Top Secret

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DIRECTORATE OF
INTELLIGENCE

Industrial Facilities
(Non-Military)

Basic Imagery Interpretation Report

Shang-hai Petroleum Refinery, Gough Island Area

Shang-hai, China

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CENTRAL INTELLIGENCE AGENCY
Directorate of Intelligence
Imagery Analysis Service

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INSTALLATION OR ACTIVITY NAME		COUNTRY
Shang-hai Petroleum Refinery, Gough Island Area		CH
UTM COORDINATES	GEOGRAPHIC COORDINATES	WAC-PIC
51RUE619689	31-20-11N 121-33-17E	0492-28X2

MAP REFERENCE
USATC Series 200, Sheet 0492-2HL, 2nd edition, August 64, Scale 1:200 (SECRET)

LATEST IMAGERY USED	NEGATION DATE (If required)
	Not Required

ABSTRACT

This report provides an imagery-derived analysis of the Shang-hai Petroleum Refinery, Gough Island Area. The major refinery components consist of crude oil distillation units, a probable thermal cracking unit, a possible catalytic cracking unit, a possible reformer, a possible gas processing unit, a lubricating oil plant, and several treating and blending areas. The products of the refinery include straight-run and blended gasolines, kerosene, diesel and fuel oils, lubricating oils, waxes and probably coke and gaseous hydrocarbons.

The refinery was in operation before March 1962, the date of the earliest photography used in this study. Two phases of expansion in facilities were noted on photography, one in 1964-65 and the second in 1966. These two periods of expansion greatly increased the capacity and variety of products of this refinery.

This report includes a detailed line drawing, a photograph of the refinery, mensuration of storage tanks and a discussion of the status of facilities.

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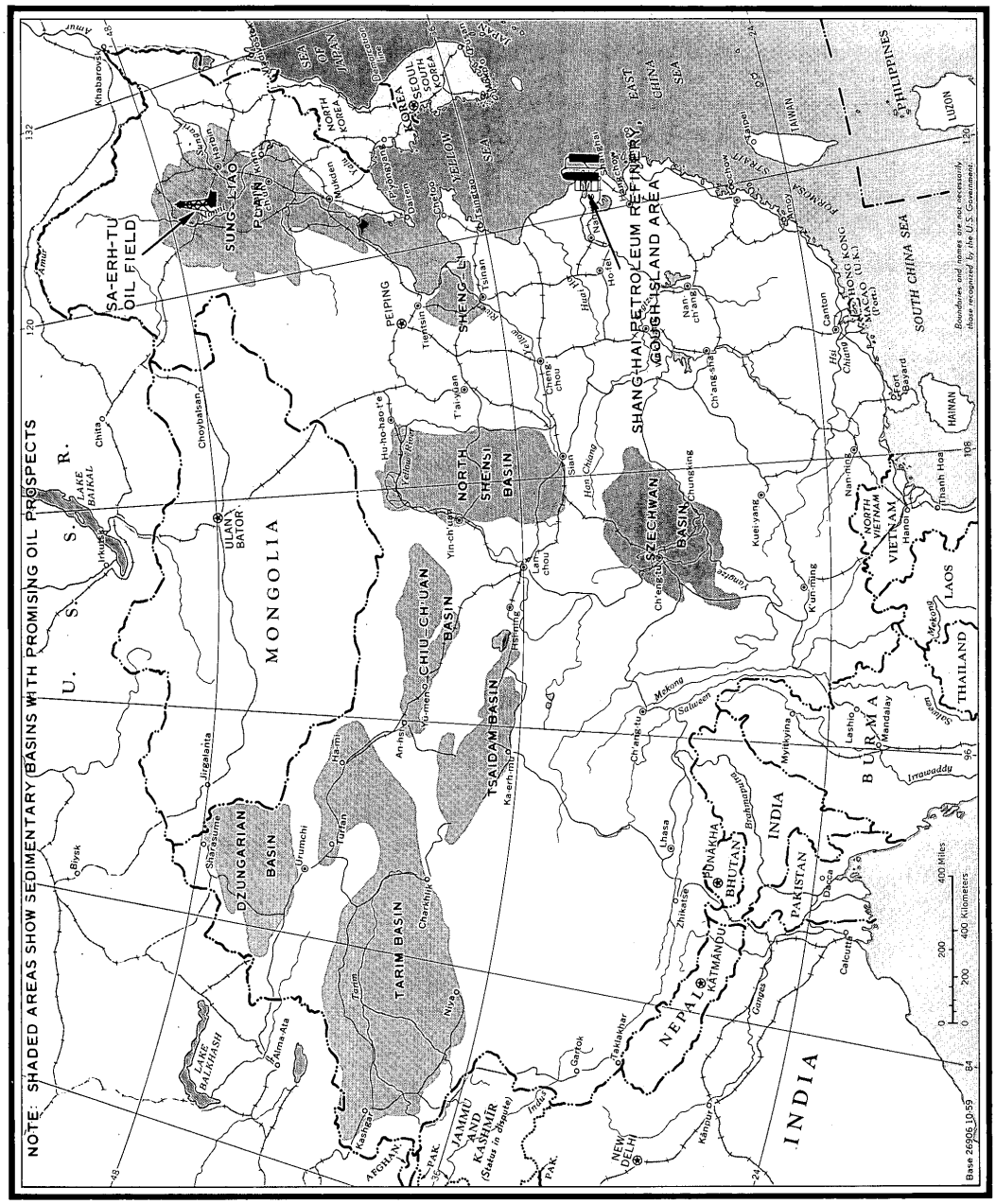

FIGURE 1. LOCATION MAP.

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INTRODUCTION

The Shang-hai Petroleum Refinery, Gough Island Area, is located on the east bank of the Huang-pu Chiang (River) in the northeastern outskirts of Shang-hai. There is no rail service into the refinery area, and access by road is very limited. There are numerous offshore wharves with facilities for loading and unloading tankers and barges (Figures 2 and 3). Any significant quantities of crude oil received by or products shipped from this refinery would be by water transport.

The first refinery facilities at this plant were built in the early 1950's at the site of an existing POL storage area. In 1958, the facilities were expanded and the capacity of the refinery was greatly increased to process crude oil from the rapidly developing oil fields of the Szechwan Basin and Yu-men areas. Until about 1964 these were the major sources of crude for this refinery. A second period of expansion took place in the early 1960's and resulted in this plant becoming one of China's principal refineries. At present, crude oil for processing is received chiefly from the Sa-erh-tu oil field. 1,2/

Several petrochemical plants are reportedly located in the Shang-hai area, but none could be identified on photography in the vicinity of the refinery. There is an unidentified processing plant located adjacent to the northwest side of the refinery which possibly receives raw materials from it. The Shang-hai Chemical Plant, Chung-hua [redacted], lies directly across the river from the refinery and the Shang-hai Thermal Power Plant, Cha-pei [redacted] is located a short distance downriver from the chemical plant. No direct connection between either of these plants and the refinery could be established from photography. 25X1 25X1

BASIC DESCRIPTION

Physical Features

The refinery is quite irregular in plan. One side lies along and conforms to the river while the other sides reflect the different phases of expansion. The entire area is secured by walls with guard towers, and the access roads enter the plant through checking stations and gates. The walled area measures approximately 6,800 by 1,800 feet and includes about 305 acres. There is considerable room within the walled area in the northwest part of the refinery for expansion of facilities. However, in the processing area to the south, space for new construction within the walls is limited.

Operational Functions

The major refining equipment presently found in this plant includes crude oil distillation units, a probable thermal cracking unit, a possible fixed bed catalytic cracking unit, a possible catalytic reformer, a possible gas processing (possibly polymerization) unit, a lubricating oil plant and several treating and blending areas.

The simple fractionation of crude oil is accomplished by both atmospheric and vacuum pipe stills and shell stills. Petroleum coke is probably also produced by the shell stills. The possible cracking units would increase the output of gasoline and gaseous hydrocarbons which in turn could be used in the possible gas processing (possibly polymerization) unit to produce blending stock to up-grade the octane rating of the gasoline. Straight-run gasolines from the crude oil distillation units would be considerably improved by processing through the possible catalytic reformer and at the same time additional fuel oil and gases would be produced. The lubricating oil plant probably produces wax products and some aromatics in addition to lubricants. The treating and blending facilities further purify and blend the products from the various processing units to obtain a wider range of desirable products.

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Construction Status and Activity

The earliest photography used in this study was from March 1962. At that time, there was no significant construction activity observed. The shell stills, at least four fractionators, and the probable and possible cracking units were in place. One of the treating areas and about 50 percent of the probable dewaxing facilities were also complete. The storage tank farms were essentially complete, except for the intermediates and products storage which was later expanded by approximately 30 percent.

By July 1964, a new phase of construction had been started in the southeast part of the refinery. A new steam plant, the possible reform unit and the possible gas processing unit were in the early stages of construction. Additional facilities were being built in the lubricating oil plant, and a large, new vacuum fractionator with a pipe furnace had been added for crude oil distillation. Some replacement and refurbishing of facilities in the older distillation area was noted. A new, probable treating and drum filling area was added to the plant facilities.

The construction phase which had been started in 1964 was mostly complete by October 1965. The possible reform unit, the possible gas processing unit, a new probable blending and treating plant and the steam plant were complete. A small stream had been diverted from the refinery area thus allowing expansion of the lubricating oil plant to proceed.

Photography of October 1966 revealed that a cooling pond near the center of the processing areas had been earth filled, and a new distillation unit with two DeFlorez type furnaces was being constructed on the filled area. Work in the lubricating oil plant appeared to be at least 50 percent complete. The new distillation unit and the lubricating oil plant were both completed by August 1967. Since then, there have been no significant changes noted in the facilities.

Operational Status

The refinery was in operation on the earliest photography used in this study. At that time, the capacity and variety of products would have been quite limited. Several new primary and secondary units had been added to the facilities by October 1965. These additions would have greatly increased the refinery's capacity and variety of products. The latest major components of refining equipment built in this refinery appeared to be in operation by August 1967. On all imagery studied for this report, there has been fairly heavy tanker and barge traffic at the wharves serving the refinery and the refinery was probably in full operation.

Facilities and Equipment

The following table lists the functional areas and the facilities and equipment within the refinery. All items are shown on Figure 3.

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Equipment and Facilities
at the Shang-hai Petroleum
Refinery, Gough Island Area

Area	Functional Description	Equipment and Facilities*
A	Steam Plant	1 Boilerhouse 4 Storage/support buildings 3 Cylindrical fuel storage tanks 2 diam. 30 ft. [redacted] 25X1 1 Water storage basin
B	Probable Blending and Treating	2 Probable batch agitators/elevated tanks 4 Probable small vertical mixers 6 Blending tanks (3 with a thin column on roof), diam. 25 ft. 1 Control, packaging, and shipping building 3 Support buildings 1 Cylindrical storage tank, diam. 25 ft.
C	Intermediates and Products Storage	2 Support buildings 10 Cylindrical storage tanks 2 diam. 55 ft. 6 diam. 50 ft. 2 diam. 40 ft.
D	Administration and Support	11 Miscellaneous buildings 4 Cylindrical storage tanks 2 diam. 15 ft. 2 diam. not measured
E	Possible Reforming	1 Possible catalytic reform unit with 8 columns/reactors, 4 petrochemical furnaces 1 processing unit/equipment enclosed in scaffolding 1 small bank of heat exchangers/ accumulators 1 compressor building 1 control building 3 Miscellaneous buildings 2 Cylindrical storage tanks diam. 10 ft. 5 Horizontal pressure-type tanks
F	Lubricating Oil Production (1) Packaging and Shipping	1 Packaging/drum filling building 1 Storage building 1 Support building 4 Cylindrical storage tanks diam. 40 ft. Drums in open storage
	(2) Probable Solvent Extraction	5 Processing columns (1 possible absorber and 4 possible extractors/ strippers in line) 2 Possible mixers 1 U/I processing unit 2 Small pipe furnaces 6 Processing buildings 8 Storage/support buildings

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Area	Functional Description	Equipment and Facilities*
F	Lubricating Oil Production	
	(2) Probable Solvent Extraction - Continued	42 Cylindrical storage and process tanks 2 diam. 30 ft. 9 diam. 25 ft. 4 diam. 15 ft. 27 diam. not measured
	(3) Probable Dewaxing and Clay Treatment	1 Probable chiller building with 6 attached settling tanks 12 Mixing/settling tanks 1 Processing building with 3 attached treating tanks 1 Processing building with 2 attached treating tanks 4 Processing buildings 6 Storage/support buildings 13 Cylindrical storage tanks 1 diam. 30 ft. 12 diam. 25 ft. 2 Tank bases U/C 2 Water basins
G	Crude Oil Distillation and Probable Coke Production	1 Battery of shell stills (7) 2 Fractionating columns 5 U/I processing columns 3 Pipe furnaces 2 Banks heat exchangers/accumulators 11 Miscellaneous buildings 15 Cylindrical storage tanks 1 diam. 40 ft. 1 diam. 30 ft. 4 diam. 25 ft. 4 diam. 15 ft. 5 diam. 10 ft.
H	Possible Gas Processing (Possibly Polymerization)	1 Large unit with equipment enclosed and line of 4-5 columns in scaffolding along one side 2 Banks heat exchangers/accumulators 5 Low mixing/blending or process tanks 2 Possible small reactors 1 Compressor building 1 U/I processing building with attached fractionator 2 Control/support buildings 4 Miscellaneous support buildings 5 Cylindrical storage tanks 2 diam. 15 ft. 3 diam. 10 ft. 2 Horizontal storage/settling tanks
I	Probable Treating	1 Processing building with 3 attached columns 1 Pipe furnace 2 Processing buildings 6 Batch agitators/mixing/storage tanks 4 Horizontal treatment/storage tanks 4 Cylindrical storage tanks diam. 15 ft.

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Area	Functional Description	Equipment and Facilities*
J	U/I Processing	3 U/I processing units, equipment in scaffolds/covered 1 Possible absorber/reactor 1 Small bank of heat exchangers 1 Processing building with 2 attached tanks/reactors 1 Processing building with 4 attached treating tanks 1 Miscellaneous building
K	Crude Oil Distillation and Possible Cracking	2 Distillation columns (1 atmospheric and 1 vacuum) 1 Possible fractionator/stripping column 1 Possible fixed-bed catalytic cracking unit with at least 2 reactors 1 U/I free-standing column 2 Pipe furnaces 3 Small banks of heat exchangers/ accumulators 1 Horizontal settling/treatment drum 3 Compressor buildings 5 Support buildings 4 Cylindrical storage tanks 3 diam. 15 ft. 1 diam. 10 ft.
L	Crude Oil Distillation	2 Large atmospheric distillation columns 1 Possible vacuum distillation column 2 Accumulators/treatment tanks 2 Pipe furnaces 2 DeFlorez type furnaces 2 Banks of heat exchangers/ accumulators 1 Bank of U/I equipment (possible heat exchangers) 6 Miscellaneous support buildings 3 Cylindrical storage tanks, not measured 1 Horizontal tank
M	Crude Oil Distillation and Probable Thermal Cracking	1 Distillation unit with Line of 7 columns (at least 3 fractionators and 4 possible extractors/strippers) 1 bank of heat exchangers/ accumulators 2 possible extractors 1 Probable thermal cracking unit with 3 reactors (associated flash drums obscured) 3 A-frame furnaces 1 U/I processing unit with 1 bank of heat exchangers/accumulators 2 Probable compressor buildings 3 Control/support buildings 1 Steam plant 4 Cylindrical storage tanks, not measured

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Area	Functional Description	Equipment and Facilities*
N	Probable Treating	1 Processing building with 1 attached treating tank/batch agitator 1 Processing building with 2 attached probable batch agitators 5 Mixers 2 Banks of heat exchangers/cooling coils 7 Processing/support buildings 3 Small cylindrical storage tanks/ mixers, not measured 3 Cylindrical storage tanks 1 diam. 30 ft. 2 diam. 15 ft.
O	Products and Intermediates Storage	3 Support buildings 97 Cylindrical storage tanks 21 diam. 40 ft. 13 diam. 30 ft. 19 diam. 25 ft. 30 diam. 20 ft. 2 diam. 15 ft. 6 diam. 10 ft. 6 diam. not measured, less than 10 ft.
P	Engineering and Support	1 Steam plant with 4 cylindrical fuel storage tanks 59 Miscellaneous buildings, including engineering, fabrication, administration, storage, and support buildings 1 Gasholder, diam. 50 ft. 1 Water basin
Q	Water Treatment	1 Probable treatment building with 11 associated storage/treatment tanks 4 Support buildings 1 Circular water storage reservoir, diam. 150 ft. 1 Water storage reservoir
R	Treating and Packaging	3 Processing buildings 5 Probable batch agitators 4 Blending tanks/agitators 5 Mixers/treating tanks 6 Mixers/filtering tanks 11 Horizontal drums 13 Packaging/storage/support buildings
S	Crude Oil and Products Storage	14 Support buildings 123 Cylindrical storage tanks 1 diam. 145 ft. 7 diam. 120 ft. 25 diam. 80 ft. 11 diam. 70 ft. 17 diam. 50 ft. 13 diam. 45 ft. 12 diam. 40 ft. 13 diam. 30 ft. 12 diam. 25 ft. 10 diam. 15 ft. 2 diam. 10 ft. 2 Horizontal storage tanks 5 Water storage basins

Area	Functional Description	Equipment and Facilities*
T	Probable Treatment and Drum Filling	1 Drum cleaning building 1 Drum filling building 18 Processing and storage buildings 3 Cylindrical storage/blending tanks, not measured 2 Water storage basins 2 Horizontal tanks Drums in open storage
U	Administration, Storage, and Shipping	1 Administration building 5 Support buildings 13 Storage buildings 2 Water basins
V	Drum Fabrication and Filling	33 Fabrication, storage, and support buildings 1 Overhead loading rack 1 Water storage basin Drums in open storage
W	U/I Processing	1 Steam plant with 2 cylindrical fuel tanks, not measured 34 Processing, storage, and support buildings 1 Conveyor and concrete, open storage pad for dry, bulk material
X	Support	35 Miscellaneous buildings 1 Water storage basin Several tank bases for dismantled storage tanks

*All measurements are only approximate.

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REFERENCES

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Map

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US Air Target Chart, Series 200, Sheet 0492-2HL, 2nd edition, Aug 64, Scale 1:200,000 (SECRET)

Documents

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2. CIA. CRS File No. 9063470, DDI 2 222 0191 68, 16 February 1968 (UNCLASSIFIED)
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Requirement

EXSUBCOM - BR-N/002-69

[redacted]