Yonsei Investment Group

Industry Analysis

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Petrochemical

Sector View : Cautious

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Overall Gloomy, But Players to Buy Still Existing

Summary

- Little Light Seen Through the Tunnel of the Global Economy

The global economy crisis which caught last year in the U.S. is not expected to be put out in recent days. Last month, IMF reported that the worldôs economy growth rate would be 0.5% in 2009. Except some representative countries of emerging markets such as China, India and some South American countries, the estimated rate shows minus figure. According to the latest Wall Street Journal Survey with 52 experts from Feb 6 to 10, most experts have pessimistic view to the global economy in 2009 especially to the latter half.

- Restructuring Due to Price Downfall and Demand Slowdown

While the oil price was skyrocketing to the peak, the price of petrochemical products was chasing the phase. This trend was shown again when the oil price dropped toward the bottom. The naphtha price hit $1200 in July last year, but now it is formed around $300. This radical change came from the delay of purchasing raw materials following the deteriorated market and the cause of gloomy market mood was originated from rare inventory consumption of downstream. Although the inventory has been reduced this year, the demand decrease is not weakening.

- Pouring Middle-East and China products

Even though some of the planned complex construction projects are now being reconsidered to be delayed or suspended due to the crisis and difficulty in financing, it is evident that products made in Middle East and China will flow out to the market. Especially, Middle-Easter products armed with incomparably cheap raw material price will be obviously threatening the other petro companies. Moreover, the combination of the resources(Middle-East) and the market(China) will be another menace to the production players in the rest of the world.

- Top pick

LG Chem is our top pick among the Korean petrochemical companies. It is one of the most defensive petrochemical stocks in the Korean stock market. It is little exposed to the risk from the Middle East and has a diversified portfolio which will bring about the favorable growth of profitability. Especially, the prospects of the IT and electronic material division is shining with the support of the government policy like Green New Deal and the demand increase of mobile phones.

Contents

1. Little Light Seen Through the Tunnel of the Global Economy

The Global Economy Stagnation Will Unlikely Recover Soon

The global economy crisis which caught last year in the U.S. is not expected to be put out in recent days. Last month, IMF reported that the world's economy growth rate would be 0.5% in 2009. Except some representative countries of emerging markets such as China, India and some South American countries, the estimated rate shows minus figure. According to the latest Wall Street Journal Survey conducted from Feb 6 to 10 with 52 experts, most experts have pessimistic views on the global economy in 2009 especially to the latter half.

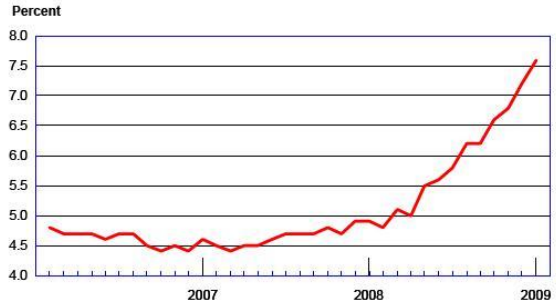
[Table1] Economy Growth Rate Forecasted in 2009

(%)	July 2008	Oct 2008	Nov 2008	Jan 2009
Global	3.9	3.0	2.2	0.5
United States	0.8	0.1	- 0.7	- 1.6
Germany	1.0	-	- 0.8	- 2.5
France	1.4	0.2	- 0.5	- 1.9
United Kingdom	1.7	- 0.1	- 1.3	- 2.8
Canada	1.9	1.2	0.3	- 1.2
Japan	1.5	0.5	- 0.2	- 2.6
S. Korea	4.3	3.5	2.0	- 4.0
China	9.8	9.3	8.5	6.7
India	8.0	6.9	6.3	5.1
Brazil	4.0	3.5	3.0	1.8

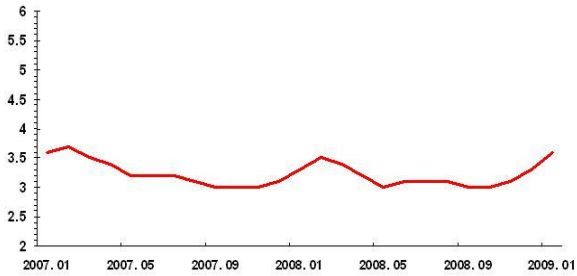
Source: IMF, Ministry of Strategy and Finance

As the crisis was getting more serious and deeper, the government of nations announced that they would take appropriate stimulus actions to normalize their economies. It included bailouts for banks and industrial corporations and job generation through the policies like Green New Deal. In spite of the stimulus policies of most nations, the situation is not yet likely to recover. Unemployment rate of each nation has been going up steadily since the latter half last year in Korea. The U.S. unemployment rate is now over 7% which is the highest ever. Accordingly, the consumption has shrunk. This situation is immediately conveyed to front industries and makes them confront demand decrease. The circulative ring of darkness is formed. The ring will remain uncut until governments adopt highly effective and appropriate policies. Otherwise, it takes much time to return.

[Graph1] Unemployment Rate of the U.S and Korea



The U.S. Unemployment Rate, seasonally adjusted



Korea Unemployment Rate

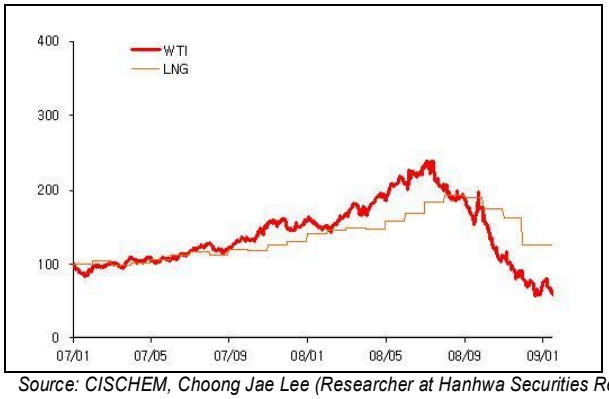
Source: Bureau of Labor(left), Korea National Statistical Office(right)

2. Restructuring Due to Price Downfall and Demand Slowdown

Macroeconomic Shock Hit The Industry Directly and Deeply

While the oil price was skyrocketing to the peak, the price of petrochemical products was chasing the phase. This trend was shown again when the oil price dropped toward the bottom. The naphtha price hit $1200 in July last year, but now it is formed around $300. This radical change came from the delay of purchasing raw materials of the front industry as the market condition became worse due to the indigestion of inventories of downstream products. The inventory has been reduced this year, so the decrease in demand has been weakening temporarily. However, it is obvious that demand is on the decrease. In the global economy stagnation influenced seriously badly the front industries and the front industries have had bad effects on the petrochemical industry accordingly. It does not take much time to realize that the key to normalize the situation is definitely the recovery of the global economy.

[Graph2] Crude Oil (WTI) & LNG Price



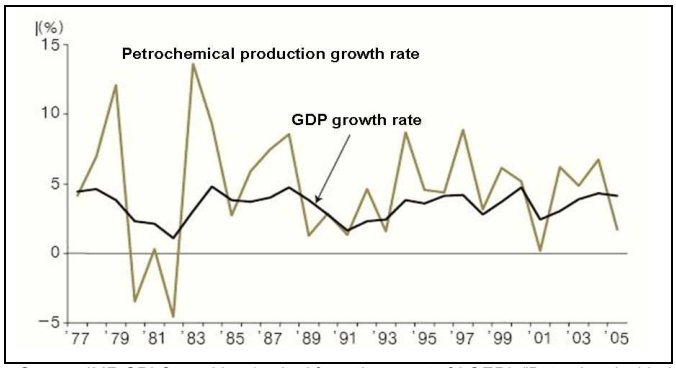
[Graph3] Naphtha Price

Source: CISCHEM, Choong Jae Lee (Researcher at Hanhwa Securities Research Center)

The Bullwhip Effect

The petrochemical industry forms a vital sector in the manufacture of industrial materials. In other words, the industry has a highly vertical structure. Hence, the effect of economic boom or depression on the industry follows the effect on the front industries. It makes the Bullwhip Effect occur. The Bullwhip Effect is the phenomenon of distortion of information as the information about the down stream demand of the front industries is conveyed to the upper stream (supply of the petrochemical industry). This makes the variance of the petrochemical industry larger than the one of the economic growth. Therefore, the Bullwhip Effect resulted in the unexampled decease in the demand of petrochemical products. As mentioned above, when the oil price was going high, the price of petrochemical products was skyrocketing simultaneously, so the front industrial corporations tried to buy raw materials as at lower price as possible, but more than they needed. When this kind of speculative demand was prevailing, the consumption was frozen, and the front industrial companies stopped producing and used their inventory to fulfill demand.

[Graph 4] Global GDP and Petrochemical Production Growth Rate



Source: IMF, SRI Consulting (recited from the report of LGERI, "Petrochemical Industry Outlook in 2009")

Although the phase of inventory adjustment in the front industry have been over already and demand for petrochemical products hit the bottom, the additional decrease on the demand is likely shown due to the fact that the depression is going on.

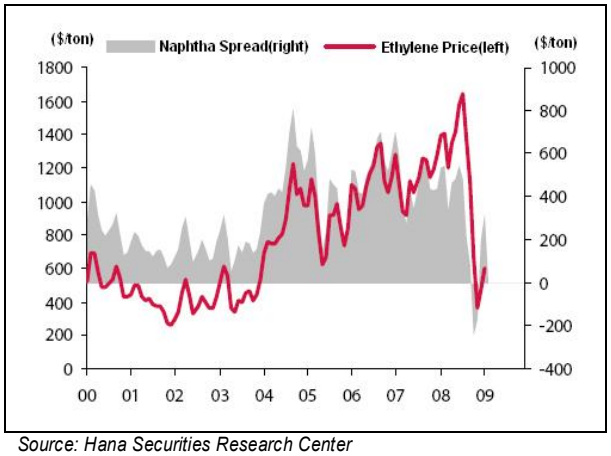
Possibly Take Longer to Recover

Normally, the amount of time from the bottom to the peak in the circulative cycle of the industry is approximately five to six years. The cycle reached the peak in 1995 and then hit the bottom in 2001. In 2005, the cycle was at the peak again. The previous dominant forecast was that the cycle would start to be on the slide from 2006. However, the unprecedented global economic boom and delay of pouring products from the Middle East allowed the industry to enjoy the boom condition longer. The industry started to be on the downhill from the latter half in 2008. Moreover, the incomparably price competitive products from the Middle East plan on will come out on the market. This supply side attack will make the situation of the other players worse. The price of products will undoubtedly drop and accordingly the other producers will lose their competitive power especially in the general product market. In other words, the advent of the new offensive player menace the whole market and it will possibly take longer to recover the market situation.

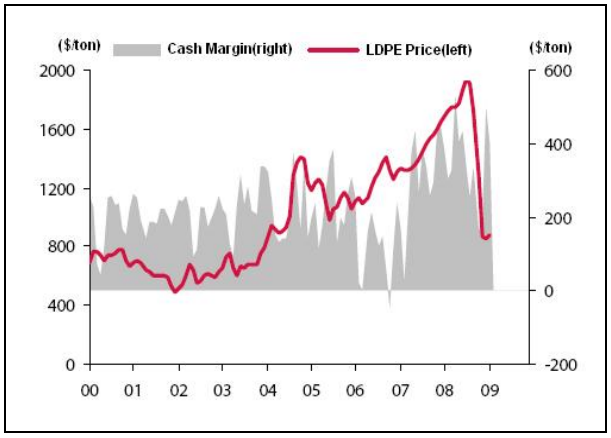
The Effects of The Raw Material Price

Major factors to influence the petrochemical market can be categorized into three heads. Those are the capacity expansion of the Middle East, the increase of the rate of self-sufficiency in petrochemical products of China and the raw material prices. The effect of the last factor of those three is pertinent to the effect of the rest. The price of petrochemical products fluctuates with the effect of the price of raw materials like oil price. We cannot certainly say that the high oil price is good or bad for the market. It depends on whether a company can pass on the change in the raw material price to the price of the end products. If the extent of increase in the end products is equal to or larger than that in the raw material price, there would not be any problem, even good for companies. It is easy to pass on the change in the raw material price to the price of the end products when demand and supply is stable but not fluctuating. However, demand and supply is forecasted not to be stable due to the Middle East and China. Also, it is a clearly visible trend that the oil price is tending upwards despite of the recent rapid drop. If the price of raw materials goes up without the stable demand and supply, the margin will fall down with a run. Therefore, the profitability of the industry is expected to be aggravated in 2009, and the trend will continue long at least by 2011 due to the imbalance of supply and demand and the difficulty in cost passing.

[Graph5] Ethylene-Naphtha Spread



[Graph6] LDPE-Naphtha Spread



Source: Hana Securities Research Center

The Global Restructuring In The Industry

We need to focus on three major forms of the global restructuring in the industry.

First, the Middle East's influence is now and will be increasing. As part of that, they started to buy the other petrochemical companies or establish joint ventures in addition to building complexes in their region and China. For example, Saudi Basic Industries Corporation (SABIC) acquired GE Plastics from General Electric Co for $11.6 billion in cash plus assumption of liabilities. The transaction will bring SABIC new markets and 30,000 customers worldwide. Besides, the Middle Eastern petrochemical industry plan to give variety to its products from solely the olefin series upstream to the aromatic downstream. Although the question about the possibility to succeed is not yet solved, but it can be considered to be the first sign of their huge effect.

Second, the western major players will try to dispose of their general products-related divisions. Instead, they will strengthen the technology based portfolios. For instance, Dow Chemical attempted to dispose of five polymer related divisions through establishing a joint venture with PIC (Kuwait) to which both of them contributed in half. Simultaneously, DOW bought Rohm & Hass, which is the leader in the technology solution and special chemical fields. This was just a beginning. Not only the American companies but also Europeans will tie into withdraw the business that has no technically distinct power.

Finally, the alliance of resources and market which means the cooperation between China and the Middle will be accelerated. The Middle East want to obtain more value-added from diversified products, and at the same time China want to grow its self-sufficiency rate without using their petro resources. For example, QP (Qatar) and SABIC concluded contracts with Sinopec, which is the Chinese largest petrochemical company, to build complexes in China. The competition between the two new players will be interesting.

[Table2] Major Petrochemical Industry Consolidation Landmarks

Year	Contract Contents
2008	ÅBASF agrees to buy Ciba for US$5.5bn ÅAshland agrees to buy Hercules Inc for US$2.6bn ÅDow Chemical agrees to buy Rohm & Haas for US$15.3bn
2007	ÅBasell agrees to buy Lyondell Chemical for US$12.1bn ÅSaudi Basic Industries Corporation (SABIC) agrees to buy Huntsman for US$6.5 ÅGeneral Electric agrees to sell its plastics division to Saudi Basic Industries Corporation (SABIC) for US$11.6bn
2006	ÅIneos agrees to pay £460m for Kerling polymers arm of Norsk Hydro ÅLinde bids US$14bn for BOC ÅBASF agrees to buy Degussa's construction materials unit for ú2.2bn
2005	ÅRAG buys 43% of Degussa from E.ON for ú2.8bn ÅBayer spins off its chemicals arm and part of its polymers arm as Lanxess for US$3.21bn ÅAccess Industries consortium buys Basell from BASF and Shell for US$5.7bn

Source: http://www.caslon.com.au

3. New Obstacles ï The Middle East

The Background of The Advent of the Middle East

When we analyze things about economy, we first analyze its supply and demand. The advent of the Middle East is about supply in the petrochemical industry. The Middle East firmly and incomparably has the cost competitive power with the help of the oil fields in their region, so they didnôt need to diversify their product portfolio in the past. However, they have to now.

The population growth rate of the region from 2000 to 2007 is 13.8%, which is relatively higher than the worldôs average, according to the survey conducted by the UN. The Baby Boom Age after the Iraq War which occupies a great portion of the population is now in their thirtyôs. Accordingly the unemployment rate is quite high. The mono culture of the region is now confronting the limitation, so they want to restructure their economy system which is highly exposed to the risk from the fluctuating oil price. Petrochemical industry in one of the easiest to start for them with the direct use of raw materials in the region. Petrochemical complexes themselves that produce not only downstream products but also highly value-added special products can solve the unemployment problems. Moreover, they allow the nations to raise the processing industry based on the competitive power of the petrochemical industry which brings about the additional job creation.

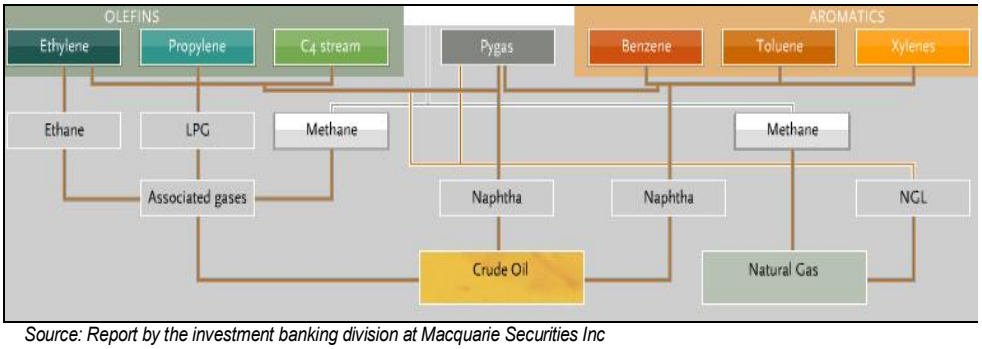
In addition to that, the Middle East saved a huge amount of money in proportion to increase of the oil price. As seen in the Graph 1, we can recognize that the oil price has been on the upward tendency despite of the recent drop. The increase of the Oil Money brings about and expansion of infrastructures, investments into government-owned companies and also overseas investments for technical advancement.

Even though the oil price dropped and it is not as high as in the last year, the government and petrochemical corporations in the Middle East will continue to put their oil money into the development of the petrochemical industry in order to win the superior position in the industry and to come to the ready to the coming crisis of the mono culture.

Cost Competitive Power of the Middle East

The reason why the Middle East could be a menace to the other players is quite clear and easy to think. It is because they have incomparable cost competitive power. When making olefins, three major upstream sources (ethane, LPG, and naphtha) can be used.`

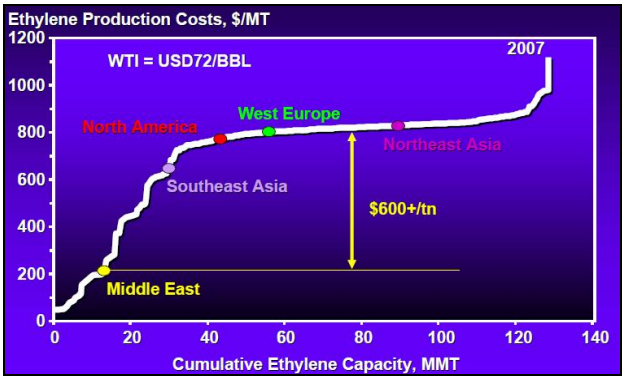
[Flowchart1] Summary Flow Chart of Petrochemical Production



Source: Report by the investment banking division at Macquarie Securities Inc

The Western and Asian petrochemical industries are mostly naphtha-based. The Middle East, however, takes advantage of ethane in production. The governments in the region have supplied the regional petrochemical companies with ethane at 0.75 to 2 dollars per mmBTU (mega million British thermal unit, 1BTU=1055.06J=0.252kcal) as a part of government subsidies. Compared to this, the average price of ethane in North America in 2007 was approximately 12 dollars per mmBTU. While the region was enjoying the advantage, the price of naphtha which is necessarily linked to the oil price was going up. Consequently, the disparity of cost competitive power between the Middle East and the other regions has been widened.

[Graph7] Ethylene Production Costs, ($/MT)



Source: Presentation by Steve Zinger at 2008 APIC-CMAI Annual Seminar

In the past, the major factor which decided the winner in the industry was the scale of a company or the target market size. In other words, if a company had a huge complex or a market whose demand is enough to make enormous profit, the company would be a winner. This is what has driven the growth of the Korean petrochemical industry. However, it seems different now. An offensive armed with the unparalleled cost competitive power from the Middle East is brining a shame to the others.

[Table3] Ethylene Production Cost by Raw Materials

Source	Ethane	Naphtha	Natural Gas
Cost($/(M/T))	161(29.3%)	550(100.0%)	650(118.2%)

Note : Parentheses refers to comparison with the ethylene production cost using Naphtha.
Source: Korean Development Bank Economy Research Center

Ethane is abstracted from the associated gas and the non-associated gas while developing an oil field. The ethane content in the associated gas is about 15% and that in the non-associated is about 5%. It is the fact that some of the Middle Easter countries, especially Saudi Arabia whose oil fields contain mostly the associated gas, are now running short of ethane gas due to the completion of large complex projects.

Nonetheless, the effect of the cost competitive power of the Middle East does not seem to come to the end. The current situation is that There are a variety of petro resources that the Middle East have such as the natural gas which consists of the heavy feedstock. With using those resources, it is possible to make things other than ethylene, which would further raise their production competitive power. They do not have large complexes to produce those things, so there seems no big problem for a short term. However, with Saudi Arabia as a center, the diversification of the heavy feedstock and downstream is under consideration in most of the Middle Eastern countries.

[Table4] Major Production Capacity Expansion in the Middle East

	Producers	Location	Products	Capacity(MT / year)	Timing
Ethylene	Equate	Shuaiba	Ethylene	850,000	Feb 09
	PetroRabigh	Rabigh	Ethylene	1,300,000	1Q 09
	SHARQ	Al Jubail	Ethylene	1,200,000	2009
	Total	-	-	3,350,000	-
Propylene	APPC	Al Jubail	Propylene	450,000	Mar 08
	JCP	Al Jubail	Propylene	150,000	2012
	NatPet	Yanbu	Propylene	420,000	2H 08
	PetroRabigh	Rabigh	Propylene	900,000	1Q 09
	Total	-	-	1,929,000	-
Polypropylene (PP)	Al-Waha	Al Jubail	PP	450,000	1H 09
	APPC	Al Jubail	PP	450,000	Mar 08
	NatPet	Yanbu	PP	420,000	2H 09
	PetroRabigh	Rabigh	PP	700,000	1Q 09
	Total	-	-	2,020,000	
Polyethylene (PE)	Equate	Shuaiba	HDPE	300,000	1H 09
	SHARQ	Al Jubail	HDPE	400,000	2009
	Q-Chem	Mesaieed	HDPE	350,000	2H 09
	PetroRabigh	Rabigh	HDPE	300,000	1Q 09
	Equate	Shuaiba	HDPE	300,000	1H 09
	SHARQ	Al Jubail	LDPE	400,000	2009
	PetroRabigh	Rabigh	LDPE	350,000	1Q 09
	Qatofin	Mesaieed	LDPE	450,000	1Q 09
	SEPC	Al Jubail	HDPE	400,000	2H 08
	SEPC	Al Jubail	LDPE	400,000	2H 08
	Total	-	-	3,650,000	
Monoethyleneglycol (MEG)	Equate	Shuaiba	MEG	600,000	
	SHARQ	Al Jubail	MEG	700,000	
	Total	-	-	1,300,000	

Source: Hana Management Research Center

4. Top pick ï LG Chem

The Diversified Portfolio

The product portfolio of LG Chem does not cover only the general petro chemical area, but also electronic materials and industrial materials. Others petrochemical companies such as Honam Petrochemical and Hanhwa Petrochemical are more exposed to the prospective risk originated from the Middle East due to their simplified portfolio. LG Chem, however, is relatively little exposed to the risk. Also, the diversified portfolio allow them to raise the competitive power in the industry which has discouraging prospects and is expected to be full of competitive mood.

Little Exposed to The Expansion of The Middle East

The market erosion risk come from the Middle East companies has been an issue recently. Even though many of them delayed their launching date, it is not permanent delay. Compared to the other petrochemical player, LG Chem is expected to be relatively less affected by the risk.

First, the proportion of the petrochemical division in the net sales and the operating profit is about 60%, but PE, PP, EG which will be influenced by the Middle East account for one-fourth of the petrochemical division.

Second, the technical competitive power of LG Chem weakens the risk. Even products which will be directly influenced by the Middle East are specialty grade products that the Middle East does not and cannot produce yet, so the profitability is fairly high.

Third, it is more possible that the middle eastern products will be exported to Europe rather than to Asia because of the weak cost competitive power and lack of supply in Europe. Also, as the project financing market in the Middle East shrank, the financing cost is increasing, which brings about the increase of the plant construction cost. Accordingly, the fixed cost like the depreciation cost is also increasing. In this situation, the companies in the region might pass on the increased cost to the price. Therefore, for short term, the shrink of the margin is not forecasted to be restrictive

The Promising IT & Electronic Division

LG Chem has a variety of businesses which is expect to develop. Specially, the IT and electronic division is now doing its best and bringing about good results. The division covers the areas of mobile energy, optical materials and electronic materials. In the mobile energy area, they produce both lithium-ion and lithium-ion polymer rechargeable batteries. Supply of Nokia and Motorola, the market share of LG Electronics in Europe and the demand for lap top batteries are increasing. Moreover, the fact that the price of cobalt which is the core raw material has dropped by about 30% compared to the peak in 2008 is one of the factors leading the improvement of profitability. In addition to this, the hybrid car battery area, which is not contributing much to the net sales, is expected to grow when the batteries are commonly used in the near future.

5. Appendix

[Petrochemical Production Flow Chart]