Crude Oil Procurement by Japanese Oil Companies

Shigeki KAJIWARA
Researcher of Oil Group
(Marketing Administration Group, Marketing Administration Dept. Kyushu Oil Co., Ltd, now)

Introduction

The world crude oil market contains not merely spot markets featuring physical transactions but highly developed paper markets, notably futures and forward delivery, thus forming a very composite market structure in which all these transactions are interrelated and reciprocally influential. While driving forward management rationalization and efficiency increases, Japan's oil industry on its part recognizes that, on intricate-ever international crude oil markets, how to identify and procure crude oil of good economics are the industry's top priorities. In this report, a train of general business procedures related to crude oil procurement by Japanese oil companies, ranging from the selection of grades of crude oil to be purchased, transportation of crude oil by tankers, mechanism of determining crude oil prices, to settlement of invoices covering crude oil purchases are outlined, quoting actual examples.

1 Overall Train of Business Procedures Related to Crude Oil Procurement

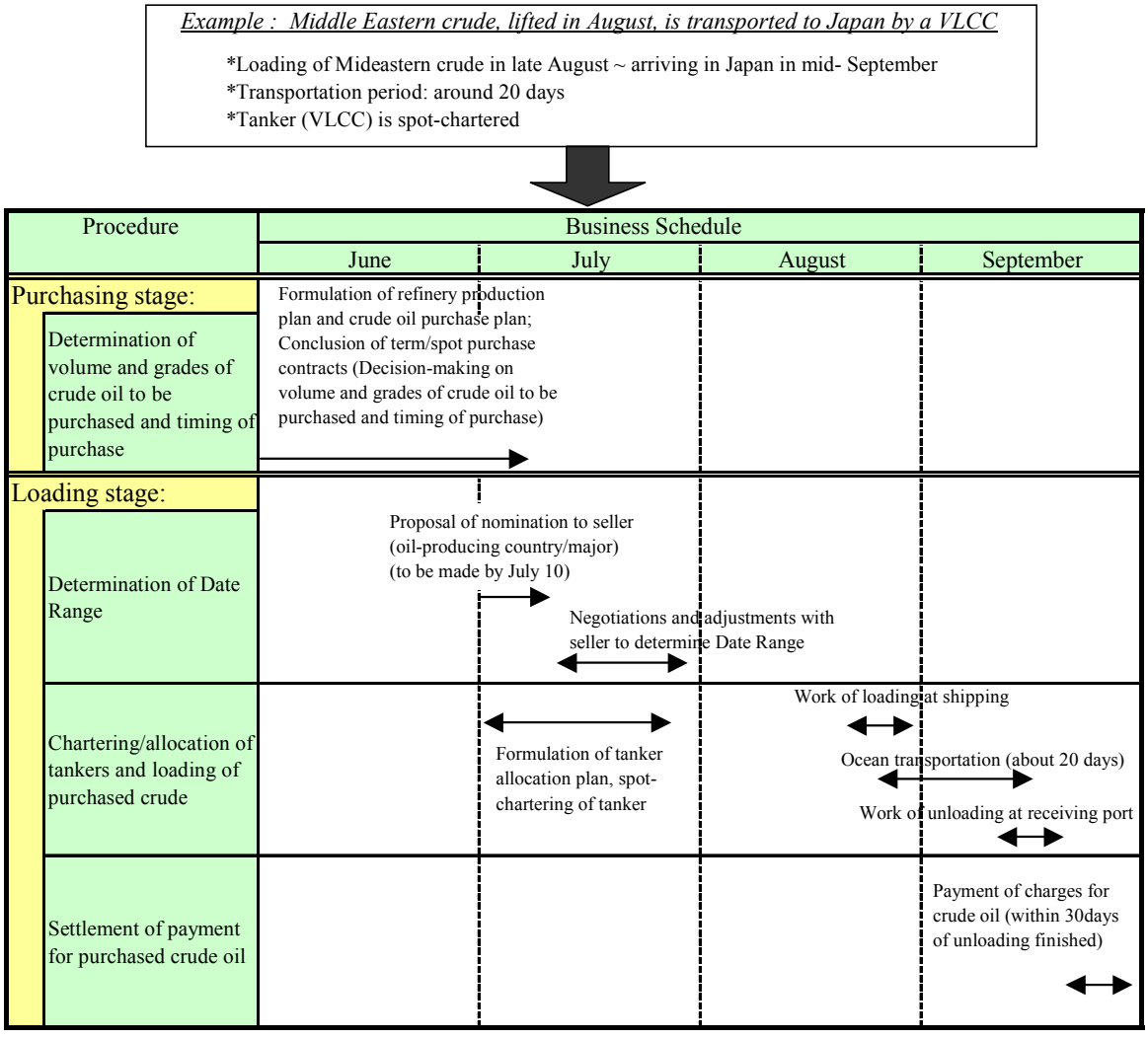
Train of procedures for crude oil procurement by oil companies: A general train of crude oil procurement business procedures in oil companies is shown in **Fig. 1** Note 1 on the next page. First of all, oil companies must determine volumes of crude oil needed to be procured, grades of crude oil, and the timing of procurement. In general, when procuring crude oil, oil companies establish optimal plans for refinery product output, taking into account the scale of estimated demand for oil products and the total product sales volume, and work out concrete crude oil purchase plans on a medium- and long-term basis (for one year or longer) and on a short-term basis (for the current month), based on the optimal refinery production plans noted above.

Conclusion of crude oil purchase contracts: Based on the foregoing crude oil purchase plans, oil companies conclude crude oil purchase contracts - either term or spot contracts 0— with crude oil sellers or suppliers (i.e., crude oil-producing countries or the international oil majors). While the term-to-spot contracts ratio varies, depending on individual oil companies' projections of oil supply and demand for the future and their management strategies, the Japanese oil companies are purchasing crude oil at a ratio of 80 to 20, on an average, in favor of term contracts. Whatever the contract form may be adopted, the oil companies as crude oil buyers reach agreements with sellers at this stage of concluding contracts on various conditions such as volumes, grades, prices, and the timing for crude oil purchase.

Note 0: This report constitutes a part of the study report on a research conducted in fiscal 2000 under a consignment agreement between the Agency of Natural Resources and Energy of the Ministry of International Trade and Industry (currently the Ministry of Economy, Trade and Industry) and the Institute of Energy Economics, Japan.

Business of crude oil loading crude oil into tankers: Concrete crude oil loading into tankers comes next. This procedure is carried out basically on a monthly basis. In reference to **Fig. 1** illustrated above as a concrete example, the oil company (i.e., the buyer) involved, in order that Middle Eastern crude oil is lifted in August and transported to Japan in a VLCC (Very Large Crude Carrier), is expected to undergo negotiations with the oil-producing country or the major (i.e., the seller) concerned during July, or the month preceding the month of loading, for settlement of items in concrete terms such as the volume, the grade, and the Date Range (the timing for loading crude oil into the tanker at the shipping port).

Fig. 1 Train of General Procedures for Crude Oil Procurement



Note 1: Fig. 1 and a train of fundamental business procedures related to crude oil procurement, as outlined below, represent only one example and it should be noted that they are subject to variations, depending on a contract form and a business environment as well as unexpected troubles forcing modifications of various plans originally adopted, result ing in sudden changes in business procedures and requiring much more complicated reactions to such changes. More over, although Japan's crude oil procurement from the Middle East area - the largest crude oil supply source for Japan - is taken up as a concrete example in this report, it is necessary to note that some aspects of the business procedures differ from those outlined here in case crude oil is procured from areas other than the Middle East.

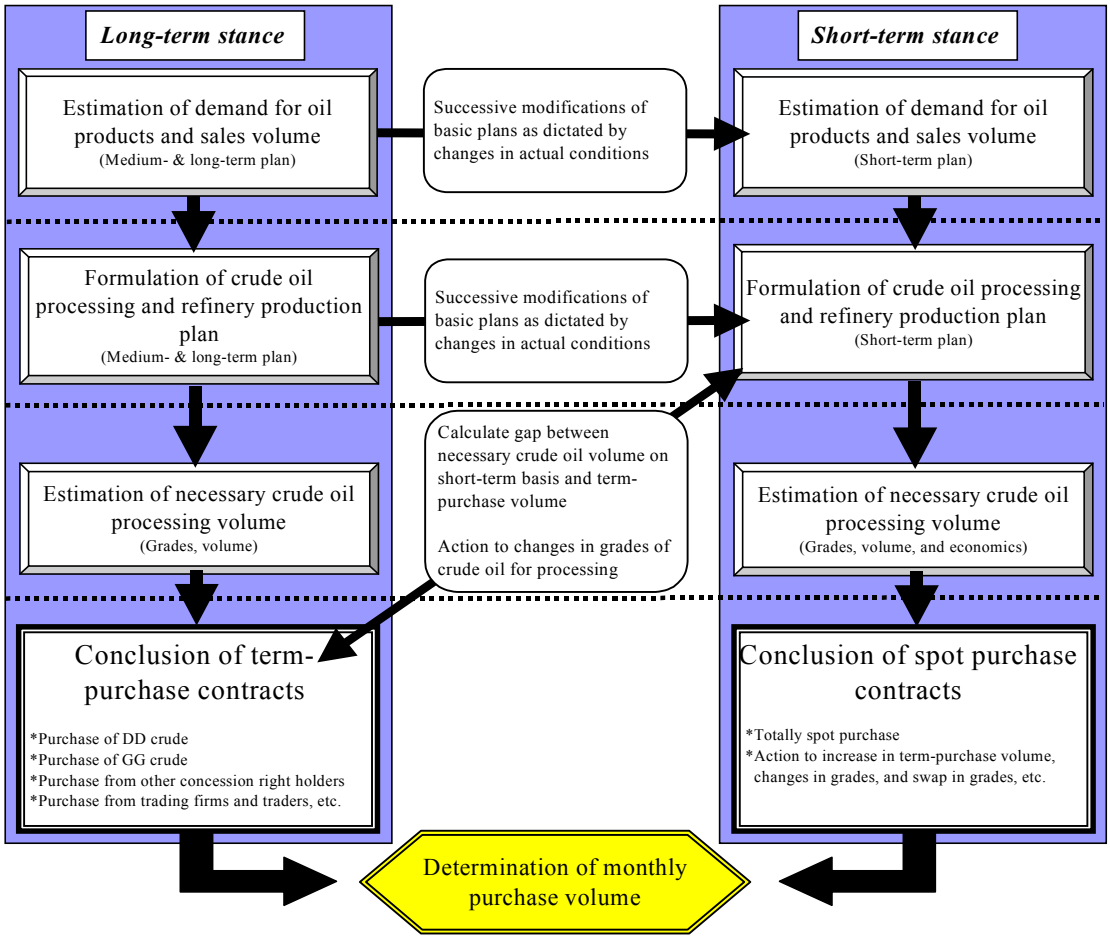
Chartering of tankers: As the Middle Eastern crude is traded on an FOB (Free On Board) basis, the oil company (i.e., the buyer) must charter a tanker to afford a means of transporting crude oil purchased and assign the tanker to a loading port so that the Date Range agreed on with the seller side can be met. The tanker employed is either owned by the oil company involved or chartered from a shipping company on a long-term basis, or chartered from the spot tanker market.

Settlement of payment for purchased crude oil: Settlement of crude oil purchase accounts is generally made within 30 days from the date of finishing crude oil loading (i.e., the B/L Date). In case of lifting crude oil in August, the price of the bulk of crude oil is determined on the basis of the international spot market in August and hence the price of crude oil purchased is finalized from the end of August to the beginning of September.

2 Crude Oil Purchasing Stage (Formulation of Crude Oil Purchase Plans ‘ Conclusion of Contracts)

Outlined below are procedures followed by oil companies when procuring crude oil, showing how volumes and grades of crude oil to be purchased and the timing of purchase are determined.

Fig. 2 General Decision-Making Process in Crude Oil Procurement Activities

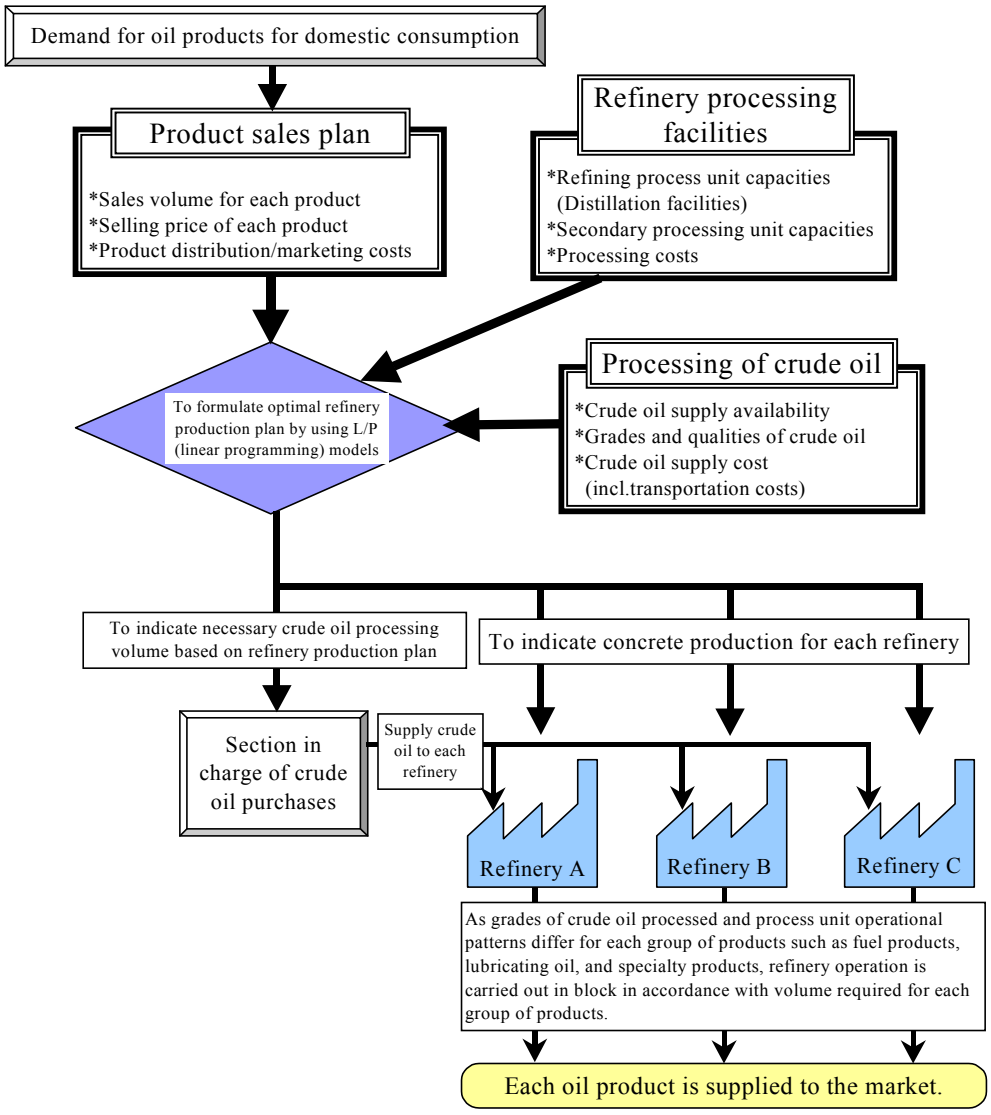


(Source: Prepared on the basis of various published materials)

Decision-making process for crude oil procurement: **Fig. 2** shows a general decision-making process followed by oil companies when procuring crude oil. In general, oil companies formulate optimal refinery production plans, based on anticipated demand for oil products and product sales volume. The optimal refinery production plan thus formulated is then compared with actual crude oil inventories to determine in concrete terms necessary volumes and grades of crude oil to be purchased and the timing of purchase.

Formulation of refinery production plan: Next, **Fig. 3** shows a process for formulating refinery production plan and a train of concrete production activities. Today, many oil companies formulate optimal refinery production patterns, using L/P (linear programming) models. When formulating refinery production plans, following factors are put into the model as exogenous factors — (1) product sales plan based on demand projection, product sales prices, and product distribution and marketing costs, (2)

Fig. 3 Process for Formulating Refinery Production Plan and Concrete Production Activities Based on Plans



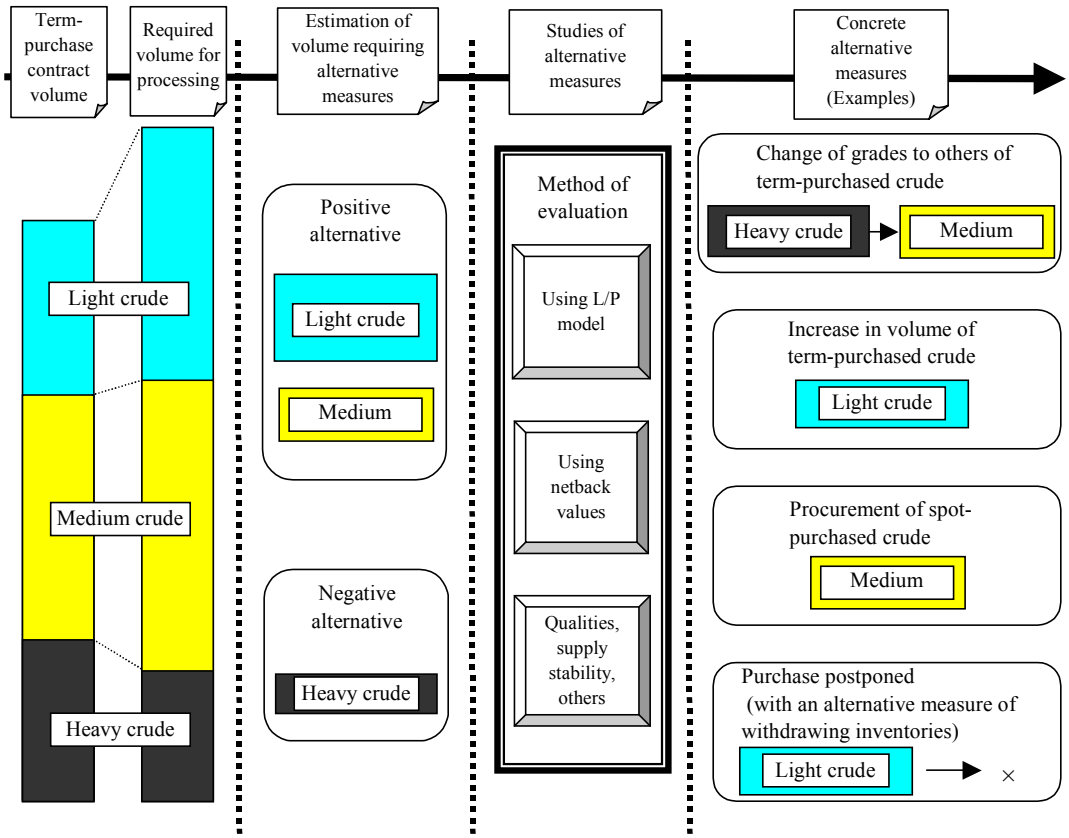
(Source: Prepared on the basis of various published materials.)

refinery processing unit capacities and processing costs, and (3) crude oil supply availability for processing, grades/qualities of crude oil, and crude oil purchase costs - to formulate optimal production patterns.

Formulation of plans for crude oil purchase: In accordance with the optimal refinery production plans thus formulated, a train of refinery production activities, ranging from crude oil purchase to actual refinery processing, are performed. A section of an oil company in charge of purchasing crude oil plays its role in formulating medium- & long-term (for one year or longer) and short-term (for the current month) crude oil purchase plans on the basis of the optimal refinery production plans and in supplying each refinery with crude oil required for processing at that refinery at an appropriate time.

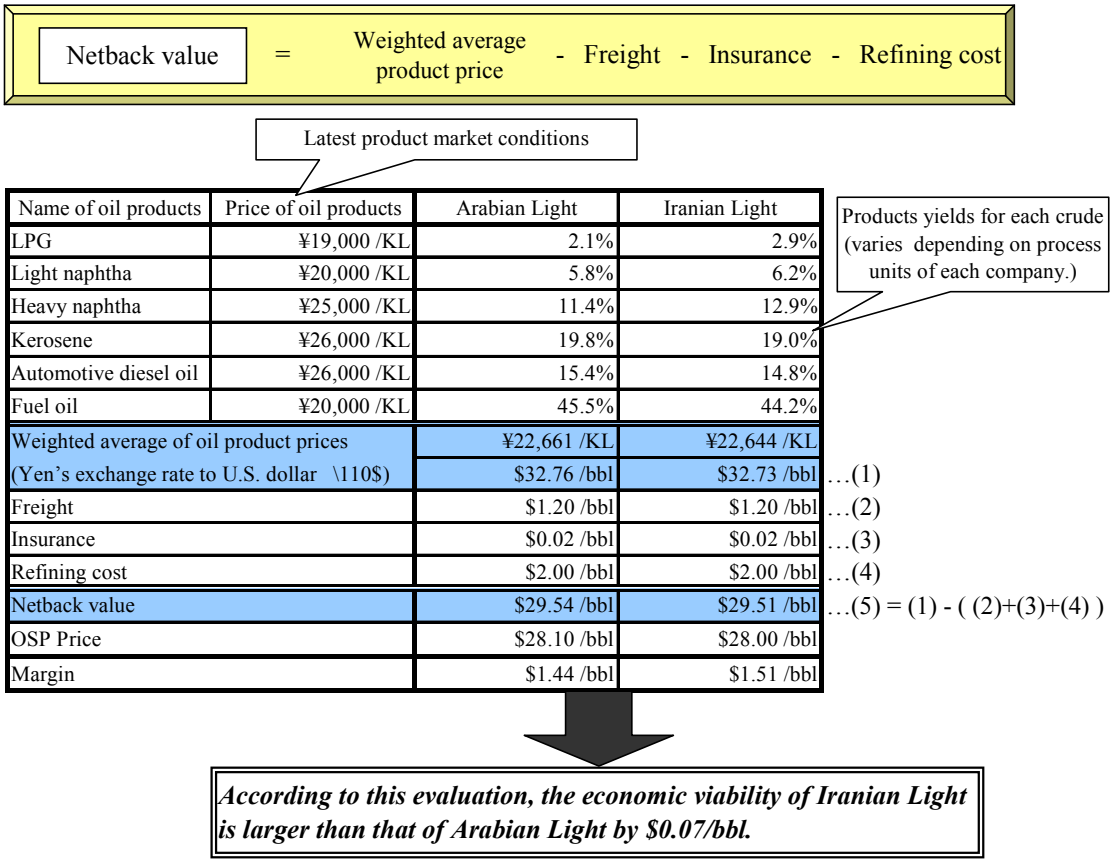
Evaluation of crude oil purchased: **Fig. 4** shows general procedures for purchasing crude oil and the method of evaluating crude oil purchased, and **Fig. 5** shows an example of evaluating economic viability of crude oil by means of netback values of that crude oil. Factors that must be studied when purchasing crude oil include : (1) ratios (or yields) of individual products obtained from processing that crude; (2) the purchase cost of that crude; and (3) the volume of crude that can be physically purchased. Generally, based on the evaluation of crude oil indicated by the optimal refinery production plan obtained by using an L/P model, the economic viability of such crude oil as can be physically purchased in the

Fig. 4 General Procedure for Purchasing Crude Oil and Method of Evaluating Crude Oil Purchased



(Source: Prepared on the basis of various published materials.)

Fig. 5 Evaluation of Economics by Netback Values and Selection of Crude Oil Purchased



Name of oil products	Price of oil products	Arabian Light	Iranian Light	
LPG	¥19,000 /KL	2.1%	2.9%	
Light naphtha	¥20,000 /KL	5.8%	6.2%	
Heavy naphtha	¥25,000 /KL	11.4%	12.9%	
Kerosene	¥26,000 /KL	19.8%	19.0%	
Automotive diesel oil	¥26,000 /KL	15.4%	14.8%	
Fuel oil	¥20,000 /KL	45.5%	44.2%	
Weighted average of oil product prices		¥22,661 /KL	¥22,644 /KL	
(Yen's exchange rate to U.S. dollar \110$)		$32.76 /bbl	$32.73 /bbl	…(1)
Freight		$1.20 /bbl	$1.20 /bbl	…(2)
Insurance		$0.02 /bbl	$0.02 /bbl	…(3)
Refining cost		$2.00 /bbl	$2.00 /bbl	…(4)
Netback value		$29.54 /bbl	$29.51 /bbl	…(5) = (1) - ((2)+(3)+(4))
OSP Price		$28.10 /bbl	$28.00 /bbl	
Margin		$1.44 /bbl	$1.51 /bbl	

(Source: Prepared on the basis of various published materials.)

international crude oil market is studied by means of netback values of that crude to determine the grades and volumes of crude actually purchased - a case most frequently observed.

Adjustments to crude oil processed: There is a possibility, however, that qualities of oil products obtained by processing a grade of crude oil do not satisfy [Note 2] quality requirements, as the method of evaluation, simultaneously using an L/P model and netback values, often fails to discover quality problems latent in that crude, thus making it necessary to make adjustments to the crude oil mix processed in the initial stage so that products obtained therefrom can meet product specifications. In a concrete method of making such adjustments, it is widely practiced to set a limitation to the mixing ratio of such a crude having the danger of producing poor-quality products. Since such a limitation to the crude oil mixing ratio is greatly affected by factors such as refinery processing unit configuration, unit operational conditions and product quality specifications, many oil companies adopt their own standards [Note 3] based on the "Rule of Thumb" learned from the past experiences.

Note 2: This is due to fact that product specifications such as the smoke point of kerosene and the Cetane Index of automotive diesel oil cannot be adjusted by processing conditions such as reforming.

Note 3: Because of such constraints in the stage of crude oil processing, it should be remembered tht oil companies, when purchasing new grades of crude oil, need to study the quality characteristics of each grade of crude oil in addition to the product yields and the price of that crude.

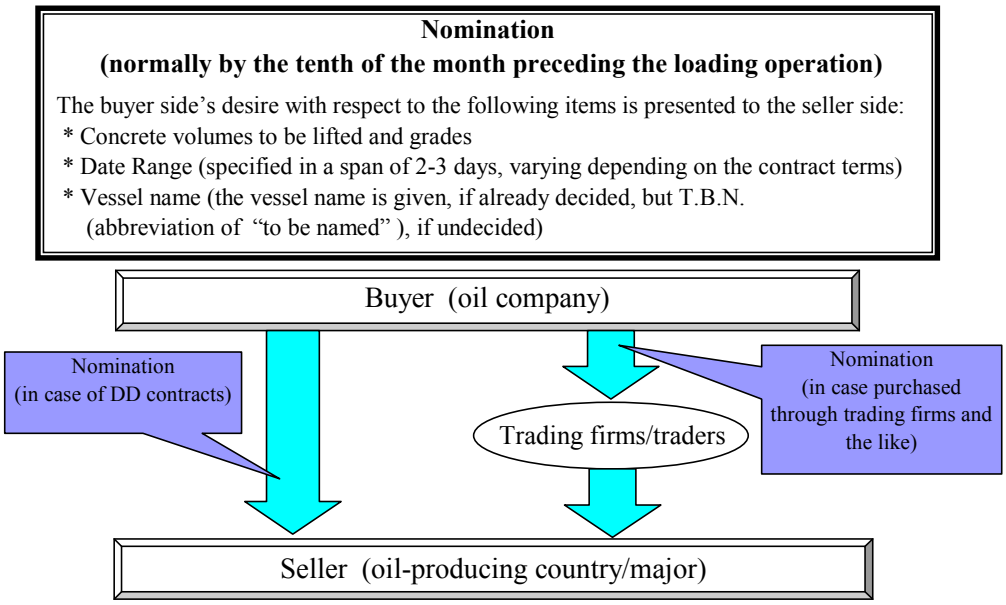
Conclusion of crude oil purchase contracts: Based on the concrete crude oil purchase plan formulated by the above-mentioned procedures, oil companies (i.e., buyers) and oil-producing countries or majors (i.e., sellers) conclude term or spot crude oil purchase/sale contracts, with oil companies reaching agreements with seller sides with respect to various terms such as volumes, grades and prices of crude oil purchased and the timing of purchase.

3 Crude Oil Loading Stage (monthly crude oil loading by tankers)

Business of lifting crude by tankers: When volumes and grades of crude oil to be actually purchased and the timing of purchase are determined after evaluating them by L/P models and netback values, concrete lifting of crude oil by tankers follow. As mentioned above, the lifting of crude oil by tankers is basically conducted on a monthly basis. In this report, various business operations related to crude oil procurement are outlined in accordance with a train of procedures, assuming that Middle Eastern crude is purchased for lifting in mid-August and transported to Japan in a VLCC.

Nomination: When procuring crude oil for lifting in August, the oil company (i.e., the buyer) proposes the desired Date Range and the name of a tanker used to the oil-producing country or a major (i.e., the seller). Concurrently, the buyer notifies the seller for confirmation of concrete volumes and grades of crude oil to be actually purchased. This procedure is called the nomination, generally by the tenth of the preceding month of lifting. In case of lifting in August, the nomination must be presented by July 10. The desired Date Range, to be included in the nomination, is generally given in a span of 2 to 3 days, though it may vary depending on conditions of the contract. **Fig. 6** gives a general idea of presenting the nomination.

Fig. 6 Presentation of Nomination

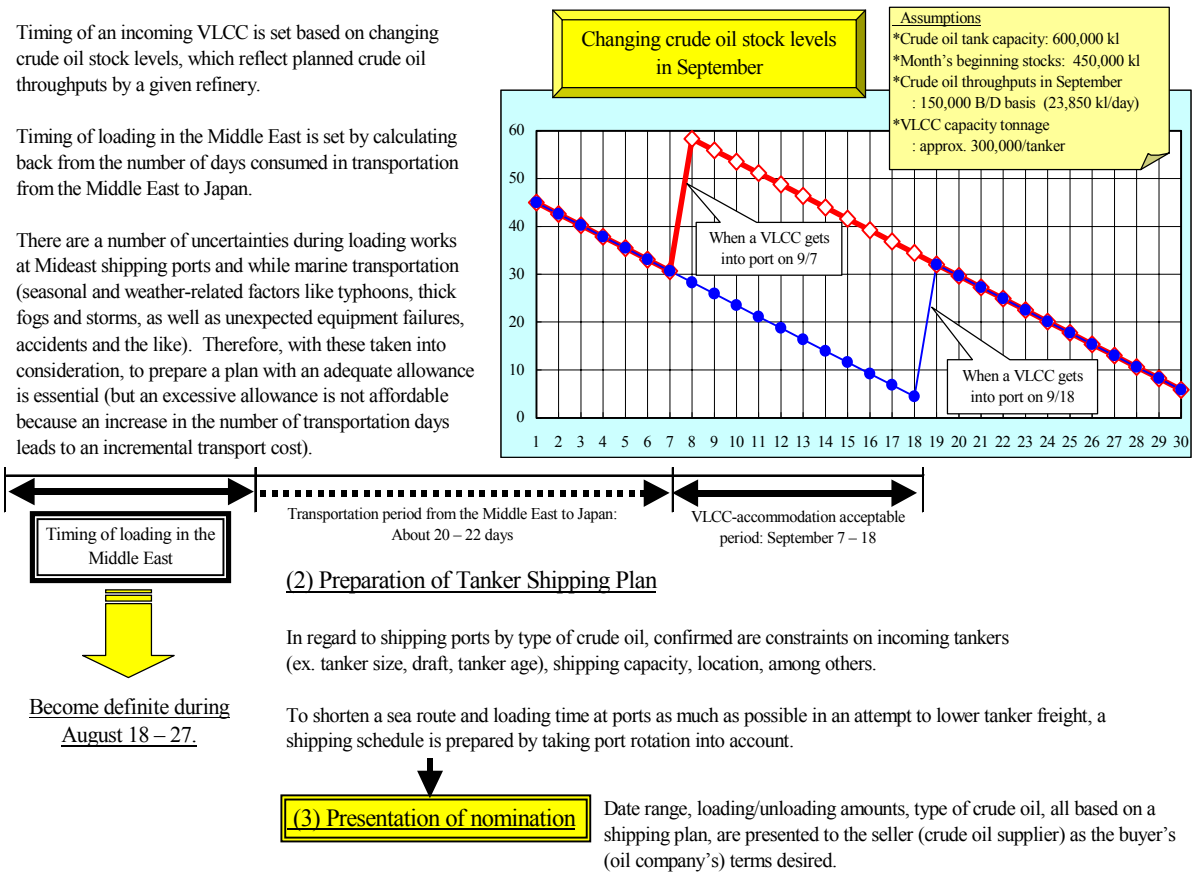


(Source: Prepared on the basis of various published materials.)

Adjustments to contents of nomination: In the stage of presenting the nomination, it is necessary for the oil company (i.e., the buyer) to clearly indicate desired lifting volume, grades and the Date Range. In this connection, it may become possibly necessary to make some adjustments to the contents of the nomination, as actual conditions in terms of crude oil cargo loading capacity and the number of cargo tanks of the tanker in question may require adjustments to the volume and the grade of crude oil to be lifted. Moreover, when the tanker enters into two or more ports during one voyage, it may be necessary to adjust the rotation schedule for the tanker in advance. As for the Date Range, it is determined in the following manner. First, the most suitable timing of crude oil unloading at a receiving port is set, taking into account the following two factors: (1) movements in crude oil inventories in tanks at the receiving port; and (2) the latest conditions of the tanker that transports crude oil. A desired timing for lifting crude at a shipping port in the Persian Gulf is then estimated by counting backward the number of days required for the Persian Gulf-Japan voyage.

Formulation of tanker assignment-crude oil loading plan: The indication of the Date Range in the nomination means that a VLCC must be must be moved to and moored at a crude oil shipping port to be in time for that Date Range. **Fig. 7** shows a procedure for formulating a tanker assignment-crude oil loading plan.

Fig. 7 Preparation of Tanker Allocation & Shipping Plans (for August Loading in Mideast - September Unloading in Japan)

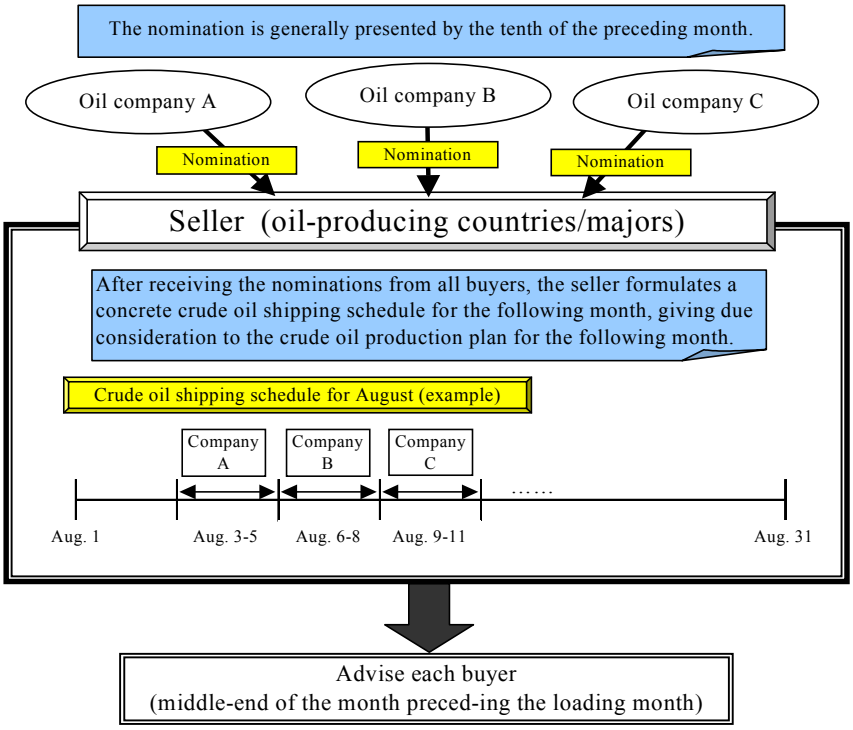


(Source) Prepared from various reference materials.

While the outline of the business of crude oil transportation by tankers is given in the next chapter, factors such as the actual conditions for crude oil loading at a shipping port as well as weather conditions during the voyage must be taken into consideration when presenting the nomination, in which the desired Date Range is shown as noted above. Furthermore, it may also be necessary to confirm beforehand the adaptability of the tanker to be used to the shipping port in question as it may have constraints due to the size, the age and the loading capacity of the incoming tanker. Especially, in case the tanker enters into a number of shipping ports during one voyage, a general procedure calls for the setting of the Date Range at each shipping port after formulating the optimal tanker movement and crude oil loading schedule with the minimum feasible loss in terms of time and costs in the entire voyage, taking into consideration the time required for loading due to physical limitations and loading capacities at each port.

Seller's formulation of crude oil shipping schedule: **Fig. 8** shows a conceptual map of a flow of procedures, beginning with the presentation of the nomination and ending with the determination of finalized volume of loading and the grade of crude oil and the Date Range. Oil-producing countries and majors (i.e., sellers) normally receive the nomination by the tenth of every month, either directly from oil companies or indirectly through trading firms or traders. In case of lifting crude oil in August, sellers formulate their crude oil shipping schedules for August, after studying the nomination presented by buyers by July 10, showing the desired purchase volume and the grade of crude oil and the Date Range, together with crude oil production plans on the part of sellers themselves, and normally advise the buyers of the final shipping schedule around July 15-20. This is usually called the "Acceptance." In case the reply from the seller does not agree with the conditions desired by the buyer, the two parties repeat back-and-forth negotiations until a final agreement is reached.

Fig. 8 Formulation of Crude Oil Shipping in Oil-Producing Countries



(Source: Prepared on the basis of various published materials.)

There is a possibility, therefore, that oil companies may be forced to revise the tanker allocation-crude oil loading plan [Note 4] due to changes in the volume and the grade of crude and the Date Range, which, in turn, is due to circumstances on the part of sellers. Meanwhile, the shipping schedule for August loading, as assumed in the example above, is normally finalized by the end of July at the latest.

4 Transportation of Crude Oil by Tankers

The business of assignment and chartering of tankers, which provide a means of transporting purchased crude oil, is outlined in this chapter.

Naming of tankers classified by size: **Table 1** shows the general naming of tankers classified by size.[Note 5] There are two units - deadweight tons (DWT) and gross tons (GT) - in use to indicate the size of ships. The DWT unit is mainly used to indicate the cargo tonnage that can be loaded in a ship, while the GT unit indicates gross tonnage of a ship. VLCCs are basically used to transport crude oil from the Middle East to Japan.

Business of assignment and chartering of tankers: As the Middle Eastern crude is traded undeFOB-based contracts, as noted above, oil companies (i.e., buyers) must assign tankers to the shipping port in accordance with the Date Range agreed with the sellers. In this case, the oil companies investigate the current situation of using tankers, owned by the oil companies themselves or chartered on a long-term basis, and if these tankers are in operation in other areas or if they cannot meet the Date Range timing, the oil companies must charter tankers on the international spot tanker market.

Constraints due to the tanker size: As shown in **Table 2**, however, some shipping ports in Middle Eastern oil-producing countries and some receiving ports in Japan have constraints in terms of the size,

Table 1 General Naming of Tankers Classified by Size

Size (DWT)	Naming	Remark
49,999 or less	Handy Size	Also named MR (Medium Range)
50,000 – 79,999	Panamax	Largest tanker that can pass through Panama Canal. Can load approx. 400-600 thou. bbls
80,000 – 124,999	Aframax	Medium-range vessel that can load approx. 600-800 thou. bbls. Used by Japanese oil companies to transport crude oil mainly from the Asian area.
125,000 – 159,999	Suezmax	Largest tanker that can pass through Suez Canal. Can load approx. 800 – 1,200 thou. bbls.
160,000 – 199,000	Small VLCC	Very few tankers of this size are in operation and hence are not common.
200,000 – 319,999	VLCC	Large-sized tanker that can load approx. 1.5-2.2 mil. bbls. Used for large-scale and long-distance transportation.
320,000 or more	ULCC	Can load approx. 2.2 mil. bbls or more. Since only limited number of ports can receive these tankers, they are not in common use in Japan.

(Source: Prepared on the basis of various published materials.)

Note 4: Such a problem is encountered frequently especially in case production of the crude oil in question is at a low level and crude oil shipping capacity of the port is extremely limited. Since the oil companies are not necessarily be guaranteed that the desired grade and volume of crude oil and the Date Range are met, they are required to have flexible plans so that such emergencies can be avoided.

Note 5: The naming indicates what is generally accepted in the absence of an exact definition of the size classification.

Table 2 Port Facility Capacities of Major Harbors in Middle Eastern Oil-Producing Countries and Japan

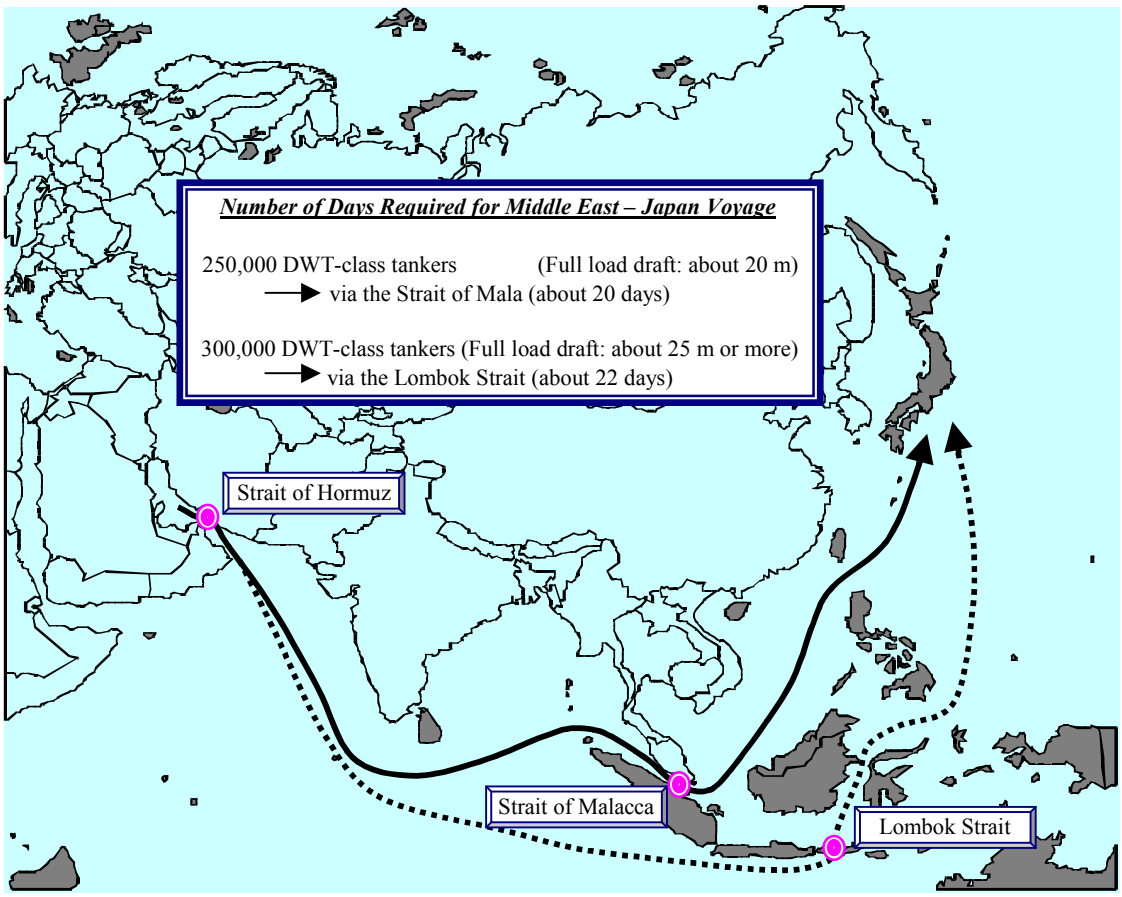
Country	Harbor	Berth	Largest length (m)	Largest width (m)	Largest draft (m)	Largest DWT	Loading/ Unloading capacity (tons/hr.)
Crude oil shipping port (loading port) – Middle East area							
U.A.E.	Jebel Dhanna	Sea Line Load Berth No. 4	377.7	-	14.9	110,000	7,750
	Das Island	Tanker Berth 3 (SPM)	-	-	24	400,000	6,000
Saudi Arabia	Ras Tanura	Sea Islands	-	-	-	450,000	38,400
	Juaymah	Crude SPMs	-	-	30	750,000	17,800
	Ras Al Khafji	Berth No. 4 SBM	342	-	19.5	323,000	8,500
	Yanbu	ARAMCO Berth No. 62	525	-	28.95	500,000	17,800
Kuwait	Mina al Ahmadi	SPM No. 22	-	-	24.73	550,000	11,000
Iran	Kahrg Island	Sea Island Berth No. 15	-	-	31	550,000	30,000
Iraq	Mina al Bakr	P'fmA Bths 1,2; P'fmB Bths 4	366	-	21	350,000	19,000
Oman	Mina al Fahal	SBM No. 2	-	-	-	600,000	-
Qatar	Al Shaheen	Al Shaheen SPM No.1	-	-	-	370,000	8,350
Crude oil receiving ports (unloading ports) – Japan							
Japan	Muroran	Berth J-1	321.5	58	15	258,000	6,900
	Kashima	Sea Berth	340	-	19	200,000	11,000
	Chiba	Keiyo Sea Berth	348.9	60	19.2	258,100	10,000
	Negishi	A – West Jetty (Dolphin)	362	-	17	160,000	7,500
	Yokkaichi	Showa Outer SBM	-	-	19.99	275,000	8,350
	Mizushima	Mitsubishi No. 6 Pier	340	-	16	260,000	12,000
	Tokuyama	Idemitsu Sea Berth	340.6	60	19.5	274,150	10,000
	Sakaide	Cosmo Oil Pier No. 1	333	-	16.27	130,000	8,500
	Oita	Kyushu Oil Jetty	350	-	20.1	273,000	8,500
	Kiire	No. 4 Berth	458	-	30.6	500,000	25,700

age and loading capacity of tankers, thus raising the possibility that there may be cases in which tankers are prohibited from entering the ports and loading/unloading volumes in the ports are limited. Moreover, the sea route connecting oil-producing countries and Japan have some constraints. As shown in **Fig. 9**, the Strait of Malacca, lying in the sea route for transporting crude oil from the Middle East to Japan, allows VLCCs having a loading capacity of 250,000-DWT or less only to pass through due to the full load draft problem, and VLCCs of 300,000 DWT or more and ULCCs are forced to make a long detour through the Lombok Strait (having a depth of more than 30 meters) , located to the east of Java.

Problems related to assignment of tankers: As there exist various constraints at various points such as crude oil shipping points, receiving points and the sea route connecting shipping and receiving points, it is necessary to have a thorough knowledge about the way in which the tankers in operation can overcome these constraints, when studying the crude oil transportation by tankers, and also about how such constraints tend to increase the number of days required for one voyage and the transportation cost.

Furthermore, as the movement of tankers is affected by a number of uncertainties such as the progress in the loading and unloading work and weather conditions during the voyage, it is rather very rare that things move as originally planned. Especially when a tanker enters a number of shipping and receiving ports in one voyage, it is an extremely important matter for an oil company to make an optimal schedule for assigning a tanker and loading crude oil in such a manner that time and cost required for the

Fig. 9 Constraints on Sea Route from Middle East to Japan



(Source: Prepared on the basis of various published materials)

entire voyage be reduced to the minimum feasible level, taking into account various constraints noted above as well as the time required for loading and unloading work anticipated from the existing capacities of facilities at ports visited.

Business of chartering tankers on the spot market: **Fig. 10** shows a business procedure of chartering tankers on the spot market. When planning to use tankers on the spot market as a means of transporting Middle Eastern crude oil to Japan, the decision on plans for assigning tankers and crude oil loading is followed by preparations for chartering a tanker. The timing of chartering a tanker generally precedes the beginning of crude oil loading by 3-4 weeks.

Narrowing down of candidate tankers: The business procedure begins with the narrowing down of candidate tankers to select a most prospective one so that the timing best meets the date of beginning crude oil loading in the Middle East area. The extremely crucial point here is to check whether a shipping company managing operation of the tanker in question is reliable and whether the stability of transportation and the safety of loading/unloading operations are guaranteed. Moreover, several constraints inherent in individual ports and uncertain factors affecting the movement of a tanker as noted above must be taken into consideration.

Fig. 10 Business of Chartering Tankers on Spot Market

Decision on Plans for Allocation of Tankers and Loading of Crude Oil

(Example: Loading of Middle Eastern crude in August – two grades, 1.85 mil. bbls in total – for transportation)

Chartering of Tankers on Spot Market

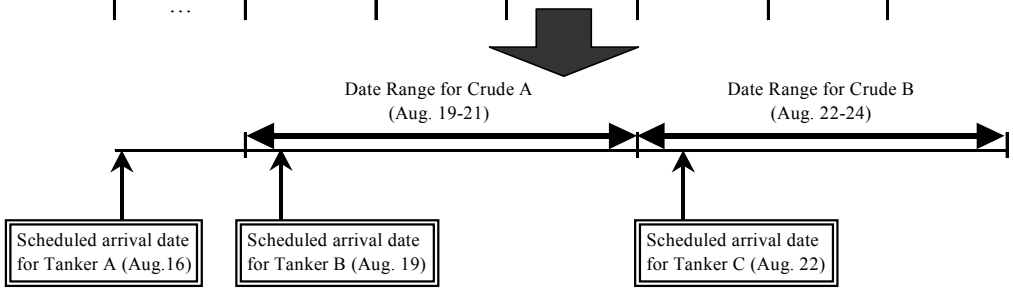
(Timing for chartering generally precedes the beginning of loading by 3-4 weeks.)

(1) Selection of most prospective tankers

In reference to a position list for spot tankers (showing the information on tanker movements on the spot market) provided by brokers, most prospective tankers are narrowed down so that they meet the timing for crude oil loading at the Middle Eastern port.

* Position List (Sample)

Vessel name t	Yr. of construction	Loading tonnage	Scheduled arrival date at Middle East	Shipowner	~	~
Tanker A	1998	310,433 DWT	8/16	Shipping Co. A	…	…
Tanker B	1992	285,933 DWT	8/19	Shipping Co. B	…	
Tanker C	1995	299,200 DWT	8/22	Shipping Co. C		
…						
…						



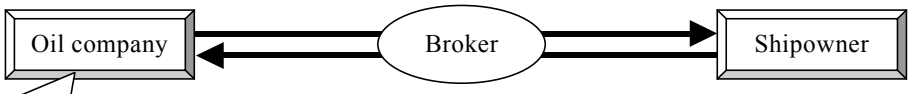
Tanker B is a most prospective candidate in terms of the timing. The Tanker A is checked for several items listed in the table below to make a final decision whether or not charter the tanker.

Items to be checked

* Good vessel management system, safety in transportation, safety in loading/unloading
* Latest movements of the candidate tanker
* Facility capacity (loading/unloading capacity, sailing speed, etc.) of the candidate tanker
* Adaptability to constraints on entry into loading/unloading ports (size, draft, age, etc. of the tanker)

(2) Spot chartering

Conduct negotiations with the shipowner through a broker on various conditions such as freight to reach agreement and conclude contract.



The oil company makes a survey on:
Latest market trends and projection
Other charterers'/shipowners' moves
to investiage the market conditions and enter into negotiations with the shipowner at an appropriate timing.

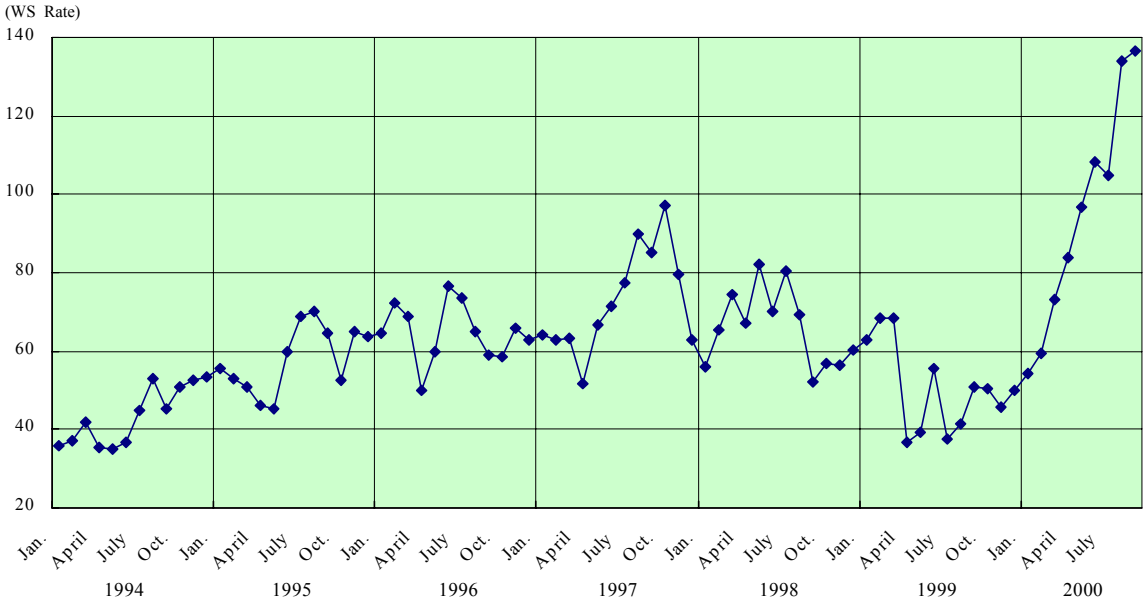
Major conditions for contracts
*Loading volume
*Sea route
*Lay/Can (Date of beginning loading/Date of canceling contracts)
*WS Scale Rate
*Demurrage

(Source: Prepared on the basis of various published materials.)

Negotiations on conditions for tanker chartering: After the candidate tanker is determined, negotiations on conditions for chartering are conducted with the owner of the candidate tanker through a broker. Major conditions for contracts include the volume of loading, the sea route, Lay/Can (the date of beginning loading/the date of canceling the contract), the freight and the demurrage. The freight is expressed in WS (World Scale) rate[Note 6] based on the spot tanker market.

As shown in **Fig. 11**, the WS rate keeps fluctuating greatly in accordance with the tanker fleet supply and demand balance on the spot tanker market.

Fig. 11 Movements of WS (Worldscale) Rates



(Source: Prepared on the basis of various published materials.)

Fig. 12 Sample Calculation of Tanker Freight

(Sample)				
Sea route	: Ras Tanura (Arabian crude)	→	Mina al Fahal (Omani crude)	→ Yokohama
Volume loaded	: Ras Tanura (Arabian crude)	→	Mina al Fahal (Omani crude)	→ Yokohama
Volume loaded	: 250,000 MT			
Flat rate	: $11.00/MT			
Current WS rate	: $35,000/day			

Tanker freight = 250,000 × 11.00 × 70% = $1,925,000 + Demurrage

(Source: Prepared on the basis of various published materials.)

Note 6: The WS rate, which constitutes the basis for the tanker freight, is expressed as the ratio to the standard rate (Flat Rate = WS rate 100), revised and published every year, in principle, by the British Worldscale Association

Note 7: The mooring time of 72 hours are generally allowed for VLCCs for loading/unloading operations. In case the total mooring time required for loading/unloading operations and for waiting until the tanker is brought alongside the berth exceeds this allowable time in one voyage, the demurrage corresponding to the time in excess of the allowable time must be paid to the shipowner.

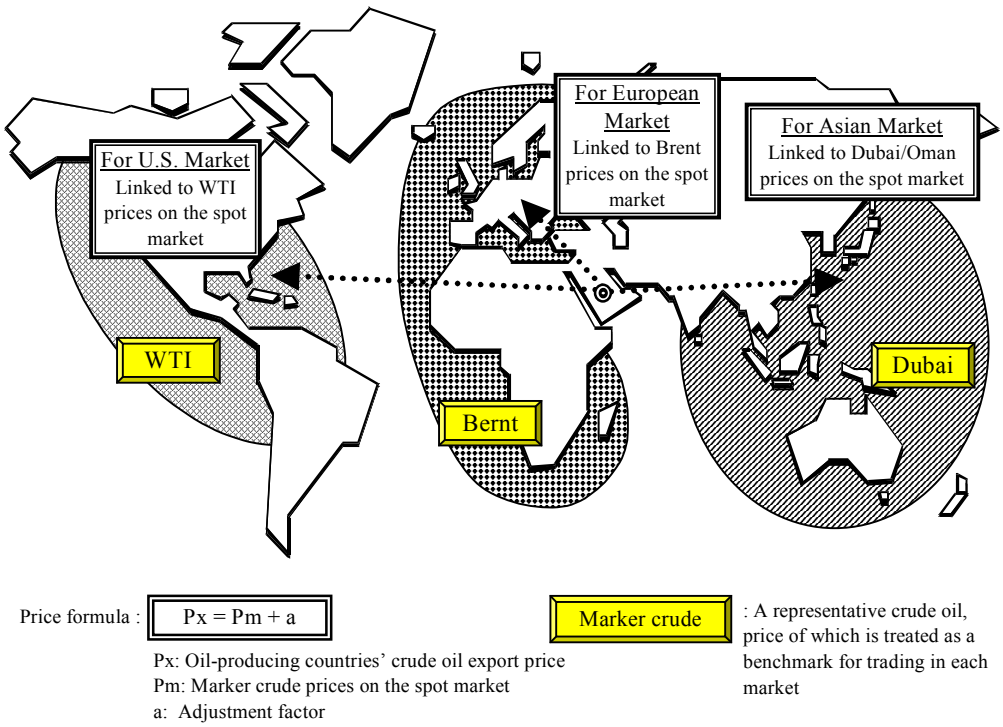
5 Determination of Crude Oil Purchase Prices and Settlement of Its Payment

The mechanism of determining the crude oil purchase price and the settlement of its payment are outlined in this chapter.

Marker crude and the price formula for each market: **Fig. 13** shows the marker crude for the world's three major markets - Europe, U.S. and Asia — and the price formula of the Middle Eastern crude for each destination. For each market, a marker crude is designated for use as a benchmark for crude oil pricing, with the actual price of crude oil traded in that market basically linked to each marker crude price. For example, the same Arabian light crude is priced differently in many cases in accordance with the crude oil supply and demand situation in each market, as the different marker crude is used for each market.

Components of the crude oil price formula: **Fig. 14** shows a structure of the crude oil price formula. Factors comprised in the crude oil price formula are the marker crude price on the spot market and, in addition, an adjustment which is set independently by each oil-producing country. While the marker crude price on the spot market varies in accordance with the current trends of the international spot crude oil market, the adjustment factor is determined, taking various elements into account such as quality and transportation cost differentials between the crude oil in question and the marker crude as well as the oil-producing countries' marketing policy for each destination.

Fig. 13 Marker Crude for Each Market and Crude Oil Pricing Formula [Note 8] for Each Destination



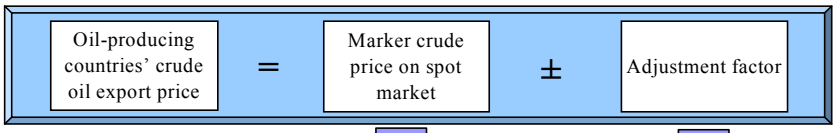
Note 8: In and after March 2000, some Middle Eastern oil-producing countries switched the marker crude for the European market from Brent prices on the spot market (Dated Brent) to Brent prices for futures trading (BWAVE) on IPE.

Problems concerning factors comprised in the crude oil price formula: As shown above, the crude oil price formula comprises two factors, with problems related to each factor being questioned by market participants. First, with regard to the marker crude price on the spot market, it is pointed out that production of Brent crude - the marker crude for the European market - and of Dubai crude - the marker crude for the Asian market - has been on a downtrend in recent years, leading to a scale-down in the trading volume of these crude oils in the international market. This decrease in the market fluidity means an increase in anxiety that they are subjected to arbitrary price manipulations by a few limited number of traders.[Note 9]

Meanwhile, the adjustment factor faces a controversial argument that it is determined independently by each oil-producing country and no details of its determining process are made known to the oil-consuming countries' side like Japan, thus leaving the way how crude oil prices are determined quite unclear. For reference, **Table 3** (shown at the end of this chapter) shows price formulas for representative crude oils, designed for each market.

Determination of prices for purchased crude oil: **Fig. 15** shows a conceptual map for determination of prices for purchased crude oil and settlement of payment. In case of the example - i.e., loading of crude oil in August, the price for the bulk of crude oil purchased is determined on the basis of prices of Dubai and Oman - Middle Eastern marker crudes for the Asian market - for one month of August, and therefore the timing at which the crude oil price is finally determined is either the end of August or the beginning of September. [Note 10]

Fig. 14 Structure of Crude Oil Price Formula and Mechanism of Determining Crude Oil Prices



Determining body	International spot crude oil market	Oil-producing countries
Determining factor	Crude oil supply & demand balance in the market concerned	Quality and transportation cost differentials plus oil-producing countries' marketing policy for each oil-consuming area

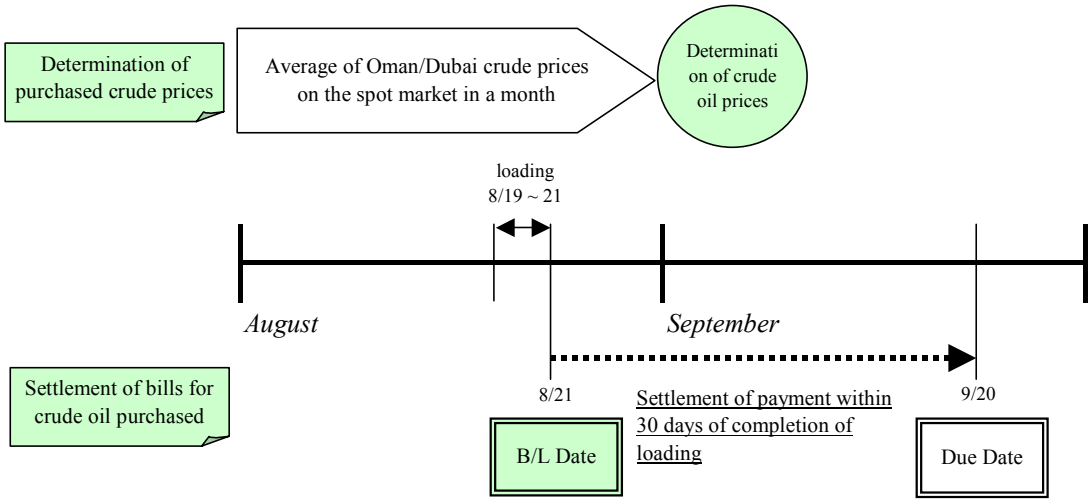
(Source: Prepared on the basis of various published materials.)

Note 9: In fact, Brent crude oil prices on the spot market - Dated Brent - has come to fluctuate so violently due to the decline in the fluidity of this crude on the market that both oil-producing and oil-consuming countries have become increas ingly dissatisfied. As a result, some cases have recently been witnessed in which some Middle Eastern oil-producing countries are switching the marker crude for the European market from the conventional Dated Brent to the price of Brent in futures trading on IPE because of a large scale and high degree of transparency of prices of the latter.

Note 10:While forms in which crude oil is purchased comprise one related to the spot market and another based on fixed prices. The latter form, however, is rarely to be seen these days.

Settlement of bills for crude oil purchased: Concurrently with the determination of crude oil prices, oil-producing countries or majors (i.e., sellers) make invoices covering their crude oil sales and send them to each buyer. Buyers then settle the payment, generally 30 days after the B/L Date.

Fig. 15 Determination of Purchased Crude Prices and Timing of Payment



(Source: Prepared on the basis of various published materials.)

Table 3 Price Formulas for Representative Crude Oils by Oil-Producing Country (As of September 2000)

	Grade of Crude – API	Point of Sale	No. of days between completion of loading and B/L date	Price Formula	Adjustment Factor 00 / 9
For Asian market					
	Saudi Arabia				
	Arabian Light-33	f.o.b.	0	(Dubai + Oman) / 2 ± (Adjustment factor)	+0.10
	Arabian Heavy-27	f.o.b.	0	(Dubai + Oman) / 2 ± (Adjustment factor)	-1.50
	Iran				
	Iranian Light-33	f.o.b.	0	(Dubai + Oman) / 2 ± (Adjustment factor)	0.00
	Iranian Heavy-30	f.o.b.	0	(Dubai + Oman) / 2 ± (Adjustment factor)	-0.65
	Kuwait				
	Kuwait-31	f.o.b.	0	(Dubai + Oman) / 2 ± (Adjustment factor)	-0.95
	Neutral Zone				
	Khafji-28	f.o.b.	0	(Dubai + Oman) / 2 ± (Adjustment factor)	-1.50
	Qatar				
	Dukhan-41	f.o.b.	0	(Oman MPM) ± (Adjustment factor)	+0.75
	Marine-36	f.o.b.	0	(Oman MPM) ± (Adjustment factor)	+0.27
	Iraq				
	Basrah-34	f.o.b.	0	(Dubai + Oman) / 2 ± (Adjustment factor)	-1.10
	Yemen				
	Marib-48	f.o.b.	0	(Dated Brent) ± (Adjustment factor)	-0.50
	Masila-30.5	f.o.b.	0	(Dated Brent) ± (Adjustment factor)	-1.20
	Mexico				
	Isthmus-33	f.o.b.	0	(Dubai + Oman) / 2 ± (Adjustment factor)	+0.10
	Maya-22	f.o.b.	0	(Dubai + Oman) / 2 ± (Adjustment factor)	-2.65

Table 3 Price Formulas for Representative Crude Oils by Oil-Producing Country (Cont'd)

	Grade of Crude – API	Point of Sale	No. of days between completion of loading and B/L date	Price Formula	Adjustment Factor 00 / 9
For West European Market					
	Saudi Arabia				
	Arabian Light-33	f.o.b.	+50	(WTI) ± (Adjustment factor) – (Freight discount)	-4.65
	Arabian Heavy-27	f.o.b.	+50	(WTI) ± (Adjustment factor) – (Freight discount)	-6.35
	Kuwait				
	Kuwait-31	US Gulf	Deliv. Date	(WTI) ± (Adjustment factor)	-4.60
	Iraq				
	Basrah-34	f.o.b.	+15	(WTI) ± (Adjustment factor)	-6.70
	Kirkuk-37	Ceyhan	+10	(WTI) ± (Adjustment factor)	-5.50
	Nigeria				
	Bonny Light-36	f.o.b.	+5	(Dated Brent) ± (Adjustment factor)	+0.20
	Forcados-29	f.o.b.	+5	(Dated Brent) ± (Adjustment factor)	-0.40
	Brass River-42	f.o.b.	+5	(Dated Brent) ± (Adjustment factor)	+0.15
	Mexico				
	Isthmus-33	f.o.b.	0	0.4 x (WTS + LLS) + 0.2 x (Dated Brent) ± (Adjust.fac.)	-1.50
	Maya-22	f.o.b.	0	0.4 x (WTS + 3% Fuel Oil) + 0.1 x (LLS + Dated Brent) ± (Adjustment factor)	-2.55
	Olmeca-39	f.o.b.	0	(WTS + LLS + Dated Brent)/3 ± (Adjustment factor)	+0.05
	Colombia				
	Cano Limon-30	f.o.b.	0	(WTI) ± (Adjustment factor)	-4.52
	Venezuela				
	Furrial-30	f.o.b.	0	(WTI) ± (Adjustment factor)	-4.72
For West European Market					
	Saudi Arabia				
	Arabian Light-33	f.o.b.	+40	(BWAVE) ± (Adjust. factor) – (Freight discount)	-3.95
	Arabian Heavy-27	f.o.b.	+40	(BWAVE) ± (Adjust. factor) – (Freight discount)	-6.20
	Kuwait				
	Kuwait-31	f.o.b.	+40	(BWAVE) ± (Adjustment factor)	-5.10
	Iran				
	Iranian Light-33	Rotte.	Deliv. Date	(Dated Brent) ± (Adjustment factor)	-0.84
	Iranian Heavy-30	Rotte.	Deliv. Date	(Dated Brent) ± (Adjustment factor)	-1.34
	Iraq				
	Kirkuk-37	Ceyhan	+5	(Dated Brent) ± (Adjustment factor)	-3.50
	Yemen				
	Marib-48	f.o.b.	0	(Dated Brent) ± (Adjustment factor)	-0.50
	Masila-30.5	f.o.b.	0	(Dated Brent) ± (Adjustment factor)	-1.20
	Nigeria				
	Bonny Light-36	f.o.b.	+5	(Dated Brent) ± (Adjustment factor)	+0.02
	Forcados-29	f.o.b.	+5	(Dated Brent) ± (Adjustment factor)	-0.40
	Brass River-42	f.o.b.	+5	(Dated Brent) ± (Adjustment factor)	+0.15
	Libya				
	Es Sider-37	f.o.b.	0	(Dated Brent) ± (Adjustment factor)	-0.80
	Zueitina-42	f.o.b.	0	(Dated Brent) ± (Adjustment factor)	-0.60
	Syria				
	Syria Light-37	f.o.b.	+5	(Dated Brent) ± (Adjustment factor)	-2.50
	Souedieh-24	f.o.b.	+5	(Dated Brent) ± (Adjustment factor)	-6.00
	Egypt				
	Suez Blend-32	f.o.b.	0	(Dated Brent) ± (Adjustment factor)	-4.00
	Belayim Blend-26	f.o.b.	0	(Dated Brent) ± (Adjustment factor)	-5.30
	Mexico				
	Isthmus-33	f.o.b.	0	0.887 x (Dated Brent) + 0.113 x (3.5% Fuel Oil) -0.16 x (1% F. O. – 3.5% F. O.) ± (Adjust. fac.)	-0.11
	Maya-22	f.o.b.	0	0.527 x (Dated Brent) + 0.467 x (3.5% Fuel Oil) -0.25 x (1% F.O. – 3.5% F.O.) ± (Adjust. fac.)	-1.10

(Note) WTI: West Texas Intermediates, LLS: Louisiana Light Sweet, WTS: West Texas Sour Oman MPM: Posted price of Omani crude, Dated Brent: Brent crude prices in spot trading after the date of loading is determined, BWAVE: IPE Brent Weighted Average (Weighted average price of Brent in futures trading) *The "Adjustment factor" in the price formula for Saudi Arabian crude directed to the U.S./European markets include the "Freight discount factor."

(Source) Prepared on the basis of various published materials, including "Oil Markets and Prices," Oxford Institute for Energy Studies 1993, by P. Horsnell, R. Mabro; PIW Special Supplement Issue, Middle East Economic Survey, etc.