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DEVELOPMENTS OF THE CHINESE NITROGEN INDUSTRY

by

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by

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Good afternoon, ladies and gentlemen,

It is my honor to be invited by IFA Production and International Trade Committee to be here to present you the developments of Chinese nitrogen industry, which is the largest nitrogen industry in the world and probably the most complex and fast changing nitrogen industry too. I hope we can share our experiences and lessons through this presentation. My presentation includes the five following parts:

- Introduction
- Present Status of the Industry
- Features of the Chinese Nitrogen Industry
- Challenges of the Industry
- Outlook

Introduction

The nitrogen industry plays a very important role in the whole fertilizer industry in China. More than 500 nitrogen producers account for two-thirds of the total sales revenue, two-thirds of the total assets, one half of the total profit of the whole fertilizer industry. About 530,000 people are employed in the industry. In the flourishing era of the industry in the 1980's, there were nearly 2,000 nitrogen plants distributed in almost every counties in China. During the past 50 years, especially in the last two decades, China built a huge nitrogen industry based on the condition of insufficient natural resources, especially natural gas and chiefly domestic technologies. The nitrogen industry is actually the cradle of the chemical industry in China. Some of the nitrogen plants involved into large chemical bases and the industry today also possess 100% of the nitric acid production and 50% of the methanol production in China.

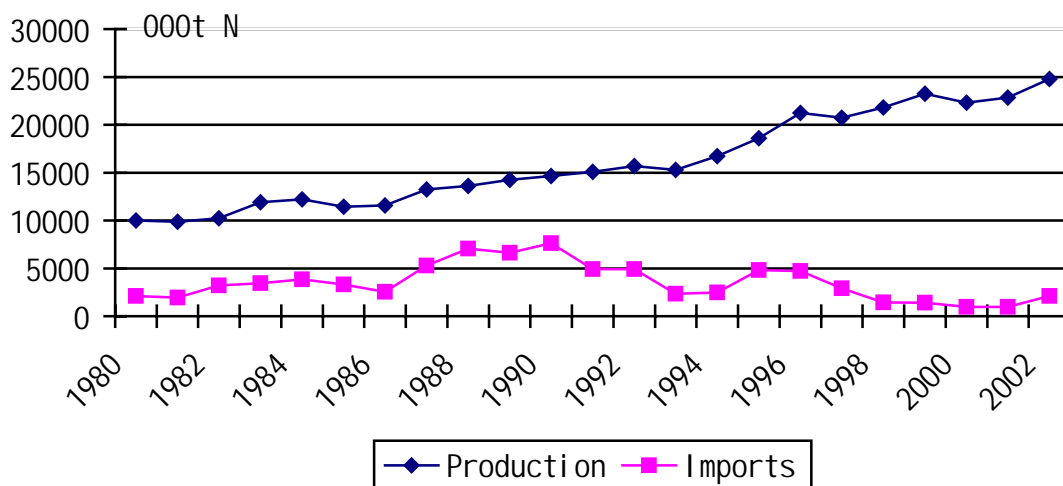
The development of the nitrogen industry in China also contributes a lot to the agricultural sector, by which the world's most densely populated country is fed. Thanks to the rapid growth of the domestic production in the 1990's of nitrogen fertilizers, especially urea, China's became self-sufficient in nitrogen fertilizers and the fertilizer prices also came down to acceptable levels to farmers and made it possible for the government to withdraw subsidiary gradually. Presently, the nitrogen industry in China is basically in a free market and competition has shaped the industry to be more efficient and stronger than ever before.

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In the beginning of the 21st century, the Chinese fertilizer industry met a lot challenges both from politic, economic and/or environmental aspects. This paper will address these challenges and outlook the future of the industry.

Present Status

Chinese nitrogen industry dates back to 1940's, and it developed very quickly in 1980's and 1990's. The following chart shows the Chinese nitrogen fertilizer production since 1980.



The domestic nitrogen production increased at a rather high growth rate, i.e. 4.5% per annum. At the same period, the imports decreased substantially from the peak level of 7.6 million tonnes to present 1~2 million tonnes (Mt) per annum. The 1~2 Mt was mostly from compound fertilizers such as DAP and NPK. Urea imports was not important in the market now.

With the production growing, the nitrogen fertilizer structure was gradually reformed; high-analysis fertilizer- urea has occupied a lion's share and production of low-analysis fertilizer Ammonium Bicarbonate (ABC) was reduced.

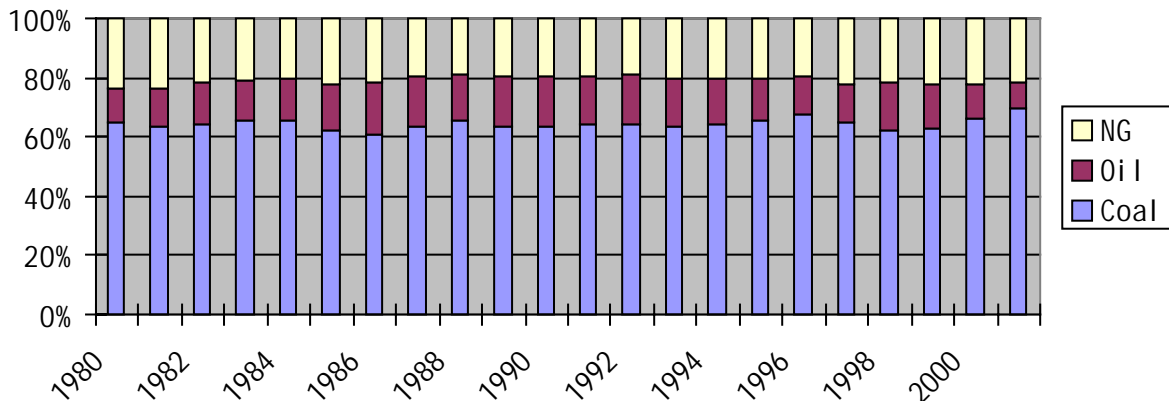
In 1988, the ABC occupied 60% of the total nitrogen production in China and that of urea was 31%. In 2002, urea output was 65% of the total nitrogen production and ABC was about 20%.

During recent years, due to the promotion of balanced fertilization, the production of compound nitrogen fertilizers also increased rapidly. Nitrogen in MAP and DAP has increased from nothing in 1984 to 0.8 Mt in 2002. And nitrogen in NPK also increased from nothing to 0.85 Mt in 2002.

Features of the Chinese Nitrogen Industry

Chinese nitrogen fertilizer industry was developed due to some special situations: first, Chinese energy structure is different when compared with most other countries. Natural gas resources are in shortage and the network grid is not developed in China. Even today's exploitation of resources in China's Western area and the East-West Gas Pipeline cannot ease the problem. Second, to save capital cost, Chinese nitrogen industry was mostly based on domestic technology and equipment, so the industry's plant scale is not very large and technologies used are not advanced. And the product structure is also different compared with other countries. China has produced and used ammonium bicarbonate, a low-analysis fertilizer of 17% nitrogen for a long time, and it occupied 60% in nitrogen production in peak time and today it even has more than 20% in the total nitrogen production.

- Coal-based plants: Coal plays a dominant role as feedstock in ammonia production.



We can see from the chart that the coal-based ammonia production was always more than 60% of the total and most of the coal is lump anthracite due to the gasification technologies. The coal is mined only in few places such as Shanxi, and distributed to almost all around China. This logistical system has a lot of drawbacks and transportation cost is high. This feedstock affects the cost reduction and competitiveness of the coal-based ammonia production. Some plants have been and will change to advanced coal gasification technologies such as Texaco and Shell to utilize the widely distributed coal resources, especially powder coal. Coal still occupies a lion's share in the ammonia feedstock for a long time.

- Oil-based plants were built mostly in 1980's and 1990's in the provinces where there is no natural gas for world-scale plants. In recent years, oil prices increased to a level that is deemed unacceptable for ammonia production. Therefore, some oil-based plants were converted to natural gas whenever natural gas is available and some will be changed to coal or petroleum coke. Oil-based plants will gradually disappear in near future.

- Natural gas is encouraged to be used for nitrogen fertilizer production in China. But formerly, as the infrastructure was not sufficient, natural gas-based plants were built in remote area. Now natural gas pipelines are under construction, a natural gas grid is being developed. However, due to economic reasons, the natural gas-based ammonia plants are still considered in remote area where gas prices are cheap enough.

- Medium and Small Plants Dominate

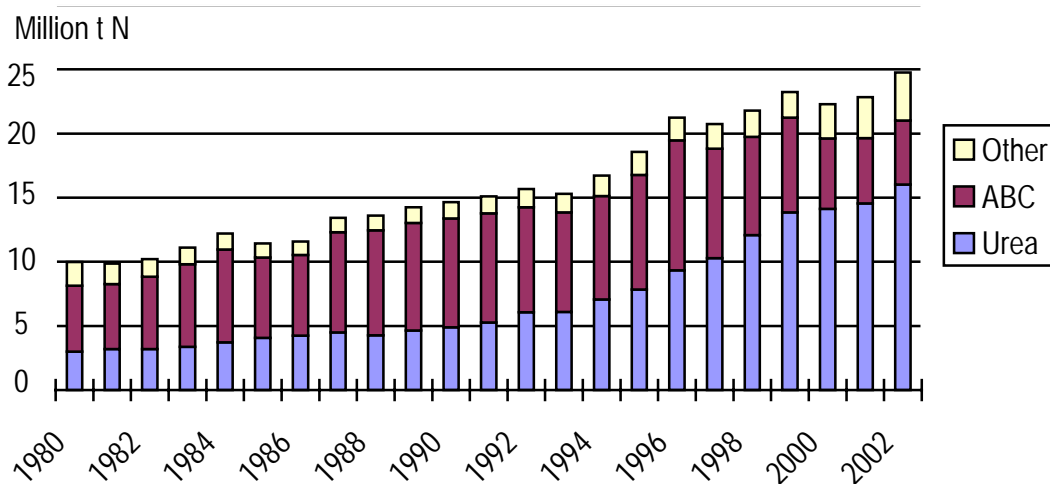
In China, there are only 26 world-scale nitrogen fertilizer producers (1,000 tonnes of ammonia per day). Other plants are all small and medium sized with smaller scales and lower efficiencies. During past decades, these small and medium sized plants kept expanding and/or de-bottlenecking and their scale and efficiencies have been improved greatly.

Today a medium-scale ammonia plant means 20 kt/a or above plants and 10 years ago, the threshold of medium plants was just 60 kt/a. That is reason why the total ammonia production is increasing while the number of ammonia producers has reduced substantially.

- Low-Analysis and Less Compound Fertilizers

In the Chinese nitrogen industry, most fertilizers are produced as single nutrient fertilizers while Ammonium Bicarbonate (ABC) was applied as the chief nitrogen fertilizer in 1980's and early 1990's.

The following chart shows the production of different nitrogen fertilizers.



Since the mid-1990's, thanks to the national strategy of conversion from ABC to urea in medium and small plants, the share of ABC to production was reduced to about 20% in 2002 and urea's share was increased to 65%. Other products' share such as compound fertilizers - MAP, DAP, NPK was also improved due to the balanced fertilization concept in recent years.

ABC's future production is very difficult to estimate as most ABC is produced in small plants that are very flexible; these plants may operate when market is good and stop temporarily when the fertilization season has passed. Generally speaking, the ABC's share will gradually shrink to the benefit of urea and compound fertilizers.

Challenges of the Industry

- Agricultural Situation

Chinese agriculture is undergoing a situation of restructuring from chiefly grain crops to more cash crops in the near future after China entered WTO. In some areas of China, especially in the export-oriented agricultural regions, such as Shangdong and Jiangsu Provinces, about 40% of the fertilizers is applied on cash crops and only 60% on cereal crops. If this transition is successful, nitrogen fertilizer demand will increase at a moderate rate.

With the government's policy to return cropland to forestry and grassland, fertilizer use in forestry, pasture and fishery is becoming the new potential area for an increase in the use of fertilizers in China.

Since beginning of 2003, the government is adopting new policies to increase the revenue of farmers; For example, the special cash-crop tax has been exempted since 2003. This measure will stimulate the intention of planting cash crops.

The transition of planting structure requires that the nitrogen industry not only produces high-analysis and compound fertilizers suitable for cash crops, but also enhances agronomic service to farmers.

- WTO Entry

The tariff quota system (TRQ) has been applied for fertilizers since China entered WTO in the end of 2001.

China's fertilizer import quota is as follows: (million metric tonnes products)

Year	2001	2002	2003	2004	2005	2006
Urea	1.3	1.3	1.8	2.3	2.8	3.3
DAP	5.4	5.67	5.95	6.25	6.56	6.90
NPK	2.7	2.83	2.98	3.12	3.28	3.45

After China entered WTO in the end of 2001, the Urea import quota will increase from 1.3 Mt in 2001 to 3.3 Mt 2006. The DAP quota will increase from 5.4 Mt to 6.9 Mt in 2006 and the NPK quota will increase by 5% per year, from 2.7 Mt in 2001 to 3.45 Mt in 2006. All these products contain nitrogen. Due to the domestic and international market situation, except for NPK, China has not exhausted its entire quota last year. In 2002 the fertilizer imports to China were 0.79 Mt of urea, 4.92 Mt of DAP and 2.83 Mt of NPK.

The fate of quota system is not clear after 2006. However, if the quota system is exempted after 2006, the nitrogen industry will face real international competition.

- Environmental Worries

The "Green Food" concept, a similar concept as "Organic Food" in western countries, is wide spreading in China in recent years. The Chinese Green Food Development Center, an organization under the Ministry of Agriculture, published a regulation on "green food" production. According to the regulation, there are AA and A grade green food categories. On AA grade green food, any kind of chemical fertilizer is banned, and on A grade green food, the use of nitrate nitrogen, such as ammonium nitrate, is banned. Some local governments have banned the application of nitrate-nitrogenous fertilizers according to a misleading concept. The Chinese nitrogen industry has made some studies and also lobbies the agricultural sector to show the safety aspects of nitrate fertilizers, but the result is not satisfactory.

- Political Reasons

Due to the government worries on the illegal explosive use of ammonium nitrate, the Chinese government banned the production, use and transportation of fertilizer grade Ammonium Nitrate in October 2002. The AN has to be converted to NPK or other non-explosive fertilizers.

While this policy only affects 0.5 Mt of nitrogen in China, it still has a huge impact on some producers and may possibly impact the NPK market if this AN is all converted to NPKs.

- Energy Supply Becoming Tight

Energy supply to the nitrogen industry is becoming tighter than before. Also, energy prices are increasing gradually.

China has been a large oil importer. In 2002 oil imports reached Mt. Oil prices are too to be accepted by fertilizer industry. Most oil-based plants will be reformed to coal or natural gas in coming years, and some have to be closed.

Natural gas prices are also increasing. China is building a new natural gas grid and more western natural gas will be supplied to eastern developed regions, where the natural gas prices are higher. The natural gas-based plants will face tight material supply in the future.

Coal prices also increased. Due to the banning on overload transportation and crackdown on small and unofficial mines, which has high explosion possibilities, coal prices from Shanxi have increased by about 50% since 2000. How to shift from expensive Shanxi coal to other cheap coal is another challenge for the industry.

Outlook of the Nitrogen Industry

In the future, the Chinese nitrogen industry will restructure to adapt to a new environment, in order to enhance the competitiveness of the industry. The nitrogen fertilizer production will increase at a moderate rate and the domestic nitrogen fertilizer market will be basically self-sufficient with some imports as supplement. Some key development points of the nitrogen fertilizer are as follows:

Reforming the Feedstock of the Present Ammonia Plants

A lot of large and medium-sized ammonia plants, especially those with a capacity above 200 kt/a ammonia that are based on expensive feedstocks, such as Shanxi anthracite or oil, will switch to local coal or convert to natural gas with modern gasification technologies such as Texaco or Shell. And normally, for medium-sized plants, the existing ammonia plants will be de-bottlenecked and modernized to world-scale standards. For large-scale plants near oil refineries, hydrogen will also be produced as by-product.

Some small-sized plants will also use domestic-developed coal gasification technologies to change their feedstock. But because their financial capability is limited, only some small portion will be changed.

This restructuring will greatly enhance the capacity and the competitiveness the medium and small plants.

Expanding the Large Fertilizer Plant Capacity

In the sector of large plants in China, 13 ammonia/urea plants were imported in 1970's. With the development of ammonia technologies, the existing facilities have a large potential to be expanded. So several large ammonia/urea plants are planning to be expanded by 50%.

Such plants including Yutianhua Co. in Yunnan Province, Lutianhua Co. and Sichuan Chemical Group in Sichuan Province, Daqing and Ningxia plant of CNPC (China National Petroleum Company) and etc. Most of these projects are under construction.

Building Some Large Ammonia Plants

The building of new large plants slowed down toward the end of 1990's due to the prevailing bleak urea market situation during that period.

Since 2002, stimulated by the better urea market, some large plants are proposed to be built in area with cheap natural resources, either natural gas or coal. These large projects include:

'000 t product per year	Capacity		Remarks
	Ammonia	Urea	
Dezhou Hengshen Chemical Industry Co.	300	520	
Benxi Chemical Group, Liaoning	300	520	Second-hand plant from South Africa
Ningxia Fengyou Chemical Group Co., Ningxia	400	700	Second-hand plant from USA
Xinjiang Kuche (Invested by Huajin Group, Liaoning), Xinjiang	300	520	Relocation of a plant from Eastern China
Yuntianhua Group, Kunming, Yunnan	500		To supply ammonia to Yunnan phosphate plants
Zhanyi Chemical Group Co., Yunnan	500		To supply ammonia to phosphate plants
Shanxi Jichen Lanhua Stock Co. Jicheng, Shanxi	180	300	Under construction
Shanxi Jinfeng Chemical Co., Jincheng, Shanxi	+180	+300	Planned
Tianji Group, Gaopin in Jincheng, Shanxi	300	520	
	360	600	

The feature of these plants is that they will all be built in the resource areas where cheap natural gas or coal could be supplied. Some will use second-hand facilities. Therefore the production cost of these plants will be low enough to compete in the international market.

Also as before, the medium and small nitrogen plants will continue improving their technologies and de-bottlenecking their existing plants.

In summary, it is predicted the nitrogen fertilizer industry will become stronger and healthier through a restructuring in plant scale, technology and feedstocks. On the other hand, small-scale plants will be gradually closed due to the competition of larger plants and ABC production will be reduced to a lower level. The Chinese nitrogen industry will continue to play a key role in the whole chemical industry in China.