Petroleum and Gas Industries Manpower Requirements 1962

A Report of

THE NATIONAL PETROLEUM COUNCIL

1963

NATIONAL PETROLEUM COUNCIL

REPORT OF THE COMMITTEE ON PETROLEUM AND GAS INDUSTRIES MANPOWER REQUIREMENTS (1962)

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MORGAN J. DAVIS
CHAIRMAN OF THE COMMITTEE

HEADQUARTERS OFFICE

601 Commonwealth Building
1625 K Street, N. W.
Washington 6, D. C.

Telephone:

EXecutive 3-5167

REPORT
OF THE
NATIONAL PETROLEUM COUNCIL'S COMMITTEE ON
PETROLEUM AND GAS INDUSTRIES MANPOWER REQUIREMENTS (1962)

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REPORT OF THE
NATIONAL PETROLEUM COUNCIL'S COMMITTEE ON
PETROLEUM AND GAS INDUSTRIES MANPOWER REQUIREMENTS (1962)

INTRODUCTION

On October 3, 1962, Hon. John M. Kelly, Assistant Secretary of the Interior, in a letter[1/] to R. G. Follis, Acting Chairman of the National Petroleum Council pointed out the possibility that under emergency situations there might develop a shortage of skilled manpower -- and, therefore, current information on manpower requirements expressed in percentages by skills -- was required in order to complete a general study requested by the Department of Defense. Accordingly, he asked that the Council appoint a committee to make a thorough study of domestic manpower requirements as of July 1, 1962, throughout the petroleum and gas industries.

The Agenda Committee of the Council, in its report of October 3, 1962, which was unanimously adopted by the Council at its meeting on October 4, 1962, recommended that a committee be appointed to undertake the requested study, confining its report to findings of fact.

1/ See Appendix A - October 3, 1962 letter.

Pursuant to this action, on November 9, 1962, the Chairman of the Council, with the approval of the Assistant Secretary of the Interior, appointed this Committee[2] and designated Mr. Morgan J. Davis as Chairman. Mr. Frederick S. Lott, of the Office of Oil and Gas, Department of Interior, was designated Government Co-Chairman of this Committee.

Subsequently, at the request of Committee Chairman, Morgan J. Davis, the Chairman of the Council, with the approval of the Assistant Secretary of the Interior, on January 14, 1963, appointed a Working Subcommittee[3], consisting of 10 organization and personnel experts and 2 representatives of related oil and gas associations, under the Chairmanship of George Dempster, Shell Oil Company. Mr. Frederick S. Lott was designated Government Co-Chairman of this Subcommittee.

On February 5, 1963, a meeting of the Working Subcommittee was held in the Council's office, for the purpose of assessing its assignment and determining the best method of securing the manpower data requested by the Department of Interior. Representatives from the Office of Oil and Gas and the Office of Emergency Planning were present and gave more

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2/ See Appendix B - Committee membership.
3/ See Appendix C - Subcommittee membership.

specific guidance than the broad language of the original October 3, 1962 letter - adding the request that the study include major construction and contract service manpower estimates.

Certain conclusions on scope and methodology, acceptable to the Government representatives present, were set down in a statement of proceedings which the Committee Secretary sent February 15, 1963 to each member of the Main Committee for any further guidance on the indicated fact-finding ground-rules.

Meanwhile, various data sources were contacted and arrangements made to obtain the basic statistical information required without the use of extensive questionnaires. Various aspects of the study were assigned to the Council's office staff and to the individual Subcommittee members who were in a position to consult with operating and functional management and specialists with respect to the various assumptions, operating practices, work-force characteristics, key occupations and manpower estimates.

Since the nature of the fact-finding task could be handled mainly by correspondence no interim Subcommittee meeting was called. Review and collation of information and data was done in the Council's Office.

On June 4, 1963, the Subcommittee met in the Council's office and reviewed and drafted their report, which government representatives present considered as appropriately fulfilling the October 3, 1962 request of the Department of Interior.

The Committee Secretary on instructions from Chairman Morgan J. Davis, sent the Subcommittee's report to each member of the Main Committee for appraisal and review. On July 15, 1963, the Main Committee met in the Council's office and after full discussion adopted the Subcommittee's report as part of its Final Report.

(a) The Main Committee and the Subcommittee recommend that the Key Occupations section of this report be reprinted separately by the Council and made available to Government Agencies involved in priority emergency use of resources including manpower, in the quantities they may wish for their distribution to Federal, State and Local Agency Offices.

(b) The Committee and Subcommittee suggest that any future National Petroleum Council studies of facilities of the petroleum and natural gas industries requiring survey questionnaires also include, when appropriate, manpower statistics. These would be helpful "bench marks" to any future manpower studies.

(c) The Committee and Subcommittee further suggest that the National Petroleum Council recommend to the Department of the Interior that any future petroleum studies or surveys conducted by Interior or other Government agencies include an appropriate question or questions regarding manpower requirements.

STUDY ASSIGNMENT

The October 3, 1962 request from the Department of Interior can be summarized - "to make a thorough study of domestic manpower requirements as of July 1, 1962, throughout the petroleum and gas industries -- expressed in percentages by skills within Standard Industry Classification and recorded by civil defense areas[4/]--".

Representatives from Interior subsequently requested that the study include major construction and contract services manpower estimates. They pointed out that this type of information plus the above 1962 manpower requirements data was needed to complete a general study requested by the Department of Defense.

The Subcommittee and government representatives concluded that the scope of the study should follow the same general categories and boundaries as in the 1956 Council manpower study, i.e., domestic employment by major function, but excluding all service stations, and gas distribution beyond the "city gates". Only U.S. flag ocean tanker fleet personnel were to be included.

4/ See Appendix D - Map of OEP-OCD and Interior Regions.

While Subcommittee's terms of reference did not include related chemical manufacturing manpower estimates, government representatives asked that the manpower statistics[5/] collected in the 1963 NPC study of Chemical Manufacturing Facilities of the Petroleum and Natural Gas Industries be incorporated in the Subcommittee's report.

Because of the magnitude and variety of services performed on a contract or fee basis in the petroleum and gas industries, it was concluded that only total manpower estimates of primary operational/maintenance services and of major construction projects manpower would be feasible - and that geographical estimates as of mid-1962 would not be too meaningful for the evident end-use of the study data for many of these contract projects and services.

It was pointed out that construction manpower has seasonal as well as on-site peaks with respect to total workforce and to skills employed. Accordingly, government representatives asked that an example of on-site construction manpower profile be included as an aid to understanding of the estimates. Other special characteristics and assumptions are noted under the Construction section.

5/ See Appendix E - Table of manpower in Chemical Manufacturing.

The Subcommittee made the point that a count of manpower by "occupational skills" employed mid-1962 in the petroleum and natural gas industries should not be considered representative of work-force composition to rehabilitate and operate facilities in a post attack period. However, the government representatives felt some form of data on peace time manning would be useful and accordingly, they asked the Subcommittee to consider sampling enough companies or otherwise obtain useful percentage factors of "broad categories of occupations" officers and managers, professional, operatives, maintenance crafts and labor, etc.

Other than data specifically identified, no attempt has been made by the Subcommittee to estimate employment in supporting industries which make essential commodities, equipment, materials, etc., used in the oil and gas industries - nor employment in the many contract services involving job shops, personnel and materials transport, in-plant feeding, guards, agents, outside counsel, office services, etc. - all significant in the aggregate.

The consensus of the Subcommittee was that the study report include a listing of Key Occupations in the petroleum and gas industries as a practical and ready means of identification of skills needed to rehabilitate and operate facilities

under emergency situations. Government representatives concurred, pointing out that such a listing would aid the responsible agencies in their preparation of standby "guidance on priority-emergency use of resources including manpower" for local area labor offices and for state, regional and national authorities.

It was considered that a revision and updating of the NPC 1956 Manpower Report listing of key occupations and the related descriptive material would serve this purpose. This approach also retained generally the benefit of prior committee and trade association review and findings with respect to what is inherently a difficult task and a fair compromise at best of varied organizational structures and titles used in these industries.

The format adopted followed the suggestions of the Manpower Mobilization Division, Department of Labor, which had expressed interest in this project and subsequently rendered valuable assistance in the final editing.

METHODOLOGY

The general approach to the study data fact-finding was influenced by what government representatives were free to indicate might be the likely end-uses of the information. The Subcommittee also favored avoidance of any extensive questionnaire procedure if other data sources or estimating techniques could produce useful figures within acceptable tolerances. It was pointed out that any employment count at a specific time reflected many variables involving work-day and work-week schedule practices, overtime, absenteeism, vacations, turnover, training and manning practices, productivity, etc.

The survey problem of arriving at estimates for "manpower requirements expressed in percentages by skills..." was solved in the main when it was found out that the U. S. Census Bureau could supply occupational data based on the 1960 Population Census for the 4 census regions and total U. S., coded into the Standard Industrial Classifications.

This is unpublished information and is based on replies from individuals in each state census population sample. This source data looked promising for the study and so, the Council Office purchased selected tabulations which were analyzed and

grouped in broad categories of skills, by the Council Office staff.

It should be noted that basic Census data was collected in the first half of 1960 by questionnaire and follow-up on a 25 percent sample (every fourth household approach) from which total population characteristics such as age, sex, occupation by skills, etc., were in turn computed by various Census Bureau statistical and sampling techniques.

In this connection, the Subcommittee took cognizance of the fact that the Defense Readiness Handbook, Department of Labor, suggests that manpower agencies use the State occupational distribution of employment contained in the 1960 Population Census in their planning in the absence of any more recent local or area surveys. The Subcommittee also concluded that the U. S. Census data base would likely be as good as the results from a special NPC questionnaire survey involving hundreds of establishments and occupations.

In order to evaluate the general validity of the 1960 Census data, summary tables for each primary function showing percentage distribution of the significant skill groups were sent to members of the Subcommittee to check against the composition of similar work force groups in their company. Views were also solicited regarding the significance of any change in

manning practices between the 1960 Census and the mid-1962 date which would have materially affected work force composition in the various divisions of the petroleum and gas industries.

With due regard for the difference that would be inherent in a population type census versus a company or establishment employment count, the Subcommittee's opinion was that this source and the resulting occupational distribution for functional divisions were reasonable and should be within the accuracy limits required for Interior and Defense general studies. The Subcommittee felt that the variations in organizational structure, size, occupational classifications and operating practices among any "sample group" of companies would not likely yield any more meaningful results.

The Census data fortunately was available by the 4 Census Regions. The cost and time of acquiring state detail for functional divisions, and thus, an OEP-OCD and Interior Regional count, was considered prohibitive, even by the Census staff. Accordingly, occupational distribution of the 4 Census Regions has been applied to the OEP-OCD and Interior Regions geographically on a best-fit-basis.

The purchased tabulations of this 1960 U. S. Census information have been turned over to the Office of Oil and Gas, Department of Interior, for their and the Department of Defense subsequent use.

The 1960 U. S. Population Census information also provided a count of males and females. This data has been included for general information on page 16.

The survey problem of obtaining a mid-1962 total employment count by Standard Industrial Classification (SIC) was solved in part by obtaining unpublished state figures on Petroleum and Gas Extraction, Refining and Oil Pipe Lines - via the cooperation of the Bureau of Employment Security, Department of Labor. The state figures permitted calculation of the U. S. and Regional totals shown in some of the tables and identified with the SIC code numbers used.

BES data (3 digit SIC codes) is supplied quarterly by State agencies which in turn obtain the information from required company returns. It should be noted that both company and State allocation of employment to SIC groups is subject to differences due to local interpretation. Members of the Subcommittee who checked the coding of their company returns for the second quarter of 1962 found such differences, particularly in the allocation of headquarters staff. However, the Subcommittee felt that some of these variances would be compensating and that the resulting totals for Regions and the U. S. were likely to be of equal, or of better, accuracy than from any direct

questionnaire approach involving hundreds of establishments. Also, this is a regular data source and thus is available periodically in the future to the Department of Interior.

Examples of such differences have been given to BES staff for their study and consideration of appropriate corrective steps.

Employment figures for gas transmission, marine, and certain other forms of transportation, research, construction and other contract services are not identified separately for the petroleum and natural gas industries under the Standard Industrial Classification codes established by the Bureau of the Budget and revised in 1957. For some of this data the Subcommittee has had the benefit of trade association statistics or estimates, which were much appreciated. For other data the Subcommittee has been required to make their own estimates based on "sampling" or by use of "manpower unit factors" applied to selected operating statistics or indicated capital expenditures.

The Subcommittee, likewise, found that BES data for Wholesale Trade - Petroleum Bulk Stations and Terminals (SIC 5092) are no longer available separately. Instead they are included in the general group statistics for Miscellaneous Wholesalers (SIC 509). With the hope that these data would

still be accumulated separately at the state level, inquiry was made by letter to each State Office involved. Only 18 states out of the 50 maintain such records and these states supplied the Council Office with mid-1962 employment figures.

Since there are over 30,000 petroleum and LPG bulk plants and terminals in the U. S., a direct questionnaire approach to obtain mid-1962 employment data was considered unsound. Accordingly, the Subcommittee decided to defer making an estimate until preliminary figures could be obtained from data sources for the County Business Patterns (first quarter 1962) Reports, issued by the Census Bureau for the Department of Commerce.

Data sources are noted on each divisional estimate together with any assumptions and factors used.

FINDINGS - MANPOWER REQUIREMENTS (1962)

General Comments on Work Force Characteristics

The Subcommittee has interpreted the term "manpower requirements" to mean the going level of work force employed for a specific time period in each functional division or activity, assuming customary work practices and normal or seasonal work situations.

Accordingly, it should be noted that the mid-1962 estimates that follow in this report represent an employment count about the end of June for some divisions and activities, and for others, a yearly monthly average count, or a shorter period month average count as considered appropriate both to the normal or seasonal work situation and to the 1962 level of operations and expenditures. Also, such employment figures do not reflect the total in - out employment resulting from turnover; neither can total figures be generally translated into man-hours or man-months or man-years because of the varied work schedule practices, especially in the contract work force.

Based on the 1960 U. S. Population Census, employment of females in the oil and gas industries (as defined for purposes of this study) represents about 11.5 percent of the regular work force. Divisional percentages are shown below:

Industry Division	Percent Females in Work Force
Oil and Gas Extraction and Field Services	9
Oil Refining	12
Oil and Gas Pipe Lines	8
Oil Distribution	16

The petroleum and natural gas industries require extensive dependence on science and technology because of the inherent technical nature of their activities and products.

The Subcommittee estimated that as of mid-1962 there were about 40,100 natural scientists and engineers employed in the primary operating divisions, as defined for purposes of this study, including oil and gas field services (SIC 138) but excluding marine, rail and for-hire-truck transportation. This figure does not include architectural and engineering manpower in other consulting or contractor firms used.

An additional 9,200 scientists and engineers were estimated to be engaged primarily in research and development conducted by companies in these industries, and would reflect their petro-chemical and government R & D efforts.

Divisional estimates and the percentage relationship to company and contract service total work force are summarized below:

INDUSTRY DIVISION	SCIENTISTS AND ENGINEERS NUMBER 1/	SCIENTISTS AND ENGINEERS PERCENT	TOTAL WORK FORCE
Oil and Gas Extraction	25,100	8.4	298,400
Oil Refining	9,500	5.6	169,800
Oil and Gas Pipe Lines	3,000	4.9	60,800
Oil Distribution	2,500	1.4	181,300
Research and Development	9,200	39.0	23,800
TOTAL	49,300	6.7	734,100 2/

1/ Based on two general data sources, the 1960 Population Census and the 1960 National Science Foundation survey - and adjusted to be more representative of the mid-1962 situation. Gas transmission data was obtained by company sample.

2/ Excludes Miscellaneous Manufacturing and Blending Plants, and Marine, Rail, and For-Hire Truck Transportation.

SUMMARY
OF
ESTIMATED MANPOWER REQUIREMENTS (1962)
MID-1962 LEVEL OF EMPLOYMENT BY DIVISION 1/

DETAIL IS SHOWN ON PAGE NO.	INDUSTRY DIVISION	OPERATIONS AND MAINTENANCE: OIL AND GAS COMPANIES	OPERATIONS AND MAINTENANCE: CONTRACT SERVICES	CONSTRUCTION: SELECTED MAJOR PROJECTS (PLANTS/SYSTEMS)
20 & 37	OIL AND GAS EXTRACTION	168,100	130,300	3,600
	OIL MANUFACTURING:			
22 & 38	Refining	164,300	5,500	11,200
21	Miscellaneous and Blending Plants	28,600		
	TRANSPORTATION:			
24 & 40	Oil Pipe Lines	21,800	200	30,000
24 & 40	Gas Pipe Lines	38,400	400	
26 - 27	Marine	13,900	27,200	
28	Tank Cars (leased)	2/	2,000	
30	Tank Trucks (for-hire)	2/	44,300	
32	OIL DISTRIBUTION	172,700	8,600	
33 - 34	RESEARCH AND DEVELOPMENT	23,000	800	
	TOTAL	630,800	219,300	

1/ Assumptions, sources and bases of estimates are outlined in the following report sections. Percentage distribution of major skills are also included therein when such information is available.

2/ Employment involved in industry-owned equipment is assumed to be reported in other industry divisions.

CRUDE PETROLEUM AND NATURAL GAS EXTRACTION

Estimated Manpower Requirements (1962)
For Operations and Maintenance

The table on the following page reflects the mid-1962 level of employment reported by operating companies (SIC 131-2) and primary oil and gas field contract service companies (SIC 138). Construction done by operating companies' own work force would be covered in these figures.

SIC 131-2 figures have been adjusted by approximately 5000 to cover natural gas companies' employees engaged in these activities but reported under Utilities SIC code. (AGA source.)

CRUDE PETROLEUM AND NATURAL GAS EXTRACTION

ESTIMATED MANPOWER REQUIREMENTS (MID-1962)	U. S. TOTAL	PERCENT	OEP-OCD AND INTERIOR REGIONS 1	4	6	2	3	5	7	8
OPERATIONS AND MAINTENANCE										
Establishments reported primarily engaged in exploration, leasing, drilling and operating oil and gas field properties including gas liquids extraction plants. Probably includes some intra-state pipe lines and certain headquarters staff. (SIC 131-132 adj)	168,100		1,310	7,730	13,030	13,485	2,120	114,855	14,520	1,050
Establishments reported primarily engaged, on a contract or fee basis, in drilling, in geophysical and geological work, and in various oil and gas field construction and maintenance services. Probably includes some research laboratories. (SIC 138)	130,300		330	5,620	13,940	6,415	4,040	89,140	8,935	1,880
TOTAL CRUDE PETROLEUM AND NATURAL GAS EXTRACTION	298,400	100.0	1,640	13,350	26,970	19,900	6,160	203,995	23,455	2,930
PERCENTAGE DISTRIBUTION OF MAJOR SKILLS										
Managers, Officials and Proprietors	25,960	8.7	8.1	8.7			8.7		8.6	
Scientists and Engineers	25,065	8.4	10.2	5.6			8.2		11.1	
Other Professionals and Semi-Professional Workers	18,200	6.1	9.4	3.0			6.5		5.7	
Leasemen, Scouts, Buyers, Sellers and Other Agents	6,865	2.3	2.8	2.1			2.2		2.8	
Office and Clerical Workers	31,630	10.6	13.0	8.5			11.4		8.4	
Foremen	15,220	5.1	6.9	5.3			4.8		5.9	
Craftsmen, Inspectors and Equipment Operators	21,185	7.1	10.0	8.1			6.5		8.3	
Operating Engineers, Motormen and Pumpers	31,035	10.4	10.5	15.5			10.0		8.1	
Truck and Tractor Operators	9,250	3.1	4.0	4.9			2.7		3.1	
Seismic, Drilling, Plant and Field Operatives and Laborers	108,620	36.4	22.5	37.1			36.9		37.1	
Protective and Building Service Workers and all Others not Classified	5,370	1.8	2.6	1.2			2.1		0.9	

PETROLEUM REFINING
Estimated Manpower Requirements (1962)
For Operations and Maintenance

The table on the following page reflects the mid-1962 level of employment reported (SIC 291) as part of a refinery complex. Own work force used in construction would be included in these figures.

Contract maintenance service manpower has been estimated using an "average" factor for 45 refineries sampled. It should be noted that contract maintenance practice varies considerably between refinery locations.

The 1960 Population Census tabulations showed an employment estimate of 28,600 for miscellaneous oil product manufacturing and blending plants (SIC 295 - and 299.) This count was considered reasonable for mid-1962 and is shown in the summary table on page 18.

P E T R O L E U M R E F I N I N G

ESTIMATED MANPOWER REQUIREMENTS (MID-1962)	U. S. TOTAL	PERCENT	OEP-OCD AND INTERIOR REGIONS 1	4	6	2	3	5	7	8
OPERATIONS AND MAINTENANCE										
Establishments reported primarily engaged in distilling, cracking and reforming crude oil and volatiles into products and other derivatives. Probably includes some laboratories and certain headquarters staff. (SIC 291)	164,300		17,340	21,460	8,310	27,280	1,255	58,520	27,680	2,455
Contract maintenance services. (Committee estimate)	5,500		500	600	250	800	50	1,900	1,300	100
TOTAL PETROLEUM REFINING	169,800	100.0	17,840	22,060	8,560	28,080	1,305	60,420	28,980	2,555
PERCENTAGE DISTRIBUTION OF MAJOR SKILLS										
Managers, Officials and Proprietors	8,660	5.1	6.3	4.9			4.2		6.2	
Scientists and Engineers	9,510	5.6	6.7	5.3			5.7		4.8	
Other Professionals and Semi-Professional Workers	17,150	10.1	11.5	8.5			9.8		11.3	
Buyers, Sellers, Creditmen and Other Agents	5,265	3.1	3.5	4.0			2.1		3.5	
Office and Clerical Workers	29,715	17.5	21.0	17.1			15.5		18.8	
Foremen	9,000	5.3	5.2	5.5			5.5		4.6	
Craftsmen, Inspectors and Equipment Operators	28,865	17.0	14.5	19.1			17.6		16.1	
Operating Engineers, Firemen and Oilers	9,340	5.5	5.0	5.3			5.9		5.6	
Truck and Tractor Operators	6,790	4.0	5.0	5.1			2.8		3.9	
Helpers and Laborers	40,070	23.6	18.1	22.5			27.3		22.6	
Protective and Building Service Workers and all Others not Classified	5,435	3.2	3.2	2.7			3.6		2.6	

PETROLEUM AND NATURAL GAS PIPE LINES
Estimated Manpower Requirements (1962)
For Operations and Maintenance

The table on the following page reflects the mid-1962 level of employment reported (SIC 461) for crude oil and product pipe lines. Employment figures for gas transmission pipe lines are from the American Gas Association who accumulates such statistics from copies of company work injury reports sent to the Bureau of Mines and Bureau of Labor Statistics.

Contract maintenance manpower was estimated at 600.

PETROLEUM AND NATURAL GAS PIPELINES

ESTIMATED MANPOWER REQUIREMENTS (MID-1962)	U. S. TOTAL	PERCENT	OEP-OCD AND INTERIOR REGIONS							
			1	4	6	2	3	5	7	8
OPERATIONS AND MAINTENANCE										
Companies reported primarily engaged in transportation of crude oil, volatiles and refined products. (SIC 461)	21,800		560	2,240	3,550	2,330	890	11,510	515	205
Companies reported primarily engaged in transportation and storage of natural gas up to the "city gate". (AGA survey)	38,400		535	2,740	6,300	5,590	2,765	18,540	1,470	460
Contract maintenance services (Committee estimate)	600		10	50	100	80	35	300	20	5
TOTAL PETROLEUM AND NATURAL GAS PIPELINES	60,800	100.0	1,105	5,030	9,950	8,000	3,690	30,350	2,005	670
PERCENTAGE DISTRIBUTION OF MAJOR SKILLS [1/]										
Managers, Officials and Proprietors	5,140	8.5	8.2	9.7			7.9		7.5	
Scientists and Engineers	3,000	4.9	4.0	4.7			5.3		3.8	
Other Professionals and Semi-Professional Workers	4,385	7.3	8.1	7.4			7.3		6.3	
Buyers and Right-of-way Agents	820	1.3	1.6	1.3			1.3		1.1	
Office and Clerical Workers	11,500	18.9	19.2	19.2			18.6		19.4	
Foremen	2,355	3.8	4.3	3.5			3.8		5.0	
Craftsmen and Repairmen	9,220	15.2	13.9	15.3			15.9		12.2	
Truck and Tractor Operators	1,495	2.5	2.9	2.1			2.7		2.0	
Operating Engineers	5,225	8.6	7.6	8.5			8.2		12.0	
Other Operatives and Laborers	16,445	27.0	27.3	26.6			26.9		28.6	
Protective and Building Service Workers and all Others not Classified	1,215	2.0	2.9	1.7			2.1		2.1	

1/ Weighted average of petroleum and gas transmission pipelines.

MARINE TRANSPORTATION
Estimated Manpower Requirements (1962)
For Operations

The tables on the following page reflect an estimated mid-1962 level of employment directly engaged in ocean, lake, coastal and inland waterways transportation with respect to petroleum and petroleum products only (and petrochemicals when non-separable). Only tankers of U.S. Registry have been included. Shipyard repair and construction manpower has been excluded.

The estimated level of employment is about 41,100 for marine operations.

The Subcommittee have used a "vessel unit" approach plus related relief crew and administrative and accounting overhead factors. Obviously, such a unit factor basis is a compromise between oil company and independent operator practices. The assumption has also been made that personnel primarily working in marine loading or discharge at refineries and terminals are already counted under those industry divisions (SIC).

The unit factor approach also avoids duplicating figures of manpower employed on other vessels at other times, those in the "pool" or at hiring halls, and those unemployed for part of the year.

The allocation of towing vessels to petroleum and petroleum movements has been developed from estimated petroleum and petroleum products volume translated into transportation requirements by coastal and inland waterways systems. Manning has been related to vessels in service according to size or horsepower, and where appropriate, to manned barges.

OCEAN TANKERS (U.S. FLAG)

BY VESSEL TYPE	NO. OF VESSELS	TOTAL MANPOWER CREW AND RELIEF
10-24 M. DWT	193	11,078
25-44 M. DWT	79	4,645
45-65 M. DWT	12	740
Over 65 M. DWT	3	210
Sub Total	287	16,673
Adm. and Acctg.		1,627
TOTAL		18,300
BY OPERATOR TYPE		
Oil Companies		10,000
Contract Carriers, etc.		8,300
TOTAL		18,300

BARGING AND COASTAL/LAKE TANKERS

BY SYSTEM	NUMBER OF VESSELS SELF-PROPELLED	TUGS/TOWBOATS	MANNED BARGES	TOTAL MANPOWER CREW AND RELIEF
Great Lakes	29	5	-	1,283
East Coast	132	180	189	4,631
Miss. R/Gulf Coast	1	915	-	13,569
West Coast/Alaska	19	100	-	1,271
Sub Total	181	1,200	189	20,754
Adm. and Acctg.				2,046
TOTAL				22,800

BY OPERATOR TYPE	
Oil Companies	3,900
Contract Carriers, etc.	18,900
TOTAL	22,800

TANK CAR TRANSPORTATION
Estimated Manpower Requirements (1962)
For Tank Car Fleet Regularly Assigned
To Petroleum Service

Data from major tank car fleet owners, representing 45 percent of the total domestic tank cars in all services, was used to develop a weighted average factor for manpower engaged in fleet operation, maintenance and related general overhead. (Workers on new car production were excluded.)

The Subcommittee estimated that 91,000 cars in regular petroleum service would represent about a 2,000 manpower level requirement in 1962. No regional distribution was estimated.

It should be noted that another 68,000 cars were of types considered interchangeable to petroleum service, and if so used in part, would increase the above estimate proportionately.

Sources: National Petroleum Council Report
Oil and Gas Transportation Facilities (1962)
Committee questionnaire to major tank car fleet owners.

FOR-HIRE TANK TRUCK TRANSPORTATION
Estimated Manpower Requirements (1962)
For Operations and Maintenance

The table on the following page reflects an estimated mid-1962 level of employment engaged in the operations and maintenance of tank trucks by all common and contract carriers. The total manpower engaged in private petroleum trucking operations, both intra and interstate city, are included as a part of the data shown in the Petroleum Products Distribution section of this report.

The Subcommittee estimates that 41,400 tank truck and trailer units were engaged in for-hire service in 1962. This estimate is based upon the information contained in the 1962 report of the NPC Subcommittee on Tank Truck Transportation. Distribution of this equipment by the 8 OCDM Regions in which it is operated appears in the following table.

The Subcommittee developed a manning factor per unit of equipment, which was arrived at following an analysis of the total employees engaged in operations and maintenance versus the total units of equipment (owned, rented and leased) as reported by representative operators to the ICC. Applying this unit factor, the Subcommittee estimated that a total of 44,300 employees were engaged in the for-hire tank truck service in mid-1962.

FOR-HIRE TANK TRUCK OPERATIONS AND MAINTENANCE

OCDM REGION	TOTAL TANK TRUCK & TRAILER UNITS	ESTIMATED MANPOWER REQUIREMENTS (MID-1962)	PERCENT OF TOTAL MANPOWER
1	3,440	3,680	8.3
2	8,680	9,290	21.0
3	5,070	5,425	12.2
4	8,040	8,605	19.4
5	6,540	7,000	15.8
6	3,010	3,220	7.3
7	5,220	5,580	12.6
8	1,400	1,500	3.4
TOTAL U.S.	41,400	44,300	100.0

PETROLEUM PRODUCTS DISTRIBUTION
Estimated Manpower Requirements (1962)
For Operations and Maintenance

The table on the following page reflects the mid-March 1962 level of employment reported in petroleum bulk stations and terminals, (including LP-gas), according to preliminary figures prepared by the Bureau of the Census, United States Department of Commerce for the County Business Patterns (First quarter 1962) reports. It has been assumed that these figures are representative of the mid-1962 level of employment.

The count of employees generally excludes employees of administrative and auxiliary offices of petroleum companies operating bulk stations. However, because in some cases the reports for bulk stations and terminals included such employees, the figures are not completely comparable with these as reported for the Census of Business.

Contract maintenance service manpower has been estimated on a company sampling, and covers both facilities and delivery equipment.

PETROLEUM PRODUCTS DISTRIBUTION

ESTIMATED MANPOWER REQUIREMENTS (1962)	U. S. TOTAL	PERCENT	OEP-OCD AND INTERIOR REGIONS 1	4	6	2	3	5	7	8
OPERATIONS AND MAINTENANCE										
Terminals and bulk plants reported primarily engaged in receipt, storage and delivery of oil and LPG products to consumers and resellers. Probably includes some administrative and auxiliary office employees. (County Business Patterns - First quarter 1962 preliminary figures)	172,700		28,910	33,170	20,470	30,970	22,430	17,210	12,020	7,520
Contract maintenance services (Committee estimate)	8,600		1,450	1,650	1,050	1,550	1,100	850	600	350
TOTAL PETROLEUM PRODUCTS DISTRIBUTION	181,300	100.0	30,360	34,820	21,520	32,520	23,530	18,060	12,620	7,870
PERCENTAGE DISTRIBUTION OF MAJOR SKILLS										
Managers, Officials and Proprietors	31,550	17.4	13.6	19.0			18.1		18.2	
Scientists and Engineers	2,500	1.4	1.9	.6			1.4		2.2	
Other Professionals and Semi-Professional Workers	7,250	4.0	5.8	3.1			3.4		4.7	
Salesmen and Sales Workers	21,220	11.7	9.1	13.5			11.0		13.5	
Buyers, Creditmen, Real Estate and Other Agents	3,810	2.1	2.4	2.0			1.8		2.5	
Office and Clerical Workers	40,980	22.6	25.5	20.5			22.3		23.1	
Foremen	3,445	1.9	2.3	1.6			1.8		2.3	
Craftsmen and Repairmen	7,800	4.3	6.5	2.9			4.3		3.5	
Pumpmen and Other Operatives	5,805	3.2	3.8	2.2			3.5		3.3	
Deliverymen and Other Drivers	45,875	25.3	23.1	29.1			25.7		20.5	
Warehousemen and Laborers	7,255	4.0	3.8	3.6			4.5		4.3	
Protective and Building Service Workers and Others not Classified	3,810	2.1	2.2	1.9			2.2		1.9	

RESEARCH AND DEVELOPMENT
Estimated Manpower Requirements (1962)

The table below reflects an estimated mid-1962 level of employment based in part on preliminary 1962 data from the National Science Foundation survey and in part on a 1962 man-years count obtained from a "sampling" of companies spending about 70 percent of the total oil and gas industries 1962 R & D outlay including petrochemical and government programs.

The Subcommittee recognized the possiblility of some R & D employment being reported in Oil and Gas Field Services (SIC 138) and in Oil Refining (SIC 291) figures. However, all indications were that the bulk of the research establishments were allocated by the states to a general industry R & D code (SIC 739) and thus, not included under petroleum and natural gas codes used in this report.

Skill Category	Number	Percent
Scientists and Engineers as Managers and Administrators	1,200	5
Professionals	8,000	35
Sub-Total	9,200	40
Technicians	5,800	25
Office and Service Workers	8,000	35
Total	23,000	100

Laboratories use a variety of contract research as well as operational and maintenance services manpower. A minimum of 800 man-years has been estimated for 1962.

CONSTRUCTION
Estimated Manpower Requirements (1962)
For Major Projects

The oil and gas industries spend about 6 billion dollars in the U. S. each year for fixed assets including dry-holes and lease acquisition costs. Local, regional and national contractor firms are used. Some of these firms may be primarily engaged in services to the oil and gas industries, i.e., oil and gas field services (SIC 138). Many, of course, conduct engineering and construction activities in other industries and public works - and outside the U. S.

Construction manpower requirements reflect the level of spending committed in annual company budgets usually approved each year-end. Each project will vary in lead-time required for engineering and contract-letting and with respect to on-site schedule to completion. Manpower requirements in total and by skills employed vary during the course of construction and each project has its manpower requirement peak. Accordingly, an estimate of percentage distribution of skills in construction at mid-1962 would not be too meaningful, if even possible. In order to illustrate the variables involved, an actual off and on-site manpower profile[6/] has been included in this report.

6/ See Appendices F - engineering and construction profile for a refinery project of the magnitude of $100,000,000.

Since construction projects very in so many ways, i.e., types, schedules, locations and rate of industry spending, the Subcommittee has made only total U. S. manpower estimates based on "manpower component factors" applied to indicated levels of capital expenditures or to indicated new capacity, as considered appropriate.

VOLATILES EXTRACTION PLANTS

Various trade journal articles and other published sources indicated the following general level of plant construction in 1961, 1962 and projected 1963:

	Annual Capital Expenditures (New and Rebuilt)
1961	$125,000,000
1962	110,000,000
1963	100,000,000

Some of the plants completed in 1962 were started in 1961; others started in 1962 will be completed in 1963. The Subcommittee made the assumption that the indicated level of activity, although shifting geographically, would represent a fairly even around-the-year work force requirement. Accordingly, a man-years factor per $1,000,000 (representing a composite of several companies' experience) was used by the Subcommittee to make their estimate of 3,600 as representative of mid-1962 employment, including contract engineering and construction work force.

REFINING

The Bureau of Mines reported the following additional and replacement capacity building as of January 1962:

	(Barrels Per Day) Additional	Replacement
Crude Oil Distillation	110,350	90,400
Cracking and Reforming	77,285	-

One new refinery was in process of construction and it represented 100,000 B/D crude oil and 43,000 B/D cracking and reforming capacity of those listed above.

Capital expenditures in refining also involve construction to facilitate operations, efficiencies, quality improvement, etc. The 1959-61 level of capital expenditures for these improvements plus additional capacities is reported around 350-360 millions of dollars annually excluding petrochemicals. 1962 expenditures are estimated to be of the same general size. A major share of this construction is handled by contract work force including a considerable part of the engineering.

The Subcommittee made these broad assumptions - that about 320 millions of dollars were handled by contract - and that this level of annual spending, with the likely overlap into a following year, would represent a fairly even around-the-year contract work force requirement in total. Accordingly,

a man-years factor per $1,000,000 (representing a composite of several companies' experience) was used by the Subcommittee to make their estimate of 11,200 as representative of mid-1962 employment, including contract engineering and construction work force.

OIL AND GAS PIPE LINES

U. S. pipe line construction for 1962 has been reported as in the table below:

Size	Gas	Oil	Total Miles
4-10 in.	2,550	3,350	5,900
12-14 in.	750	250	1,000
16-18 in.	800	450	1,250
20-22 in.	500	150	650
24-26 in.	300	-	300
30-34 in.	1,750	50	1,800
36 in.	400	700	1,100
Totals	7,050	4,950	12,000

Publications have indicated that about 400,000 horsepower was added to the pipe line industry during 1962. This would reflect new stations as well as increases to existing stations.

The following levels of capital expenditure have been reported or estimated for pipe lines, stations and related storage:

	(Millions of Dollars)		
	Crude and Products	Natural Gas	Total
1961	200	803	1003
1962	289	531	820
1963	362	720	1082

The indicated increase in 1963 is mainly due to the Colonial project and the growing backlog of planned projects for natural gas transmission.

The Subcommittee asked the Pipe Line Contractors Association for their estimate of line construction manpower requirements based on data accumulated from their members and on factors considered representative of pipe line construction practices. (Most pipe line contractors work nine-hour days, seven days a week.)

The Association has estimated the mid-1962 level of employment (excluding station construction) at 23,000, based on various man-days per mile factors for differences in size and terrain. These quoted comments are pertinent and illustrate the seasonal characteristics of this activity:

> "If we use an average tenure of four months, or 104 working days (shorter last year than usual), we arrive at a total employment figure of 22,000 men. Our records indicate that with turnover and the owning companies' tendency to divide projects into progressively smaller portions, it is very likely that as many as 50,000 men were employed last year in actual field construction work. We estimate that about 10 percent of these fall into what is usually called indirect field labor, such as supervisory personnel, mechanics, field office people and service truck drivers.
>
> "We estimate that another 1000 people are employed the year round in the warehouses, central accounting and field personnel departments of the contractors' staffs.
>
> "The foregoing figures naturally exclude personnel employed in engineering, purchasing and construction management capacities by owning companies; however, owning companies' construction forces would be included to the extent

that pipelines built by them are included in the mileage totals.

"We can see no significant difference in labor required between oil and gas pipeline construction, and therefore have not separated these two categories."

With respect to new station construction and added pumping capacity, a dollar factor per installed horsepower (representing a composite figure for both oil and gas station constructions) was applied to the reported 400,000 horsepower added in 1962. Station construction is usually on nine-hour days and six-day weeks. Based on a 40-60 labor to material/equipment ratio and going wage rates, approximately 940,000 man-days (nine-hour days) or 3,000 man-years (312-day years) were estimated for the 1962 station projects. The bulk of this construction was probably done in, say, a six-month period -- hence, the mid-1962 level of employment for these activities was estimated at about 6,000.

The Subcommittee felt another 1,000 men should be added for storage and miscellaneous, bringing the total contract work force up to about 30,000 in mid-1962 engaged in oil and gas pipeline construction.

UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF THE SECRETARY
WASHINGTON 25, D. C.

C
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P
Y

October 3, 1962

Dear Mr. Follis:

In 1956 the National Petroleum Council prepared a report on Oil and Gas Industry Manpower Requirements.

It is possible that under emergency situations there might develop a shortage of skilled manpower. Therefore, current information on manpower requirements expressed in percentages by skills within Standard Industry Classification and recorded by civil defense areas is required in order to complete a general study requested by the Department of Defense. As the study progresses it is suggested that consultation with the Office of Oil and Gas may be advisable to determine the most useful form in which to present the material.

I therefore request the National Petroleum Council to appoint a committee to make a thorough study of domestic manpower requirements as of July 1, 1962, throughout the petroleum and gas industries.

Sincerely yours,

/S/ JOHN M. KELLY

Assistant Secretary of
the Interior

Mr. R. G. Follis
Acting Chairman
National Petroleum Council
1625 K Street, N. W.
Washington 6, D. C.

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Office of Oil and Gas
U.S. Department of the Interior

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Vincent M. Brown
National Petroleum Council

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Office of Oil and Gas
U.S. Department of the Interior

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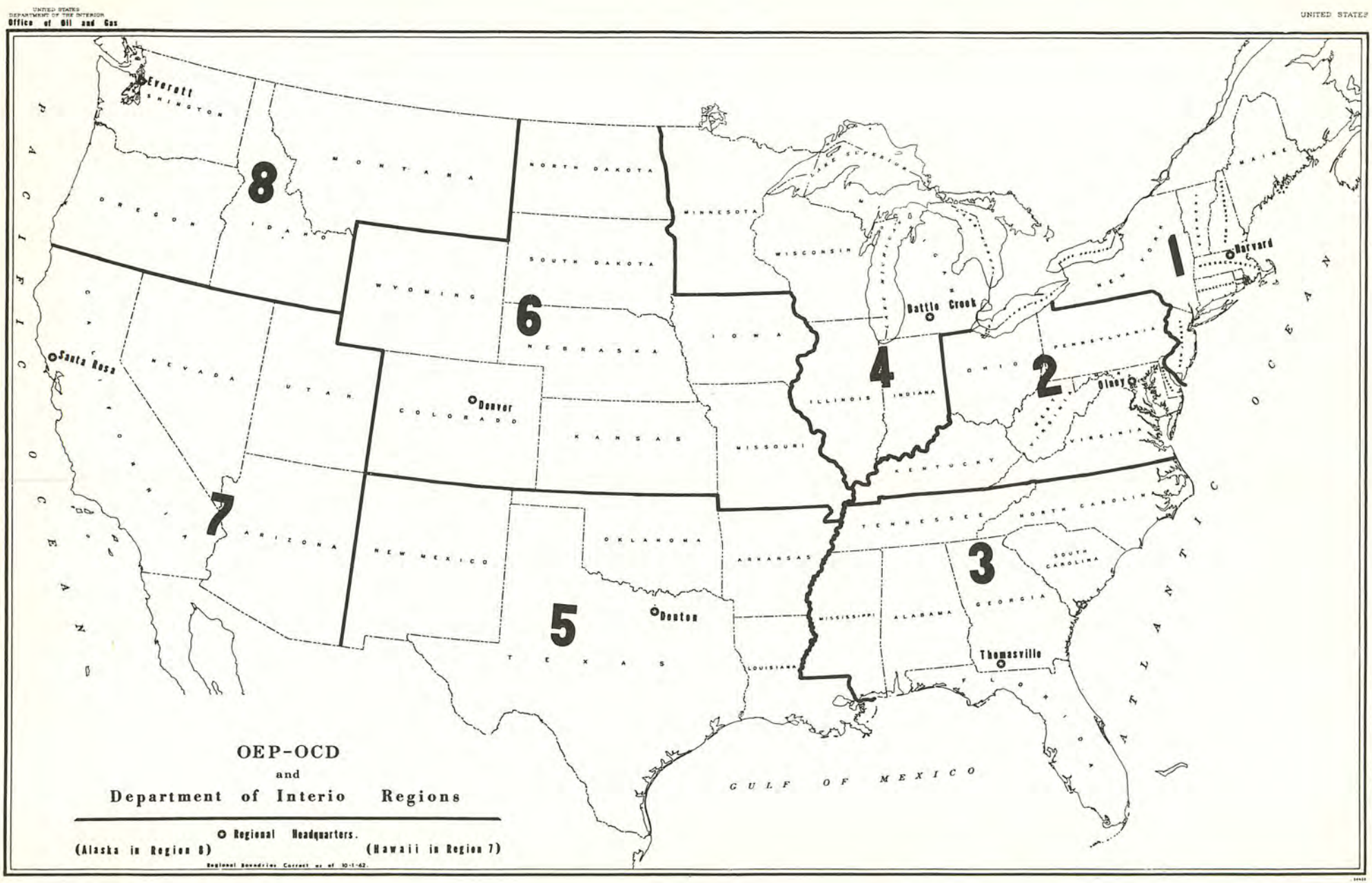
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Office of Oil and Gas
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FLORIDA
LOUISIANA
TEXAS
PACIFIC OCEAN
ATLANTIC OCEAN
GULF OF MEXICO
OEP-OCD
and
Department of Interio Regions
O Regional Headquarters.
(Alaska in Region 8)
(Hawaii in Region 7)
Regional Boundries Correct as of 10-1-62.

APPENDIX E

TOTAL AVERAGE NUMBER OF EMPLOYEES AT LOCATIONS OF
CHEMICAL MANUFACTURING PLANTS OF PETROLEUM AND NATURAL GAS INDUSTRIES
AS OF JANUARY 1, 1961
(Including New Construction By July 1, 1963)

OEP-OCD REGIONS	AT "SELF-CONTAINED" [a] FACILITIES			AT "NON-SELF-CONTAINED" FACILITIES [c]			
	AS OF JANUARY 1, 1961	SCHEDULED FOR PRODUCTION BY JULY 1, 1963	TOTAL	AS OF JANUARY 1, 1961	SCHEDULED FOR PRODUCTION BY JULY 1, 1963	TOTAL	TOTAL
REGION 1							
Operating	69	50	119	2,034	42	2,076	2,195
Maintenance	3	20	23	2,307	8	2,315	2,338
All Others [b]	120	30	150	1,752	20	1,772	1,922
TOTAL	192	100	292	6,093	70	6,163	6,455
REGION 2 & 3							
Operating	136	60	196	4,264	172	4,436	4,632
Maintenance	61	60	121	4,689	217	4,906	5,027
All Others [b]	132	80	212	3,075	103	3,178	3,390
TOTAL	329	200	529	12,028	492	12,520	13,049
REGION 4							
Operating	342	30	372	3,311	-	3,311	3,683
Maintenance	154	-	154	4,382	33	4,415	4,569
All Others [b]	116	-	116	2,692	-	2,692	2,808
TOTAL	612	30	642	10,385	33	10,418	11,060
REGION 5							
Operating	2,955	210	3,165	13,983	490	14,473	17,638
Maintenance	2,273	146	2,419	13,694	335	14,029	16,448
All Others [b]	1,946	121	2,067	9,028	563	9,591	11,658
TOTAL	7,174	477	7,651	36,705	1,388	38,093	45,744
REGION 6							
Operating	214	36	250	678	-	678	928
Maintenance	138	20	158	339	-	339	497
All Others [b]	155	35	190	176	-	176	366
TOTAL	507	91	598	1,193	-	1,193	1,791
REGION 7 & 8							
Operating	1,328	14	1,342	3,787	115	3,902	5,244
Maintenance	1,172	6	1,178	2,723	45	2,768	3,946
All Others [b]	1,246	3	1,249	3,013	85	3,098	4,347
TOTAL	3,746	23	3,769	9,523	245	9,768	13,537
TOTAL UNITED STATES							
Operating	5,044	400	5,444	28,057	819	28,876	34,320
Maintenance	3,801	252	4,053	28,134	638	28,772	32,825
All Others [b]	3,715	269	3,984	19,736	771	20,507	24,491
TOTAL	12,560	921	13,481	75,927	2,228	78,155	91,636

a/ A "Self-Contained" facility is defined as a chemical plant that can maintain continuity of operation (assuming availability of feed stocks and power requirements) independent of any other physical unit or facility.
b/ Includes supervisory, clerical, etc.
c/ Data shown is for the overall facility, of which the non-self-contained chemical plant is only a part.

Source: National Petroleum Council's Survey of Chemical Manufacturing Facilities of Petroleum and Natural Gas Industries.

PASCAGOULA REFINERY PROJECT
ORDER OF MAGNITUDE - $100,000,000
Engineering and Construction Manpower Profile
(22 Months Actual; 7 Months Estimated)

The table on the following page shows the average number of men per month at 40 hours per week by various skills employed on this project. The refinery includes the following facilities:

Crude Unit
Isocracker
Hydrogen Manufacturing Plant
Catalytic Reformer
Fluid Catalytic Cracker
Alkylation Plant
Treating Facilities
Boiler Plant
Tankage and other associated facilities such as Waste Disposal, Water Supply, Cooling Tower, Electrical Power Distribution, etc.
Product Tankage and Loading Racks
Wharf
Offices, Laboratory and Shop Buildings

Courtesy of Standard Oil Company of California

PASCAGOULA REFINERY PROJECT
CONSTRUCTION MANPOWER BY MONTHS FROM START TO FINISH
AVERAGE NUMBER OF MEN PER MONTH AT 40 HOURS PER WEEK

(MONTHS) →	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29 ← (MONTHS)	TOTAL MAN-MONTHS	PERCENT
CONTRACT MANPOWER																															
Boilermakers - Welders	-	-	-	-	-	-	-	-	6	33	42	57	83	113	123	163	212	234	255	248	246	225	200	100	50	10	5	-	-	2,405	
Bricklayers	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	4	7	11	16	29	27	25	20	5	-	-	-	-	145	
Carpenters	-	-	-	-	-	-	1	4	5	3	4	10	28	55	116	178	203	199	175	144	175	197	175	100	50	25	10	2	-	1,859	
Cement Finishers	-	-	-	-	-	-	-	-	1	-	-	-	2	4	8	10	20	26	30	31	39	43	40	20	10	5	2	-	-	291	
Electricians	-	-	-	-	-	-	-	3	2	1	2	6	7	26	39	80	120	148	190	162	213	247	260	225	150	75	20	5	1	1,982	
Operators - Oilers - Mechanics	-	-	-	-	-	1	17	21	26	40	42	65	70	98	128	154	167	168	176	163	174	212	225	150	100	50	10	2	1	2,260	
Iron Workers	-	-	-	-	-	-	1	2	1	-	1	5	17	32	68	94	92	88	91	98	118	119	100	75	50	25	5	-	-	1,082	
Millwrights	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	14	16	25	25	50	40	20	10	5	2	-	212	
Insulators - Sheet Metal - Roofers	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	6	6	10	11	24	49	98	117	107	53	20	5	-	509	
Painters	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	7	19	26	38	47	60	80	75	60	20	5	1	441	
Pipefitters - Plumbers	-	-	-	-	-	-	-	1	-	-	5	7	22	42	65	96	137	190	229	269	371	518	526	501	301	126	50	25	5	3,486	
Pipe Welders	-	-	-	-	-	-	-	-	-	-	-	2	9	19	28	42	63	86	86	113	155	196	200	200	150	75	25	10	1	1,460	
Truck Drivers	-	-	-	-	-	-	-	1	1	1	3	10	11	16	23	30	31	30	28	34	42	50	50	35	25	15	5	3	1	445	
Laborers	-	-	-	-	-	11	14	25	51	69	81	88	129	169	246	329	358	329	332	324	381	376	375	325	300	200	50	15	2	4,379	
Pile Drivers	-	-	-	-	-	-	-	-	-	-	-	1	4	18	28	22	10	10	12	12	8	8	6	4	-	-	-	-	-	143	
Sub Total	-	-	-	-	-	12	33	57	93	147	180	251	382	592	872	1,203	1,425	1,533	1,658	1,667	2,038	2,339	2,390	1,992	1,393	729	227	74	12	21,299	67.6
Foreman	-	-	-	-	-	1	2	2	3	5	7	7	13	15	15	24	25	32	80	108	120	134	140	125	100	60	25	10	5	1,058	
General Foreman	-	-	-	-	-	-	1	1	1	2	2	2	4	5	7	8	8	10	16	29	39	42	50	40	35	20	10	5	2	339	
Field Engineers - Inspectors Clerks - Warehousement	-	-	-	-	-	1	9	14	16	19	19	35	47	65	78	98	105	128	135	145	149	140	140	120	100	60	30	10	5	1,668	
Supervisory Staff	-	-	-	-	-	-	1	2	4	5	8	10	13	16	20	27	27	30	33	40	53	54	60	50	35	20	10	5	3	526	
Sub Total	-	-	-	-	-	2	13	19	24	31	36	54	77	101	120	157	165	200	264	322	361	370	390	335	270	160	75	30	15	3,591	11.4
TOTAL CONTRACT (On-Site)	-	-	-	-	-	14	46	76	117	178	216	305	459	693	992	1,360	1,590	1,733	1,922	1,989	2,399	2,709	2,780	2,327	1,663	889	302	104	27	24,890	79.0
COMPANY MANPOWER																															
Clerical Staff	-	-	-	-	-	1	2	2	3	7	8	11	11	14	15	17	19	19	18	18	20	21	20	18	18	16	14	9	6	307	
Engineer - Inspectors	-	-	-	-	-	1	2	3	7	8	8	9	11	20	26	32	34	37	38	41	43	42	43	42	40	32	20	15	9	563	
TOTAL COMPANY (On-Site)	-	-	-	-	-	2	4	5	10	15	16	20	22	34	41	49	53	56	56	59	63	63	63	60	58	48	34	24	15	870	2.8
Contract and Company Design - Engineering - Drafting Manpower	17	35	47	85	105	144	167	185	218	264	322	360	398	411	440	425	428	362	328	307	279	192	92	46	31	25	11	5	5	5,734	18.2
GRAND TOTAL (PROJECT)	17	35	47	85	105	160	217	266	345	457	554	685	879	1,138	1,473	1,834	2,071	2,151	2,306	2,355	2,741	2,964	2,935	2,433	1,752	962	347	133	47	31,494	100.00

LIST OF

KEY OCCUPATIONS

IN THE

PETROLEUM AND NATURAL GAS

INDUSTRIES

LIST OF

KEY OCCUPATIONS

IN THE

PETROLEUM AND NATURAL GAS

INDUSTRIES

* * * * * *

A selected listing of occupations with Dictionary of Occupational Titles and Codes, or Definitions references, representative of the skills needed for continuity of operations and the availability of essential products.

The listing is restricted to "key occupations" and does not represent the full manning requirements. In general, occupations needing less than 6 months accelerated training have been omitted.

Prepared as a Supplemental Section
to the
Report of the
National Petroleum Council's
Committee on Petroleum and Gas
Industries Manpower Requirements (1962)

July 16, 1963

CONTENTS

KEY OCCUPATIONS IN CENTRAL AND OTHER PRINCIPAL OFFICES

GENERAL DESCRIPTION

These establishments are primarily engaged in corporate and general administrative, supervisory, purchasing, engineering, traffic, financial and accounting, personnel, labor relations and other management functions performed centrally for other establishments of the same company.

In some cases all or part of these functions may be conducted in a major operating establishment. This would be the likely situation in the case of a small company, partnership or individual proprietorship.

Corporate - Key Occupations

Individuals classified as officials, managers, proprietors or agents, who are concerned with the business affairs of a company or enterprise, many of whom are company directors or responsible to a board of directors. May be located in a parent company or subsidiary's central headquarters; some may be located in other principal offices of the company.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Chairman of the Board	Special Definition - A director who presides at board meetings, and may preside at stockholder meetings, in which the transactions, accounts, and affairs of the company are reviewed and passed upon, including the election of Board members and corporate officers and other authorizations usual to a Board's province. May also serve as the chief executive of a company.	
President	President	0-97.01
Vice President (Executive - Senior - Function)	Vice President	0-97.02
Secretary	Secretary	0-97.03
Assistant Secretary	Secretary	0-97.03
Treasurer	Treasurer	0-97.04
Assistant Treasurer	Treasurer	0-97.04
Controller	Controller	0-97.05
Assistant Controller	Controller	0-97.05
General Counsel	Lawyer, Corporation	0-22.10
Stock Transfer Agent	Special Definition - Issues company stock and maintains stock record books.	

Executive and Coordination - Key Occupations

Officials, managers and professionals concerned with and responsible for proper and economic use of assigned resources in such forms as physical assets, money, materials and human talent; for planning, organizing, directing, coordinating, guiding and otherwise controlling the activities of the business or assigned segment; for invention, innovation and efficiencies; and for internal and external relationships required to accomplish objectives.

May be located in a parent company or subsidiary's headquarters; some may be located in other principal offices of the company.

Occupations are usually further defined according to field of activity or function, e.g., exploration, production, manufacturing, transportation, marketing, credit, employee or public relations, etc.; by organizational level, e.g., department, division, section, etc.; and by geographical province, e.g.; head office, region, area, division, district, etc.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Chairman of the Board	(See corporate definition)	
President	President	0-97.01
Vice President (Executive - Senior - Function)	Vice President	0-97.02
Director, of -	Manager, General	0-97.41
General Manager, of -	Manager, General	0-97.41
Coordinator, of -	Manager, General	0-97.41
Manager, of -	Manager I and II	0-97.51
General Superintendent	Superintendent, General	0-97.51
Chief, of -	Manager I and II	0-97.51
	General Foreman I and II	0-97.57
Manager, Credit	Manager, Credit and Collections	0-85.10

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Manager, Insurance	Manager, Insurance	0-98.10
Manager, Purchasing	Purchasing Agent	0-91.60
Buyer	Purchasing Agent	0-91.60
Manager, Supplies (Oil & Gas)	Manager, Contracts	0-97.65
Manager, Traffic	Manager, Traffic	0-97.66
Manager (Field office)	Manager, Branch	0-97.45
Office Manager	Manager Office	0-97.12
Assistant, to -	Junior Executive	0-97.14
Supervisor, Section	Foreman I and II Chief Clerk	0-97.13

Professionals and Semi-Professionals - Key Occupations

May be located in a parent company or subsidiary headquarters - or in other principal offices of the company.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Accountant	Accountant	0-01.10 0-01.20 0-01.40 0-01.50 0-01.70
Auditor	Auditor	0-01.60
Actuary	Actuary	0-36.55
Architect	Architect	0-03.10

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Economist	Economist, Ind.	0-36.11
Engineer	Engineer	
Chemical	Chemical	0-15.01
Civil	Civil	0-16.01
Corrosion	Electrical (Electrolysis, etc.)	0-17.01
Electrical	Electrical	0-17.01
Industrial	Industrial	0-18.01
Mechanical	Mechanical	0-19.01
Petroleum	Petroleum	0-20.11
Gas	Petroleum	0-20.11
Metallurgist	Metallurgist	0-14.20
Welding	Mechanical	0-19.01
Hygienist/Toxicologist	Special Definition - Professional providing counsel in the manufacturing, distribution and consumer handling of products in matters related to health, and obtaining adequate information to establish safe handling procedures for potentially hazardous materials.	
	Chemist, Biological	0-07.02
Attorney	Lawyer	0-22.10
Librarian	Librarian	0-23.20
Physician	Physician	0-26.10
Nurse	Nurse	0-33.36
Physical Scientists		
Chemist	Chemist	0-07.03
		0-07.21
Geologist	Geologist	0-35.63
Geophysicist	Geophysicist	0-35.65
Physicist	Physicist	0-35.73
Mathematician	Mathematician	0-35.76
Statistician	Statistician	0-35.75
		0-36.51

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Translator	Translator	0-68.32
Manager/Supervisor		
(Employee Relations)	Manager, Personnel	0-39.83
(Employment)	Manager, Employment	0-39.82
(Training)	Director, Training	0-39.81
(Wage and Salary)	Wage and Salary Adm.	0-39.86
(Labor Relations)	Manager, Ind. Rel.	0-68.70
(Safety)	Director, Safety	0-39.81
(Benefits and Records)	Supervisor, Benefits and Records	0-68.77
Placement Specialist	Employment Interviewer	0-68.71
Labor Relations Repr.	Labor Relations Specialist	0-68.76
Job Analyst	Job Analyst	0-39.85
Manager/Supervisor (Computer Center)	Manager I and II	
Engineer/Analyst (Systems)	Systems Engineer	0-69.98
Computer Programmer	Special Definition - Analyzes and converts business and technical data processing problems for solution by computer. Programs such problems for computer processing using the symbolic interpretive or compiler programming system. Verifies and prepares instructions to operators.	
	Programmer	0-69.981
Computer Operator	Special Definition - Operates a computer and related equipment. This is the journeyman level requiring a person skilled in the operation of a computer and its components. The system includes such equipment as magnetic tape units, printers, card readers and punches.	
	Console Operator	1-25.17

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Specialist	Special Definition - Experts in a technical or specialized activity requiring the equivalent of an advanced professional education and many years experience. A recognized expert both within the company and outside by trade and professional associations.	
Analyst	Special Definition - Experts within a fairly broad activity. Collate data and conclusions. Requires a broad knowledge of the company to evaluate properly the possible effects of many influences on the assigned activity.	
Draftsman	Draftsman Oil and Gas Draftsman, Map	0-48.10 0-48.15
Surveyor	Surveyor	0-64.10
Safety Engineer	Safety Engineer	0-18.01
Safety Specialist	Safety Inspector	0-79.04

Office General - Key Occupations

Experienced workers and "lead supervisors" who are part of the manager and professional support groups in a parent company or subsidiary's headquarters - and in the principal offices and establishments of the company. Occupations are generally described according to activity or function, e.g. accounting, cost, tax, budget, material, traffic-rate, dispatching, cashier, etc. - and by organizational and geographical province, e.g., personnel, credit, division, district, etc.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Clerk, Senior	Chief Clerk	0-97.13
	Clerical Technician	0-69.97
Supervisor, Section	Foreman II	
Supervisor		
(Tariffs)	Tariff Supervisor	1-35.11
(Rates)	Rate Supervisor	1-18.97
Analyst, Rate	Statistician	0-36.51
Secretary	Secretary, Private	1-33.01
Stenographer, Legal	Stenographer, Legal	1-37.12
Bookkeeper	Bookkeeper II	1-01.02
Tabulating Machine Operator	Tabulating Machine Operator	1-25.64
Superintendent (Building)	Maintenance Foreman	5-99.060
Engineer (Building)	Stationary Engineer	5-72.010

KEY OCCUPATIONS IN PETROLEUM AND NATURAL GAS EXTRACTION

GENERAL DESCRIPTION

ACTIVITY

This industry division is composed of establishments primarily engaged in the search for, discovery, development and operation of crude petroleum and natural gas field properties and gas processing plants. Incident to this effort is the secondary objective of locating and exploiting deposits of non-hydrocarbon materials.

Major activities are exploring for prospects; acquiring land and leases; drilling of exploratory and field wells; completing and equipping wells; producing and operating surface equipment and liquid hydrocarbon extraction plants; and all other activities incidental to making crude oil, liquid hydrocarbons and natural gas marketable or useable up to the point of shipment from the producing properties and plants.

SPECIAL CHARACTERISTICS

The inherent risk factors of exploration, the physical difficulties involved in drilling on land and off-shore to great depths with potential hazardous pressures, the safe and efficient exploitation of field reservoirs - all require extensive dependence on research and technology.

State conservation laws generally cover the spacing, drilling, casing, completion, and operation of oil and gas wells.

This industry division depends on a large number of general and specialized Service establishments that are (1) primarily engaged in drilling wells for oil and gas for others on a contract, fee, or other basis, (2) primarily engaged in geophysical, geological and other exploration work on a contract, fee, or other basis, and (3) primarily engaged in performing oil and gas field services such as excavating slush pits; grading and building foundations at well locations; well surveying; shooting wells; perforating casing; acidizing and chemically treating wells; hydraulically fracturing wells; and cleaning out, bailing, swabbing wells, and any other related services.

ORGANIZATION

This industry division's activities may be organized and conducted in a separate company, large or small; in a functional department of an integrated company; in geographical regions, areas, divisions, districts, fields, plants and laboratory establishments.

The activities are customarily classified into five general categories, namely: Exploration, Land, Drilling and Production, Gas Processing and Research and Technical Services.

Exploration - Key Occupations

Exploration is concerned with finding new oil, gas, and mineral resources to meet increasing demands and replace depleted reserves. It is conducted by two closely coordinated prospecting teams commonly known as geological and geophysical groups. These groups are assisted by scouts who collect information on local industry activity such as leasing and well drilling.

Geological

The geological group consists of geologists and geological specialists, such as paleontologists and stratigraphers, who collect, study, and interpret geological data to determine the most favorable structures where new oil, gas, and mineral reserves might be found. Geologists conduct surveys in the field and make maps of geological formations exposed at the earth's surface; they construct lithologic logs of the subsurface from drill cuttings and cores and prepare maps of subsurface conditions and formations by correlating and integrating all available geological and geophysical information and data. Based on the results of this work, decisions are made to embark upon extensive exploration programs, acquire or surrender acreage, and drill wildcat wells. Consequently, academic and specialized training followed by practical experience are necessary to qualify for this work.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Captain (Marine Craft)	Master (Water Transportation)	0-88.02
Draftsman, Supervisor	Superintendent, Mapping	0-48.26
Draftsman	Draftsman, Geological	0-48.50
Driller (Geologic)	Prospecting Driller	5-75.050
Engineer (Marine Craft)	Engineer, Chief, Marine	0-88.21
Area/District Geologist	Geologist	0-35.63

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Geologist, Petroleum	Geologist, Petroleum	0-35.63
Laboratory Technician	Laboratory Assistant	0-50.20
	Chemist Assistant	0-50.22
Mineralogist	Geologist (Mineralogist)	0-35.63
Paleontologist	Paleontologist	0-36.03
Petrologist	Geologist (Petrologist)	0-35.63
Photogeologist	Geologist	0-35.63
	Special Definition - Makes planometric and topographic maps from airphotos; utilizes geomorphologic and other geologic principles in the mapping of soils, outcrops, mineralization zones, and types of vegetation; interprets geologic structures and history of development of the terrain from distribution of rock exposures mapped from airphotos; and analyzes cultural features and physical geography.	
Stratigrapher	Geologist (Stratigrapher)	0-35.63
Structural Geologist	Geologist	0-35.63
	Special Definition - Makes field and laboratory studies of structural features of the earth, including folds, faults, and smaller-scale deformational features seen in the textures and fabrics of rocks; interprets the history of development of a region or area from field and laboratory investigations; locates structural traps for oil and gas, and	

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
	defines areas where other mineral deposits might occur.	
Surveyor	Surveyor, Geophysical Prospecting	5-83.972
	Surveyor	0-64.10

Geophysical

The geophysical group is composed of geophysicists, seismologists, electrical engineers, physicists, and mathematicians who conduct geophysical surveys in the field and, based on their interpretation of the results of this work, construct maps showing subsurface formations and structures. This information is closely integrated with the results of studies made by the geologists. This group utilizes various complex physical and electrical instruments, such as the seismograph, gravimeter, magnetometer, and electrical-resistivity measuring devices. The jobs are highly technical and require people with academic and specialized training followed by practical experience to qualify for this work.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Captain (Marine Craft)	Master (Water Transportation)	0-88.02
Civil Engineer	Civil Engineer	0-16.01
Computer	Computer, Electrical Gravity and Magnetic Prospecting	0-66.68
	Computer, Seismograph	0-66.67
Draftsman	Draftsman, Mechanical	0-48.18
	Draftsman, Geophysical	0-48.50
Driller (Shothole)	Prospecting Driller	5-75.050
Electrical Engineer	Electrical, Prospecting Engineer	0-17.01

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Engineer (Marine Craft)	Engineer, Chief, Marine	0-88.21
Equipment Designer	Machinery and Tool Designer	0-19.01
Equipment Mechanic	Machinist	4-75.010
Area/District Geophysicist	Geophysicist	0-35.65
Instrument Mechanic	Instrument-Maker-and-Repairman	5-00.912
	Instrument Repairman	5-83.971
Observer	Observer, Seismic Prospecting	0-66.66
	Observer, Electrical Prospecting	0-66.63
	Observer, Gravity Prospecting	0-66.65
Party Supervisor	Supervising Observer, Seismic Prospecting	0-66.66
Radar, Radio Operator	Radio Operator	0-61.30
Radar, Radio Repairman	Radio Mechanic	5-83.447
Seismologist	Geophysicist (Seismologist)	0-35.65
Seismologist's, Party Chief	Manager, Field Party, Geophysical Prospecting	0-98.30
Shooter	Shooter, Seismograph	5-74.030
Surveyor	Surveyor	0-64.10
	Surveyor, Geophysical Prospecting	5-83.972

Scouting

Scouts are responsible for the collection and dissemination of local drilling, land and geophysical data.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Chief Scout	Scout, Chief	1-48.22
Scout	Scout	1-48.22

Land - Key Occupations

Land is responsible for the acquisition of land and leases, curing of titles, and the maintenance of land records and royalty payments. These activities may be performed by two groups, generally designated as land, and title and rental groups.

Land Group

The land men are responsible for the acquisition of leases and curing titles. They also acquire surface leases, rights-of-way, lease amendments, and negotiate various types of other agreements.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Draftsman	Draftsman, Map	0-48.15
Area/District Manager	Manager, Leasing	0-98.22
Land Man	Leaseman	1-48.21
Supervisor, Drafting	Draftsman, Head	0-48.15
Supervisor, Surveying	Surveyor, Supervisor	0-64.10
Survey Party Chief	Surveyor, Supervisor	0-64.10
Surveyor	Surveyor	0-64.10

Title and Rental

The title and rental men are responsible for the maintenance of adequate land records insuring the prompt and accurate payment of lease rentals and royalties.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Analyst	Title Clerk	1-49.60
Senior Analyst	Searcher, Real Estate Titles	0-68.46
Supervisor (Rental & Records)	Manager, Rental Department	0-98.23
Supervisor (Title)	Title Supervisor	0-68.46
Supervisor (Title & Rental)	Manager, Rental Department	0-98.23

Drilling and Production - Key Occupations

Drilling and Production are concerned with the drilling of field wells and of exploratory (wildcat) wells at locations determined by Exploration; the proper development of oil and gas reserves including reserves acquired by purchase; the daily production from properties and gas processing plants; and the maintenance of facilities and equipment.

Operations

Production operations are handled primarily by men with long practical experience in drilling and production operations. They are responsible for drilling, testing and treating exploratory and development wells and producing these wells in accordance with Federal, State, and Company regulations. Also, they are responsible for the day-to-day maintenance of facilities and field equipment.

Supervisors - responsible for the initiation, coordination, development and completion of optimum producing oil and

gas wells. Inherent in achieving this end objective are: maximum utilization of existing and potential human, material and natural resources, establishment of over-all programs of production, maintenance and safety and finally, the achievement of these goals within established legal and economic boundaries.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Boat Captain	Master, Water Transportation	0-88.02
Boat Engineer	Engineer, Chief Marine	0-88.21
Construction and/or Maintenance Foreman	Roustabout Foreman	5-93.310
Development Foreman	Foreman, Petroleum Production	5-93.310
Area/District Gauger	Gauger, Chief	5-93.310
Area/District Superintendent	Superintendent, Production	0-98.33
Driller	Cable Driller Rotary Driller	5-75.270 5-75.050
Drilling Foreman	Foreman, Petroleum Production	5-93.310
Drilling Superintendent	Superintendent, Field Drilling	0-98.32
Lease Foreman	Foreman, Petroleum Production	5-93.310
Material Supervisor	Manager, Warehouse	0-99.92
Port Captain	Port Captain	0-88.02
Water System Foreman	Foreman, Waterworks	5-95.340
Production Engineer, Chief	Petroleum Engineer, Chief	0-20.11

Field Workers - under the general supervision of Driller, Production Foreman, or Maintenance Foreman, these men are responsible for completing the objectives of their supervisors (as described above). They perform the actual functions of: derrick building, pipe setting, perforating formations, pumping, well workovers, engine overhaul and maintenance, transportation and storage of materials and many others associated with the drilling and maintenance of an on or off-shore oil or gas well.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Able-Bodied Seaman	Able Seaman	5-48.040
Derrickman	Derrickman	5-20.825
Electrician	Electrician	4-97.010
Machinist	Machinist, Field	4-75.010
Materials Coordinator	Stock Chaser	1-18.65
Meterman	Meter Repairman	5-83.465
Unit Operator	Derrick Operator	5-20.825
Pump Repairman	Pump Serviceman	5-83.641
Radio Technician	Radio Repairman	5-83.411
Tester	Tester	0-50.34
Tool Dresser	Cable-Tool Dresser	5-75.280
Truck Driver, Heavy Duty	Special Definition - A skilled worker who loads, drives and unloads large trucks usually equipped with a power winch, and other attachments such as booms, cranes, and other "take-off" power attachments. Equipment and materials handled are unwieldy, valuable, and heavy, and require	

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
	great care and skill. Operation is frequently over difficult terrain and subject to all weather conditions.	
	Driver and Rigger	5-49.205
Welder	Welder, Combination	4-85.040
Motorman	Special Definition - Maintains drilling engines used in drilling operations. Performs duties such as changing oil, lubricating various parts, determining need for overhauls, etc.	
	Oil-Tool Maint. Man	5-83.641
Well Cleaner	Clean-out Driller	5-20.820
Well-Logging Operator	Well-Logging Operator	0-66.54

Engineering

Professionals and semi-professional workers are seeking new and better methods for the recovery of underground liquid and gas reserves. A basic part of this objective is developing programs such as gas lift, water flood, multi-zone production, increased drilling depths, etc. Secondary to the actual recovery operations are engineering features such as the development of corrosion-resistant metals, large off-shore drilling platforms, etc.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Area/District Engineer	Chemical Engineer, Production	0-15.01
	Mechanical Engineer	0-19.01
Civil Engineer	Construction Engineer	0-16.01
Corrosion Engineer	Electrical Engineer, Electrolysis-Mitigation Engineer	0-17.01

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Development Engineer	Machinery and Tool Designer-Oil Well Equipment	0-19.01
Draftsman	Draftsman, Oil and Gas	0-48.10
Drilling Engineer	Mechanical Engineer, Oil Field	0-19.01
Electrical Engineer	Electrical Engineer	0-17.01
Laboratory Technician	Chemist, Assistant	0-50.22
Log Engineer	Formation Testing Operator	5-20.150
Mechanical Engineer	Mechanical Engineer, Oil Field	0-19.01
Engineering Aide	Special Definition - Assists various types of engineers in maintaining technical records, charts, graphs, etc., performing rudimentary math computations; ready blueprints and interprets data.	
Development Geologist	Special Definition - Gathers, analyzes and correlates various geologic data such as electric and sample logs, core records, testing, well and seismic data, etc., to identify rock strata, determine formation boundaries and make stratigraphic interpretations. Theorizes concerning subsurface structure; prepares isopach and pressure maps; outlines specific recommendations concerning pool development possibilities.	
	Geologist, Petroleum	0-35.63

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions
Reservoir Engineer	Special Definition - Studies and evaluates data on history of individual wells, subsurface pressure surveys, known or anticipated characteristics of formations, core analysis, electrical formation surveys, etc., to aid in forecasting calculated potential of oil and gas recovery from individual reservoirs, estimating the natural flow life of wells and evaluating the producing possibilities of oil and gas bearing formations found in individual wells. Petroleum Engineer 0-20.11

Natural Gas Processing - Key Occupations

Natural Gas Processing is concerned with the processing of natural gas including the recovery of propane, isobutane, butane, isopentane, natural gasoline and stabilized distillate, as well as the compression of gas for delivery to pipeline transportation companies, and for reservoir pressure maintenance both in cycling and in secondary recovery operations.

Plants designed to treat natural gas make use of one or more of the following processes: compression, absorption, adsorption, distillations, fractionation, and refrigeration. Auxiliary plant equipment includes steam and electrical generators and facilities to produce and treat cooling water.

Supervisors - direct the actual functions which are mandatory for the continued operation of Natural Gas Processing Facilities. These include receiving a continuous stream of raw gases; directing and coordinating maximum utilization of facilities; controlling day-to-day and long-term process and product variables; planning and directing major improvements, renovations and repairs to plant and field facilities.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Area/District Superintendent	Superintendent, Production	0-98.33
Meter Engineer	Meter Engineer	5-83.974
Maintenance Foreman	Special Definition - In charge of field or plant maintenance which involves installing, dismantling, assembling, and repairing oil field and plant equipment. Makes necessary adjustment to assure efficient operations. Maintenance Foreman	5-99.060
Material Supervisor	Manager, Warehouse	0-99.92
Plant Foreman	Manager, Production	0-97.51
Plant Superintendent	Manager, Production	0-97.51

Plant Workers - nonsupervisory personnel who maintain operating and mechanical variables within predefined limits. These men have the responsibility for detecting and correcting malfunctions within plant equipment. Their duties extend to assisting in the performance of major overhaul and renovation projects, usually under the general supervision of a plant or maintenance foreman.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Electrician	Electrician	4-97.010
Instrument Man	Instrument Repairman	5-83.456
Operator No. 1 (Various)	Stationary Engineer	5-72.010
Repairman	Repairman	5-83.641
Warehouseman	Stock Clerk	1-38.01
Welder	Welder, (Any Ind.)	4-85.030

Technical Staff - who initiate and originate changes in the design and operation of currently operating Natural Gas

Liquids Extraction Facilities. Devise new methods for more efficiently treating and testing raw and finished products; seeking new methods for increasing the liquid recovery potential of Natural Gas Extraction Facilities; maximizing operating levels of temperatures, pressures and flow input.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Chemist, Plant	Chemist, Petroleum	0-07.03
Chief Chemist	Laboratory Chief	5-86.515
Area/District Engineer	Engineer, Chief	0-98.24
Gas Process Engineer	Chemical Engineer, Production	0-15.01

Field Office, Plant or Laboratory Services

Professionals or skilled and experienced staff providing for local establishments specialized services not otherwise performed by central and other principal offices.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Manager/Supervisor (Employee Relations)	Manager, Personnel	0-39.83
(Laborer Relations)	Labor Rel. Specialist	0-68.76
Safety Specialist	Safety Inspector	0-79.04
Manager/Supervisor (Stores)	Chief Storekeeper	1-38.51
Manager/Supervisor (Office)	Manager, Office	0-97.12
Accountant	Accountant	0-01.10 0-01.20

Exploration and Production Research and Technical Services - Key Occupations

Basic and applied research and development activities and other technical services variously called - Production Research, Geochemical Research, Well Drilling, Completion, and Stimulation Research; Formation Evaluation Research, Oil and Gas Recovery Research, Numerical Analysis Research; Development and/or Technical Services Department, Division, Research Center, Laboratory, or Group (includes Technical Information, Patent Coordination, Technical Reports, Technical Administration, Research Shop, Computer Center).

Laboratory Administration

Professionals concerned with the implementation of R & D programs, budgets and related administrative functions; who participate in the setting of research objectives; who coordinate professional advice and the exchange of technical information to and from operating management.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
General Manager/ Manager/Director	Laboratory Chief	
Director/Manager		
(Basic Research)	Manager I I	
(Applied Research)	Manager I I	
(Technical Services)	Manager I I	
Consultant, Sciences		
(Chemistry)	Chemist	0-07.03
(Geology)	Geologist	0-35.63
(Physics)	Physicist	0-35.73
(Mathematics)	Mathematician	0-35.76
Manager/Head (Departments or Divisions)	Manager II	
Supervisor/Leader (Sections or Groups)	Foreman I & II	

Professionals

Highly skilled professional scientists, technologists, and engineers working on improved and better methods for or related to finding crude oil, gas, and minerals, for effectively exploiting discovered deposits of these materials, and for bringing these materials to the earth's surface, and working toward discovery, development and evaluation of new methods of finding, exploiting, and producing (recovering) crude oil, gas, and minerals.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Chemical Engineer	Chemical Engineer Research and Development	0-15.01
Chemist	Chemist Petroleum	0-07.03
Civil Engineer	Civil Engineer	0-16.01
Computer Programmer	Special Definition - Analyzes and converts business and technical data processing problems for solution by computer. Programs such problems for computer processing using the symbolic, interpretive or compiler programming system. Verifies and prepares instructions to operators.	
	Programmer	0-69.981
Electrical Engineer	Electrical-Research Engineer	0-17.01
Geochemist	Chemist, Geochemical Prospecting	0-07.03
	Chemist, Physical	0-07.84
	Chemist, Petroleum	0-07.03
	Special Definition - The geochemist is a professional scientist who applies chemical and physical principles and techniques to the solution of geologic problems. He conducts research on the composition	

Industry Title	Dictionary of Occupational Titles Codes, or Definitions	
	of earth materials, including sedimentary, igneous, and metamorphic rocks, and the fluids contained in these. He conducts research by the application of chemistry and physics on the origin and geologic history of rocks and fluids contained in the earth's crust. He determines by use of radioactivity decay schemes the age in an absolute chromology of rocks and minerals. He utilizes chemical composition of rocks for stratigraphic correlation.	
Geologist	Geologist	0-35.63
Geophysicist	Geophysicist	0-35.65
Linguist-Translator	Linguist-Translator	0-68-32
Mathematician	Mathematician	0-35.76
Mineralogist	Geologist (Mineralogist)	0-35.63
Mechanical Engineer	Mechanical Engineer	0-19.01
Metallurgist or Metallurgical Engineer	Metallurgist, Extractive Metallurgist, Physical Chemist, Metallurgical	0-14.10 0-14.20 0-07.21
Mining Engineer	Mining Engineer	0-20.01
Paleobotanist	Paleontologist	0-36.03
Petroleum Engineer	Petroleum Engineer	0-20.11
Petrologist	Geologist (Petrologist)	0-35.63
Photogeologist	Geologist	0-35.63
	Special Definition - Makes planometric and topographic maps from airphotos; utilizes geomorphologic and other geologic	

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
	principles in the mapping of soils, outcrops, mineralization zones, and types of vegetation; interprets geologic structures and history of development of the terrain from distribution of rock exposures mapped from airphotos; and analyzes cultural features and physical geography.	
Physicist	Physicist	0-35.73
Stratigrapher	Geologist (Stratigrapher)	0-35.63
Structural Geologist	Geologist Special Definition - Makes field and laboratory studies of structural features of the earth, including folds, faults, and smaller-scale deformational features seen in the textures and fabrics of rocks; interprets the history of development of a region or area from field and laboratory investigations; locates structural traps for oil and gas, and defines areas where other mineral deposits might occur.	0-35.63
Writer, Technical Publications	Writer, Technical Publications	0-06.90

Technicians

Key technicians without formal professional training but with long and specialized experience in laboratory work, operating specialized instruments and apparatus required for or developed in the course of these researches; acting as assistants to professional men in such capacities that they may not be replaced by men who have been trained for short periods. This includes personnel of research shops who fabricate highly specialized apparatus and instruments and personnel of research libraries who classify and make available pertinent scientific literature and technology, all of whom make a distinct contribution toward carrying out the research function.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Computer Operator	Special Definition - Operates a computer and related equipment. This is the journeyman level requiring a person skilled in the operation of a computer and its components. The system includes such equipment as magnetic tape units, printers, card readers and punches.	
	Console Operator	1-25.17
Draftsman	Draftsman, Geological	0-48.50
	Draftsman, Mechanical	0-48.18
	Draftsman, Oil and Gas	0-48.10
Electronic Technician	Special Definition - Constructs, tests, or uses electronic equipment. Performs experiments involving electronic equipment under direction usually of an engineer.	
	Electronics Technician	0-67.10
Equipment Designer	Machinery and Tool Designer	0-19.01
Instrument Maker	Instrument Maker	5-00.912
Instrument Repairman	Instrument Repairman	5-83.971
Laboratory Technician	Laboratory Assistant	0-50.20
	Chemist, Assistant	0-50.22
Librarian	Librarian, Reference	0-23.20
	Librarian, Assistant	1-20.01
Machinist	Machinist	4-75.010
Gravity Prospecting Operator	Observer, Gravity Prospecting	0-66.65
Seismic Observer	Observer, Seismic Prospecting	0-66.66
Seismograph Driller	Prospecting Driller	5-75.050

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Seismograph Shooter	Shooter, Seismograph	5-74.030
Shop Foreman	Shop Foreman	5-00.912
Shop Superintendent	Manager, Production	0-97.51
Surveyor	Surveyor, Geophysical Prospecting	5-83.972

PETROLEUM REFINING - KEY OCCUPATIONS

GENERAL DESCRIPTION

ACTIVITY

This industry division is composed of establishments primarily engaged in producing gasolines, kerosene, distillate, fuel oils, residual fuel oils, lubricants and other products from crude petroleum, and its fractionation products either through straight distillation of crude oil, redistillation of unfinished petroleum derivatives, cracking reforming, hydrogen treating, alkylation, polymerization, or other processes.

Physical treatment may involve receiving, storing, blending and compounding, pumping, drumming, packaging, loading and shipping. Steam generation, air compression and water pumping and cooling are involved; electric power may be self-supplied or purchased.

SPECIAL CHARACTERISTICS

A comparatively large bulk liquids continuous-type operation requiring extensive instrumentation and controls.

While yields will vary with such factors as the raw materials used, temperature and pressure conditions, equipment design and choice of catalyst, the continuing processing of crude oil requires the disposition or storage of all hydrocarbon fractions contained.

Oil processes and products require an extensive dependence on science and technology.

ORGANIZATION

Petroleum refining may be organized and conducted in a separate company; in a functional department of an integrated company; in separate refinery establishments.

Research and Development and Technical Services may be organized and conducted in a separate company; in a functional department of a refining or an integrated company; in laboratories, some adjacent to a refinery supplying some services. Patent and Licensing staff are usually part of or closely associated with the R & D organization.

SUPPLY PLANNING AND SCHEDULING

Professionals concerned with the coordination and regulation of refinery operations and inventories in accordance with an integrated supply program; quality control; and yield, cost, and economic evaluations.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions
Manager/Supervisor (Crude Oil & Volatiles)	Special Definition - Responsible for the formulation, implementation, scheduling and coordination of refinery feedstocks supply and transportation arrangements in accordance with supply programs, short-and-long-term; for procurement, exchange and disposal of crude oil, natural gasoline and other hydrocarbon raw materials as required; for arrangements for main storage tankage.
Manager/Supervisor (Supply & Scheduling)	Special Definition - Responsible for refinery feedstocks and product yield and inventory schedules; for evaluation and selection of crude oils; and for regulation and control of product quality.
Technologist or Senior Analyst	Chemical Engineer 0-15.01

REFINERIES - KEY OCCUPATIONS

Administration

Professionals responsible for and concerned with an efficient and coordinated operation, meeting quantity and quality schedules, maintenance of facilities, and industrial security and safety in compliance with regulations and company standards.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Refinery Manager/ Superintendent	General Manager Refinery	0-97.41
Operations Manager/ Superintendent	Manager Production	0-97.51

Process Operations

Professionals and experienced, skilled workers concerned with the running of various plant units and controlling flow, temperature, pressure, etc., to obtain optimum quality and quantity yields in line with safe operating procedures. (Occupations generally categorized on basis of operations involved, e.g., light oils, fuels, heavy oils, treating, lubricants, grease, thermal cracking, catalytic cracking, polymerization, crude distillation, hydrogenation, etc.)

Process Manager/ Superintendent	General Foreman II	0-97.57
General Foreman	General Foreman II	0-97.57
Technologist	Chemical Engineer	0-15.01
Foreman (Unit)	Foreman, Refining	5-91.901
Shift Supervisor/ Foreman (Unit)	Foreman, Refining	5-91.901
Stillman/ Operator No. 1. (Unit)	Stillman	4-55.010 thru 4-55.030

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Treator No. 1 (Unit)	Treator	4-55.310
Compounder	Compounder	4-55.380
Grease Maker	Grease Maker	4-55.910
Refrigerating Engineer	Refrigerating Engineer	5-72.310
Gas Dispatcher	Special Definition - Operates the fuel distribution and reduction system and gas collection system throughout the plant. Checks and approves repairs to gas lines and balances gas which is delivered and charged to various stabilizing and processing units. Dispatcher, Refinery	5-49.401

Oil Movement, Storage and Shipping

Supervisors and skilled workers concerned with crude oil and product transfer, blending, mixing, loading and unloading tank cars, tank trucks, barges and tankers. (Occupations generally categorized on basis of facility or operation, e.g., docks, loading-rack, packing, drumming, warehousing, etc.)

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Manager/Supervisor (Receiving & Shipping)	Chief Dispatcher	0-98.27
Shift Supervisor/ Foreman (Unit)	Foreman, Refining	5-91.901
Dispatcher	Dispatcher, Refining	5-49.401
Operator-Pumper No. 1	Pumper II	5-72.550
Oil Blender No. 1	Compounder	4-55.380

Analytical and Control Laboratory

Professionals or skilled testing workers concerned with plant problems, quality control of production, blending, storage stocks and shipments.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Manager/Chief Chemist	Laboratory Chief	0-15.01
Section Head/Leader	Foreman I	5-91.901
Chemist (various)	Chemist	0-07.03
Laboratory Foreman (various)	Foreman I & II	5-91.901
Spectroscopist	Spectrographer	0-55.44
Tester (various)	Tester	0-50.34

Utilities and Effluent Disposal

Professionals and skilled workers concerned with refinery requirements of steam, electricity, water and air and with the safe disposal of refinery wastes.

Manager/Superintendent	General Foreman II	0-97.57
Electrical Engineer	Electrical Engineer	0-17.01
Technologist	Chemical Engineer	0-15.01
Shift Supervisor/ Foreman (unit)	Foreman, Refining	5-91.901
Operator No. 1	Compressor Operator	7-72.580
	Stationary Engineer	5-72.010
	Boilerhouse Operator	5-72.930
Pumper No. 1	Pumpman II	7-72.510

Maintenance

Supervisors - professionals or skilled and experienced staff concerned with the maintenance, repair and changes of facilities and equipment. (Foremen generally categorized according to type of work or craft supervised.)

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Manager/Superintendent	Superintendent, Maint.	0-97.56
Supervisor/Foreman (Planning & Scheduling) (Shops) (Construction) (Maintenance) (Zone/Area) (Garage)	Foreman I	5-91.901
Master Mechanic/General Foreman	Master Mechanic	5-83.621
Craft Supervisor	Foreman I	5.91.901
Craft Foreman	Foreman I	5-91.901
Labor Foreman	Foreman II	5-94.040

Craftsmen - skilled workers experienced in refinery equipment, working pressures and temperatures, and necessary safety standards and procedures.

Boilermaker No. 1	Boilermaker	4-83.100
Brickmason No. 1	Brickmason	5-24.010
Crane Operator No. 1	Cat-Crane Operator	5-73.050
Electrician No. 1	Electrician	4-97.010
Instrumentman No. 1	Instr.-Repairman I	5-83.971
Insulator No. 1	Asbestos Worker	5-33.110
Leadburner No. 1	Leadburner	4-97.031
Machinist No. 1	Machinist, shop	4-75.010
Mechanic No. 1	Millwright	5-78.100

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Pipefitter No. 1	Pipefitter	5-30.010
Tinner No. 1	Sheet-Metal Worker	4-80.010
Tool Repairman No. 1	Tool Dresser I	4-84.010
Valve Repairman No. 1	Valve Grinder	6-78.517
Welder No. 1	Welder, Combination	4-85.040

Technology and Engineering

Professionals or Technicians concerned with job engineering, engineering development, design and drafting, process control and instrumentation, debottlenecking, plant trouble-shooting and plant changes. (Engineers generally categorized according to type of work, specialty, equipment, etc.)

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Manager/Superintendent	Superintendent, Technical	0-98.24
Chief Engineer	Chief Engineer	0-98.24
Technologist	Chemical Engineer	0-15.01
Mechanical Engineer	Mechanical Engineer	0-19.01
Electrical Engineer	Electrical Engineer	0-17.01
Civil Engineer	Civil Engineer	0-16.01
Supervisor, Inspection	Foreman I	5-91.901
Inspector	Mechanical Inspector	5-76.310
Chief Draftsman	Draftsman, Chief	0-48.10
Draftsman	Draftsman, Mech.	0-48.18

REFINERY OR LABORATORY SERVICES

Professionals or skilled and experienced staff providing specialized services not otherwise performed by central and other principal offices.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Manager/Supervisor (Plant and Fire Protection)	Superintendent, Plant Protection	0-99.95
Inspector/Engineer	Industrial Engineer	0-18.01
Manager, Employee Relations	Manager, Personnel	0-39.83
Managers/Supervisor (Labor Relations)	Labor Relations Specialist	0-68.76
(Employment)	Manager Employment	0-39.82
(Wage/Salary)	Salary & Wage Admin.	0-39.86
(Safety)	Director, Safety	0-39.81
(Benefits, etc.)	Supervisor, Benefits	0-68.77
Manager/Supervisor (Stores)	Chief Storekeeper	1-38.51
Manager/Supervisor (Office)	Manager Office	0-97.12
(Accounting)	Chief Accountant	
Accountant	Accountant	0-01.10
		0-01.20
Manager/Supervisor (Tech. Information)	Bibliographer	0-23.30
Technical Writer		
Chief Librarian	Librarian	0-23.20
Abstractor	Abstractor	0-68.45

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Manager/Supervisor (Service Engineering)	Plant Engineer	0-19.01
Master Mechanic	Master Mechanic	5-83.621
Manager/Supervisor (Computers)	Manager II or Foreman I	
Engineer/Specialist (Systems)	Systems Engineer	0-69.98
Computer Programmer	Special Definition - Analyzes and converts business and technical data processing problems for solution by computer. Programs such problems for computer processing using the symbolic, interpretive or compiler programming system. Verifies and prepares instructions to operators.	
	Programmer	0-69.981
Computer Operator	Special Definition - Operates a computer and related equipment. This is the journeyman level requiring a person skilled in the operation of a computer and its components. The system includes such equipment as magnetic tape units, printers, card readers and punches.	
	Console Operator	1-25.17

RESEARCH AND TECHNICAL SERVICES - KEY OCCUPATIONS

Oil process and product basic and applied research and related technical services.

Laboratory Administration

Professionals concerned with the implementation of R & D programs, budgets and related administrative functions; who participate in the setting of research objectives; who coordinate professional advice and the exchange of technical information to and from operating management.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
General Manager/ Manager/Director	Laboratory Chief	
Director/Manager		
(Process Research)	Manager II	
(Product Research)	Manager II	
(Basic Research)	Manager II	
(Technical Services)	Manager II	
Consultant, Sciences		
(Chemistry)	Chemist	0-07.03
(Physics)	Physisist	0-35.73
(Mathematics)	Mathematician	0-35.76
Manager/Head (Departments or Divisions)	Manager II	
Supervisor/Leader (Sections or Groups)	Foreman I and II	

Professionals

Professionals of varied science and engineering disciplines responsible for and concerned with the direct conduct of R & D work, either individually or in teams, depending on the research problems and phases of the problems as well as individual traits and capabilities; also concerned with the generation of research proposals, the evaluation of technical merit and promise, and the continuing consultation and two-way flow of information with other research groups and the operating users of the R & D results.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Chemist (various)	Chemist	0-07.03 0-07.21
Chemical Engineer	Chemical Engineer	0-15.01
Electrical Engineer	Electrical Engineer	0-17.01
Mechanical Engineer	Mechanical Engineer	0-19.01
Metallurgist	Metallurgist	0-14.20
Mathematician	Mathematician	0-35.76
Physicist	Physicist	0-35.73
Computer Specialist	Mathematician	0-35.76

Technicians and Crafts

Semi-professionals or skilled workers who work directly with scientists and engineers, or are part of support units to such professionals.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Research Assistant	Research Assistant	0-68.40
Lab. Technician/Assistant	Chemist Assistant	0-50.22
Glassblower	Glassblower, Lab.	0-65.440
Photographer	Photographic Engineer	0-56.96
Instrument Maker	Instrument Maker	5-00.912
Test Engine Mechanic		5-81.620
Draftsman	Draftsman	0-48.18
Lab. Foreman	Foreman I & II	5-91.901

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Pilot Plant Foreman	Foreman II	5-91.901
Pilot Plant Operator	Stationary Engineer	5-72.010
Shop Supt./Foreman	Shop Foreman	5-92.768
Machinist	Machinist	4-75.010
Welder	Welder, Comb.	4-85.040
Pipefitter	Pipefitter	5-30.010
Electrician	Electrician	4-97.010
Boiler Maker	Boiler Maker	4-83.100

Patents and Licensing

Professionals concerned with recognizing patentable ideas or concepts in research results, exploring limitations, developing patent position, preparing and prosecuting applications, handling patent office actions and exploiting patent assets through licensing and cross-licensing agreements.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Director/Manager (Patents & Licensing)	Patent Lawyer	0-22.30
Patent Attorney	Patent Lawyer	0-22.30
Patent Agent	Investigator	1-57.50
Patent Librarian	Librarian	0-23.20
Patent Searcher	Patent Clerk	1-49.12

TRANSPORTATION - KEY OCCUPATIONS

GENERAL DESCRIPTION

ACTIVITY

This industry division is composed of establishments primarily engaged in moving large daily quantities of crude oil, hydrocarbon volatiles, natural gas and finished products over long distances that often separate producing, refining, terminal storage and consuming centers. Tankers, barges, pipelines and road or rail vehicles are used.

Transport of materials and personnel are also a significant part of this general activity, being handled by both company-owned and contract equipment.

SPECIAL CHARACTERISTICS

Owing to their physical nature, oil and gas require special arrangements for their transport in tankers, barges, pipelines and road or rail vehicles, some of which have to bear the disadvantage of lack of alternative uses and empty return journeys. Storage presents greater problems than that of most other commodities including control and prevention of storage and in-transit losses.

Shipments must be scheduled ahead, checked and revised regularly to insure adequate transportation in compliance with Government and company regulations.

It should be noted that national emergency conditions may greatly affect transportation activities. For example; emergency conditions may require increased rates of operation, major revisions such as reversal of flow direction, dismantling and rebuilding facilities, conversion to other uses, transportation of new and different materials, integration of various owner's facilities into single systems and extension to new areas. These accentuate the need for personnel with technical training and especially for those with long experience which gives them knowledge of intricate equipment and operating systems.

ORGANIZATION

This industry division's activities may be organized and conducted in a separate company, large or small; in a functional department of an integrated company; in geographical establishments and operating units.

The activities have been classified in four general categories, namely: Marine, Oil Pipe Lines, Gas Transmission Lines, and Air-Rail-Truck Traffic.

MARINE TRANSPORTATION - KEY OCCUPATIONS

The transportation of petroleum, its products and derivatives and chemicals by tankers and barges on ocean and inland waterways. This activity requires men who have consistently demonstrated good judgment based on their comprehensive knowledge of port conditions; bunkering facilities; supply points; safe work practices; Government regulations; ship operations including elements of navigation, docking, pilotage, loading, unloading, tank cleaning, ballasting, crewing and victualling. The competencies can be acquired only through adequate training and significant experience.

Scheduling and Operating

The planning, coordinating, scheduling, chartering and directing shipments of petroleum; its products and derivatives and chemicals to and from refineries and marine terminals, procuring tonnage needed to supplement long term contract coverage of requirements; and estimating demand and evaluating performance by the carriers.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Transportation Manager	Manager Operations	0-98.83
Marine Manager	Superintendent, Marine	0-98.84
Operations Coordinator	Float Master	0-98.82
Supervisor of Operations	Float Master	0-98.82
Senior Analyst	Manager, Traffic	0-98.92
Analyst	Traffic Analyst	0-97.66

Port Operations

Men directly engaged in superintending the loading and discharging of cargoes, or in expediting turnaround of tankers and barges in ports. The hazards involved and the coordination of activities necessary to avoid delays require experienced men.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Port Captains	Port Captains	0-88.02
Port Engineers	Port Engineers	0-88.22
Port Stewards	Port Stewards	0-98.63
Port Radio Engineers	Radio Operators	0-61.30
Port Dispatchers	Float Master	0-98.82

Inland Waterways and Salt Water Shipping

Qualified officers and men who man tankers, tugs and barges operating in inland waters and who hold certificates issued by the Bureau of Marine Inspection and Navigation for ratings above Ordinary Seaman, Wiper or Messman.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Master	Master	0-88.02
Chief Mate	Chief Mate	0-88.03
Second Mate	Second Mate	0-88.03
Third Mate	Third Mate	0-88.03
Engineer	Engineer, Chief - Marine	0-88.21
Seaman (Able Bodied)	Seaman (Able Bodied)	5-48.040
Steward	Steward, Chief	2-28.01
Cook	Cook, Chief	2-26.63
Pumpman	Tanker Pumpman	7-72.510

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Machinist	Engineer	0-88.24
Electrician	Electrician, Ship	4-97.210

OIL & PRODUCTS PIPE LINE TRANSPORTATION -

KEY OCCUPATIONS

Pipe line transportation of crude oil and LPG from production area and natural gasoline plants to refineries or to terminals for trans-shipment to tankers, barges, tank cars and trucks, and the transportation of refined petroleum products from refineries to bulk terminals or from ship and barge terminals to distribution centers. This activity requires men who are knowledgeable of pipe line systems and their operation and maintenance; characteristics of the material transported and stored and maintenance of its "quality integrity"; and safe and proper work practices in compliance with regulations and public/land owner welfare.

Engineering

Professionals - men who implement the technical phases of design, construction, maintenance and operation of pipe line gathering, truck line transportation, storage and delivery systems and equipment.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Chemist	Chemist	0-07.03
Civil Engineer	Civil Engineer	0-16.01
Corrosion Engineer	Chemical Engineer	0-15.01
Chief Draftsman	Draftsman	0-48.10
Draftsman	Draftsman	0-48.10/ 0-48.11/ 0-48.18/ 0-48.26

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Electrical Engineer	Electrical Engineer	0-17.01
Mechanical Engineer	Mechanical Engineer	0-19.01

Superintendence

Professionals or experienced men who are responsible for the control and coordination of all system activities within jurisdiction, and in relation to established schedules, over-all policies and practices.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Area/District Engineer	Engineer, Chief (a supervising engineer responsible for an assigned part of a pipe line system)	0-98.24
Superintendent	Superintendent, Pipe Lines	0-98.26

Construction, Maintenance, and Repair

Responsibility for construction, maintenance and repair of pipe lines, tanks, terminals, pumping stations and related facilities to comply with specifications. For maintenance and repair must know location of lines and general history and conditions of lines and related facilities.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Aircraft Patrol Pilot	Airplane Patrol Pilot	0-41.10
Aircraft Mechanic	Airplane Mechanic	5-80.100
Pipe Line Foreman (Construction)	Pipe Line Foreman	5-94.120

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Pipe Line Construction Inspector	Pipe Line Construction Inspector	5-76.950
Pipe Line Foreman (Maintenance)	Pipe Line Maintenance Foreman	5-95.080
Work-Equipment-Operator	(Power-Shovel-Operator)	5-73.210
(Construction Maintenance)	(Trench-Digging-Machine Operator)	5-23.030
	(Operating Engineer, Construction)	5-23.910
Welder Foreman	Welder Foreman, Combination	4-85.040
Truck Driver, Heavy Duty	Special Definition - A skilled worker who loads, drives and unloads large trucks usually equipped with a power winch and other attachments such as booms, cranes and other "take off" power attachments. Equipment and materials handled are unweildy, valuable, heavy and require great care and skill. Operation is frequently over difficult terrain and subject to all weather conditions.	
	Driver and Rigger	5-49.205
Welder	Welder, Pipe Line	
	(Acetylene)	4-85.030
	(Arc)	4-85.020
Meter Mechanic	Meter Repairman	5-83.465
Instrument Repairman	Instrument Repairman	5-83.971
Electrician	Electrician	4-97.010

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions
Maintenance Mechanic	Special Definition - Keeps pumps, drivers, and auxiliary equipment in good repair: Examines machinery for defects. Dismantles equipment and control apparatus, replaces defective parts and re-assembles equipment making necessary adjustments to insure efficient operation. Maintenance Mechanic II 5-83.641

Communications

Responsible for installation and maintenance of communications system which consists of automatic controls and sequence operation devices as well as transmission of intelligence for remote control of operations. This system may be any one or a combination of telephone and teletype, microwave and radio circuits.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Area/District Superintendent		
Electrician	Electrician, Radio	5-83.445
Foreman	Line Foreman	5-53.410
Lineman	Lineman	5-53.440
Radio Technician	Radio Repairman	5-83.411

Right-of-Way and Claims

Responsibility for obtaining right-of-way for pipe line installation, purchasing of land and settling claims for damages resulting from construction and operation of pipe lines.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Right-of-way and Claims Agent	Right-of-way Agent	1-48.23

Oil and Products Movement, Storage, and Dispatching

Responsibility for the coordination in pipe line transportation of crude oil, LPG and products. Directs the operation of pipe lines through exacting allocation of space in pumping schedules and storage facilities for shipments of oil of various grades from wells and storage tanks to refineries and marine terminals. Similar responsibilities apply to the movement of LPG from natural gasoline plants and products from refineries to storage and distribution centers.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Chief Dispatcher	Dispatcher Chief I	0-98.27
Dispatchers & Schedulers	Dispatcher, Relay	1-49.63
	Dispatcher I	5-49.401

Pumping Station Operations

Responsibility for the efficient operation of pump stations and related equipment located at intervals along crude oil, LPG, and products pipe lines. Around-the-clock operations involves automatic, remote controlled and manually controlled diesel, electric, and gas turbine driven pumping equipment. Also included is the operation and control of related instruments, auxiliary compressors or power equipment, communication equipment, and meters, plus the station security and attendance.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Station Superintendent or Foreman	Foreman	5-95.080
Station Attendant or Operator	Stationary Engineer	5-72.010

Terminal and Tank Farm Operations

Responsibility for delivery of crude oil, LPG, and products from pipe lines to terminals; its measurement, storage, specification control and delivery to refineries, marine terminals, tank cars, tank trucks or distribution locations.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Terminal Superintendent or Foreman	Wharfinger, Head	0-98.84
Chief Deliveryman Deliveryman Terminal Man	Gager, Chief, Delivery	5-49.405
Tester (Laboratory)	Special Definition - Performs laboratory tests on crude oil, LPG, and product samples. Tests include gravity, flash point, corrosion, water content, viscosity, vapor pressure, end point distillation, sulphur content and octane number required for quality control and monoriting of products tendered for shipment through pipe lines.	
	Tester	0-50.34

Crude Oil, LPG and Products Measurement

Responsibility for pipe line runs of crude oil from leases or LPG and products from storage for most efficient use of system. Performs tests to determine basic sediments, water and other contaminants to insure compliance with specifications. Gauges or measures for quantity of crude oil, LPG or products with acceptable accuracy for compliance with regulations of government agencies relative to proration and other specifications.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Chief Gauger	Chief Gager	5-95.080
Gauger	Gager	6-55.060

NATURAL GAS TRANSMISSION - KEY OCCUPATIONS (SEE NOTE)

Natural gas transmission companies own, construct, and operate long distance, high-pressure pipe lines for the gathering of natural gas from producing areas and transmission to consuming areas, where it is sold to local public utility companies for distribution to individual customers or is sold directly to industrial customers.

Compressor stations and processing facilities are located at intervals along the pipelines to maintain necessary pressures and control quality. To help minimize seasonal variations in gas demand, many natural gas transmission companies also maintain underground reservoirs where gas is stored during the summer for withdrawal during the peak demand winter months.

Industry Title	Dictionary of Occupational Titles and Codes or Special Definitions	
	GAS SUPPLY	
Sr. Draftsman and/or Draftsman	Draftsman, Geological	0-48.50
Gas Well Test Technician	Technical Assistant	
Jr. Well Test Engineer	Technical Operator	0-66.50
Well Tester	Bottom-Hole-Pressure-Recording Opr.	0-66.50
Well Test Engineer or Gas Engineer	Petroleum Engineer	0-20.11
District Well Test Engr.	Superintendent, Technical (Profess. & Kin.)	0-98.24
Gas Buyer or Gas Contract Representative	Supply Representative, Dry Gas	0-97.65

NOTE: Key occupations in central and other principal offices, gas processing, and exploration and production activities of gas transmission companies are covered in other specific sections.

Industry Title	Dictionary of Occupational Titles and Codes or Special Definitions	
	GAS SUPPLY	
Field Representative	Scout	1-48.22
Regional Reserves and Availability Engineer	Superintendent, Technical	0-98.24
Reservoir or Reserves and Availability Engineer	Special Definition - Studies and evaluates geological engineering, production, scout reports, test and other data on complex oil and natural gas reservoirs; estimates volume of reserves, recovery rates and production life of wells, fields and systems comprising such reservoirs.	
	Petroleum Engineer	0-20.11
Reserves Supply (Field) Representative or Development Geologist	Geologist, Petroleum	0-35.63
	Special Definition - See page 2.12.	
	UNDERGROUND STORAGE	
Chief Storage Engineer	Superintendent, Technical	0-98.24
Geologist	Special Definition - Professional planning and direction of geological and geographical surveys to determine specific subsurface structures suitable for development as underground gas storage reservoirs; professional services on geological aspects of well drilling and reservoir development, testing and operation.	
	Geologist, Petroleum	0-35.63
Storage Field Technician	Technical Assistant	
Well Superintendent	Foreman (Petrol. Prod.)	5-93.310

Industry Title	Dictionary of Occupational Titles and Codes or Special Definitions
	UNDERGROUND STORAGE
Driller	Prospecting Driller 5-75.050
Instrument Repairman	Instrument Repairman - any Ind. I 5-83.971
Senior Operator	Special Definition - Heads up shift for well operation; schedules and participates in preparing specific wells for injection or withdrawal to meet dispatching requirements by considering expected gas volume, current operating condition, past performance and well location.
	COMPRESSOR OPERATIONS
Station or Plant Supt.	Compressor-Station Engr. Chief (Pipelines) 5-95.080
Shift Foreman	Compressor-Station Shift Engineer (Pipelines) 5-72.920
Compressor Operator	Gas Compressor Operator 5-72.920
Auxiliary Operator	Gas Compressor Operator 5-72.920
Electrician	Electrical Repairman - any Ind. 4-97.420
Maintenance Mechanic	Master Mechanic, Maint. - any Ind. 5-83.621
Machinist	Machinist - Mach. Shop. 4-75.010 Machinist, Maintenance - any Ind.
Repairman	Compressor-Station Repairman 5-83.641
Field Clerk, Senior	Clerk, Chief 1-05.01

Industry Title	Dictionary of Occupational Titles and Codes or Special Definitions
	DISPATCHING
Chief Dispatcher	Chief Dispatcher II 5-49.402
Dispatcher or Assistant Dispatcher	Dispatcher II 5-49.402
Well Operation Coordinator	Special Definition - Schedules production of gas wells within an operating district within established allowables, proration schedules, dispatching requirements and operating limitations; coordinates activities of well operators.
	MEASUREMENT
Supvr., Chart Processing	Chief Clerk, Measurement Department 1-36.12
Supvr., Gas Sales or Purchase	Chief Chart Clerk 1-36.13
Measurement Specialist	Meter Engineer, Head - Pipelines 5-83.971
Meter Repairman	Meter Engineer - Pipelines 5-83.974
Instrument Technician	Meter Engineer - Pipelines 5-83.974
	PIPELINE OPERATIONS
District Pipeline Supt.	Special Definition - Directs operation, inspection and maintenance of an assigned district of the pipeline system - may include cathodic protection, well and/or delivery point facilities, pipeline alteration, additions or coordination of major construction. Responsible for hiring, training, supervising and maintaining morale of district employees. Maintains favorable relations with landowners adjacent to the pipeline system. Superintendent, Pipelines 0-98.26

Industry Title	Dictionary of Occupational Titles and Codes or Special Definitions
	PIPELINE OPERATIONS
Crew Foreman or Maintenance Foreman	Pipeline Maintenance Foreman 5-95.080
Utility Man	Straw Boss (Lead Repairman)
Heavy Equipment Operator	(Caterpillar-Crane Operator - any Ind.) 5-73.050 (Bulldozer Operator) (Const.) 7-23.030
Welder	(Welder, Acetylene - any Ind.) 5-85.030 (Welder, Arc - Any Ind.) 4-85.020 (Welder, Pipeline (Const.)
Well Operator	Special Definition - Regulates flow of gas from wells in an assigned geographic area in accordance with given operating schedules: Operates such items as valves, measuring and regulating equipment, heater and dehydration units; changes recording charts; blows drips, inspects and performs minor maintenance of well head facilities; witnesses state tests.
Station Attendant or Field Dispatcher	Pressure Man, Pipeline 5-54.525
District Clerk, Senior	Clerk, Chief 1-05.01

Industry Title	Dictionary of Occupational Titles and Codes or Special Definitions
	PIPELINE OPERATIONS
Truck Driver, Heavy Duty	Special Definition - A skilled worker who loads, drives and unloads large trucks usually trailer-type and equipped with a power winch and other attachments such as booms, cranes and other "take off" power attachments. Equipment and materials handled are unwieldy, valuable, heavy and require great care and skill. Operation is frequently over difficult terrain and subject to all weather conditions. Driver and Rigger 5-49.205
	COMMUNICATIONS
Communications Superintendent	Superintendent, Communications 0-99.55
Communications Technician	Electrical Engineer 0-17.01
Radio Repairman	Electrician, Radio - any Ind. 5-83.445
Radio Towerman	Rigger, Radio (Radio Broad.; tel. and tel.) 5-83.448
	RIGHT-OF-WAY AND CLAIMS
Area or District Landman or Right-of-Way Specialist	Superintendent, Right-of-Way 0-22.10
Right-of-Way and Claims Agent	Right-of-Way Agent 1-48.23
Supvr., Clerical Services	Supervisor (Clerical)

AIR-RAIL-TRUCK TRAFFIC - KEY OCCUPATIONS

The traffic function is concerned with planning and directing the movement of crude oil, its products and derivatives as well as personnel and materials by air, rail and truck (inter-city) transport via company owned or leased equipment and contract or common carriers. Intra-city truck deliveries may be involved but generally these movements by company fleet or contract carrier are part of Oil Distribution.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Aircraft Co-pilot	Co-pilot	0-41.10
Aircraft Dispatcher	Dispatcher, Airplane	0-61.61
Aircraft Engineer	Aerial Engineer	5-80.100
Aircraft Mechanic	Airplane Mechanic	5-80.100
Aircraft Pilot	Airplane Pilot	0-41.10
Supervisor (Tank Cars)	Tank Car Supervisor	0-98.75
Supervisor (Motor Transport)	Special Definition - Negotiates and arranges for-hire air and truck transportation, to meet scheduled requirements; may dispatch, set routes and otherwise control deliveries.	
	Superintendent, Trans.	0-98.62
Supervisor (Tariffs and Rates)	Rate Supervisor	1-18.97
Supervisor (Passenger Traffic)	Ticket Agent	1-44.12
Tank Car Inspector	R. R. Car Inspector	5-76.620
Tank Car Repairman	R. R. Car Repairman	5-79.070

PETROLEUM PRODUCTS DISTRIBUTION - KEY OCCUPATIONS

GENERAL DESCRIPTION

ACTIVITY

This industry division is composed of establishments primarily engaged in the receipt of petroleum products and LPG in large quantities by tank car, truck, pipe line, tanker or barge--and the delivery to consumers and resellers including service stations. The activity is mainly wholesale trade and includes required supporting sales and technical services on product applications and performance.

Bulk plants and terminals in which these products are stored are located close to consuming centers; included are tanks, unloading and loading facilities, truck transport units, drum and package warehouses, and many have blending and drumming and canning operations and control-testing laboratories.

SPECIAL CHARACTERISTICS

Storage, handling, and delivery of petroleum products and LPG are subject to federal, state, and local safety and fire regulations.

Maintenance of quality controls and "product integrity" is required throughout distribution activity and for hundreds of products to insure safe and proper performance of the delivered products.

ORGANIZATION

This industry division's activities may be organized and conducted in a separate company with one or more plant or terminal units; in a functional department of an integrated company; in geographical regions, areas, divisions, districts, zones, and in plant or terminal establishments.

Products Supply and Performance

Experienced staff concerned with product performance and the continuity of product supplies into bulk plants and terminals and the level of inventories carried and needed to meet forecast demand requirements, and as may be affected by season, transportation capabilities, and emergency situations.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions
Manager/Supervisor (Technical Service)	Manager Technical Service 0-39.97
Manager/Supervisor (Supply Programming)	Special Definition - Responsible for the formulation, integration, and continuing analysis of short- and long-term supply programs; for the delineation and continuing analysis of each product origin's economic shipping territory; and for related industry supply/ demand studies and estimates.
Manager/Supervisor (Product Supply)	Special Definition - Responsible for the day-to-day implementation, scheduling, dispatching, and coordination of products supply and transportation arrangements; for the procurement, exchange, and disposal of products as required to balance supply positions; and for arrangements for main storage tankage and for outside terminal services as required.
Senior Analyst	Special Definition - Specialist in supply and transportation features and systems; assembles and reviews a variety of interrelated data and information; and prepares reports, estimates, schedules, etc., based on his expert knowledge.

Field Representatives

Professionals concerned with proper bulk plant and terminal operations and maintenance and with product applications and performance.

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions	
Field Operating Representative	Special Definition - Responsible for the operation of a number of bulk plants, terminals, and warehouses within a specified geographical area. Directs and supervises personnel in the receipt, storage, handling, and delivery of products.	
Field Engineer	Civil Engineer	0-16.01
	Mechanical Engineer	0-19.01
Field Service Engineer	Chemical Engineer	0-15.01
	Mechanical Engineer	0-19.01

Bulk Plants and Terminals

Supervisors and skilled workers responsible for receipt, physical control and storage delivery, and servicing, and meeting all requirements in connection with public health and safety.

Industry Title	Dictionary of Occupational Titles and Codes, or Definition	
Bulk Plant and Terminal Superintendent	Special Definition - Responsible for the full operation and administration of a bulk plant or terminal and the receipt, storage, handling and delivery of bulk products.	
	Manager, Bulk Plant	0-99.72
Bulk Plant and Terminal Supervisor	Receiving and Shipping Foreman	5-99.070

Industry Title	Dictionary of Occupational Titles and Codes, or Definitions
Maintenance Mechanic	Maintenance Mechanic II 5-83.641
Truck Mechanic	Truck Mechanic 5-81.030
Truck Dispatchers	Dispatcher, Motor Vehicle 1-18.61
Heavy Truck Operators	Special Definition - Drives heavy "tanker" equipment conveying oil and pressurized liquid gas products in bulk from terminal or bulk plant to reseller and consumer storage; loads and unloads using hose connections; gauges deliveries, renders invoices and may make collections; required to exercise strict caution at all times in view of the potential accident hazard in industrial and urban centers. Tank-Truck Driver 7-36.250
Warehouse Supervisor	Special Definition - Supervises work of the personnel of the warehouse, including unloading, storing, recording, arranging, and loading of incoming and outgoing products. Receiving-and-Shipping Foreman 5-99.070