.0	-301.4	140	.522	4.35	196.5	45.4	.273	21,040*	19,690*
Butene-1	C ₄ H ₈	56.1	20.7	—	104	.601	5.00	203*	39*	—	20,840*	19,400*
Cis-Butene-2	C ₄ H ₈	56.1	38.0	-218.0	94.2	.527	5.22	310*	37*	—	20,780*	19,430*
Trans-Butene-2	C ₄ H ₈	56.1	33.0	-157.7	100	.610	5.08	310*	37*	—	20,750*	19,400*
Isobutene	C ₄ H ₈	56.1	19.5	-250.5	104	.600	4.99	292.5	39.5	.234	20,720*	19,370*
Pentene-1 (Amylene)	C ₅ H ₁₀	70.1	86.2	-216.4	87.2	.617	5.38	385*	36*	—	20,710*	19,360*
Cis-Pentene-2	C ₅ H ₁₀	70.1	68.6	-250.2	82.6	.601	5.30	396*	35*	—	20,660*	19,310*
Trans-Pentene-2	C ₅ H ₁₀	70.1	90.8	-211.0	84.0	.684	5.44	390*	35*	—	20,640*	19,290*
2-Methylbutene-1 (Isopropylene)	C ₅ H ₁₀	70.1	88.0	—	84.5	.655	5.45	387*	36*	—	20,610*	19,260*
2-Methylbutene-2	C ₅ H ₁₀	70.1	108.4	-292.0	92.0	.643	5.27	363*	37*	—	20,560*	19,310*
2-Methylbutene-3	C ₅ H ₁₀	70.1	101.2	-297.0	80.6	.607	5.55	401*	35*	—	20,570*	19,220*
Hexene-1	C ₆ H ₁₂	84.2	146.4	-218.0	77.2	.678	5.64	463*	34*	—	20,450	19,100
Cis-Hexene-2	C ₆ H ₁₂	84.2	155.4	-231.0	73.0	.689	5.73	473*	34*	—	20,420	19,070
Trans-Hexene-2	C ₆ H ₁₂	84.2	154.2	-207.0	75.7	.683	5.68	472*	34*	—	20,400	19,050
Cis-Hexene-3	C ₆ H ₁₂	84.2	153.7	-211.0	75.4	.684	5.60	472*	34*	—	20,420	19,070
Trans-Hexene-3	C ₆ H ₁₂	84.2	154.6	-171	76.0	.682	5.68	474*	34*	—	20,400	19,050
DIOLEFINS												
Propadiene	C ₃ H ₂	40.1	-30.1	-213.0	106	.595	4.95	210	70	—	20,860*	19,930*
Butadiene-1,2	C ₄ H ₂	54.1	+50.5	—	83.5	.658	5.48	343*	—	—	—	—
Butadiene-1,3	C ₄ H ₂	51.1	24.1	-104.0	94.2	.627	5.22	308	45	—	20,230*	19,180*
Pentadiene-1,2	C ₅ H ₂	68.1	112.8	-85.0	71.5	.697	5.80	420*	—	—	—	—
Cis-Pentadiene-1,3	C ₅ H ₂	68.1	111.0	—	71.8	.690	5.76	420*	—	—	—	—
Trans-Pentadiene-1,3	C ₅ H ₂	68.1	108.1	—	70.0	.682	5.68	415*	—	—	—	—
Pentadiene-1,4	C ₅ H ₂	68.1	78.9	-234.0	81.3	.665	5.51	350*	—	—	—	—
3-Methylbutadiene-1,2	C ₅ H ₂	68.1	101	-194.0	82.9	.685	5.70	410*	—	—	—	—
2-Methylbutadiene-1,3 (Isoprene)	C ₅ H ₂	68.1	93.3	-221.0	74.8	.660	5.71	395*	—	—	—	—

* Heat of combustion as a gas—otherwise as a liquid. * Critical temperature-boiling point correlation. * Mixture of cis- and trans isomers.
 † Vapor pressure curve or correlation. ** Sublimes.

TABLE-15 C₃ AND C₄ LPG PRODUCTION (LB/H) OF EACH YEAR

	C ₃ LPG				C ₄ LPG			Total				
	C ₂ 10 ³ Lb/H	C ₃ 10 ³ Lb/H	C ₄ 10 ³ Lb/H	Total 10 ³ Lb/H	C ₄ 10 ³ Lb/H	C ₅ 10 ³ Lb/H	Total 10 ³ Lb/H	C ₂ 10 ³ Lb/H	C ₃ 10 ³ Lb/H	C ₄ 10 ³ Lb/H	C ₅ 10 ³ Lb/H	Total 10 ³ Lb/H
1981 *1 (Kg/H)	0.44	23.6*1	0.54	24.58*3 (11.17)	13.06*2	0.27	13.33*4 (6.06)	0.44	23.6	13.6	0.27	37.91 (17.23)
1982 (Kg/H)	0.74	39.4	0.90	41.04 (18.65)	22.20	0.45	22.65 (10.30)	0.74	39.4	23.1	0.45	63.69 (28.95)
1983 (Kg/H)	0.89	47.3	1.08	49.27 (22.40)	26.52	0.54	27.06 (12.30)	0.89	47.3	27.6	0.54	76.33 (34.70)
1984 (Kg/H)	1.23	65.7	1.51	68.44 (31.11)	36.89	0.75	37.64 (17.11)	1.23	65.7	38.4	0.75	106.08 (48.22)
1985 (Kg/H)	1.23	65.7	1.51	68.44 (31.11)	36.89	0.75	37.64 (17.11)	1.23	65.7	38.4	0.75	106.08 (48.22)
1986 (Kg/H)	1.43	76.2	1.75	79.38 (36.08)	42.95	0.88	43.83 (19.92)	1.43	76.2	44.7	0.88	123.21 (56.00)
1987 (Kg/H)	1.43	76.2	1.75	79.38 (36.08)	42.95	0.88	43.83 (19.92)	1.43	76.2	44.7	0.88	123.21 (56.00)
1988 (Kg/H)	1.63	86.8	1.99	90.42 (41.10)	49.01	1.00	50.01 (22.73)	1.63	86.8	51.0	1.00	140.43 (63.83)
1989 (Kg/H)	1.63	86.8	1.99	90.42 (41.10)	49.01	1.00	50.01 (22.73)	1.63	86.8	51.0	1.00	140.43 (63.83)
1990 (Kg/H)	1.63	86.8	1.99	90.42 (41.10)	49.01	1.00	50.01 (22.73)	1.63	86.8	51.0	1.00	140.83 (63.83)

Note: *1 come from TABLE-12 (4) (ATTACH.18)

*2 TABLE-12 (4) (ATTACH.18) minus C₄
in C₃ LPG of this Table
13.6 - 0.54 = 13.06

Calculation way

*3 C ₃ LPG			*4 C ₄ LPG		
	%	Lb/H		%	Lb/H
C ₂	1.8	0.44	C ₄	98	13.06
C ₃	96.0	23.60	C ₅	2	0.27
C ₄	2.2	0.54			
	100.0	24.58		100	13.33

The following table shows the results of the experiment. The first column is the number of trials, the second column is the number of correct responses, and the third column is the percentage of correct responses. The data shows that the percentage of correct responses increases as the number of trials increases, indicating that the subjects are learning the task.

Number of Trials	Number of Correct Responses	Percentage of Correct Responses
10	5	50%
20	12	60%
30	18	60%
40	25	62.5%
50	32	64%
60	38	63.3%
70	45	64.3%
80	52	65%
90	58	64.4%
100	65	65%

The results of the experiment show that the subjects are able to learn the task and improve their performance over time. The percentage of correct responses increases from 50% at 10 trials to 65% at 100 trials. This suggests that the subjects are learning the task and becoming more accurate in their responses as they practice.

TABLE-16 C₃ AND C₄ LPG (T/H, T/D, T/Y) PRODUCTION OF EACH YEAR

	C ₃ LPG			C ₄ LPG			Total			REMARK NATURAL GAS PRODUCTION MM scf/D
	T/H*	T/D	10 ³ T/Y	T/H*	T/D	10 ³ T/Y	T/H*	T/D	10 ³ T/Y	
1981	11.17	268.08	97.85	6.06	145.44	53.08	17.23	413.52	150.93	150
1982	18.65	447.6	163.39	10.30	247.20	90.23	28.95	694.80	253.60	300
1983	22.40	537.6	196.22	12.30	295.20	107.75	34.70	883.80	303.97	350
1984	31.11	746.64	272.52	17.11	410.64	149.88	48.22	1,157.28	422.40	500
1985	31.11	746.64	272.52	17.11	410.64	149.88	48.22	1,157.28	422.40	500
1986	36.08	865.92	316.06	19.92	478.08	174.50	56.00	1,344.00	490.56	600
1987	36.08	865.92	316.06	19.92	478.08	174.50	56.00	1,344.00	490.56	600
1988	41.10	986.40	360.04	22.73	545.52	199.11	63.83	1,531.92	559.15	700
1989	41.10	986.40	360.04	22.73	545.52	199.11	63.83	1,531.92	559.15	700
1990	41.10	986.40	360.04	22.73	545.52	199.11	63.83	1,531.92	559.15	700

Note: * from TABLE-15 (ATTACH.21)

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is crucial for ensuring transparency and accountability in the organization's operations.

2. The second part of the document outlines the various methods and tools used to collect and analyze data. It highlights the need for consistent data collection procedures and the use of advanced analytical techniques to derive meaningful insights from the data.

3. The third part of the document focuses on the role of technology in data management and analysis. It discusses how modern software solutions can streamline data collection, storage, and processing, thereby improving efficiency and accuracy.

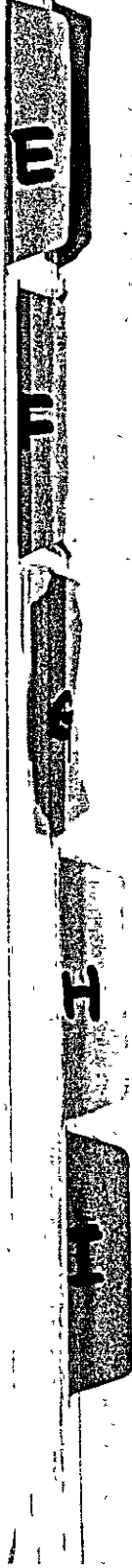
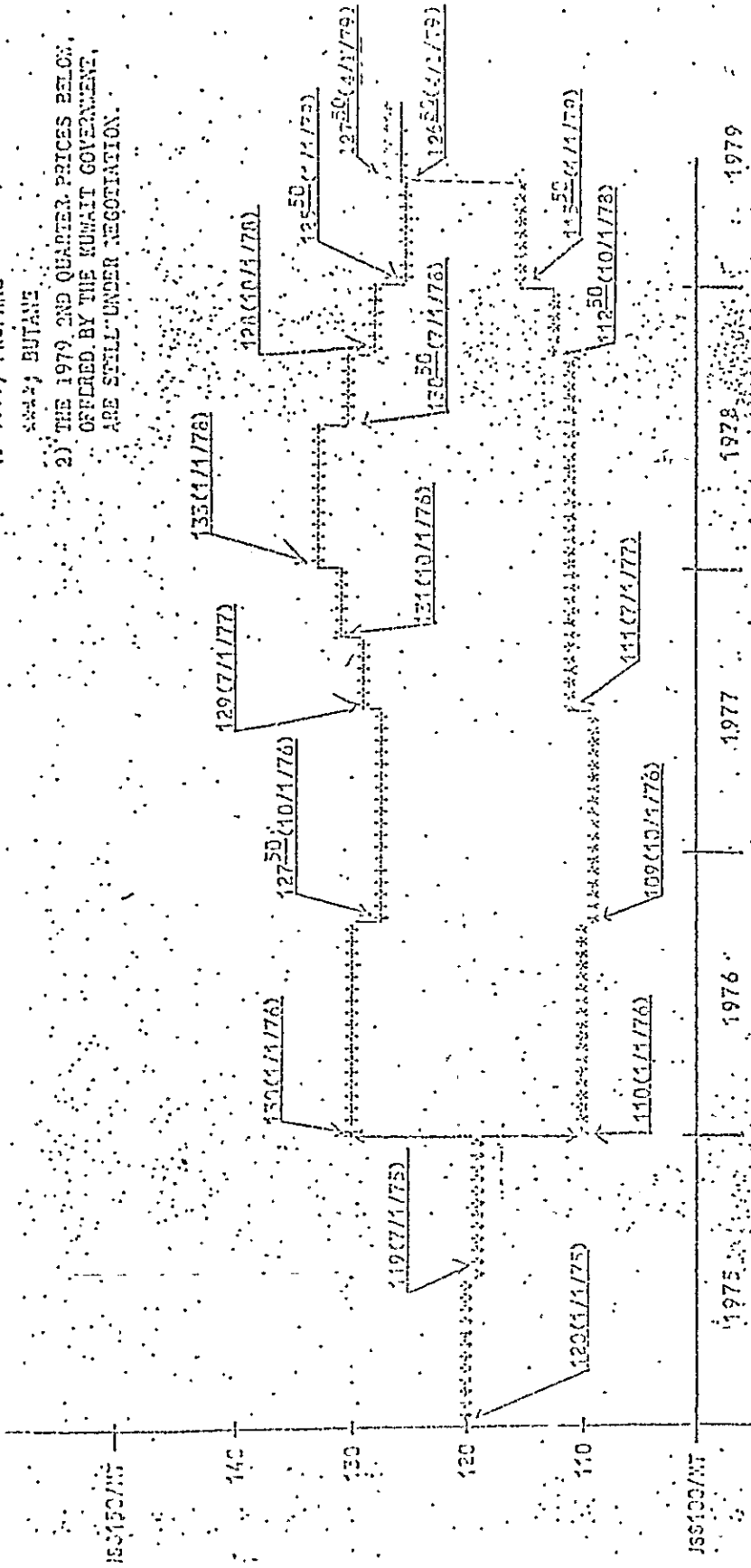
4. The fourth part of the document addresses the challenges associated with data management, such as data quality, security, and privacy. It provides strategies to mitigate these risks and ensure that the data remains reliable and secure throughout its lifecycle.

5. The fifth part of the document concludes by summarizing the key findings and recommendations. It stresses the importance of ongoing monitoring and evaluation to ensure that the data management processes remain effective and aligned with the organization's goals.

CUMY : US\$/MT

NOTE : 1) 1977 PROPANE
2) 1979 BUTANE

THE 1979 QND QUARTER PRICES BELOW
OFFERED BY THE KUWAIT GOVERNMENT
ARE STILL UNDER NEGOTIATION.



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 matters. The text notes that without clear records, it becomes difficult to track expenses, revenues, and other critical data points.

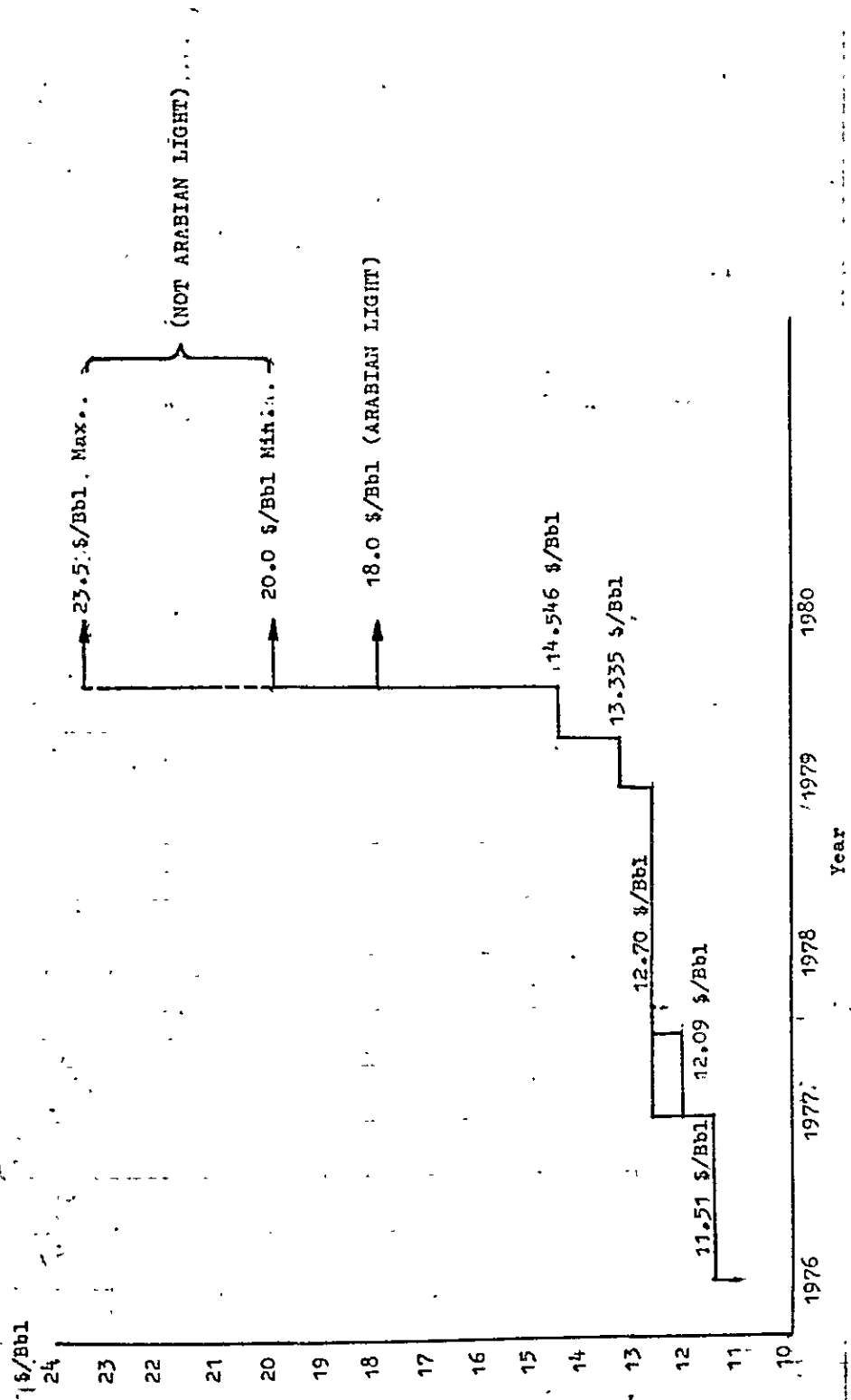
2. The second part of the document addresses the challenges associated with data management and storage. It highlights the need for secure and scalable solutions to handle large volumes of information. The author suggests that investing in robust IT infrastructure is crucial for ensuring the integrity and availability of data over time.

3. The third part of the document focuses on the role of technology in streamlining operations. It discusses how automation and digital tools can significantly reduce manual errors and improve efficiency. The text also touches upon the importance of training staff to effectively utilize these technologies.

4. The fourth part of the document explores the impact of regulatory changes on business operations. It notes that staying up-to-date with the latest regulations is vital for compliance and avoiding legal penalties. The author recommends regular audits and consultations with legal counsel to ensure full adherence to all applicable laws.

5. The fifth and final part of the document provides a summary of the key points discussed. It reiterates the importance of a proactive approach to record-keeping, data management, and operational efficiency. The author concludes by encouraging businesses to embrace change and innovation to thrive in a competitive market.

(MARKET PRICE, ARABIAN LIGHT, PER BBL)



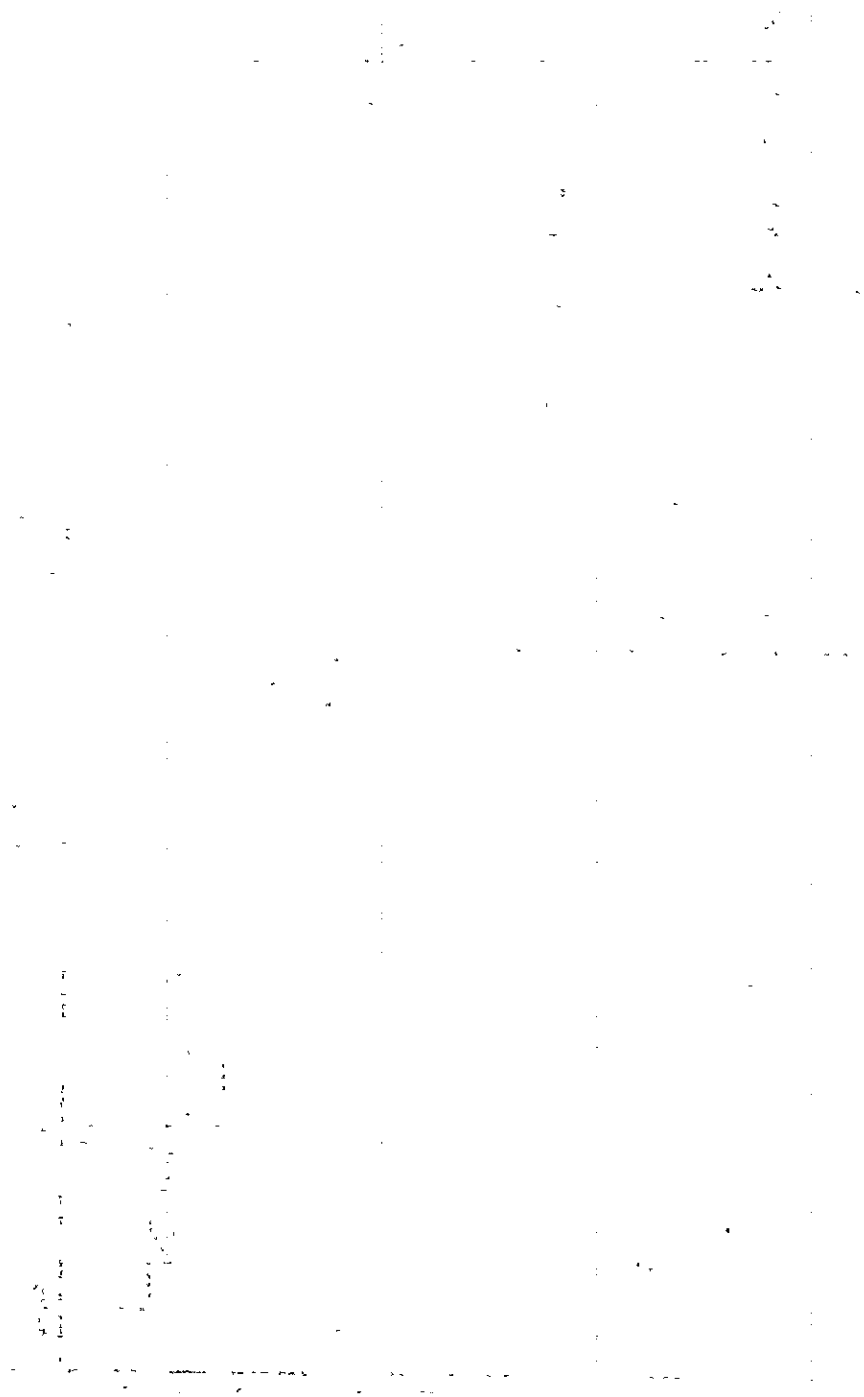


TABLE-17

AVERAGE VALUE OF C₃ AND C₄ LPG

	C ₃ LPG		C ₄ LPG		C ₃ and C ₄ LPG (2) + (4) 10 ³ \$/Y	C ₃ and C ₄ LPG (1) + (3) 10 ³ T/Y	C ₃ and C ₄ LPG (7) (5) ÷ (6) 10 ³ \$/T	C ₃ LPG: % on Total (8) (1) + (6) %
	(1) C ₃ LPG *1 10 ³ T/Y	(2) (1) x 160 \$/T 10 ³ \$/Y *2	(3) C ₄ LPG *1 10 ³ T/Y	(4) (3) x 180 \$/T 10 ³ \$/Y *2				
1981	97.85	15,656	53.06	9,551	25,207	150.91	167.1	64.8
1982	163.37	26,139	90.23	16,241	42,380	253.60	167.1	64.4
1983	196.22	31,395	107.75	19,395	50,790	303.97	167.1	64.5
1984	272.52	43,603	149.88	26,978	70,581	422.41	167.1	64.5
1985	272.52	43,603	149.88	26,978	70,581	422.40	167.1	64.5
1986	316.06	50,570	174.50	31,410	81,980	490.56	167.1	64.4
1987	316.06	50,570	174.50	31,410	81,980	490.56	167.1	64.4
1988	360.04	57,664	199.11	35,840	93,504	559.15	167.2	64.4
1989	360.04	57,664	199.11	35,840	93,504	559.15	167.2	64.4
1990	360.04	57,664	199.11	35,840	93,504	559.15	Average 167.2 167.1	64.4 64.5

Note: *1 are come from TABLE-16 (ATTACH.22).

*2 C₃ LPG 160 \$/T, C₄ LPG 180 \$/T

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is crucial for ensuring transparency and accountability in the organization's operations.

2. The second part of the document outlines the various methods and tools used to collect and analyze data. It highlights the need for consistent and reliable data collection processes to support effective decision-making.

3. The third part of the document focuses on the role of technology in data management and analysis. It discusses how modern software solutions can streamline data collection, storage, and reporting, thereby improving efficiency and accuracy.

4. The fourth part of the document addresses the challenges associated with data management, such as data quality, security, and privacy. It provides strategies to mitigate these risks and ensure that data is used responsibly and ethically.

5. The fifth part of the document discusses the importance of data governance and the role of leadership in establishing a strong data culture. It emphasizes that data should be treated as a valuable asset that requires careful management and oversight.

6. The sixth part of the document concludes by summarizing the key points discussed and reiterating the importance of data in driving organizational success. It encourages ongoing learning and improvement in data management practices to stay competitive in a rapidly changing market.

	(1)	(2)	(3)	(4)	(5)	(6)
	C ₃ LPG	(1)*24	(2)x3.65 ^{*2}	(3)x21,647 ^{*3}	(2)x21,647	(3)x21,647
	10 ³ lb/H*1	10 ³ lb/D	10 ⁶ lb/Y	10 ⁶ BTU/H	10 ⁶ BTU/D	10 ⁶ BTU/Y
1981	24.58	589.92	215.32	532.08	12,770.00	4,661.03
1982	41.04	984.96	359.51	888.39	21,321.43	7,782.31
1983	49.27	1,182.48	431.61	1,066.55	25,597.14	9,343.06
1984	68.44	1,642.56	599.53	1,481.52	35,556.50	12,978.03
1985	68.44	1,642.56	599.53	1,481.52	35,556.50	12,978.03
1986	79.38	1,905.12	695.37	1,718.34	41,240.13	15,052.67
1987	79.38	1,905.12	695.37	1,718.34	41,240.13	15,052.67
1988	90.42	2,170.08	792.08	1,957.32	46,975.72	17,146.16
1989	90.42	2,170.08	792.08	1,957.32	46,975.72	17,146.16
1990	90.42	2,170.08	792.08	1,957.32	46,975.72	17,146.16

Note: *1 come from TABLE-15 (ATTACH.21).

*2 LPG production can not be changed because heating value of sales natural gas should be maintained constant.

*3 come from TABLE-13-2 (14) (ATTACH.19-2).

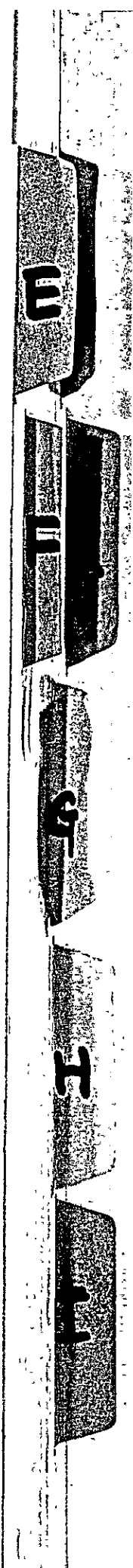


	(1)	(2)	(3)	(4)	(5)	(6)
	10^3 Lb/H *1	(1) x 24 H 10^3 Lb/D	(2) x 365^{*2} 10^6 Lb/Y	(1) x 25,882 *3 BTU/Lb Gross 10^6 BTU/H	(2) x 25,882 BTU/Lb Gross 10^6 BTU/D	(3) x 25,882 BTU/Lb Gross 10^9 BTU/Y
1981	13.33	319.92	116.77	345.01	8,280.17	3,022.24
1982	22.65	543.60	198.41	586.83	14,069.46	5,115.25
1983	27.06	649.44	237.05	700.37	16,808.81	6,135.33
1984	37.64	903.36	329.73	974.20	23,380.76	8,534.07
1985	37.64	903.36	329.73	974.20	23,380.76	8,534.07
1986	43.83	1,051.92	383.95	1,134.41	27,225.79	9,937.39
1987	43.83	1,051.92	383.95	1,134.41	27,225.79	9,937.39
1988	50.01	1,200.24	438.09	1,294.36	31,064.61	11,338.65
1989	50.01	1,200.24	438.09	1,294.36	31,064.61	11,338.65
1990	50.01	1,200.24	438.09	1,294.36	31,064.61	11,338.65

Note: *1 come from TABLE-15 (ATTACH.21).

*2 LPG production can not be changed because heating value of sales natural gas should be maintained constant.

*3 come from TABLE-13-2 (14)(ATTACH.19-2)



1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is essential for ensuring transparency and accountability in the organization's operations.

2. The second part of the document outlines the various methods and tools used to collect and analyze data. It highlights the need for consistent data collection procedures and the use of advanced analytical techniques to derive meaningful insights from the data.

3. The third part of the document focuses on the role of technology in data management and analysis. It discusses how modern software solutions can streamline data collection, storage, and processing, thereby improving efficiency and accuracy.

4. The fourth part of the document addresses the challenges associated with data management, such as data quality, security, and privacy. It provides strategies to mitigate these risks and ensure that the data remains reliable and secure.

5. The fifth part of the document concludes by summarizing the key findings and recommendations. It stresses the importance of ongoing monitoring and evaluation to ensure that the data management processes remain effective and up-to-date.

TABLE-20 AVERAGE C₃ AND C₄ LPG HEATING VALUE

	(1)	(2)	(3)	(4)	(5)
	C ₃ LPG Gross 10 ⁹ BTU/Y	C ₄ LPG Gross 10 ⁹ BTU/Y	C ₃ +C ₄ LPG Gross 10 ⁹ BTU/Y	C ₃ + C ₄ LPG Production 10 ³ T/Y	(3) ÷ (4) Gross 10 ⁶ BTU/T
1981	4,661.03	3,022.24	7,682.27	150.93	50.91
1982	7,782.31	5,115.06	12,897.37	253.60	50.86
1983	9,343.06	6,135.33	15,478.39	303.97	50.92
1984	12,978.03	8,534.07	21,512.10	422.40	50.92
1985	12,978.03	8,534.07	21,512.10	422.40	50.92
1986	15,052.67	9,937.39	24,990.06	490.56	50.94
1987	15,052.67	9,937.39	24,990.06	490.56	50.94
1988	17,146.16	11,338.65	28,484.81	559.15	50.94
1989	17,146.16	11,338.65	28,484.81	559.15	50.94
1990	17,146.16	11,338.65	28,484.81	559.15	50.94

Note: (1) TABLE-18 (6) (ATTACH.26)

(2) TABLE-19 (6) (ATTACH.27)

(4) TABLE-16 (ATTACH.22)

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TABLE-21

COST SUMMATION

Production 385,010 T/Y

			\$/T
Charge Natural Gas	50.92 MMBTU/T	1.5 \$/10 ⁶ BTU	76.38
Operation Cost	(Investment 93.253 MM\$ - 385,090 T = 242,158 \$/T)		
Depreciation	5% on Investment		11.61
Interest for Investment	5% on Investment		11.61
Tax and Insurance	2% on Investment		4.65
Maintenance	3% on Investment		6.97
Administration	2% on Investment		4.65
Over-head	2% on Investment		4.65
Interest of Working Capital			1.68
Sub-Total			45.82
Utility			40.82
Labor Cost	15x4 = 60 persons 200 \$/mon x 60 persons x 12 mon ÷ 385,090 T/Y		0.34
Sub-Total			86.98
	Minus 15% for dew point control		73.93
Total			150.31
	plus 3% for selling charge		154.82
OUTLET (INCOME)			
C ₃ and C ₄ LPG			167.1

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is crucial for ensuring transparency and accountability in the organization's operations.

2. The second part outlines the various methods and tools used to collect and analyze data. This includes the use of surveys, interviews, and focus groups to gather qualitative information, as well as the application of statistical software for quantitative analysis.

3. The third part details the process of identifying and measuring key performance indicators (KPIs). It explains how these indicators are selected based on the organization's strategic goals and how they are used to track progress and performance over time.

4. The fourth part describes the process of reporting and communicating the results of the analysis. It highlights the importance of presenting the data in a clear and concise manner, using visual aids such as charts and graphs to enhance understanding.

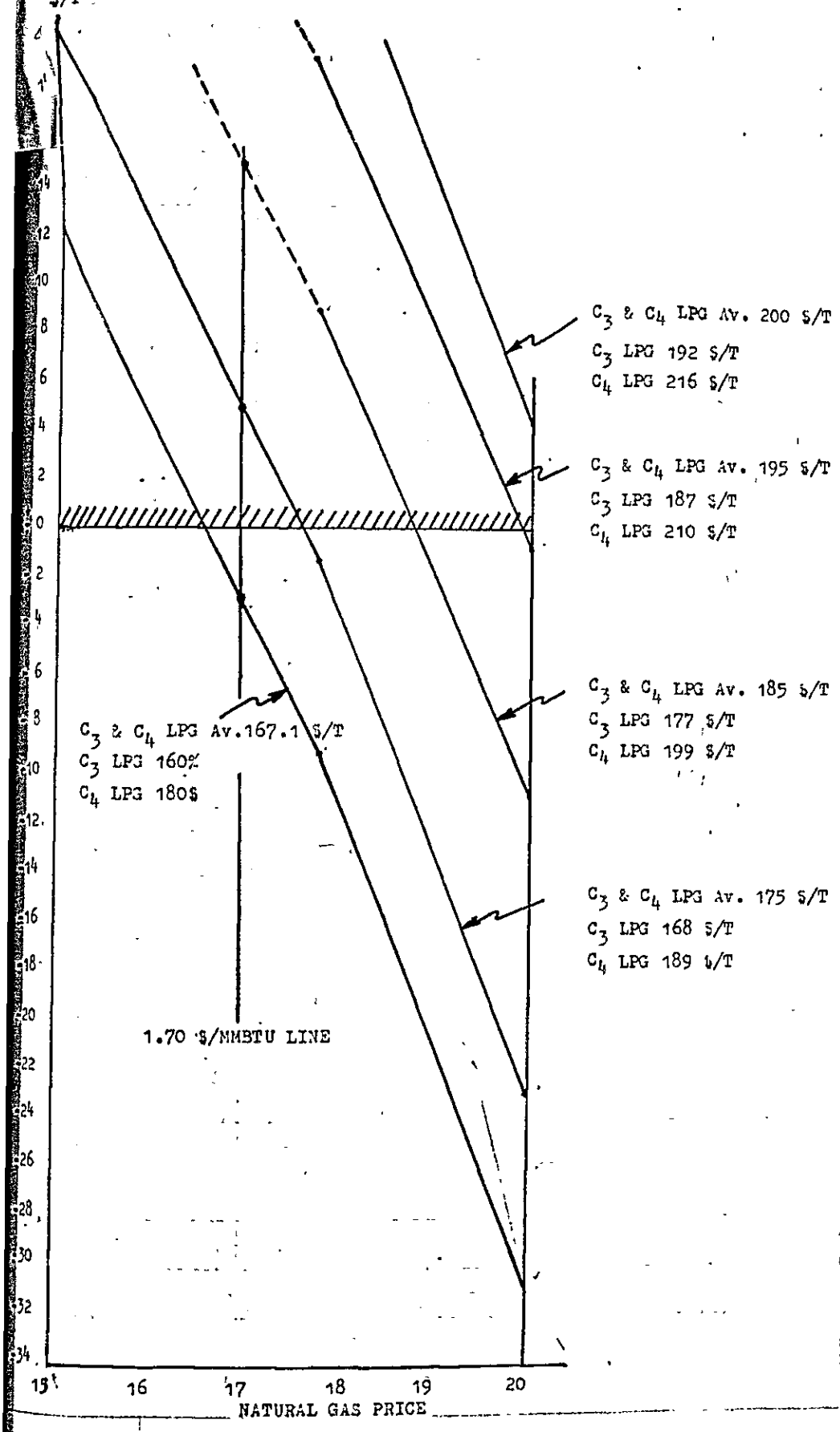
5. The final part of the document discusses the implications of the findings and the steps that should be taken to address any identified issues or areas for improvement. It stresses the need for ongoing monitoring and evaluation to ensure that the organization remains on track with its objectives.

FIG.9 PROFIT OR LOSS VS. NATURAL GAS PRICE

ATTACH.30

FOR C₃ AND C₄ LPG

PROFIT
OR LOSS
\$/T



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