

# 석유제품의 B2B 전자상거래 분석: OILPEX 사례를 중심으로

## Analysis of the e-Business Challenges of the Oil Product Industry with a Case Study of Oil Product Exchange (OILPEX)

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## I. Introduction

Korean oil product market ranks 6<sup>th</sup> in the world in terms of oil consumption. But Korean oil industry had been regulated and dominated by the government and major refiners. The oil business law reinforced refiners' governance and gave them impenetrable entry barrier over the industry. It was not until 1998 that import is liberalized and their control over distribution started to weaken (Ministry of Commerce, Industry, and Energy, 2000). And together with these deregulation measures, e-business has brought change to the old practices. This paper aims to analyze how this change has come around in general and specifically how Oil Product Exchange (OILPEX) has been leading e-business challenges in the rapidly changing environment.

The rest of this paper is organized as follows. Section 2 describes the characteristics of Korean oil product industry with illustrative figures. Section 3 discusses the forces of change, which can be explained by deregulation and e-business. Section 4 explains 3 emerging e-business models in terms of how it differs and what value proposition each has in the oil product industry. Section 5 discusses OILPEX's business models and system features, and finally section 6 concludes the paper with some implications.

## II. Korean Oil Product Industry

Asian oil consumption comprises 26.9% of world oil consumption. North East Asian market, which includes Korea, Japan and China, takes up to 16.2% of global

oil consumption (Murti et al, 2001). Asian market is expected to exceed North American market in 2010 (EIA, 2000) and become the largest market in the world (Korea Industry Development Institute, 2000). In this sense, there was mutual agreement among 3 countries in 1988 to form buyer's market by amassing buying power of North East Asian market. The mutual agreement on e-commerce was also followed in 2000. And OILPEX was presented as one of the best practices for three countries' cooperation model in 2001 at the APEC energy department. Ongoing cooperation meeting will be held biannually. As for the Korean market, Korea alone ranks 6th in oil consumption and 4th in refinery capacity. Consumption of 6 major oil products (gasoline, kerosene, heating oil, diesel and two kinds of fuel oil products) alone are worth over 35

billion dollars in 2000 (Korea Industry Development Institute, 2000). Korean oil product is characterized as an oligopoly dominated by four major oil refiners. SK, LG-Caltex, Hyundai and S-Oil dominated 99% of domestic oil market in 2000, while importers are staggering at 1% (Ministry of Commerce, Industry and Energy, 2000). Regulation has acted as an entry barrier not only for importing but also for free transactions across supply chains.

### III. The Forces of Changes

#### 3.1 Deregulation

Deregulation in the Korean oil product industry has been major force of change. As shown in <Table 1>,

<Table 1> Deregulation Measures

Year	Enactment	Issues
1992	Poll sign (Mar.)	Poll free stations appear
1994	Price scheme linked to crude oil prices	Refiners' market competition intensified Ssangyong oil invoked price war Growing pressure on market opening after WTO affiliation
1995	Price scheme linked to international oil product prices Gas station installment liberalized	An increase in number of new gas stations Establishment
1996	Oil product sales license liberalized (permission to registration)	Gas stations' profitability deteriorated through intense competition
1997	Price/import liberalization (Jan.)	Gas stations' bankruptcy rate grew IMF crisis
1998	Distribution liberalization New refiners' entry and foreign investment liberalized	Oil industry restructuring started after the crisis Oil consumption decreased Importers' started importing oil products Poll free stations reached 200 Distribution disorder caused by refiners' dumping
2001	Multi-poll sign allowed	

there have been major changes since 1997, when price, import and distribution were liberalized. Deregulation is fermenting fragmentation and stimulating new players. And the balance of power is slowly moving from suppliers to buyers. As deregulated oil markets develop and mature, price competition converges with narrow margins. In OILPEX, the trading prices of gasoline, diesel, kerosene have dropped between 15% and 20%. Open competition will drive the "open marketplace trading" initiative and process improvements which may, in turn, further squeeze margins. Local market barriers initially made switching difficult and expensive. One of the most common barriers was limited storage facility mainly held by major oil refiners (SK, LG-Caltex, Hyundai, S-Oil) (Yang, 2001). Another was transportation, usually contracted long term with the major refiners as well. Recently, however, the rate of switching has increased quite significantly as the barriers have been removed. For example, It is estimated that around 4% of the domestic consumption would switch to importers during this year alone.

### 3.2 e-Business

Oil product industry has been recently challenged by the power of internet and e-business. As shown in

<Table 2>, oil industry is currently moving to e-business driven market (Fish, 2000). NYMEX announced its transformation to eNYMEX and world's 1<sup>st</sup> spot trading commodity exchange, IPE, which provides Brent reference price has been acquired by InterContinental Exchange (ICE) which is a consortium among US major refiners and major investment banks. In Korea as well, new B2B e-business models such as OILPEX and Netoil are emerging and challenging traditional trading practices. Incumbents are also preparing for e-business. SK and LG jointly launched new venture, Oilchain. And SK is also participating in the crude oil exchange, J-oil exchange, which is a consortium among Japanese general trading companies and refiners. Due to regulated and refiners oriented policy, oil product market players have had little information on how they purchase oil products. However, more players can access on the real-time market pricing information. Like many products and services, oil product industry is also entering the era of "open marketplace" where anybody can trade as long as they can earn the trust (Park and Lee, 2001). Korean government is a strong supporter of B2B trade in this regard. The government is pushing industries for e-business in introducing new legislation such as e-commerce stimulation act and tax reduction act for

<Table 2> Oil Industry Structural Change

Major Driven	OPEC Driven	Market Driven	Financial Product	e-Business
Prior to 70's	70's	80's	90's	2000's
<b>&lt;Characteristics&gt;</b>				
Major dominates up & down stream	OPEC controls upstream /Major controls downstream sellers' market	Spot products buyers' market	Rapid growth of financial products	Rapid transition to e-business platform from traditional floor exchange
<b>&lt;Price determined&gt;</b>				
Major	OPEC	Market Forces	Market Speculator	Market Speculator
<b>&lt;Reference Price&gt;</b>				
Major declared price	OPEC declared price	Brent, WTI, Dubai spot price	Futures price	Futures price

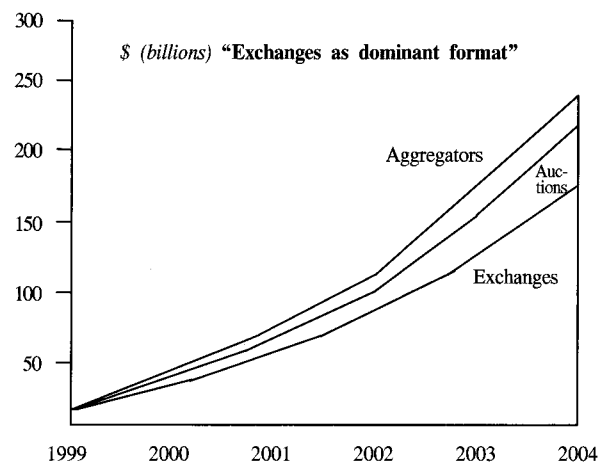
(Korea Industry Development Institute, 2000)

e-commerce.

With these e-business and deregulation, there are some intrinsic favorable factors for B2B trade in the oil product industry. There are overriding favorable factors. To begin with, oil products have been proven commodities in the exchanges such as NYMEX, IPE and SIMEX. There needs no effort for standardization or supplier catalogs (Lief, 1999). They can be traded unseen. Secondly, buyers are highly fragmented. There are 11,000 gas stations, 7,000 convenience stores and 1,000 commercial and industrial customers (1,000 represents the number of the companies of which yearly consumption exceeds more than 1,000 barrel). And new sellers are emerging. General trading companies are participating in oil product import and the number of importers and wholesalers are growing very fast. Currently, there are 17 importers and 230 wholesalers. Thirdly, real-time price information critical to short-term contract and price discovery is highly difficult for the fragmented players, which is likely the attracting factor to the online marketplace where reference price discovery can be accessed (Lee, 2000). Lastly, past trading practice has been very inefficient and lacked transparency. There are growing needs for convenience in order fulfillment and value-added services such as financial services.

#### IV. Emerging B2B e-Business Models in the Oil Product Industry

B2B e-business models can be categorized into exchanges, aggregators and auctions by “who creates the market and the role the market is playing” (PricewaterhouseCoopers, 2001). This paper expects exchanges to be the dominant format of energy B2B trade (see the <Figure 1>).



(Lief, 1999)

<Figure 1> Energy B2B Trade Opportunity

**Exchanges** known as e-markets, are virtual “communities” to create a significantly more efficient supply chain for conducting businesses. The exchange model creates value by matching supply and demand. Multiple buyers and sellers are brought into exchanges, where real-time market pricing information and immediate access to a pool of buyers and sellers are provided. Exchanges require real-time bid/offer matching process to determine product price as well as settlement and clearing. The exchange model works best for near-commodity items like oil products that can have several attributes but are easy to specify based on supply and demand for trading (Tulis, 2000). There exist several exchanges, including AlTrade of Altra Energy, Enron’s EnronOnline and OILPEX of Korea Electronic Oil Exchange Co., Ltd. Exchange typically generates revenue from transaction fees and some for membership fees. An exchange significantly reduces the search costs of buyers and sellers finding each other. Moreover, buyers and sellers benefit from the greater price transparency and liquidity an online exchange provides. Not only order matching, but some exchanges also provide commercial and industrial customers consulting services

on oil product buying strategies (OILPEX), settlement and clearance of derivative transactions (EnronOnline). Adding new services are equally important with acquiring liquidity in that once leadership on liquidity and services determined, the industry will consolidate along the primary marketplace.

**Aggregators** form groups of buyers to gather the purchasing power of many buyers particularly small and mid size buyers they can negotiate price reductions. Currently, there are very few sellers in the space, therefore they rely on other sources which already achieved scale to close the deal. For example, leading aggregators including Netoil turn to OILPEX for sourcing suppliers, while they provide extra bids to the market. Not just online aggregators, but also offline aggregators such as Oilmart and Energy World also source their suppliers from OILPEX. Both buyers and sellers benefit from aggregators. Buyers benefit from volume discount on prices, while suppliers gain access to a low-cost distribution channel. In addition, aggregators have some advantages over exchanges for aggregation of small size deals and sourcing service-based deals. But the barriers to entry into a pure aggregation role are not particularly high, given that the activity requires little capital investment. As such, aggregators

will focus on relationship-oriented deals in their future service offerings (Tulis, 2000).

**Auctions** are whereby sellers can post excess inventories to sell or buyers bid on those offers (Kaplan and Sawhney, 1998). There are a variety of auction formats in whether prices rise or fall from the initial setting price. The predominant format in Korean oil industry is a straight auction. A straight auction is a seller-driven model allowing sellers to increase their returns (as they gain new market share at low customer acquisition costs) and test product price points (Tulis, 2000). An example of straight auction is Oilchain, which is scheduled to open in August 2001. Oilchain aims at positioning itself in the non-brand market which has grown to 20% of the total oil product market. The trading practice of the market has been free transactions which oil business law prohibits among players such as merchant (mostly cash-rich wholesalers), non-brand gas stations and convenience stores. Since Oilchain is not only situated in this non-brand market where trading practice violates current law, but also SK and LG want to secure the brand market not to shrink, Oilchain limited its business model to the Auction model in the non-brand product market. Accordingly, Oilchain's membership would not include commercial and industrial

〈Table 3〉 Comparison of B2B Models

Exchanges	Aggregators	Auctions
<b>&lt;Description&gt;</b>		
Online marketplace for oil product trading among a pool of buyers and sellers	Forums whereby buyers aggregate their demand to better negotiate with suppliers	Forums whereby suppliers post their surplus for buyers to bid on
<b>&lt;Pricing&gt;</b>		
Dynamic pricing based on supply and demand	Prices are generally fixed or predetermined	Initial/minimum price set by seller, Matching price determined through bidding
<b>&lt;Value Proposition&gt;</b>		
Promote market liquidity and price transparency for a more efficient market	Reduce procurement costs for buyers and Provide suppliers with a low-cost distribution channel	Provide opportunity for sellers to offload surplus

customers and brand gas stations. Its current primary focus is on liquidating non-brand product legally. Prices are expected to be lower than those of brand product market.

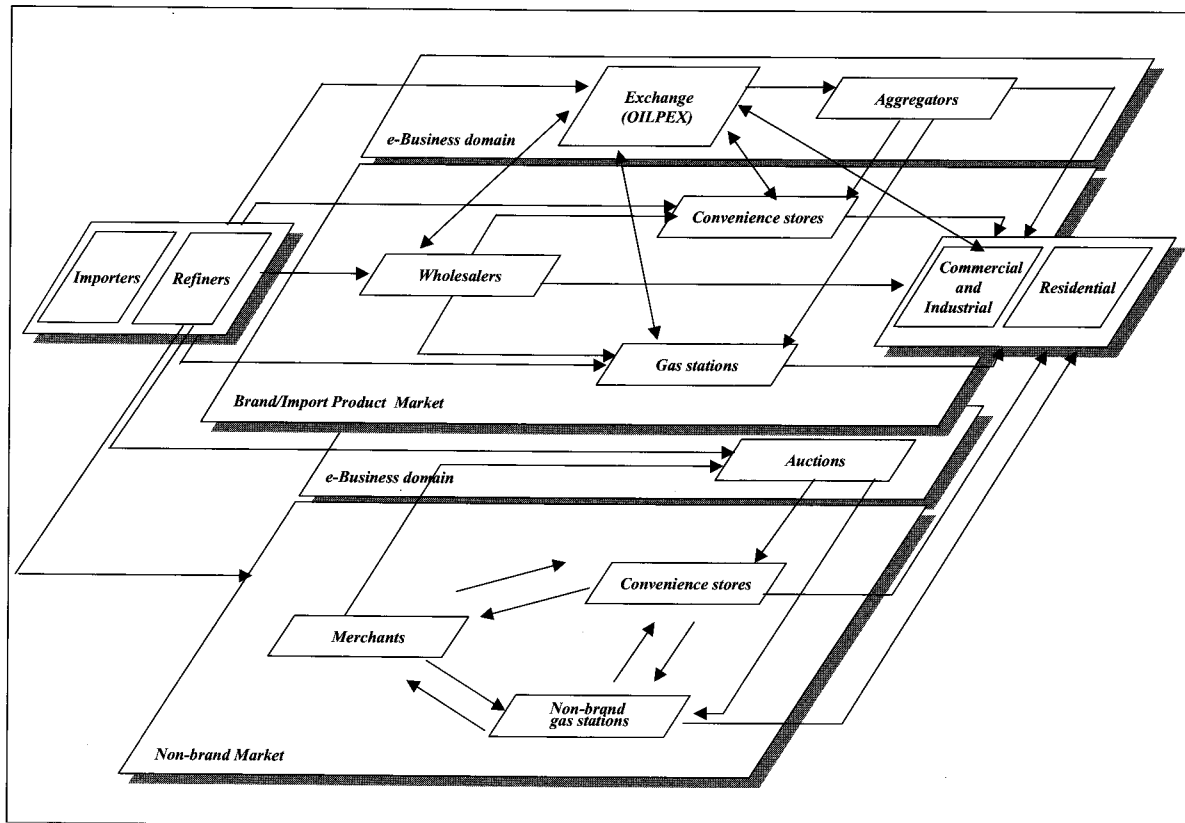
<Table 3> compares characteristics and differences of the three B2B models.

## V. A Case Study of OILPEX: Business Models and System Features

### 5.1 Business Models

OILPEX has been leading challenges against structured oligopoly problems in the industry and brought significant changes into the market through applying market mechanism of NYMEX and IPE on the e-busi-

ness domain. As <Figure 2> describes, firstly OILPEX is at a level with brand/import product market which comprises traditional brand market plus newly added import product market. This market takes 80% of total oil product market and OILPEX plays an exchange hub in the dimension which allows multiple buyers and sellers to access market information and trade in efficient and transparent manner. Secondly, OILPEX lies in a new domain stretched from the market. Thus, OILPEX is an e-business exchange or e-marketplace evolved from traditional commodity marketplace. OILPEX has positioned itself as an exchange market in a new e-business domain as shown in <Figure 2> where traditional distribution channels are plugged into. Oil business law specifies the actors and the directions that transactions should follow. In 1998, this regulation was partly liberalized and import was not regulated any-



<Figure 2> Business Models in Korean Oil Industry

more. And direct distribution to gas stations and convenience stores from refiners or importers was also made possible. After this measure, competition between refiners and importers became intense, and refiners started to increase their capacity to defend their market shares and sell this surplus at below market price. As a result, new players started to gain power, in fact, which was used to be cash rich gas stations, convenience stores and wholesalers. They secured this surplus amount at a very low price and started selling to players in any kind in the market, which forms non-brand market. This is where auction model comes in. Auction model is an effort to bring this online as far as law allows (see the direction of <figure 2> where auction model is). The dimension for Auction model is at level with non-brand market.

OILPEX differs from Auction model representing non-brand market, which is to offload suppliers' surplus. OILPEX is currently situated in the new emerging e-business domain where it acts as an intermediary for brand/import product market. OILPEX model's value comes from the structural expansion of the market, price transparency through matching of real-time supply and demand and logistical efficiency enhancement. OILPEX has already established itself as the industry standard and become a default marketplace which most buyers and sellers turn to. OILPEX has market neutral stakeholders such as KNOC (Korea National Oil Corporation), SAC (Samil Accounting Corporation), KCC Information & Communication and KPC (Korea Productivity Center). This independent share holder structure ensures transparency and trust.

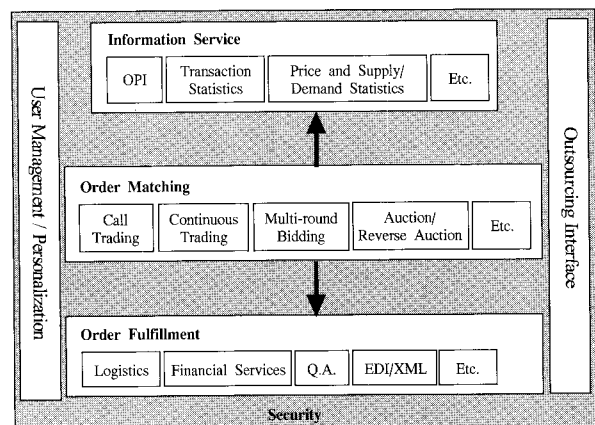
### 5.2 System Features

OILPEX provides some core proprietary functions such as call trading and continuous trading and some

outsourced functions, which supports a fully integrated business process connecting buyers, sellers and the third party service providers. <Figure 3> shows the home page of OILPEX. There are many superior features, which OILPEX has set in place for fulfilling this value. <Figure 4> illustrates the overall system architecture, where major functional modules are order matching, order fulfillment and information service. Each functional module employs component-based plug-in technologies for coping with the dynamic changes to be made in the oil product industry. For example, a new component for order matching module, called quick bidding, has been developed and launched with no com-



<Figure 3> OILPEX Home Page



<Figure 4> Overall System Architecture

plications. Furthermore, the system supports two kinds of advanced interfaces for personalization in the front-end and outsourcing in the back-end. XML-based technologies for messaging and transformation have been adopted for enhancing the flexibility of the interfaces.

### 5.2.1 Order Matching

Delivery conditions (locations, date, buyer delivery/seller delivery/OILPEX delivery) and brand matching are prerequisites for the order matching. All orders are executed on the basis of individual auction. The individual auction is classified into a call trading and a continuous trading. The principle of order matching used for transactions is as follows:

- (1) Price Priority: The highest bid and the lowest offer take precedence over all others.
- (2) Time Priority: When bids or offers are made at the same price, the earliest one takes priority over those delivered later. However, all bids and offers submitted before the opening of each trading session is considered to be simultaneous.
- (3) Size Priority: Among simultaneous bids and offers at the same price as customer's orders, precedence is given to the larger order.

**Call Trading (Matching by a single price).** Call trading refers to the transaction method in which all bids and offers submitted to the OILPEX during a certain period of time are regarded as simultaneous bids or offers and matched at a single price, which is similar to call trading in the stock trading. Call trading is used in the determination of the opening price and closing price. Adoption of call trading concept for the first time in the oil product industry made bid/offer placement possible 24 hours so that players can access the market any time. Patent right has been filed in 2000.

**Continuous Trading (Matching by multi-prices).** Con-

tinuous trading is a transaction method in which a bid and an offer are bilaterally matched. It starts with the opening price which is determined at call trading session. When a new bid or offer enters into the market, it can be matched with any of the offers or bids in the market. OILPEX designs continuous trading system in a way which gives more chance of matching while it ensures all the conditions set by buyers and sellers themselves. For example, buyers or sellers place bids or offers on an online trading floor. An efficient dissemination of market information is the pivotal factor in the trading system, enabling the investing public to promptly respond to changing market conditions. To this end, the OILPEX provides various means for investors to gain access to market information on a real time basis. Before they make bids or offers, they refer to last day's closing price for each product, international reference price, statistics, forecast, specialist comments, charts, analysis, etc. Judging from this information, buyers and sellers place their bids/offers. If exact match does not exist, the system shows them best counter bids/offers so that they are able to revise their offers to match. This process enhances matching in that every player can adjust their offers to other players' move. As such, OILPEX facilitates multilateral negotiations, allowing many buyers and sellers to make bids and offers. OILPEX participants can accept any price offered at any time or choose to withdraw or revise a bid or offer if it has not been accepted. The process has long been used by commodity trading in international oil product trading industry in generating floating price.

**Forward/Derivative transactions.** Bid/offer matching is also important in that it can bring in the concept of forward transactions. Since delivery date can be set freely, buyers who expect for prices to go up will try



to buy a forward contract, while sellers can secure the contract for import with no risk of forecasting demand inaccurately. Buyers can avert risk of price change and sellers can be risk-free of demand forecasting. It is the benefit of all. OILPEX will introduce this concept at the end of 2002 when the regulation on reverse or parallel direction of transactions is liberalized. While spot contract and forward contract fall all under the category of physical product, OILPEX is also preparing financial products such as futures and options. This will be able to explode transaction volume and make OILPEX a trading place with more liquidity.

**Multi-round bidding.** Government invested companies require multi-round bidding and also some commercial and industrial customers need very delicate product specification. Therefore, they prefer multi-round bidding which multiple sellers post closed bids on the RFB (Request For Bid). Some of government invested companies starting to use this transaction engine. Currently government-invested company's purchasing is regulated by the government contract law. According to the law, bidding for over 20 million Won (about 18,000 USD) won must conduct off-line bidding process. This law is expected to recognize electronic bidding in its specification. When this happens, use of multi-round bidding will bring the customers great convenience and easiness.

**Auction.** OILPEX has also seller-driven trading place where sellers set the minimum price and interested buyers bid on them. Some of the amount from sellers which need to be liquidated quickly are traded in auction. Auction platform supports multiple buyers bidding over time.

**Reverse Auction.** Since there is no trading places for aggregators to source their low cost suppliers, they turn to OILPEX. Aggregators usually have buying power

and there is a need for them to exert it over sellers. In this sense, reverse auction is very effective for buyers to utilize their buying powers and finally drive down the prices they aim at. OILPEX has 2 kinds of reverse auction customers such as online aggregators (Netoil, Oilpop, Oilbid, etc) and offline aggregators (Energy World and Oilmart).

### 5.2.2 Order Fulfillment Structure

In addition to order matching previously described, OILPEX supports a whole order fulfillment process. The order fulfillment process comprises authentication /security, financial service, logistics and quality assurance.

**Authentication/Security.** OILPEX supports contract signing, payment method selection, delivery confirmation processes by use of electronic authentication. These functions ensure the integrity and non-repudiation of the order fulfillment process. And all the transactions made through OILPEX are securely processed using SSL (Secured Socket Layer) method.

**Financial service.** One of the major competitive advantages OILPEX offers is financial service. Major component of this service is payment guarantee. OILPEX provides lowest rate loan service (7.5% ~ 8.0% for land and equipment and 5.5% ~ 6.5% for oil products purchasing) integrated into Korea Industrial Bank system. This financial service guarantees security and completion of fulfillment of payment for every transaction. Also purchasing through OILPEX enables players to receive tax reduction which Korean Tax Agency gives for a cash equivalent transactions. (Korean Tax Agency announced that it would give tax break on cash equivalent transactions in order to decrease the circulation of notes). All the transactions made on OILPEX through Korea Industrial Banking system are eligible for cash equivalent tax reductions.

**Logistics.** OILPEX also integrates logistics service provider into its system. OILPEX has KOTUS (Korea Transportation Union Service) in place for delivery service. KOTUS has 1,600 registered transportation vehicles out of total 4,000 registered vehicles nationwide. The transportation fees are also 5% lower than they charge to other players. It also currently apply real-name driver system for ensuring timeliness, quantity and quality assurance in the process of delivery. OILPEX has segmented the nation into 52 sections and have standardized transportation rate. Therefore, buyers and sellers freely choose delivery options according to their location comparing with buyer or seller delivery options.

**Quality Assurance.** OILPEX offers quality assurance services for the quality purchased through OILPEX. Sample is gathered in the process of transportation and tested in Korea Petroleum Quality Inspection Institute after the delivery on a request basis.

### 5.2.3 OPI (OILPEX Price Index)

OILPEX creates another meaningful information for the players since the match reflects the live market activities. More liquidity comes along, more meaningful the price becomes. OILPEX has been publishing OPI (OILPEX Price Index) through Bloomberg since February 2002, which would be the price information traded on OILPEX. And major organizations including MOE (Ministry Of Environment) and MND (Ministry of National Defense) have made reference to OPI. OPI will gain credentials as OILPEX attracts more liquidity in the trading place.

## VI. Conclusion

The Korean oil product industry is in a transitional period. The industrial structure is moving to market-led

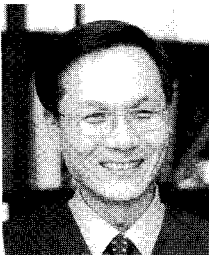
from government-led, to consumer-led from producer-led, and to demand management-led from supply management-led. These changes have been brought by deregulation and e-business. At the center of these changes, this paper identifies 3 major forms of e-business models emerging in the market. In the time of changes, OILPEX has successfully positioned itself as a market reformer in the oil product industry. By supporting efficient matching mechanism and whole order fulfillment process, OILPEX has successfully differentiated itself from other B2B models. OILPEX opened its marketplace in May 2001 and its trading has already exceeded 250 deals worth more than 2 billion Won (about 1.6 million USD) in May alone. And daily trading volume exceeds 600 million Won (about 450 thousand USD) as of mid-March 2002 and trading members subscribed reach more than 1,200. Based on the performance up until now, OIPLEX seems to overcome a "chicken and egg" problem: buyers do not want to participate unless there are a sufficient number of sellers, and sellers do not want to participate unless there are a sufficient number of buyers. OILPEX attracted both buyers and sellers quickly and created liquidity at both ends. As more transaction volume comes along, OILPEX will be able to become a primary exchange market for the price discovery through OPI and trading in the Korean oil product industry and contribute to the North East Asian oil product industry as well.

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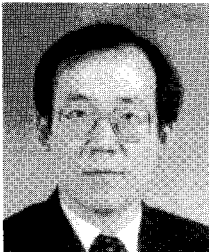
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