

Les Européens vivront ensemble tout en préservant leur culture nationale. **Dans sa diversité, l'Europe pourra sa créativité.**

Les institutions de l'Union européenne seront allégées et travailleront sans être bureaucratiques. Au lieu d'une réglementation collective, l'initiative et la responsabilité individuelles seront favorisées.

Le marché intérieur sera pleinement réalisé et renforcera la compétitivité de la région économique dans la concurrence mondiale extérieure.

L'Euro sera une monnaie unitaire stable et représentera, en raison de son propre poids et du pouvoir économique de l'Union européenne, à côté du dollar US la monnaie de référence du monde.

Nous ne devons pas avoir peur de la mondialisation, ni de nos compétiteurs traditionnels et nouveaux.

**Si nous devons avoir peur, ce n'est que de nous-mêmes. Il faut que nous comprenions le changement en tant que chance et que nous trouvions la**

**force de nous adapter aux changements.**

Je suis plein d'espoir concernant le site Europe et l'industrie chimique européenne et je fais confiance à nos atouts. Si nous nous y attelons vraiment, nous ferons face à ce défi.

C'est en pensant à cet espoir que je souhaite à l'École de Chimie de Mulhouse et à l'université de Haute-Alsace, et surtout à leurs jeunes universitaires, beaucoup de succès à l'avenir.

## Chemical industry globalisation. Asia-Pacific emergence



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As a professional chemist, I take a great pleasure to be here to celebrate the 175th founding anniversary of a world renown and excellent school of chemistry. Moreover, it's indeed a great honor for me to be a part of the program for celebration. Mr Wolf has just presented a very interesting description of the chemical industry in Europe and how the industry is going. Here I'd like to bring your attention to the Asian-Pacific region. About twenty years ago, **an economical miracle began to happen in the so-called Four Tigers of Asia**, namely, Taiwan, Hong Kong, Singapore and South Korea. These countries have become very affluent and rich and successfully transferred themselves into so-called devel-

oped countries. Recently, a **second wave of economic development** in this region including China, Malaysia, Thailand, Indonesia and many other nations appears to happen in the same way, may be as spectacular as the one before. Therefore, some analysts begin to say that **the XX1st century shall be the century of the Asians.**

If you examine the factors of success in these countries, you quickly find there are some common elements. The first element would be **the export of consumer products** to the western countries, produced with their **inexpensive labors**; and the second element of their success would be the **growth of the chemical industry** to support the production of consumer products for export. Because they are very successful in their economic development, their living standard has improved, and the wages increased.

As a result, they can no longer do what they have been doing. So these

little tigers begin to restructure their chemical industry and the general conclusion may be diversification, internationalization of their business. So, in my presentation, I would like to use the **development of petro-chemical industry** in Taiwan as a case in point and talk to you about my company as a specific example. The *figure 1* shows a map of the Asian Pacific region.

Now I'd like to quickly review the development of the chemical industry in Taiwan. In 1945, after World War II, Taiwan then was very much an agricultural land, so there were only skeleton production of basic chemicals and the production value was very little. From 1958 to 1967, Taiwan began to produce export products. So the chemical industry began to produce some needed chemicals for import substitution. Again the value was small. But starting from 1968 to 1975, there was initial

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Figure 1 - Asian Pacific region.

petro-chemical industry development and the production value then was 750 billions NT\$. Then the petro-chemical industry really took off from 1976 to 1988 and the production value was 1,000 billions NT\$. From 1989 to 1993, there was a restructuration of petro-chemical industry and the production value went to 1,200 NT\$. From 1994 to present, this is a period of renewal with the production value of 1,340 NT\$.

Let me now quickly describe how the chemical industry was developed in a land of practically no natural resources. First of all, in a **poor country**, all you have would be **inexpensive labor**. What do you do? You say, well, I use this labor to make clothing, garments, shoes for export. So in the **apparel industry**, you buy a lot of sewing machines, you start making clothing and you export. And soon you find out that you need fabrics and then you begin to build the **textile mills**. When you start weaving the fabrics,

you say beside cotton, maybe I can make some **chemical fibers**. Good example could be polyester and then you need ethylene glycol and pure terephthalic acid and these could be produced if you have the **petrol refineries** with a fraction called ethan and if you can crack it into ethylene and other monomers. Indeed, this is how chemical industry has been built. Some economists call this development **backward integration**. Taiwan did this very successfully.

First of all, there was a development of totally integrated industry and initially there was no technology and all the **technologies were transferred or licensed from the western countries**: USA, Europe and some were from Japan. Typically the licensors and some engineering companies would go to Taiwan and build a factory, which was called the « **turn-key** » process. That means that they build a factory for you and give the key to you and teach you

how to operate it. But the Taiwanese workers, after they learned how to operate the plant, eventually they developed the **ability to improve the process** of the debottle-necking capacity. **Because Taiwan is a small place, there is a close cooperation between the up, mid, and down-stream industries** to make it a success. During these twenty-some years, the government was strongly supporting the effort. Before Taiwan was noticed by the western countries, the government was helping the industries by banning import, by giving tax leveling so to nurture the growth of the industry. Lastly but not leastly, there was an abundant **supply of very-well educated and highly motivated people**. Taiwan has always had a very good school system and people were very diligent and worked very very hard.

Concerning the magnitude of the petro-chemical and related industries in Taiwan (*table I*), I have chosen three time periods: 1985, 1990 and 1995, and you may see on that chart the contribution of the petro-chemical industry to the allied industries, the total value of the manufacturing sector and the fraction of petrochemical related industry as the percentage of the manufacturing sector. You might be surprised to see that this percentage is decreasing but the absolute value is still increasing regardless how big the absolute numbers might be. It still amounts about 30 % of the total manufacturing industry and right now is 1.8 trillion Taiwan dollars. You may see on *table II* some benchmarks of Taiwan's chemical industries. Ranking n° 1 in the world in 1993 was **ABS plastics**, the engineering plastics. Taiwan made 701 millions in US \$ in 1993, then amounted **15 % of the total world share**. The **polyester fiber** was also n° 1 with 1,3 billion US \$ and **29 % of the total world share**. Now, after 20 years, Taiwan is relatively affluent and the **petro-chemical industry now faces problems**. One of the problems is the **cost of land** which is very high now, and becomes a very significant part of the investment. In addition, it used to be that people welcomed a factory next door because it creates jobs and it brings prosperity. Now people begin to worry about why your **smoke**

**Table I** - Product values of petrochemical related industries in Taiwan.  
Unit : Billion NT \$.

Industry	1985	1990	1995
Textile	339	354	380
Wearing apparel	88	83	54
Chemical materials	259	311	670
Chemical products	67	105	151
Petroleum & coal products	200	139	208
Rubber products	51	59	65
Plastics products	266	322	331
PC related industries	1,270	1,373	1,859
Manufacturing sector	3,196	4,370	6,061
<b>PC related industries/ manufacturing sector (%)</b>	<b>39.7</b>	<b>31.4</b>	<b>30.7</b>

**Table II** - ROC's chemical status in the world (1993).

Rank	Items	Sales volume (million US \$)	Share (%)
1	ABS	701	15
1	Polyester fiber	1,330	29
1	PU leather	---	42
2	PTA	921	18
3	Phenyl glycine	7	18
4	PS	395	9
5	PVA	74	10
5	PVC	659	6

is dark and why do I smell funny things.

Also an **insufficient supply of locally produced raw materials** is becoming a problem because the relocation of the labor-intensive down stream industry is happening to south-east Asia and to China. The original nice integrated structure has been shuttered and also the country becomes more liberalized and open and there is no protection any more. It is also very difficult now to license the key technologies.

Under this environment, I would like to quickly introduce to you my company : **China Synthetic Rubber Corp. (CSRC)**. This company was formed in 1973 and the original intention was to make synthetic rubber but we end up making the important additive to rubber called **carbon black**.

Carbon black is just a dark powder which is made with incomplete combus-

tion of some residual oil of petroleum compound (coal tar, etc.). This powder is very important for reinforcement of rubber, the product you are familiar with is the **automotive tires** which contends 30 % of carbon black and absorbs about 90 % of carbon black production. There are also some additional markets such as hoses and tubings and valves, seals, printing inks, coloring plastics, etc. The important properties of carbon black are the particle size, particle size distribution, surface morphology and chemistry of these particles and structure of the agglomerates. I have to mention that the world foremost authority in the fundamental study of carbon black is here in Mulhouse. Professor J.-B. Donnet is the world renown authority in this regard.

China Synthetic Rubber Corp. licensed carbon black manufacturing technology from a US company called Continental Carbon, built a factory and

started up very poorly and made only 1,000 tons. By about 1981, its sales volume reached 20,000 metric tons and started making money and quickly it doubled again its production. In this period of 1977 to 1985, Taiwan's rubber industry grew because it primarily produced small tires for bicycles and motorcycles and eventually **Taiwan was called the Kingdom of Small Tires**. By 1986, China Synthetic Rubber Corp. was very successful and became a public company and listed in Taiwan's stock exchange. All of a sudden, it found itself having a lot of capability for investment.

By 1989, the board instructed the management to say « we are a **single-product company** and we may not weather very well in the economic cycle, **please diversify** ». So the management team worked very hard and identified a trend for diversification, namely to go into the **pharmaceutical raw materials**. Initially, the management team wanted to produce everything in Taiwan, then it turned out to be not very economical. Then it changed the way of thinking. They say « why we don't do it outside Taiwan ». Then they decided to look into making a raw material called penicillin G. This is a raw material for producing antibiotics. When this proposal was accepted, then the CSRC management team learned that a penicillin factory in the UK was on sale. They purchased the plant. This plant is in the north of London. They produce about **10 % of the total world supply of penicillin**. Since it was taken over in 1992, we have expanded its production by 30 % and it has been profitable for the last 5 years.

I just would like to comment on how this overseas acquisition was managed. First of all, we kept all the local people. We sent them only a retired American Chinese to be the managing director. He did a fantastic job in establishing trust, because you have to realize these British people did not know who the new owner was (little did they know where Taiwan was). So **establishing trust is very important**. Because their factory was sold, these workers were very pessimistic. So we had to **give them hope and vision**. We told them that penicillin was very important. Maybe it is not important in Europe but

it is very important in Asian-Pacific, in China. Then of course, our managing director injected some **Chinese culture**, like : **frugality, working very hard and sharing the profits** all the way down to the operating work force.

About 3 years ago when we examined our core business, namely carbon black, we felt that this product, though 100 years old, still had a very strong future in Asian-Pacific region specially in south-east Asian China. In order to develop it, we need to own the production technology. By then, we were very happy to find out that our licenser, Continental Carbon which was a part of Witco Corp. was for sale. So, we tried very hard and **purchased Continental Carbon Company** which has three manufacturing sites in the United States. Based on our previous managing experiences, we set this Continental Carbon Company which was a division of Witco Corp. into a self-standing company. We put in it a financial department. We **strengthened its engineering and research**. We had to hire lawyers because it is a company in the United States. As we felt deeply that we need local talents, we promoted the general manager of the division into company president.

We have been so successful with the overseas Chinese managing director so I was assigned half time to overlook this operation. Now, Continental Carbon Company has been with us more than two years, we have expanded the production capacity by 20 % and it has been doing very well. So my colleague the other day put together a world map and put our operations together and we found out that we have operation in Taiwan, in England and in the United States. Somobody says : « Wow, the son never sets over us ».

What has this overseas investment and diversification done for us ? The year I joined China Synthetic Rubber Corp. in 1992, we only had the English operation then. Our consolidated sales revenue was 83 million US \$. By last year, our total consolidated income has nearly tripled to 222 million US \$. The Taiwan operation is becoming only a fourth of the total pie and these acquisitions have not only contributed to our sales revenue but also to our profit.

To our surprise, last November, the famous business magazine *Forbes*, in its November issue of 1996, listed 200 best small companies in the emerging world and we were just very happy to find out that we were listed as one of the best 200 based on our performance and our size.

So now when I stand in this podium and look at the title of the symposium which is « the young chemists and industry in transformation », I can not help but looking back when I was a young chemist some 30 years ago. The recollection is still vivid. The moment come to my mind is when I successfully defended my Ph. D. dissertation. At that moment, I had a feeling that I had a very good knowledge of the fundamentals of chemistry. Very soon I found out how mistaken I was. For example, I used a technique called continuous wave NMR spectroscopy to do my work. A few years later, that was largely replaced by a technique called **Fourier transform NMR spectroscopy**. As I look back three decades ago, the invention of Ziegler-Natta catalysis which led to two major plastics of high density : polyethylene and isotropic polypropylene, was a revolution and one thought that would not be topped by anything. But in the last few years, there is an emergence of so-called

metallocene catalysis which promises high purity in the polymer synthesis, not only in terms of chemical composition but also molecular weight.

Thirty years ago, it would be beyond my wide dreams to think that I might be living in Taiwan, Taipei, and be responsible for operations not only in Taiwan but also in the United States and United Kingdom.

Then to my young colleagues in the audience, I urge you never stop to dream. Because only with dreaming, there is a hope. With dreaming, there could be goals and objective in life to drive for. Secondly, **be well learned in your chosen field, namely chemistry**. You have to update your knowledge in all aspects of chemistry. By this, I mean not only the academic aspects but also know how this great discipline of science is applied to many aspects of our daily life. Thirdly, you should **master at least more than one foreign language and learn to appreciate the foreign culture** in order to live in this world which is continuously shrinking and we call it a global village. Lastly but not leastly, don't be afraid to take some risks in your life such as changing jobs, career, relocation of families. You may view these risks as a part of your investment in life. You may be surprised by the so called high risk/benefit ratio. Maybe 25 years from now, some of you will be attending the 200th anniversary de l'École de Chimie de Mulhouse. By then, I'm quite confident you will be marveling the many changes in chemistry, like I'm doing now. I hope, it is my sincere hope, that you'll also have a feeling that you have striven very hard to overcome the difficulties, to meet the challenges, to capitalize the opportunity and have lived a rewarding life.



De g. à d. : A.E. Fischli (président de l'UIPAC), J.-P. Fouassier (directeur de l'ENSCMu), G. Binder (président de l'université de Haute-Alsace).

