FIG. A-1-1 DISTRIBUTION OF OIL PRODUCTS TO CENTRAL AND UPPER BURMA (MANN REFINERY)

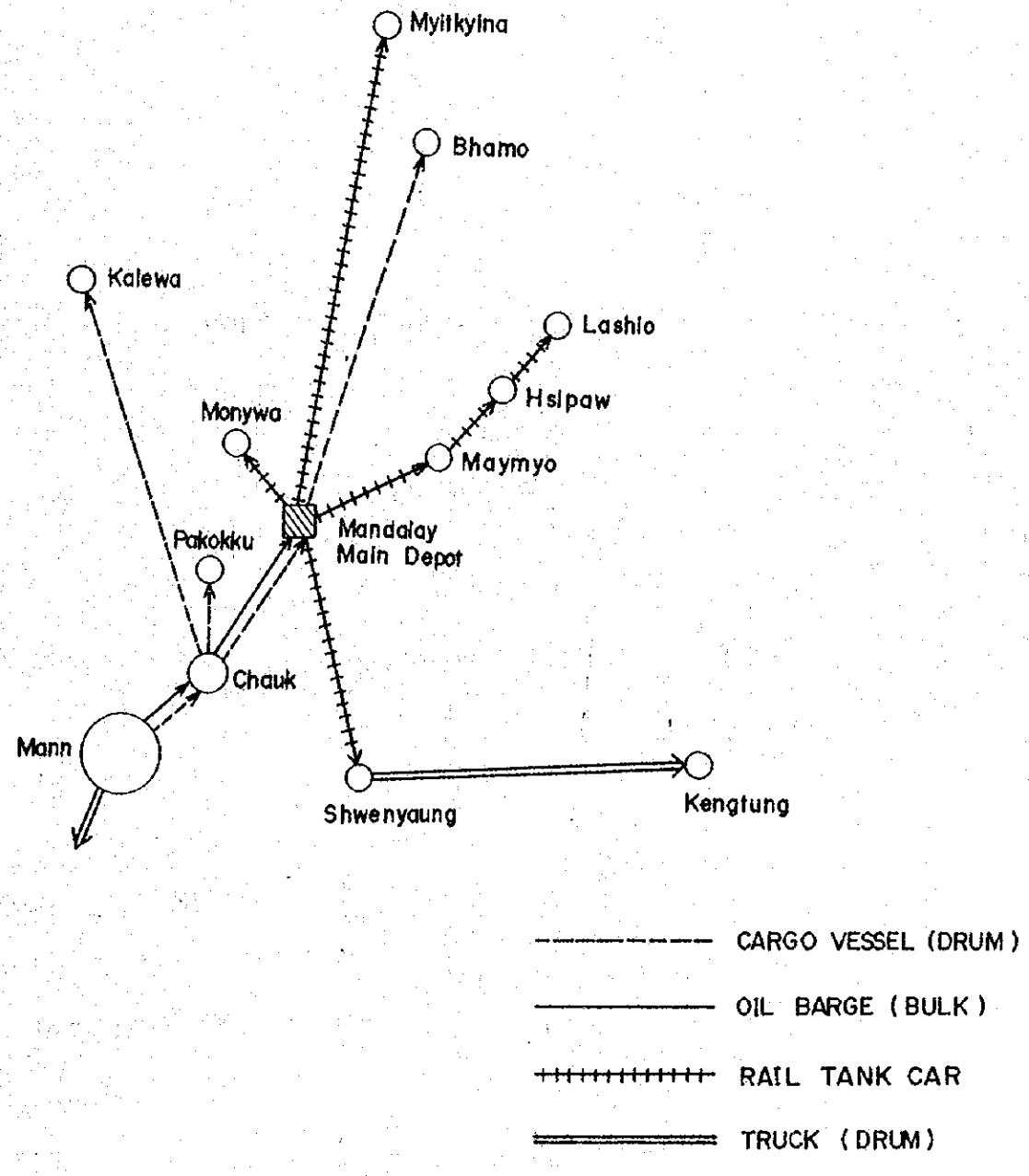
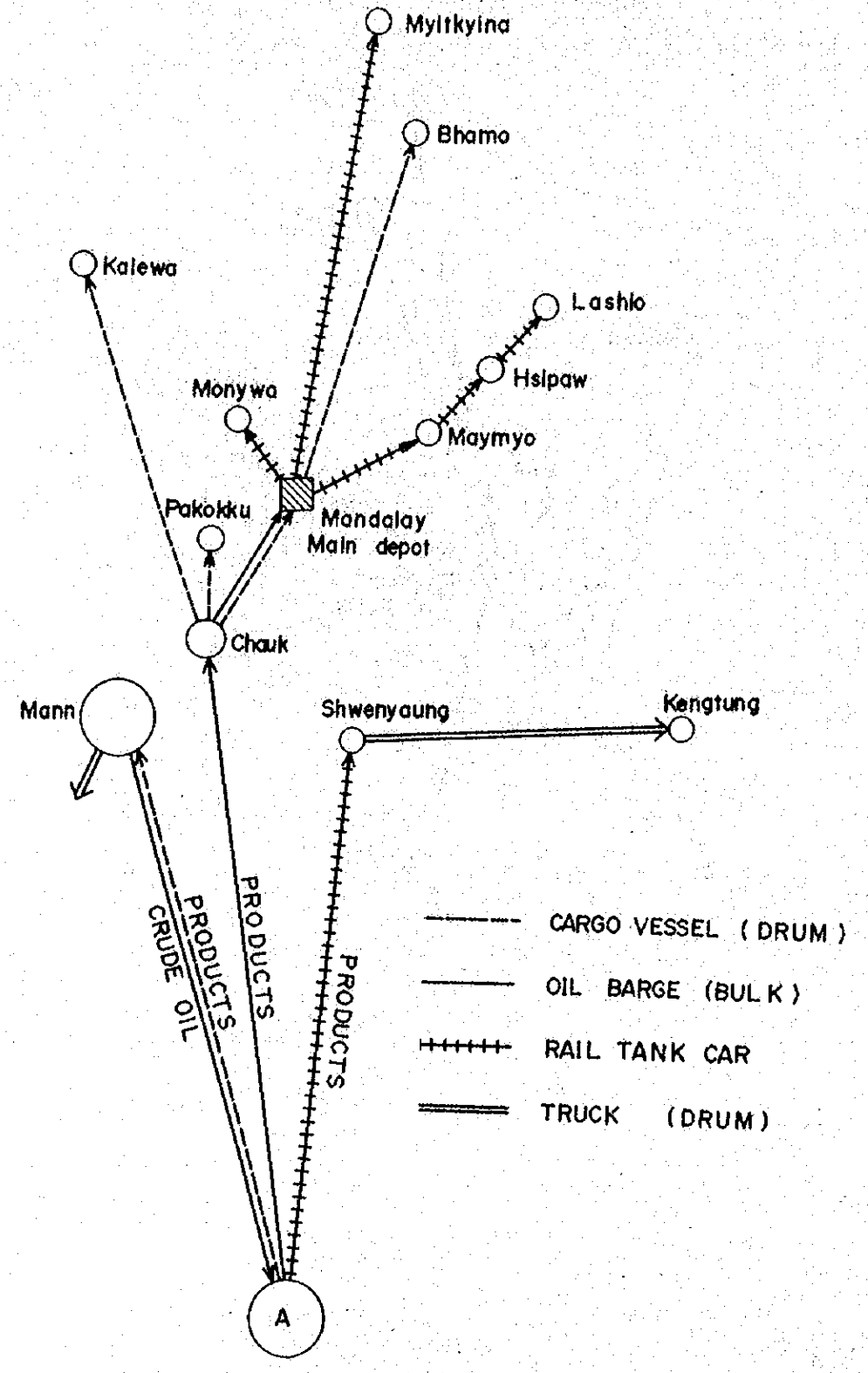


FIG.A-1-2 DISTRIBUTION OF OIL PRODUCTS TO CENTRAL AND UPPER BURMA (NEW SYRIAM REFINERY)



Appendix

2. BURMESE TEXTILE INDUSTRY

Appendix 2

THE BURMESE TEXTILE INDUSTRY

The import of textile products into Burma is as shown in Table A2 - 1. (Report to the Pyithu Hluttaw) and in Table A2 - 2 (Obtained through the survey at this time from the Burmese side).

According to these tables, we can see that the import of textile products has decreased in recent years, however, this decrease should not be attributed to domestic production increases. This is evident from Table A2 - 3. As a matter of fact, the volume of textile products imported into Burma is quite large and the Government of Burma is making efforts to increase domestic production.

However, as is evident from Table A2 - 4, cotton farmland in Burma has not increased. This is by reason of the climate and geography of the land and the limited amount of farmable land.
For these reasons, increase in the production of cotton cannot be realized as Table A2 - 5 shows.

Therefore, the Government of Burma has shown strong interest in synthetic fibers and is installing a textile plant with weaving machinery in Tables A2 - 6 and A2 - 7.
These Tables show how increase in textile production is planned by the Government of Burma.

On the contrary, at the present all the synthetic fibre requirement is being imported.
Under the above circumstances, the Government of Burma has plans to install the petro-chemical industry as a downstream of the Mann Refinery, to produce dimethylterephthalate as a raw material of polyester fibre.

The domestic crude oil to be processed at the Mann Refinery has a rich aromatic content, and naphtha fraction from the refinery will have surplus and be fully utilized as the raw material of the petro-chemical industry.

However, it is said generally that the petro-chemical industry requires a large scale of facilities as an economic scale and a large amount of capital accordingly. Therefore, in the case of Burma, the planning of a petro-chemical industry as the core concern in the production of dimethylterephthalate must be investigated carefully through the feasibility study.

TABLE A2-1 CHANGES IN IMPORTS BY TYPE OF COMMODITY

(Kyat in lakhs)

Serial No.		Type of Commodity	1961-62	1971-72	1972-73	1973-74 (First six months)
1		2	3	4	5	6
1		Capital goods-	2706	4584	2788	1147
	1	Building materials	1237	975	678	132
	2	Machinery	971	2788	1747	938
	3	Transport equipment ...	361	670	197	24
	4	Other capital goods ...	137	151	166	53
2		Inter industry use-	4471	3620	3389	1361
	1	Materials	3558	2894	2429	1061
	2	Fuel	212	138	258	15
	3	Tools and spares	701	588	702	285
3		Consumer goods-	3259	998	808	402
	1	Consumer goods, durable .	493	156	185	89
	2	Food	1029	263	234	157
	3	Textiles	1167	417	179	58
	4	Medicines and pharmaceuticals	380	116	173	79
	5	Other consumer goods ...	190	46	37	19
4		Commodity unspecified-	*	12	57	12
		Total ...	10436	9214	7042	2922

* Less than K 0.5 lakh.

Note: - Imports are on arrival basis.

TABLE A2-2 COMPARATIVE STATEMENT OF IMPORT VALUE OF TEXTILE AND ALL IMPORTS VALUE

(Kyats in Million)

Particular	1950 to 1963 14 years average		1964 to 1968 5 years average		1969 - 1970		1970 - 1971	
	Value	%	Value	%	Value	%	Value	%
All Imports	971	100%	909	100%	778	100%	880	100%
Textiles Imports	225	23%	177	20%	255	33%	202	23%
(a) Cotton Textiles	190	20%	162	18%	163	21%	106	12%
(b) Other Textiles (Synthetics Textile)	35	3%	15	2%	92	12%	96	11%

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TABLE A2-3 PRODUCTION OF SELECTED COMMODITIES

Serial No.	Commodity	Unit	1961--62	1971--72	1972--73	1973--74	1974--75* (Provisional)
1	2	3	4	5	6	7	8
1	Sugar	(000)ton	55	60	60	34	31
2	Salt	"	124	163	179	185	212
3	Cigarette	No. (Million)	1114	1519	1442	1942	1995
4	Cotton yarn.. ...	(000)ton	3.0	11.5	10.4	6.1	5.9
5	Shirting	Yds (lakh)	...	87	35	53	103
6	Poplin	"	...	10	26	10	2
7	Mosquito netting ...	"	...	42	15	2	57
8	Blankets	No.(lakh)	...	15	13	9	11
9	Towel	"	...	17	14	12	14
10	Cotton vest ...	No. (Million)	9.0	2.0	2.0	2.7	4.9
11	Gent's longyi ...	No.(lakh)	...	136	96	98	116
12	Ladies' longyi ...	"	...	25	12	7	20
13	Children's longyi ...	"	...	30	21	9	28
14	Gunny Bag ...	"	126	199	202	128	138
15	Umbrella	(000)dozen	102	84	45	26	70
16	Fountain Pen ...	(000)No.	...	368	215	165	437
17	Soap	(000)ton	44.4	33.8	38.4	26.1	38.5
18	Matches	(000)case	306	241	190	210	211
19	Candle	(000)ton	8.0	4.6	4.8	4.8	4.5
20	Brick and tile ...	No.(lakh)	629	472	990	866	940
21	Cement	(000)ton	33	203	220	150	220
22	Wire nails	"	...	4.2	4.1	2.8	2.3
23	Petroleum	Gallon (lakh)	476	516	510	611	714
24	Kerosene	"	450	787	568	632	779
25	Diesel oil	"	...	802	581	664	827
26	Furnace oil ...	"	123	479	366	390	362
27	Incandecent lamp ...	(000)No.	...	2941	3993	2082	1549
28	Fluorescent tube ...	"		378	457	437	500
29	Dry cell battery	"	6034	8674	16512	17705	22600
30	Radio	"	11	33	19	33	38
31	Motorcar	No.	...	1504	1997	948	1250
32	Bycycle	"	...	10207	7400	9635	13600
33	Water pump ...	set	...	2901	3051	5369	5385
34	Tractor	No.	...	594	1019	1012	1300
35	Fertilizer	(000)ton	...	78.5	88.0	107.0	121.4
36	Alluminium posts and pans	lbs(lakh)	41	21	15	13	15

* April to March.

Each case contains 1200 match boxes,

TABLE A2-4 SOWN ACREAGE OF COTTON

(Thousand acres)

Serial No.	Burmese Financial Years	Sown Acreage
1	1961 - 1962	469
2	1962 - 1963	551
3	1963 - 1964	674
4	1964 - 1965	616
5	1965 - 1966	567
6	1966 - 1967	487
7	1967 - 1968	526
8	1968 - 1969	389
9	1969 - 1970	362
10	1970 - 1971	467
11	1971 - 1972	554
12	1972 - 1973	532
13	1973 - 1974	527

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TABLE A2-5 PRODUCTION OF SELECTED CROPS

(Thousand tons)

Serial No.	Crops	1961-62	1971-72	1972-73	1973-74	1974-75 (Provisional)
1	2	3	4	5	6	7
1	Paddy	6726	8046	7241	8466	8446
2	Wheat	15	26	26	24	41
3	Maize (seeds)	55	57	55	61	59
4	Matpe	27	29	32	24	33
5	Butter bean	12	41	36	41	45
6	Sultapya	2	23	22	13	18
7	Peboke	10	13	13	12	13
8	Pulses	209	207	162	174	203
9	Groundnut (in shell)	387	478	377	405	459
10	Sesamum	75	111	69	152	98
11	Cotton	21	42	43	37	45
12	Jute	6	65	88	78	39
13	Rubber	25	14	15	15	15
14	Sugar-cane ...	1072	1606	2000	1661	1185
15	Burmese tobacco ...	35	51	50	32	37
16	Virginia tobacco (green)	13	18	16	10	22

Note: -(1) Agricultural year ending 30th June.

(2) Data for 1974 - 1975 covers only upto 31st October 1974.

TABLE A2-6 LIST OF TEXTILE FACTORIES USING SYNTHETIC, FIBRE AND FILAMENT YARNS

Sr. No	Factories	Capacity		Process
		Weaving Looms	Knitting Machines	
1.	People's Synthetic Textile No. 1	130	-	Weaving/Knitting/Finishing
2.	Synthetic 1	120	-	Weaving/Finishing
		250	-	Weaving
3.	Synthetic 2	177	-	Weaving
4.	Synthetic 3	23	-	Weaving
		123	-	Weaving/Finishing
5.	Synthetic 4	-	18	Knitting/Finishing
		100	15	Weaving/Printing
		-	4	Knitting
6	Synthetic 5	100	20	Weaving/Knitting
		35	-	Finishing/Printing
		-	5	Knitting/Finishing
		32	-	Weaving/Finishing
		-	8	Knitting
7.	Synthetic 6	101	-	Weaving/Finishing
8.	Synthetic 7	142	-	Weaving
		60	-	Weaving/Printing
9.	Synthetic 8	-	10	Knitting
		95	5	Weaving/Finishing
10.	Synthetic 9	170	-	Weaving/Finishing
		-	10	Knitting
		-	7	Knitting/Braiding
11.	Synthetic 10	145	-	Finishing/Weaving
		45	5	Weaving/Knitting
12.	Supervisory	55	-	Finishing/Weaving
13.	Blanket 1	90	-	Spinning/Weaving
14.	Blanket 2	190	-	Spinning/Weaving
15.	Blanket 3	22	-	Spinning/Weaving
16.	Blanket 4	63	-	Spinning/Weaving
		2268	107	

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TABLE A2-7 LIST OF NEW TEXTILE MILLS PROJECTS

Sr. No.	Factory	Requirement		Spindles	Looms
		Polyester Fibre	Long Staple Cotton		
1	Paleik	878 mta	10,000 bales	40,000	600
2	Sagaing	714 mta	13,000 bales	40,000	600
3	Shwedaung	1,115 mta	5,000 bales	40,000	600
4	Henzada	714 mta	13,000 bales	40,000	600

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Appendix

3. UTILIZATION OF ASSOCIATED GAS IN MANN OIL FIELD

Appendix 3

UTILIZATION OF ASSOCIATED GAS IN MANN OIL FIELD

At the present time, 18,000,000 SCF/D of associated gas is produced at Mann Oil Field daily. After allocating the gas required for use in the oil field area, approximately 6,000,000 SCF/D will be available for use as fuel in the Refinery Project. The quantity of the gas to be used at the Mann Refinery is about 5,364,000 SCF/D and the price of the gas is taken as Kyats 1.05 per thousand standard cubic feet.
By the utilization of the gas, the following modifications will be caused in balance of products as well as capacity of Coking Unit illustrated in Fig. 6-2 : Block Flow Diagram.

- Capacity of Coking Unit shall be increased from 5,000 BPSD to 5,600 BPSD in order to keep the same production amount of diesel oil, that is, 1,241.6 kl/CD.
- Modified balance of main products

Product	Original Figure	Modified Figure
Home fuel oil	144.5 kl/CD	0
Fuel oil	674.2 kl/CD	785 kl/CD
Coke	73.0 T/CD	82 T/CD

- Modified balance of the other products
  Coker gas oil can be fully used for blending stock to topped crude in order to make the pour point of fuel oil to meet the specified figure. Increases in coker LPG and coker naphtha can be used as products.

The capital required for the utilization of the gas is estimated as below;

Increase part of investment : U.S. $991,000

(Including compressors, gas pipeline and instrument, and others)

Increased Amount of Annual Expenses

	U.S. $
Associated Gas	311,500
Depreciation	49,550
Interest for Foreign Currency	29,730
Maintenance	24,775
Insurance	9,910
	425,465

Increase of Annual Income

° Increased part of sales:		U.S. $
Increase of fuel oil production:		3,088,000 (40,515 Kl)
Increase of coke production:		144,540 (3,285 t)
° Increase of electric consumption:	(-)	33,060 (4,364,000 KWH)
° Increase of flow improver:	(-)	60,000
Total:		3,139,480

According to the above calculation, if the increased part of fuel oil can be exported at an expected price (fuel oil is over-supplied in Burma and therefore, it can only be exported), the utilization of associated gas can bring a financial profit to the project.

However, there are so many items to be investigated carefully, i.e.: available quantity of gas, conditions of gas gathering facilities in the

Mann oil field, etc. as the basis of detailed study. So, utilization of the gas was not studied as the base case of plan, but it might be considered that the subject is one of attractive alternatives to be contempleted in execution plan.

Appendix 4. TRANSPORTATION OF PRODUCTS

Appendix 4

TRANSPORTATION OF PRODUCTS

As previously mentioned, in Burma, the main transportation route for distribution of petroleum products is the Irrawaddy River. Keeping in mind the peculiar characteristics of the Irrawaddy River, such as its depth differences during the rainy and dry seasons, the depth differences at its mouth during tide changes, products transportation problem was examined on several transportation means to check how they will affect the new oil refinery after it has been completed.

1) Conclusions

Because the following conclusions are obtained for the investigation results, they must be considered at the implementation of the Project.

(a) Barges and coastal tankers will be major means of product transportation. If vessels under order are counted together with existing vessels as number of carrier available for product shipping, delivery of products can be carried out after the new refinery has been completed.

However, currently, it is reported that a cross-country crude pipeline from Central Burma oil field region to the Syriam oil refinery is contemplated by Burmese Government and that a part of construction works have been started. Early completion of the pipeline would be an efficient way of alleviating transportation problems.

(b) Means of transportation other than mentioned above include various measures such as waggons for overland and small boats for river, accordingly, it can be considered that there is a lot of potentiality in transportation capacity. However, it will probably be necessary to strengthen the capacity of rail tank cars and bowsers corresponding to the increase of product transportation amount.

2) Investigation

(a) Product Distribution Model

Supposing the year of 1985 when three refinery including the Mann refinery will be at their full operation, a product distribution model is established as shown in Table A4 - 1.

Basis of the model are as follows :

- Capacity of the three oil refineries.

  Syriam - 20,000 BPSD service factor - 90%
  Chauk - 3,500 BPSD " "
  Mann - 25,000 BPSD " "

- Product demand in 1985 was taken same with the result that has already been estimated in Chapter 4 and the demand of each area was estimated as increasing with the same percentage of the actual record for 1972 - 74.

- In order to minimize the transportation costs, products from each refinery will be preferentially supplied for their vicinity. However, no regard was given to the differences of demand for different petroleum products in the various areas.

(b) Number of carriers for major petroleum products

Type of Carrier	Number
1,000 ton coastal tankers	2
1,000 ton cargo vessels	1
Pusher tugs	20
Tug boats	12
800 ton barges	8
500 ton barges	80
250 ton barges	10
Rail tank cars	117
Bowsers	114

The following items are on order in addition to those listed above.

Type of Carrier	Number
Pusher tugs	11
Tug boats	3
500 ton barges	24
Self-propelled barges	10

Note: Although the carriers listed above are presently used for carrying crude as well as petroleum products, by the time Mann Refinery goes on-stream in 1981, the entire fleet will be available exclusively for petroleum products transportation, since the cross-country pipe-line net work for transporting crude from oil fields to the three refineries would be completed.

(c) Examination on transport capacity of barges:

Barges will be the primary means of transportation for products. The major distribution routes, required turnaround time and quantity of product are listed in Table A4 - 2.

TABLE A4-1 PRODUCTS DISTRIBUTION IN 1985

From		By	To Depot	State/Division	Q'ty (M Bbl/Y)
Chauk Refinery 3,500 BPSD	978	T/C (B)	Lashio	Shan	699
		T/C (B)	Hshipaw	Shan	
		T/C (B)	Schwenyaung	Shan	
		L/Y (B)	Kengtung	Shan	
		L/Y (B), Truck (P)	Domestic Area	Magwe	279
				Sub-Total	978
Mann Refinery 25,000 BPSD	6,980	C/V, Truck (P), L/Y (B)	Pakokku & Chin	Magwe & Chin	887
		10% L/Y (B), Truck (P)	Domestic Area	Magwe	698
		B/G (B), C/V (P)	Mandaley	Mandaley/Saga/Kachin/Kaya	2,725
		B/G (B)	Prome	Pegu	1,289
		B/G (B)	Syrium	Export	1,381
				Sub-Total	6,980
Mandaley Depot	2,725	C/V (P)	Kalewa	Sagaing	596
		T/C (B)	Monywa	Sagaing	
		T/C (B)	Myitkyina	Kachin	222
		C/V (P)	Bhamo	Kachin	
		T/C (B)	Maymyo	Mandaley	1,907
		L/Y (B), Truck (P)	Domestic Area	Mandaley	
				Sub-Total	2,725
Syrium Refinery 20,000 BPSD	5,585	C/T (B)	Moulmen	Man/Karen	433
		C/T (B)	Tavoy	Tenasserim	145
		C/V (P)	Mergui	Tenasserim	
		C/T (B)	Akyab	Arakan	187
		C/V (P)	Sandoway	Arakan	
		C/V (P)	Kyaukpyu	Arakan	
		B/G (B)	Dunneedaw	Rangoon, Irrawaddy	4,338
		B/G (B)	Export		482
	(Thru Syrium)	B/G (B)	Export		1,381
				Sub-Total	5,585 + 1,381
Dunneedaw Depot	4,338	L/Y (B), Truck (P)	Domestic Area	Rangoon	3,587
		B/G (B)	Bassein	Irrawaddy	751
		C/V (P)	Henzada	Irrawaddy	
				Sub-Total	4,338

TABLE A4 - 2 PRODUCT DISTRIBUTION BY BARGES

Route	From	To	Required Turnaround Time (days)	Quantity (MBbl/y)
(1)	Mann Ref.	Mandalay Depot	7	2,725
(2)	Mann Ref.	Prome Depot	7	1,289
(3)	Mann Ref.	Syriam Ref.	10	1,381 (for export)
(4)	Mann Oil Field	Syriam Ref.	10	6,205 (crude oil)
(5)	Syriam Ref.	Dannidaw Depot	1.5	4,338
(6)	Syriam Ref.	Ocean Tanker	1.5	1,863 (for export)

The distribution route and quantity shown in Table A4 - 2 is based on the distribution model of Table A4 - 1, and distribution Route (4) means the transportation of crude oil from the Mann oil fields to the Syriam Refinery.

Next, route (3) shows transportation of export product from the Mann refinery to the Syriam refinery, and route (6) shows a total of export. As for distribution route (4), in the future, there will be the both cases of transportation by pipeline and by barge, so CASE A and CASE B were provided respectively.

The required number of barges for the various routes were calculated as shown below;

Route	Calculation	Required No. of barges
(1)	$\frac{2{,}725\ \text{MBbℓ/Y} \times 1/12\ \text{Y/M} \times 7.0\ \text{D}}{500^{\text{Ton}}/\text{Ship} \times \frac{1}{0.9}\ \text{kℓ/Ton} \times 6.29\text{Bbℓ/kℓ} \times 30.4\ \text{D/M}}$	= 15.0 Ships
(2)	$\frac{1{,}289\ \text{MBbℓ/Y} \times 1/12\ \text{Y/M} \times 7.0\ \text{D}}{500^{\text{Ton}}/\text{Ship} \times \frac{1}{0.9}\ \text{kℓ/Ton} \times 6.29\text{Bbℓ/kℓ} \times 30.4\ \text{D/M}}$	= 7.1 Ships
(3)	$\frac{1{,}381\ \text{MBbℓ/Y} \times 1/12\ \text{Y/M} \times 7.0\ \text{D}}{500^{\text{Ton}}/\text{Ship} \times \frac{1}{0.9}\ \text{kℓ/Ton} \times 6.29\text{Bbℓ/kℓ} \times 30.4\ \text{D/M}}$	= 10.8 Ships
(4)	$\frac{6{,}205\ \text{MBbℓ/Y} \times 1/12\ \text{Y/M} \times 7.0}{500^{\text{Ton}}/\text{Ship} \times \frac{1}{0.9}\ \text{kℓ/Ton} \times 6.29\text{Bbℓ/kℓ} \times 30.4\ \text{D/M}}$	= 48.7 Ships
(5)	$\frac{4{,}338\ \text{MBbℓ/Y} \times 1/12\ \text{Y/M} \times 1.5\ \text{D}}{500^{\text{Ton}}/\text{Ship} \times \frac{1}{0.9}\ \text{kℓ/Ton} \times 6.29\text{Bbℓ/kℓ} \times 30.4\ \text{D/M}}$	= 4.5 Ships
(6)	$\frac{1{,}861\ \text{MBbℓ/Y} \times 1/12\ \text{Y/M} \times 1.5\ \text{D}}{500^{\text{Ton}}/\text{Ship} \times \frac{1}{0.9}\ \text{kℓ/Ton} \times 6.29\text{Bbℓ/kℓ} \times 30.4\ \text{D/M}}$	= 2.2 Ships
	Total	88.3 Ships

* Note; Average size of barge; 500 ton. D/M is abreviation of DRUM.

According to the result of the above calculation, necessary number of barge for each case were calculated as follows:

Operation Factor	CASE-A	CASE-B
100%	39.6 vessels	88.3 vessels
70%	56.6 vessels	126.0 vessels

In regards to this, there are 98 vessels on hand and the number will reach 122 ships if including those on order. So it can be considered that the number of barge will be sufficient even for the case that requires maximum number of vessels.

(d) Examination on the Transportation Capacity of Coastal Tankers

Coastal tankers are being used for bulk shipping from the Syriam Refinery to Akyab, Moulmein, and Tavoy Depots which are located on the coast. For that purpose, 2 x 1,000 ton tankers have been in service. At the same time, a cargo vessel having a capacity of 1,000 tons is operating for drum shipping from Dunneedaw depot to Kyaukpyu, Sandoway and Mergui depots.

The bulk drum shipping ratio in regards to the examination of this coastal shipping will be a problem, therefore, for convenience sake, the total amount has been calculated as bulk shipment in this instance.

Considering a 1,000 ton cargo vessel as coastal tanker which has a capacity of 3,000 D/M or 600 tons, the available number of coastal tankers is considered as 2.6 x 1,000 tons.

The distribution route and quantity are shown in Table A4 - 3.

TABLE A4 - 3 PRODUCT DISTRIBUTION BY COASTAL TANKER

Route	From	To	Required Turnaround Time (days)	Quantity (MBbℓ/Y)
(1)	Syriam Ref. (Dunneedaw Dept)	Moulmein Depot	4	433
(2)	Syriam Ref. (Dunneedaw Dept)	Tavoy, Merqui Depots	6	145

Route	From	To	Required Turnaround Time (days)	Quantity (MBb /Y)
(3)	Syriam Ref. (Dunneedaw Dept)	Akyab, Kyaukpyu, Sandoway Depots	6	187

Consequently, the required number of coastal tankers for the various route was calculated as follows:

Route	Calculation	Required No. of barges
(1)	$\frac{433\ MBb\ell/Y \times 1/12\ Y/M \times 4D}{1{,}000^{Ton}/Ship \times \frac{1}{0.9}\ k\ell/Ton \times 6.29 Bb\ell/k\ell \times 30.4\ D/M}$	= 0.7 Ships
(2)	$\frac{145\ MBb\ell/Y \times 1/12\ Y/M \times 4D}{1{,}000^{Ton}/Ship \times \frac{1}{0.9}\ k\ell/Ton \times 6.29 Bb\ell/k\ell \times 30.4\ D/M}$	= 0.3 Ships
(3)	$\frac{187\ MBb\ell/Y \times 1/12\ Y/M \times 4D}{1{,}000^{Ton}/Ship \times \frac{1}{0.9}\ k\ell/Ton \times 6.29\ Bb\ell/k\ell \times 30.4\ D/M}$	= 0.4 Ships

Accordingly, required number of coastal tankers is calculated by operation factor as follows:

Operation Factor	Necessary Number
100%	1.4 ships
70%	2.0 ships
60%	2.3 ships

So, it can be concluded that the number of coastal tanker on hand is satisfactory for sea transportation of product in future.

(e) Other Means of Transportation

Other means of transportation are:

- Drum shipping by using inland waterways (cargo vessel)
- Bulk shipping by overland routes (Rail tank car, Bowser)
- Drum shipping by overland routes (Truck, Rail car, Wagon, etc.)

As for drum shipment by inland waterway, 100 ton vessels which can accommodate 250 drums per vessel is typical means of transport. However, in Burma, it is allowable to load non-dangerous oil drums on general cargo vessels together with other cargo. Also, there are a wide variety of small vessels available for handling petroleum products.

So, it is considered that there are no problems in future product transportation without reinforcement of carriers.

As for bulk transportation by overland routes, supplying for depots in areas inaccessible by waterways is carried out by using 117 rail tank cars and 114 bowsers.

It is difficult to check conditions of inland railroads and roads. Moreover, it is difficult to investigate the future transport conditions by the means used for carrying out an investigation of waterways transportation.
However, it can be said that the reinforcement of rail tank cars and bowsers will be necessary to cope with future increase of transportation volume.

Regarding transportation of drums by overland route, a wide variety of shipping methods are such as rail car, truck, wagon, vans, etc. engaged in supplying for inland depots and for end users. So, it is considered that transportation of drums has high potentiality in its capacity, and that shipping operation in future will be done as it is now doing.