

APPENDIX-F

IMPROVEMENT OF EXISTING INDUSTRIES

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APPENDIX-F

IMPROVEMENT OF EXISTING INDUSTRIES

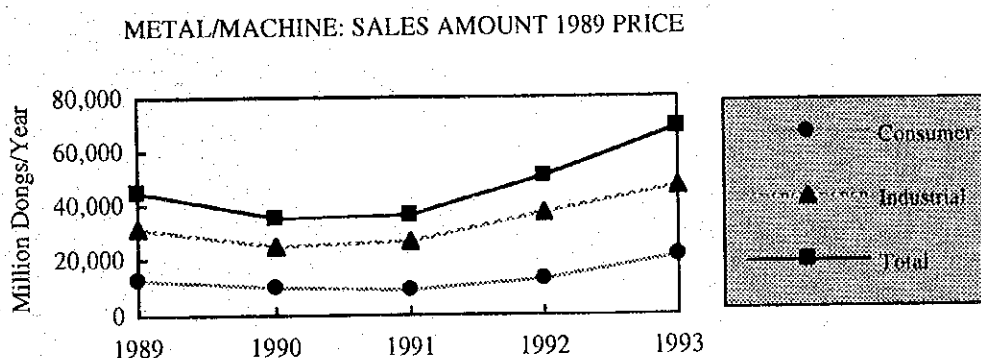
F.1 Machinery / Metalworking Industry

1) Current Situations

The Hanoi area has traditionally been a center of machine industry in Vietnam. There are more than 60 enterprises which manufacture various kinds of machines and equipment. The machine industry yields about 350 billion dong of products and employs about 14,000 workers in Hanoi. The industry was seriously affected by the governmental policy change from emphasis on production goods to consumer goods. The industry reduced its employment and has struggled to survive.

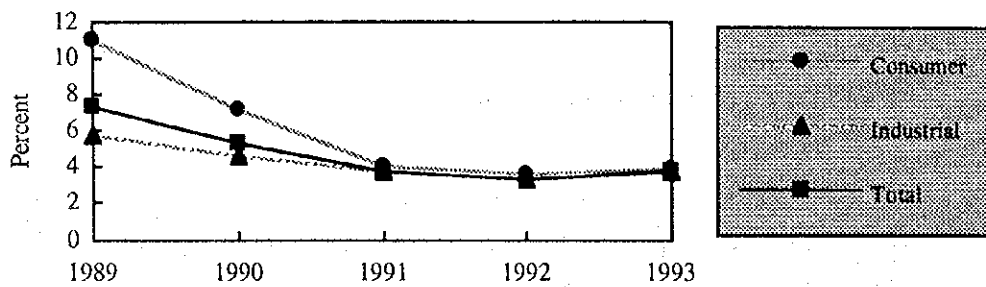
Among the 61 enterprises which responded to the questionnaire survey conducted by the Study Team, 39 enterprises reported sales amount and profit before tax of 5 years between 1989 and 1993. These data have been analyzed.

After 1989, the machine industry went through a slight depression, but it has recovered its sales since 1991 as shown in the figure below.



However, profit per sales went down to a marginal level in 1992 as shown in the figure below.

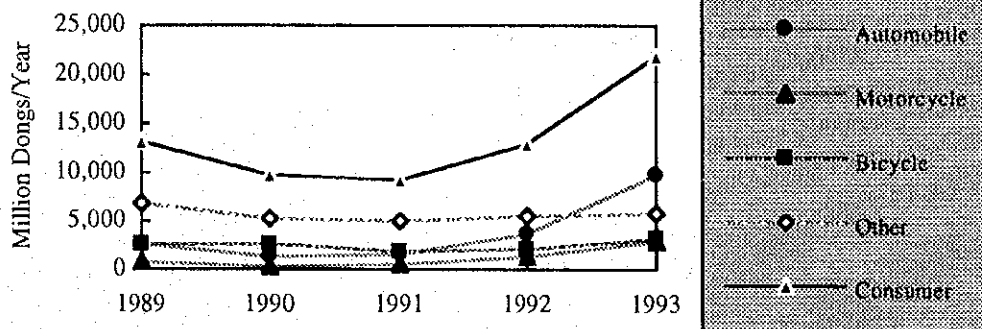
METAL/MACHINE: PROFIT PER SALES



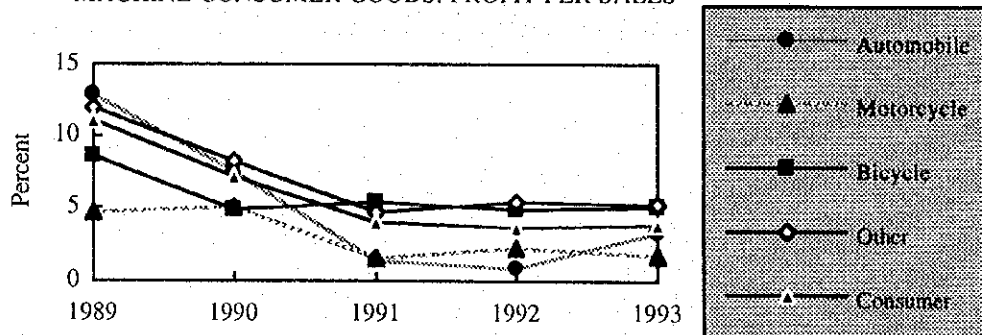
The profit drop of consumer goods producers was steeper than that of production goods producers, but both profit levels approached nearly equal levels after 1991, as a result of hard competition among enterprises.

The consumer goods producers consist of 5 automobile, 1 motorcycle, 3 bicycle and other 5 enterprises. Performance of these enterprises is shown in the figures below.

MACHINE CONSUMER GOODS: SALES AMOUNT 1989 PRICE



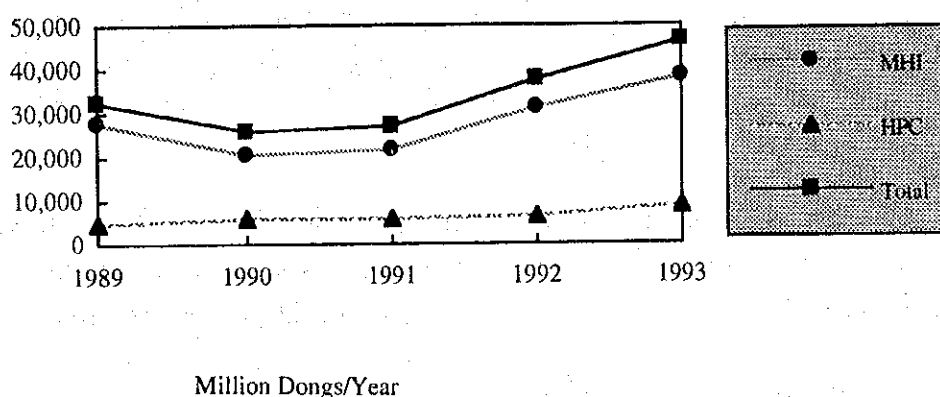
MACHINE CONSUMER GOODS: PROFIT PER SALES



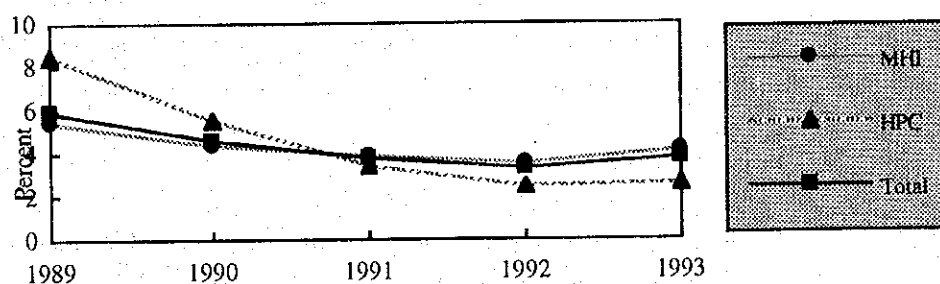
Among consumer goods producers, automobile and motorcycle producers have increased their sales; however, in the rest of the enterprises, sales have not changed. The automobile industry shows recovery of profit after 1992, though the trend is still difficult to affirm.

Among the industrial machine and equipment producers, 18 enterprises which are operated by MHI and 7 enterprises operated by HPC, reported their 5 years sales and profits. Performances of these enterprises are shown in the figures below.

INDUSTRIAL MACHINE: SALES AMOUNT 1989 PRICE



INDUSTRIAL MACHINE: PROFIT PER SALES



These enterprises are typical production goods manufacturers. Their sales have been gradually recovering since 1991, though profit per sales decreased to a minimum in 1992. Enterprises operated by HPC have more serious problems than enterprises operated by MHI. This is attributable to the fact that enterprises operated by HPC are smaller in scale.

2) Major Constraints of Machinery / Metalworking Industry

(1) Low productivity

The machine industry is basically a high added value creating industry, because the industry produces sophisticated machinery and equipment from simple metal. However, the machine industry in the Hanoi area creates an annual net product of only 9 million dongs per employee, which is about 1/200 of the corresponding industries in the industrialized countries.

(2) Operation rate of facilities

An apparent cause of low productivity is the low operation rate of facilities, which is assumed to be less than 20 percent. Insufficient work may be one reason for the low operation rate; mismatching of production and facilities may be another reason.

(3) Abandoned machines and materials

There are many abandoned machines and materials in every factory. They disturb a smooth flow of production. Probably, the factory manager has no power to remove these things from his factory, because they are the property of the Government.

(4) Inferior working conditions

Insides of the factories are too dark for workers to operate machines. Lighting is generally poor, causing considerable difficulty for the workers. It is noted further that the factories have no air conditioning; then electric fans are used, but ventilation is generally ineffective. Many factories do not have floor pavement, so that these factories are very dusty, and contamination of work and machine tools is serious.

(5) Machine arrangement

Machines are generally arranged by function in a factory; similar machines are gathered in the same corner of the factory. This system is convenient for production of small quantities. However, in order to compete in the world market, Hanoi's machine industry will have to convert to mass production, so that machines should be arranged in accordance with the production process.

(6) Subcontract system

There is almost no subcontract system in the Hanoi area. A large obstacle to develop such a system is the turnover tax. Another obstacle may be the responsibility

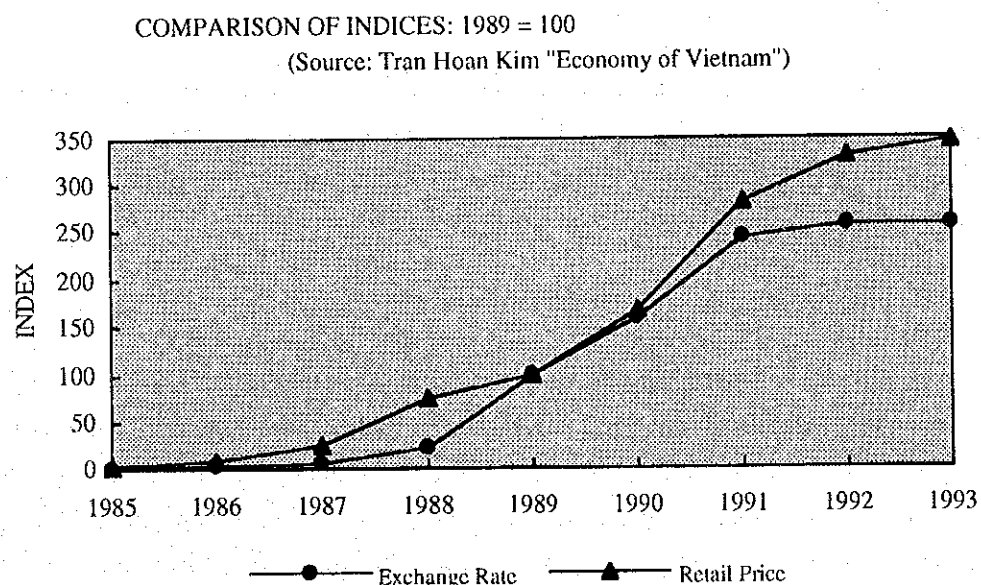
for quality assurance; the manager feels responsible for every part of the product manufactured by his factory from raw material to completion. However, this feeling is quite wrong or at least out of date.

(7) Arrangement of workshops:

Contrary to the general system of industry, each enterprise adopts a divided work system as an internal organization. In many cases, a machine shop and an assembly shop are under separate roofs. And workshops are arranged at random. Consequently, the transportation lines are long and complicated in the factory yard.

(8) Foreign exchange rate

As shown in the figure below, US dollars appear to be under-valuated if compared with the increase of retail price, which makes export difficult and import easy.



Comparison of Retail Price Increase and Valuation of US dollar

Vietnamese exports depend on agriculture and fishery products and imports rely on industrial products. In this context, the machine industry received a favorable effect by the exchange rate in 1989, however the gap between retail price increase and US dollar value had an adverse affect since 1991. This situation has favored industries depending on SKD or CKD since 1990, because they import more than other enterprises.

(9) Government control

Many enterprises in the machine industry are operated by MHI. However, many other enterprises are operated by other ministries. For example the Ministry of Transportation operates automobile assemblers, the Ministry of Forestry a wood processing machine maker, the Ministry of Water Resource a pump maker, and so on; these enterprises are not under the control of MHI. In this situation, it seems difficult to form a unified national development policy for the machine industry.

3) Proposed Improvement of the Machinery / Metalworking Industry

(1) Improvement in Management

a) Divided work system

Establishment of a divided work system is strongly recommended for the machine industry.

b) Reform of management

Improvement of productivity depends largely on the management of the enterprise. Many experiences show remarkable improvement of productivity after change of top management. The management should ensure discipline of workers in the factory and keep the workshop clean and orderly.

c) Privatization and government reform

The Government should not be an operator in the market, but should be responsible for the public interest. MHI is suggested not to operate any enterprise, but to concentrate on leading the reform of the machine industry by administration. In this case, all industries including those presently operated by various ministries, by local governments and by private companies, should be under the unified administrative control of MHI. Further, the existing turnover tax should be transformed into a value added tax, as discussed in Appendix-B.

d) Utilization of engineers

A strong point of the machine industry is that it has a large number of highly educated technical personnel. Their efficient utilization for the improvement of productivity is an important task of the management. This personnel should be utilized for the development of new designs, development of engineering, quality control, production control, and so on, which are major factors to enhance productivity.

e) Feasibility study

Vietnam has limited financial resources, and the banks and enterprises should train their staff in investment evaluation. At least, feasibility studies or pre-investment studies should be carried out by the staff before making actual investments.

(2) Improvement in Raw Materials and Processing

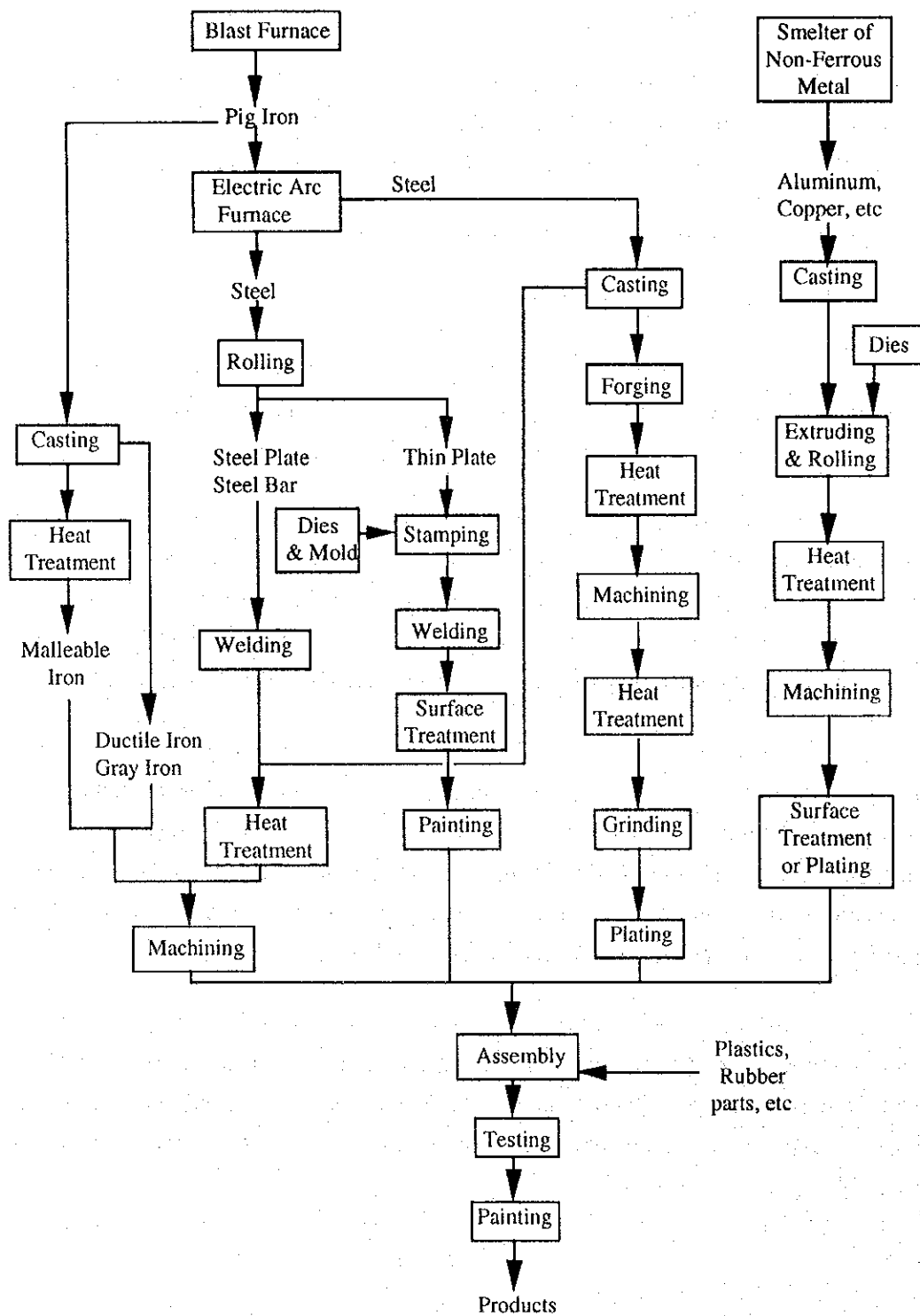
a) Raw materials and processing

The metal/machine industries use steel and iron as main raw materials. In addition to these, many non-ferrous metals such as aluminum and copper are used, and also various kinds of plastics and rubbers are incorporated in fabricating machinery.

Iron is produced from iron ore using blast furnaces. Vietnam has iron ore, however it is not well utilized for iron production, because the existing capacity of blast furnaces is small. Vietnam is increasing the capacity of its electric arc furnaces and rolling mills. About 270,000 tons of steel are produced annually by domestic rolling mills, but the total demand for steel was reported to be 800,000 tons/year in 1994.

Demand for non-ferrous metals and alloyed steel such as stainless steel is also increasing in Vietnam, however these metals are imported or utilized by recycling. The Vietnamese metal/machine industry is heavily dependent on imported materials. In the long run, Vietnam has to utilize its natural resources more effectively, however in the short run, domestic demand for steel and non-ferrous metals is too small to expand blast furnaces and to create a metal smelter on a viable scale.

The machine manufacturing procedure is complicated, as illustrated in the diagram below. Hanoi's machine industry is more dependent on cast iron than welded fabrication, if compared with other countries. Each factory contains all of the necessary processes to manufacture a machine, and consequently each facility is too small and of inferior grade in most cases.



Materials and Processes of the Metal/ Machine Industry

Compared with other ASEAN countries, Vietnam has more experience in manufacturing machines. It is noted, however, that Vietnamese technology requires a

great deal of improvements in order to meet the quality standards in the international market.

b) Welding

Welding is a popular technology in modern machine production, however the Vietnamese machine industry is not familiar with modern welding technologies. CO₂ welding has already been adopted by a company in Hanoi, but it is not yet popular. This method improves welding efficiency 2 ~ 4 times, if compared with conventional welding. Submerged welding is used in only one factory in Hanoi. This method considerably improves both quality and speed of thick plate welding.

In order to weld stainless steel, aluminum, titanium and so on, inert gas welding methods such as MIG and TIG should be introduced. These methods use argon gas, but argon gas is not available in the Hanoi area. Argon is separated from air as a by-product of oxygen production, but the existing local oxygen producer has no facilities to separate argon. It is recommended that the existing producer import argon gas for the moment and separate argon from air in the future. Adoption of modern welding technologies instead of casting, bolt fastening and riveting will considerably improve productivity and at the same time save a substantial volume of materials.

c) Plate cutting

Steel plates are cut manually by gas torch in the Hanoi area. Plasma cutting is an advanced technology enabling to easily cut not only steel but also other materials such as stainless steel. This new method combined with numerical control machines, will substantially improve cutting speed. In order to improve productivity, enterprises are recommended to introduce this cutting method in the future.

d) Casting

Iron and steel casting is a popular technology among machine industry enterprises in Hanoi. The quality level of their products varies. Some are good, but others are crude. However, if and when foundries are merged and their technology is concentrated in one or two foundries, the technological level could be raised to one of the best in Southeast Asia. Mechanization should be introduced in new foundries for better quality and efficiency.

There are several small electric arc furnaces in the Hanoi area; however, they do not have enough work to operate continuously. In order to reduce imports, these electric arc furnaces should utilize scraps abandoned locally for recycling. Introduction

of larger electric arc furnaces and steel rolling facilities is also recommended to supply steel materials locally by recycling local scraps.

e) Plating

There are several small plating shops attached to machine factories. These plating shops are too small to be equipped with environmental protection equipment. It is desirable that the existing small plating shops be separated from the enterprises and merged into one or two shops which are large enough to have waste water treatment facilities. Plating shops, as well as foundries, can be modernized by introducing a divided work system.

f) Painting

Painting shops cause environmental pollution with toxic waste solvents. Therefore, it is recommended that small painting shops to be separated from the enterprises and merged into one or two painting shops of large size enough to warrant an environmental protection system.

Pre-treatment of metal surfaces before painting is important for durable painting; however, this process is neglected by all painting shops in Hanoi. Surface rust should be removed by sandblasting or shot blasting, and oil on the surface should be removed with solvents. Existing small painting shops, except automobile assemblers, find it difficult to establish facilities for pre-treatment, so specialized painting shops with adequate pre-treatment facilities should be established.

g) Surface treatment

Surfaces of thin metal should be protected from corrosion. A popular method is the chemical formation of a thin protective film on the metal surface. A typical example is anode oxidation on an aluminum surface. The film formed by this method is hard and electrically insulated, and it is corrosion protective. There are no facilities for anode oxidation in Hanoi, so aluminum products made by Hanoi's industry are generally thick and easy to corrode.

There are several kinds of surface treatment technology available, depending on the purpose and the type of metal. Surface treatment is also important in forming a good surface for painting. In order to raise the quality standard of products, surface treatment should be introduced in the Hanoi area.

h) Sheet metal stamping

Machine tool makers produce small mechanical presses for stamping in Hanoi, and local enterprises use these machines for the production of motor and transformer cores. The mechanical press is now considered to be an obsolete machine tool of low productivity and modern factories have highly efficient automatic transfer press lines. It is noted, however, that small mechanical presses are still useful for the production of small pieces in small quantities. Therefore, one or two comparatively large scale enterprises specialized in press work should be established with transfer press lines for the mass production of large pieces such as automobile bodies and doors, refrigerator bodies, washing machine bodies, etc. Small presses should be sold out to small enterprises which produce small pieces such as washers, cans, brackets, etc. These factories should form a part of the proposed divided work system.

i) Dies and molds

Sheet metal stamping requires dies and molds. Although large precision dies and molds cannot be easily produced in Vietnam at present or in the near future, small dies and molds can be manufactured in the Hanoi area.

Dies and molds are made of extremely hard metals using electric spark cutting. The design and manufacturing of dies and molds will require special know-how. It is recommended to set up an independent company, specialized in die and mold making, because the volume of die and mold making work is too small to maintain a high level of know-how if it is carried out separately at each enterprise. A national institute in Hanoi has already started an experimental workshop for die and mold making. Such workshops should be expanded and spun off as private companies.

j) Heat treatment

Heat treatment is an important process to utilize materials effectively. There are several sorts of heat treatment according to the process.

Cast parts and welded fabrications are annealed in a furnace in order to relieve stress inside the material caused during casting or welding. If this process is omitted, products may deform, due to internal stress or deteriorate with minimal force. Large pieces must always be treated by stress-relieving heat treatment. In order to enter into the industrial machine market, machine makers must house annealing furnaces of an adequate size.

Casting and forging involve heating to normalize material structure, and in certain cases, hardening by quenching and tempering. These processes require strict temperature control in the heating furnace. An electric furnace with automatic temperature control is essential for these process. For an important machine element, adequately heat treated killed steel must be provided. In cases of small pieces, case hardening is carried out, in order to realize high hardness on the surface and good internal strength. Carbon case hardening has been common for many years. However, nitrogen case hardening, especially nitrogen penetration to the metal surface by a salt bath, is becoming more popular. For surface hardening, steel selection is important. It is recommended to create specialized enterprises in this area.

(3) Development of Specific Industrial Branches

a) Foundry industry

Foundries in the Hanoi area have the possibility to develop as casting product suppliers to ASEAN countries and even to Japan, when they are merged into one or two specialized foundry enterprise(s) and if adequately improved.

At present, foundries produce cast iron and cast steel. However, each foundry's production is small and material quality of products is of the lowest grade. In the case of cast iron, it is graded as JIS FC10 or equivalent. Every foundry lacks necessary equipment to test material composition, hardness and strength. Consequently, the foundry cannot properly test material quality. Adequate testing equipment should be provided, including:

- Spectroscopic analyzer with computer and printer for metal components
- Universal testing machine for tensile strength of materials
- Microscope for metal surfaces
- Hardness measuring instruments such as Rockwell tester and Vickers tester
- Ultrasonic tester and magnetic tester for detecting defects

Gray cast iron is used for cylinder blocks in automobile engines, beds of machine tools, pump casings, etc. However, FC10 is not recommended for use as a material in a machine element, because of its weak strength. The foundry should produce at least FC15 and much better material classes upon requests.

Malleable cast iron is used for valve bodies, pipe connections, cylinder liner of automobile engines, etc., which require stronger material than gray cast iron. Malleable cast iron is produced by a heat treatment process after casting.

Ductile cast iron has become popular for use in automobile engine crank shafts, rollers of steel mills, water ducts and various other machine elements. The material has a comparable strength to carbon steel and has the good characteristics of cast iron. Production of ductile cast iron is carried out by adding a small amount of Mg, Ca, Ce and/or rare earth to melted iron. The process needs accurate control of the metal content, and thus an induction heating furnace is often used for melting.

The foundry must develop its technology to respond to the demand of high quality cast iron, better than FC10 or equivalent, and must also develop technology for malleable cast iron and ductile cast iron. Available local material used in the foundries should be further studied, because the quality of domestic pig iron is of low quality judging from its appearance. Coal is used in their cupolas instead of coke, so its adequacy should also be checked.

b) Machine tool industry

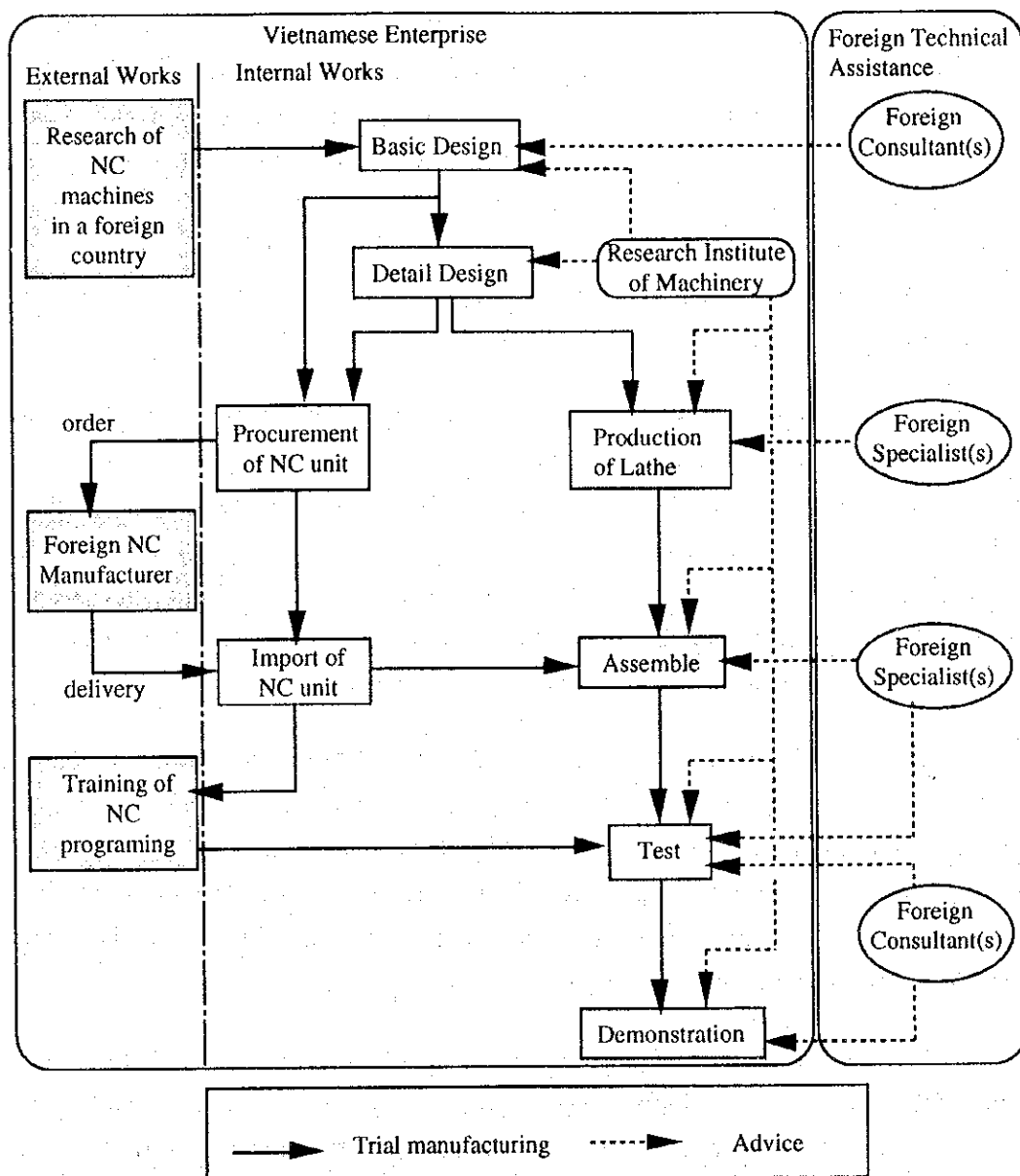
Machine tools such as lathes, drills and mechanical presses are traditionally important products in the Hanoi area. However, enterprises which produce these products have encountered difficulties after the country entered into a market oriented economy. It is partly because these enterprises have lost the support of the Government as the Government has put more importance on production of consumer goods. The machine tool industry has suffered from decreased demand in the domestic market, and they do not have the technical ability to compete with industrialized countries' products.

The machine tool is a very special product among machines. It is called a mother machine, which means they are the machines that produce other machines. Further, a machine tool can produce a machine tool of better precision than itself by correcting the machine error during operation.

Few machine tools are produced in ASEAN countries, so Vietnam has a possibility to export their machine tools to the area, if they are improved to be more competitive. A large disadvantage of Vietnamese machine tools is a lack of numerical control (NC). Almost 80 percent of machine tools sold in the international market are equipped with NC units. The NC unit is difficult yet to develop in Vietnam, however various type of NC units are available in the international market. For reference, Japanese machine tool makers never develop NC units by themselves, and they purchase from specialized NC makers outside. Vietnamese machine tool makers can follow this case. Integration of an NC unit to the existing design of machine tools is rather simple.

It is suggestible that design and manufacturing of an NC lathe be started in Vietnam. To this end, it is advised at first to dispatch Vietnamese engineers to advanced countries in order to study market trends and the basic concepts of design. The engineers should develop a basic design for an NC lathe based on their experience obtained abroad. Advice of foreign consultant(s) to the designer is suggestible in order to check his design. The basic design should be developed into detailed design. At the same time, a NC unit should be ordered to a foreign supplier with specifications prepared on the basis of the basic design. Further, engineers should be dispatched to a foreign training center for programming by the NC unit. It is recommended to obtain foreign specialists' technical advice on production and inspection of key parts of the machine. After assembling the machine, tests should be carried out at the factory. Probably many modifications will be needed. Advice of foreign consultant(s) to the engineer is important at this stage, too. After successful trials, the machine is demonstrated to potential customers.

A summary of the above procedures is illustrated in the diagram on the next page.



Trial Manufacturing of NC Lathe

c) Motorcycle industry

The number of motorcycles has increased rapidly in Vietnam. A UN transportation study reported about 160,000 motorcycles in the Hanoi area in 1992; the number currently approaches one million. Motorcycles have already been assembled by SKD in Hanoi, but no parts production has started yet.

No statistical data are available on the actual motorcycle demand in the Hanoi area; however, annual demand is estimated to be around 100,000 at present. Hence, if

production is started in Hanoi, motorcycle industry sales would be nearly 2,000 billion dong, about 6 times larger than the existing market of the entire machine industry. It is reported that a Japanese assembler intends to build an assembly shop in Hanoi as a joint venture with Vietnam. The number of motorcycles assembled in this factory will start at less than 100,000 per annum. For reference, about 700,000 motorcycles were assembled in Thailand and about 1,200,000 in China in 1992. If compared with these numbers, Vietnamese production is still small; but the motorcycle industry will grow as a strong industry in Hanoi.

The most important matter for the development of the motorcycle industry is to create a strong supporting industry in the Hanoi area. A motorcycle consists of a body, covers, an engine and driving parts. The body is made of steel plates and produced by stamping, bending and welding. The covers are made of thin steel plates and produced by stamping. The engine consists of more complicated parts, but the main parts such as the cylinder and piston are made from casting. Motorcycle makers are assemblers, and they depend on a number of subcontractors to supply parts.

In the case of Vietnam, an expected output in the order of 100,000 units per year is too small to start parts production, so that only some parts such as exhaust pipes may start to be produced. Motorcycle assemblers have a global network to supply their parts. Parts are generally well standardized and interchangeable. Consequently, if a Vietnamese subcontractor manufactures better parts at a lower price than others, it will be welcome by any assembler as a supplier.

In Thailand, Malaysia and the Philippines, governments are eager to promote supporting industries for automobile and motorcycle industries. Vietnam is expected to promote supporting industries for motorcycles first and then, supporting industries for automobiles.

At present, a motorcycle assembler is operating in the Hanoi area, however the enterprise's assembly line operates only a few months a year, because import quota for CKD parts is limited. Consequently, productivity of the assembler is quite low. If more motorcycle assemblers are invited to the Hanoi area and parts production for export is unexpectable, the situation will be worse. Promotion of motorcycle subcontractors up to the export level is important and urgent.

d) Automobile industry

Along with motorcycles, the automobile market will expand. The automobile industry may have a larger market than the motorcycle industry in the future, though it is rather small at present. This industry typically consists of a few assemblers and a

large number of subcontractors. Consequently, like the motorcycle industry, promotion of supporting industries is important for the automobile industry.

Thailand started an automobile industry with assembly of 1.0 ton trucks, and it has been expanded successfully. It is suggestible that Vietnam will establish its own development policy for the automobile industry, by referring to and studying the Thailand's success.

e) Bicycles

The bicycle industry was an important industry in Hanoi in the past. Unfortunately, however, it recently stopped production. The reason for the industry's decline is that it lost in competitiveness against foreign competitors, especially from China. This was caused by the low productivity of the industry and relative devaluation of the dong after 1989.

In order to restore the industry, the design and quality of its products should be improved, and costs should be reduced by improving productivity. It is noted that participation in the motorcycle industry is unlikely, because the production facilities are different.

f) Industrial machine industry

Demand for industrial machines and equipment for cement mills, sugar plants and so on, will increase. However, the machine industry is not yet well prepared for participation in these areas. One cause of difficulty is a lack of engineering ability to plan and complete industrial plants. Each enterprise should develop its engineering capability step by step to utilize their valuable resource of highly educated engineers.

The industry, as a whole, has quite a lot of machinery tools and equipment for the production of industrial machines; however, weak collaboration among enterprises prevents their utilization. The management of each enterprise should make more efforts to improve the operation frequency of key large machine tools by offering them for subcontracted jobs.

(4) Proposal on Automation and Numerical Control

a) Automation

Automation is a key factor in improving productivity; however, the industry in Hanoi has lagged behind in this technology. A state institute has studied automation and designed an automated production system. This sort of effort should be further

encouraged by the Government. It is a prejudice that automation reduces employment. Adequate development of automation will increase employment through expansion of the market.

b) Training of "mechatronics" engineers

In order to develop automation and numerical control, engineers who have enough knowledge both in mechanical engineering and in electronics are required. This type of engineer is difficult to find among university graduates, whose specialty tends to be either mechanical engineering or electronics. Thus, additional education for engineers is necessary. In many cases, it is more successful to educate mechanical engineers in electronics. It is also recommended that universities start courses on control technology.

c) Numerical control

Numerical control (NC) is an innovative invention for machine tools which the machine industry in Hanoi has not yet adopted. One technical institute has a few NC machines experimentally, but no machine tool manufacturer has products with any NC. Consequently, no machining workshop has adopted it. Numerical control enhances the skill of the operator to manufacture machine elements precisely without fault. Existing machine tools can be modified to numerical control by adding a control unit. Machine tool makers should seriously consider development of numerical control, as discussed in Section F.1.3), (3), b).

4) Development Strategy of Machinery / Metalworking Industry

(1) Development strategy up to 2000

The machine industry should first improve its extremely low productivity. The management of each enterprise should concentrate on improving the working environment and discipline of workers. Japan's experience in the 5S Initiative should be studied in this respect.

State enterprises should be reorganized and privatized; otherwise, productivity improvement will be hampered by many elements which plague state enterprises.

A divided work system must be created in the private sector. The necessary financing system to assist small companies and private workshops should be established and promoted by the Government. Foreign financial aid will be incorporated in this system.

The Government should attract one or two motorcycle assemblers to the Hanoi area, and assist creation of subcontractors for them. The motorcycle industry will create a substantial economic impact on the machine industry in Hanoi.

The Institute for Development of Production Technology should be promoted as an incubator of new technologies and new business in Hanoi.

Foundries should be reorganized and start to export castings to the Asian region. Ductile cast iron and malleable cast iron should be produced for domestic and export markets.

The productivity of Hanoi's machine industry is extremely low at present. Based on the annual net product per employee, it is currently about 1/200 of Japan, 1/70 of Korea and about 1/10 of China. Productivity will be more than doubled if order and discipline are established in the factories.

In the event that order and discipline are established through the 5S Initiative in the factories, more foreign investors will be attracted in the machine industry. This will considerably push up productivity.

In total, an increase of 2 ~ 4 times in productivity will be achieved by 2000, if all the above recommended measures are executed.

(2) Development Strategy up to 2010

A divided work system should be established through reorganization and privatization of state enterprises by 2010. Vietnam should participate in international divided works in the automobile and motorcycle industries. Export of machine elements should be started by the motorcycle and automobile subcontractors.

The machine tool industry should adopt numerical control and export its products to ASEAN countries.

In order to be competitive among ASEAN countries, productivity should be improved by more than 5 times within the 10-year period from 2000 to 2010. Improvement of productivity will create funds for expansion, if labor cost increases less than productivity improvement.

Net product is distributed among tax, labor cost and capital formation. If the tax increase is less than proportional to the net product increase, and if the labor cost increase is less than proportional to the net product increase, more share will be

distributed to capital formation, which means that more investment will be allotted to expansion by productivity improvement.

After 2010, Vietnam should avoid excessive dependence on foreign investors. Between 2000 and 2010, Vietnam should prepare for the post-2010 period. Productivity improvement depends on investment in new advanced facilities, so that efficient utilization of new investments should be realized.

F.2 Electric / Electronic Industry

1) Current Situation

(1) Sales and employment

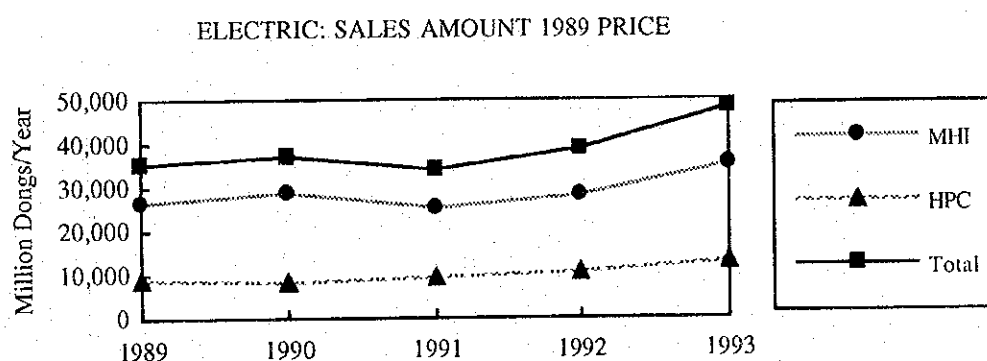
The electric industry (ISIC 3831, 3833, 3839) has 9 enterprises in Hanoi, with sales of about 1,176 billion dong in 1993. The electronic industry (ISIC 3825, 3851, 3832) has 18 enterprises in Hanoi, with total sales of about 515 billion dong. These two industries together employ about 6,600 workers in the Hanoi area.

(2) Productivity

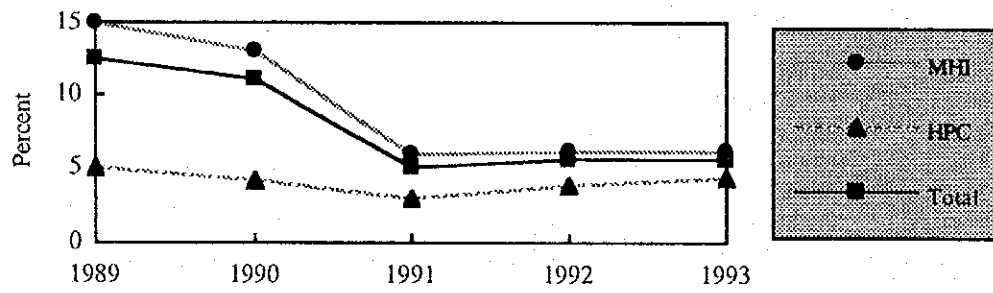
Net product per employee is 18 million dong in the electric industry and 53 million dong in the electronic industry. Compared with other industries in Hanoi, both electric and electronic industries have higher productivity; however, if compared with the industrialized countries, the net product per employee is 1/40 in electric and 1/16 in electronic. The sales amount of 6,600 employees is approximately the same as those of a company of 300 employees in an advanced country.

(3) Trend of growth

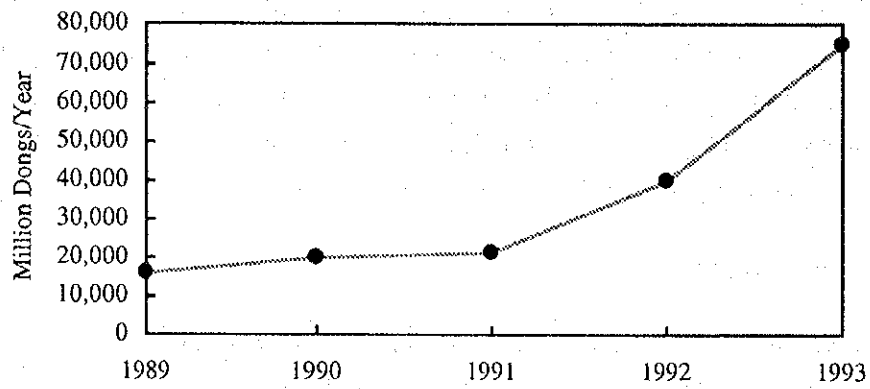
Five enterprises in the electric industry and 13 enterprises in the electronic industry have reported their sales and profits during the 5 years between 1989 and 1993 to the questionnaire survey conducted by the Study Team. The results are analyzed as shown in the figures below.



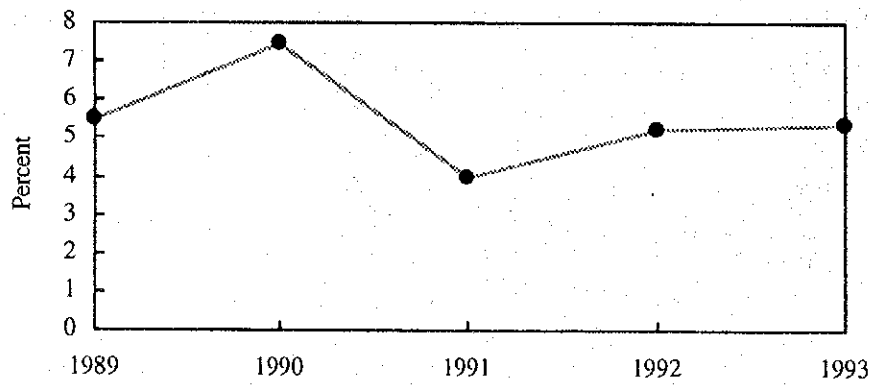
ELECTRIC: PROFIT PER SALES



ELECTRONIC: SALES AMOUNT 1989 PRICE



ELECTRONIC PROFIT PER SALES



The electric industry had a slight growth in sales during this period, but profit per sales decreased. The electric industry had high profit of over 10 percent in 1989; however, it normalized to the order of 6 percent after 1991.

The electric industry produces electric motors, transformers and home use electric fans. Transformers and switchgears have been in steady demand from electric utilities. Demand for home use fans is increasing. Industrial demand for motors is not so strong but it is steady. The electronic industry is enjoying a rapid demand increase for television sets. Since 1991, the electronic industry has expanded. Its profit is comparatively stable.

2) Major Constraints of the Electric / Electronic Industry

(1) Weakness of design and production

The table below shows a comparison of the catalogue value of motor weight between Vietnamese products and an advanced country's products, Vietnamese motors are about 1.7 times heavier than comparable motors sold in the advanced countries.

Comparison of Motor Weight

Output kW	A Advanced Countries kg	B Vietnam kg	B / A
0.75	11	17	1.6
3.8(4.0)	33	60	1.8
7.5	55	103	1.9
15	90	158	1.8
30	170	245	1.4
		Average	1.7

Note: Rotating speed of all motors is 3000 rpm.

Output in () indicates that of a Vietnamese motor, in case that Vietnamese motor has different output from that of the advanced countries.

Heavier weight means that more material is used in production, there is more surface to finish and more to transport. All these factors weaken competitiveness of the products in the market. The weight difference results from differences in design, materials, and manufacturing process.

Transformers are also 1.6 times heavier by comparison of catalogue value, as shown in the table below.

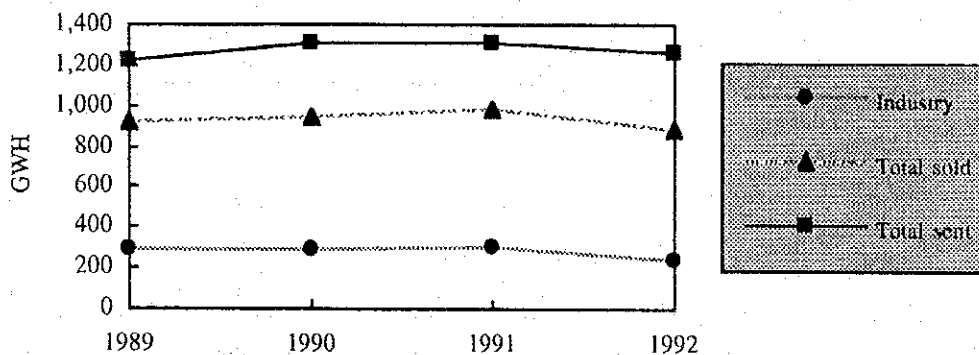
Comparison of Transformer Weight

Capacity kVA	A Advanced Countries kg	B Vietnam kg	B / A
50	265	400	1.5
100	490	750	1.5
200(180)	695	1127	1.6
300(320)	965	1550	1.6
500(560)	1415	2500	1.8
Average			1.6

Note: Transformers of the advanced countries are 6.6/0.21 kV and those of Vietnam are 6.3/0.4 kV. Capacity in () indicates that of Vietnamese transformers in case the Vietnamese transformer has a different capacity from that of an advanced country.

(2) Electricity supply

Electricity supply did not increase in the Hanoi area between 1989 and 1992, as shown in the figure below. It is difficult to predict the future trend from this fact; however, if electric supply does not increase, the electric industry will not expand.



Electricity Supply in the Hanoi Area

(3) Quality of electricity

It is reported that the electricity supply is adequate in the Hanoi area, because the northern area has sufficient capacity of hydroelectric power stations. However, fluctuation and unscheduled blackouts of electricity are frequent in Hanoi. Fluctuation and surges of electricity damage electronic control equipment. Unscheduled blackouts disturb production and cause product defects in such processes as automatic soldering, plating, machining, etc.

(4) Comparative disadvantage to Ho Chi Minh City

The electric industry has a comparative advantage in Hanoi if compared with Ho Chi Minh City and other cities in Vietnam. However, Ho Chi Minh City has a comparative advantage in home electronics, because Ho Chi Minh City has a larger population and larger purchasing power than Hanoi. Consequently, Hanoi's electronic industry needs to create specialty products in order to compete with Ho Chi Minh City.

3) Proposed Improvement of Electric/Electronic Industry

(1) Improvement in Electric Industry

a) Production procedures in the electric industry

Procedures for manufacturing electric motors, transformers and etc. are similar to those in the machine industry. Since electric motors are used to drive various machines, the electric industry has a close relationship with the machine industry. For this reason, the electric industry grows in line with the machine industry in Hanoi. Electric motors and transformers use iron cores and copper wiring. Cores are made from thin silicon steel plate by punching. Enameled copper wire is wound on the core. Electric isolation is also an important technology for production of electric machines and equipment. Technology for large capacity and high voltages will need to be developed in the future.

b) Modernization of production technology and design

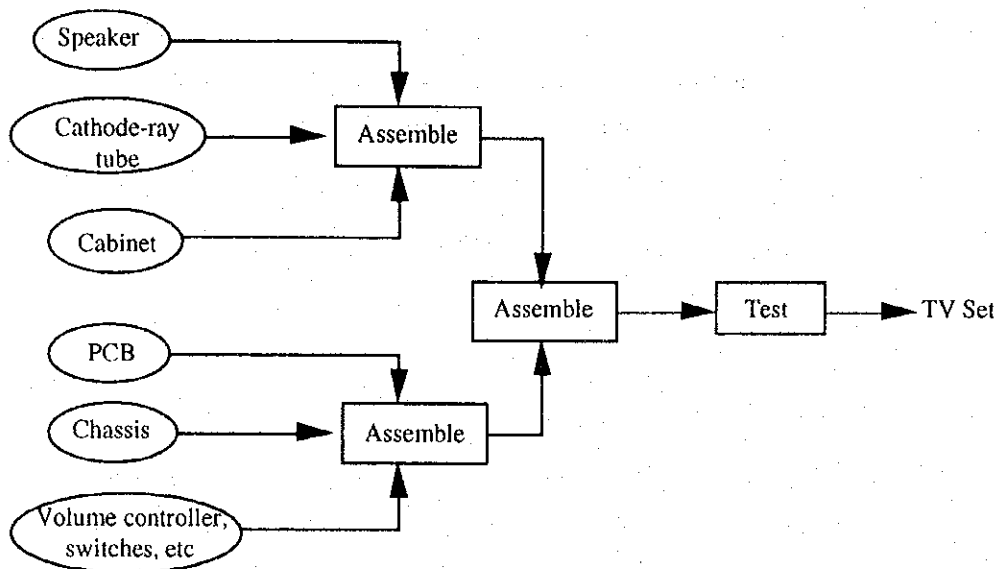
The electric industry should introduce modern production technologies. General purpose electric motors are common products of every ASEAN country, so that Vietnam should be prepared for hard competition in the market. The heavy weight of motors and transformers will cause considerable disadvantage in international competition. Design and materials should be studied and improved. If necessary, assistance of foreign manufacturers should be introduced.

(2) Improvement in Electronic Industry

a) Production process in the electronic industry

The Vietnamese electronic industries do only assembly work at present. Some software development has been started but it is still immature. Hardware parts have not yet been produced. A Vietnamese-Korean joint venture is constructing a new factory in Gia Lam for the production of television parts including cathode ray tubes.

The assembly of electric equipment is illustrated below, using an example of TV sets:



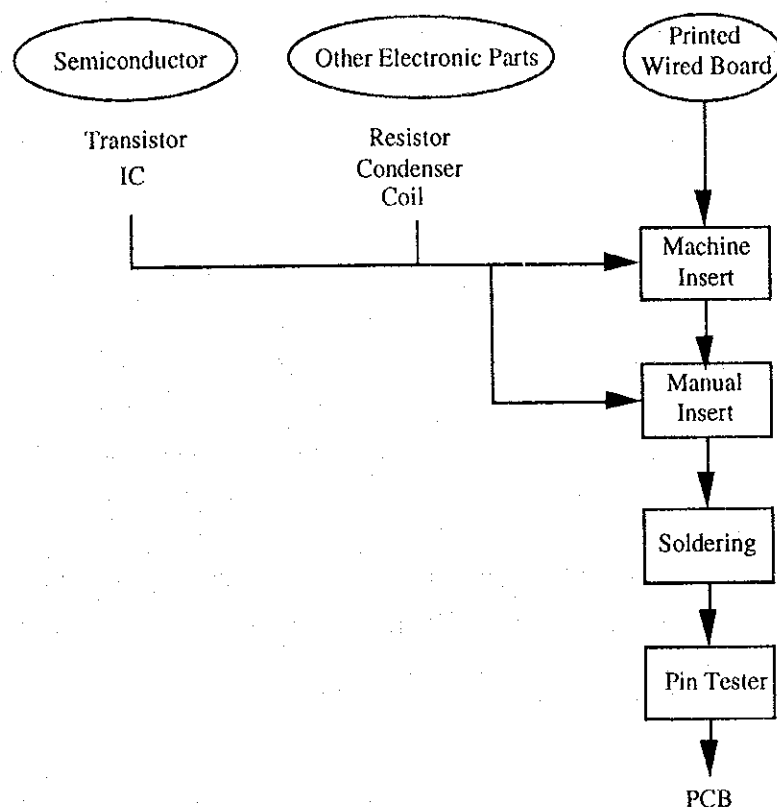
Assembly of a TV set

A TV set consists of many parts, however, in the case of CKD in Vietnam, a TV assembler imports all parts and only carries out the final assembly and tests.

Speakers and cathode-ray tubes need special production equipment, and consequently a specialized manufacturer or a specialized branch of an electric enterprise supplies them. Cabinets are made of plastics, which Vietnam can manufacture easily. A printed circuit board (PCB) is manufactured with the rather labor intensive work of inserting. The PCB is assembled on a metal chassis together with a volume controller, switches, etc. Then the unit is sealed in the cabinet and the TV set is complete.

In order to increase the local portion of the TV manufacturing process, the cabinet and the chassis should be produced first, then PCB, speaker and cathode-ray tube should be considered for production.

The process of PCB assembly is illustrated below:



Assembly of a PCB

A printed wired board is made by printing a circuit on a plastic board using electro-conductive ink. The board contains many small holes in which to insert electronic parts, then for the next process, electronic parts including ICs, transistors, resistors, coils etc. are inserted into the board. Some of these parts are inserted by machines, however others are inserted by hand on a conveyor line. This conveyor line task is labor intensive. After completing parts insertion, the PCB is soldered using a soldering machine, after which it is tested using multi-pin tester. This tester has many pins which contact the measuring points of the circuit and its functions are tested. The test result is evaluated by a computer and indicated on a monitor. This tester is a sophisticated piece of equipment supplied by a licensor of technology or a main contractor.

b) Increase of Vietnamese content

The increase of Vietnamese content is an important objective of the electronic industry; however, the amount of production is too small to economically start electronic parts production at present. The industry is assembling international brand television sets under license. The licensors generally have a strategy to produce parts of their product in different Asian countries and concentrate the production of each part in

one country. Vietnam should participate in this system. At present, Vietnamese labor costs are attractive. Vietnamese content should be increased through cooperation with Asian countries.

c) Quality of products

Electronic parts require high reliability, because electronic equipment uses many parts and if a single part has trouble, the total system will stop, causing unexpectedly great damage. Vietnamese industry has not yet prepared for strict quality control. The industry should establish high quality standards in order to participate in the production of electronic parts such as semiconductors, capacitors, resistors, coils, sensors, etc.

Initial investment will be considerable, if Vietnam joins parts production. Therefore, a prudent feasibility study should be carried out in collaboration with a foreign partner or licensor before making investments.

d) Electric motors

Electric motors produced in the Hanoi area have a larger frame size than motors of the same power which are produced in the industrialized countries. Insulation material is an important factor to help make a motor compact. Polyester film insulation which is used for class E in the Japanese Industrial Standard, is very popular for motors in the industrialized countries, while most Vietnamese manufacturers use paper with varnish as insulation. Polyimide and mica are also used as insulators for slightly more severe operating conditions (class F and H).

The magnetic characteristics of the core material influence the performance of a motor. Silicon steel plates of proven quality should be used for the motors. The number of fins on the frame should be increased as much as possible for improvement of cooling capacity. In order to reduce weight, welded construction or aluminum alloy die casting frames should be adopted. Enclosed ball bearings are becoming more popular for use in modern motor shaft bearings, instead of the open type in order to avoid refilling the grease.

e) Printed Circuit Board (PCB)

As mentioned in Paragraph a) above, PCB production should be developed in the Hanoi area. At present, one television assembler has already started the insertion of parts into printed wire board, although its operation is still primitive.

PCBs demand a 100 ppm level defect ratio in order to meet international standards. Consequently, a clean workshop and careful handling of the board and parts are required. The board must be handled by workers wearing clean gloves, and the lead wires of parts must not be touched by bare hands. Even a very brief exposure to high voltage causes damage to semiconductors so that every worker's body must be earthed in order to avoid static electricity caused by the friction of clothes. Whenever entering the workshop, static bodily electricity must be checked at the entrance.

A television assembler in Hanoi has already started inspection of PCBs by a type of pin tester, however it is too primitive to ensure good reliability. Adequate equipment for the final test should be introduced.

Machine insertion of parts has been little introduced in Hanoi. In order to be competitive in the international market, machine insertion should be further introduced in the future. Manual insertion is carried out on a conveyer line with numerous workers. In this case, adequate distribution of insertion work among workers is very important for productivity. The most efficient work distribution method should be planned considering each worker's ability and pitch time.

At present, printed wired boards are imported as well as parts. As a next step, production of printed wired boards should be considered. Modern technology has evolved a multi-layer printed wired board which is mostly used in compact electronic equipment such as the cellular telephone. This type of board is effective when used with surface mounted parts such as a large scale integrated circuit (LSI). Multi-layer boards should be targeted as a future project.

f) Software

Electronics related to monitoring, automation and computers, much depends on the development of software. Software should be developed in parallel to hardware. At the start, demand for software will be larger than for hardware, because hardware cannot operate without software. No large investment is required in software development but higher education and intelligence are needed. The Vietnamese have good aptitude in this area. Software can also be exported.

g) Batteries

Manganese battery cells are produced in the Hanoi area. The cell is practical but it needs further improvement for export. Lead secondary batteries are also manufactured in the Hanoi area. They are supplied mainly as replacement parts for

automobiles and motorcycles. In order to develop the industry, factories should modify their facilities to produce high grade manganese battery cells.

An alkaline cell has higher capacity than a manganese cell, and is used for pocket-size motor-driven equipment such as a Walkman. A nickel-cadmium cell is rechargeable, and it is used for a small electric appliances such as a portable computer, an electric razor, etc. A silver oxide cell is used for watches. A lithium cell is used for a cameras. These new types of batteries are indispensable for modern electric and electronic appliances. Accordingly, for the development of the electric and electronic industries, their production should be studied.

(3) Development of Home Electronics Industry

a) Radios and TV sets

TV and radio broadcasting networks are operated by the Ministry of Culture and Information. The broadcasting enterprise is supported by earnings from commercial advertising and a government subsidy, but there is no charge to broadcast receivers.

Demand for radios and TV sets is increasing and their production has already been started by CKD. The local production of parts is an important target for the future development. AM-FM radio cassette recorders have a high demand among young people. The size of the domestic market is difficult to estimate, because no statistical data are available for analysis. TV sets are on the increase among families in urban areas. The exact domestic demand is also difficult to estimate because of lack of available statistical data.

In order to encourage the consumer electronics industry in the Hanoi area, the local government should prepare enough information to substantiate a domestic market in the area.

b) Refrigerators, washing machines and rice cookers

No manufacturer produces refrigerators, washing machines or rice cookers in the Hanoi area. However, demand for these household electric appliances is increasing, and consequently these products have been imported or smuggled into the Hanoi area and have appeared in front of shops.

Electricity blackouts are rather frequent in Hanoi, however interruption is normally short, so that refrigeration is not affected seriously. Washing machines still have difficulty in using city water taps, because the water pressure is not strong enough

to use at the tap of each family. However, the water system in Hanoi is being rehabilitated with foreign assistance, so in the near future, demand for washing machines can be expected to increase. The rice cooker is becoming popular among rice eating nations. It is normally combined with a timer and thermal switch, so that rice and water can be put in the cooker at night, and the next morning rice is cooked ready to eat.

In the Hanoi area, women normally have a job outside even after marriage. Consequently, these electric household appliances will be important in assisting them.

c) Electric fans and air conditioners

Household electric fans are produced by local manufacturers. These fans are rather simple but useful. Motors for these fans are mostly imported from China at present. Local production of small motors should be considered. It is noted that, these fans have no timer and, if export is intended, improvement in the existing designs should definitely become necessary.

Air conditioners are imported but are still too expensive to be purchased by the average family, only being used in offices, hotels and restaurants. Central air conditioning is still rare in the Hanoi area, however offices, hotels and restaurants will adopt central air conditioning systems in the future, and as a trend, independent air conditioners will be directed to home use.

4) Development Strategy of Electric / Electronic Industry

(1) Development strategy of electric industry up to 2000

Domestic demand for electric machines and equipment will increase in accordance with expansion of electric utilities. If the elasticity of electric demand to GDP is approximately 1.0, electric consumption will increase more than 1.6 times between 1993 and 2000. Demand for electric appliances will be increased at the same level as electric demand.

The industry should modernize its production facilities to be more competitive. Productivity should be improved from the present level of annual net product of 18 million dong per capita to 30 million dong or more. Then, more than 1.6 times can be produced without increase in employment.

Vietnamese utility enterprises intend to modernize their transmission lines. In order to realize their plan, high voltage equipment such as transformers, circuit

breakers, etc. will be needed. The electric industry should extend its participation in this area.

(2) Development strategy of electronic industry up to 2000

Strong demand for television sets will support expansion of the electronic industry during the coming several years; however, demand will be saturated when television sets are owned by most high income families in the Hanoi area. At present, production of television sets is concentrated on the 14 inch type. However, future demand will be expanded to a larger size, maybe 21 inches and larger.

Computers have not sold well in Hanoi yet, but potential demand is strong among the young generation. Computer production would be rather difficult at present, but there is a possibility of an explosive demand expansion.

Automation and computer control should be developed urgently. In this area, good collaboration between mechanical engineers and electronic/electric engineers is required. The electronics industry must increase its participation in the production of printed circuit boards (PCB).

(3) Development strategy of electric industry up to 2010

The current price of electricity in Vietnam appears to be too cheap to secure enough revenue for necessary expansion of electric utilities. However, expansion of electric utilities is a key requirement for economic growth in every industry.

The electric industry should satisfy the demand for electric utilities, by producing the equipment for not only low voltage distribution lines but also for high voltage transmission lines. Complete large power generators may be difficult to produce; however, the electric industry should collaborate with the machine industry so that it can participate in the production of machines and equipment in power stations.

When the running tap water system is improved and becomes prevalent in the urban area, a market for electric washing machines will open in Hanoi. People's income increase will result in more demand for home air conditioners, rice cookers, microwave ovens, etc. Production growth of these slightly sophisticated home electric products is expected between 2000 and 2010. If attractive incentives are given, international electric companies will open joint venture factories in Hanoi.

The home electric industry should be supported by Vietnamese subcontractors. An efficient divided work system should be in effect by 2000. When high quality home electric appliances are manufactured in Hanoi, they will be exported to the Asian

markets. If the present tendency for yen appreciation continues, Japan will not be a good place to produce home electric appliances; products from Hanoi could be exported to Japan, U.S.A. and Europe.

(4) Development strategy of electronic industry up to 2010

Vietnam may achieve a GDP per capita of more than 400 US\$ by 2010, if the trend of economic expansion continues at the level of the period between 1989 and 1993. This level of economy is still underdeveloped. However, the infrastructure for industry will be ready for further development.

The ability of the Vietnamese people will promote electronic industry development, especially in the software area, because no large investment is required. Hardware, such as semiconductor production, should rely on direct investment of international enterprises, because of huge requirements for investments and export marketing. In order to attract foreign investors, strong incentives shall be given and excellent infrastructure should be developed so that they are competitive with other ASEAN countries.

Expansion of the automobile industry will increase demand for electric and electronic parts for automobiles. Production of these parts will not require large investments, and it appears to be feasible to start in the Hanoi area.

F.3 Textile / Garment Industry

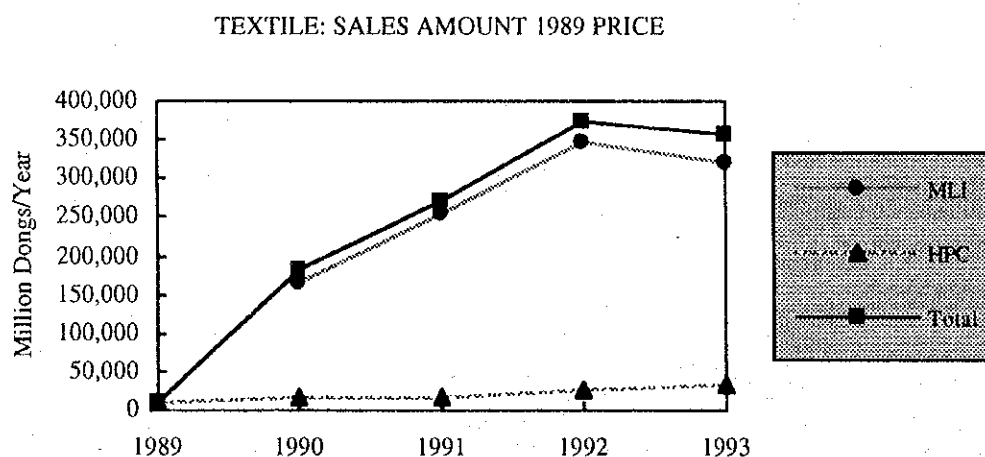
1) Current Situation

Among the textile (ISIC 3211, 3213, 3214) and garment (ISIC 322) enterprises which replied to the questionnaire survey conducted by the Study Team, 14 are operated by MLI, 10 by HPC and 2 by the private sector. The number of employees in the textile and garment industries is assumed to be about 26,000 or about 31 percent of total manufacturing employment in Hanoi.

Net product per employee is about 10 million dong in the textile industry and 7 million dong in the garment industry, which are both extremely low if compared with the industrialized countries. The industries contribute about 300 billion dong to exports, which corresponds to about 64 percent of total exports by Hanoi's manufacturing industry.

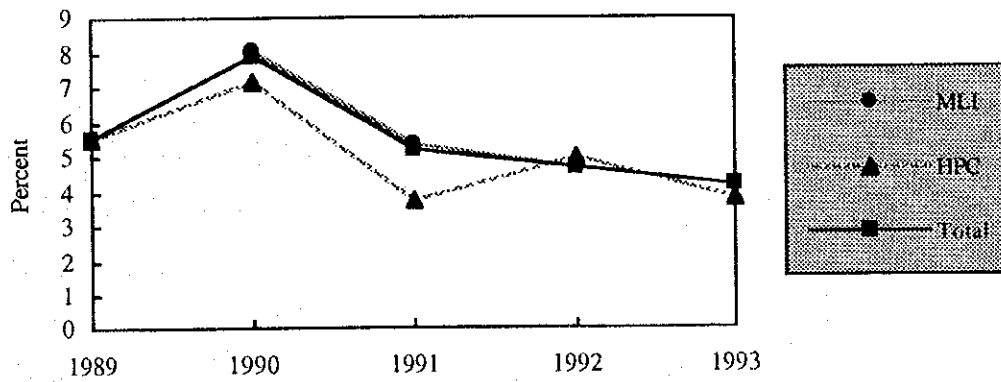
Most of the textile enterprises operate with machines which are 15 ~ 30 years old, on an average, while most of the garment enterprises operate comparatively new machines of 5 years old or less.

The textile industry (ISIC 3211) has increased sales since 1990, by expansion of MLI operating enterprises, as shown below.



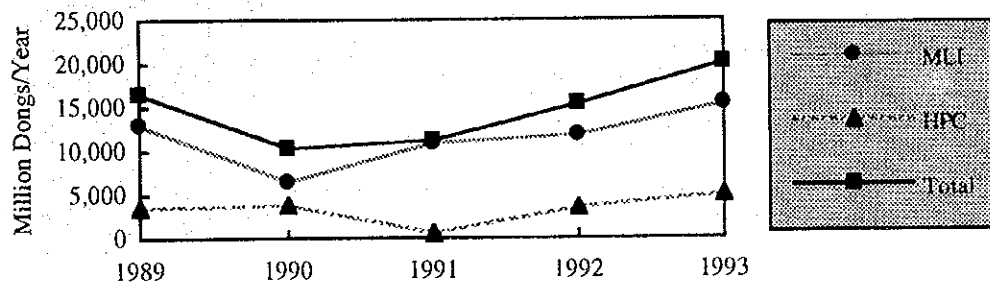
However, profit per sales has gradually decreased as shown in the figure below.

TEXTILE: PROFIT PER SALES

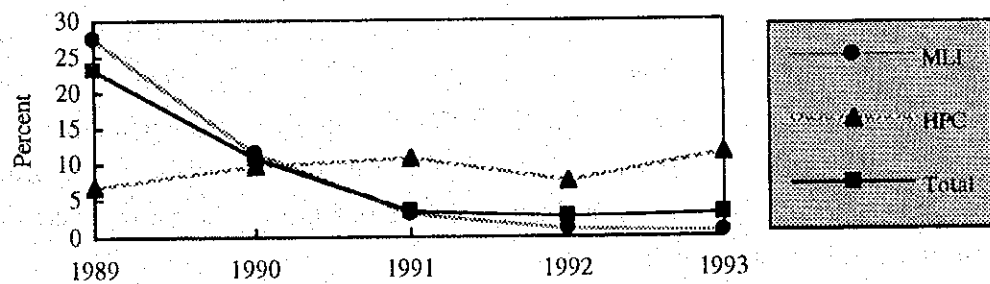


There are only 2 specialized knit producers. Their sales decreased after 1989, but have recovered since 1991. Profit per sales has been decreasing as shown in the two figures below .

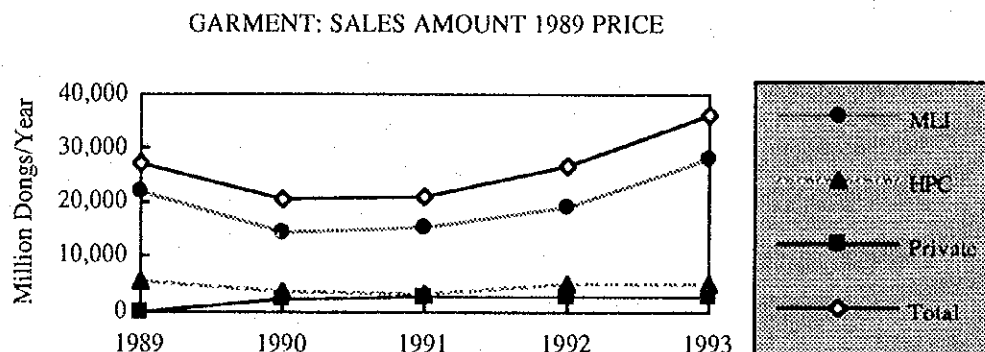
KNIT: SALES AMOUNT 1989 PRICE



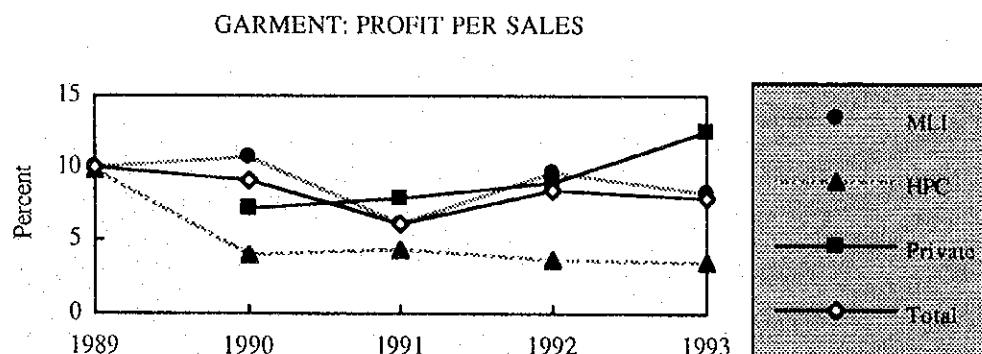
KNIT: PROFIT PER SALES



The garment industry (ISIC 3220) has been recovering from decrease in sales, as shown below.



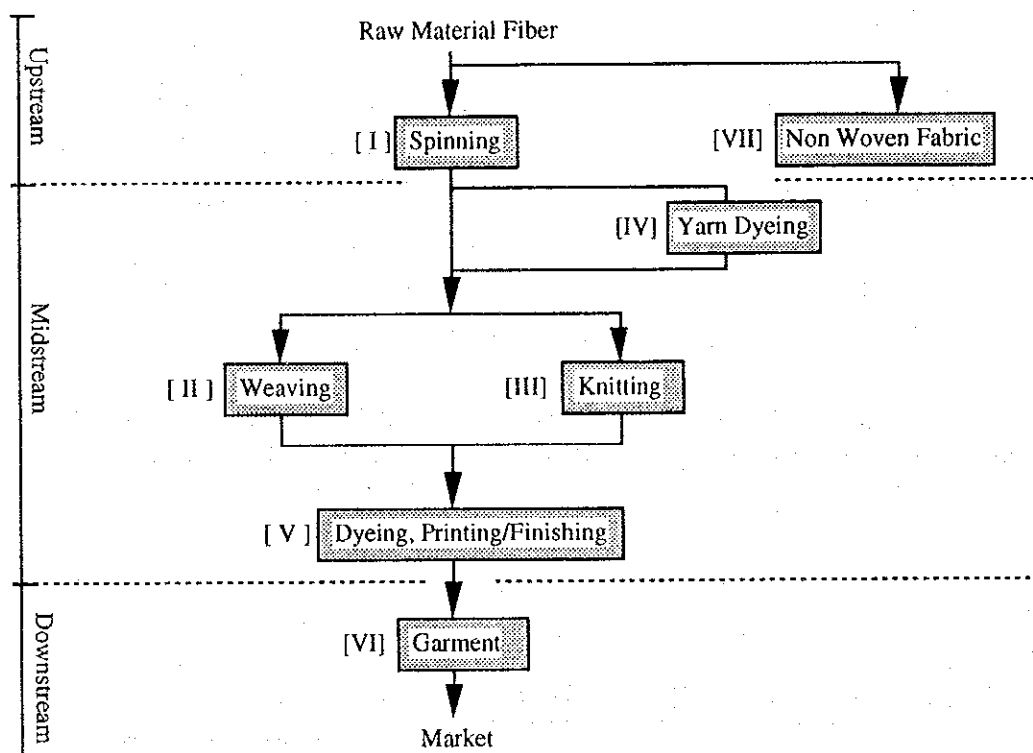
Enterprises operated under HPC are suffering from a stagnation of sales growth and profit decrease, as shown below.



2) Major Constraints of Textile / Garment Industry

(1) Process flow of textile / garment industries

Processes of the textile / garment industries are illustrated in the diagram below. The raw material is spun into yarns in the first step [I]. Then the yarns are woven or knitted into fabrics [II], [III]. The fabrics are dyed, bleached, printed and finished [V]. Yarns are also dyed before being woven or knitted in the dyeing process [IV] in the case of making stripes and gingham pattern fabrics. The garments are made from finished fabrics by sewing.



Process Flow of Textile / Garment Industries

(2) Domestic demand for textiles

At present, Vietnam consumes about 60,000 tons per year of textiles for domestic use, which corresponds to an annual consumption of 0.8 kg per capita. Domestic consumption of textiles is expected to increase proportionally to GNP. TEXTIMEX has shown the following fabric production plan:

Year	Production Capacity	
	For Domestic Use	For Export
1992- 1995	350 million m / year	150 million m / year
1996 - 2000	650 million m / year	350 million m / year

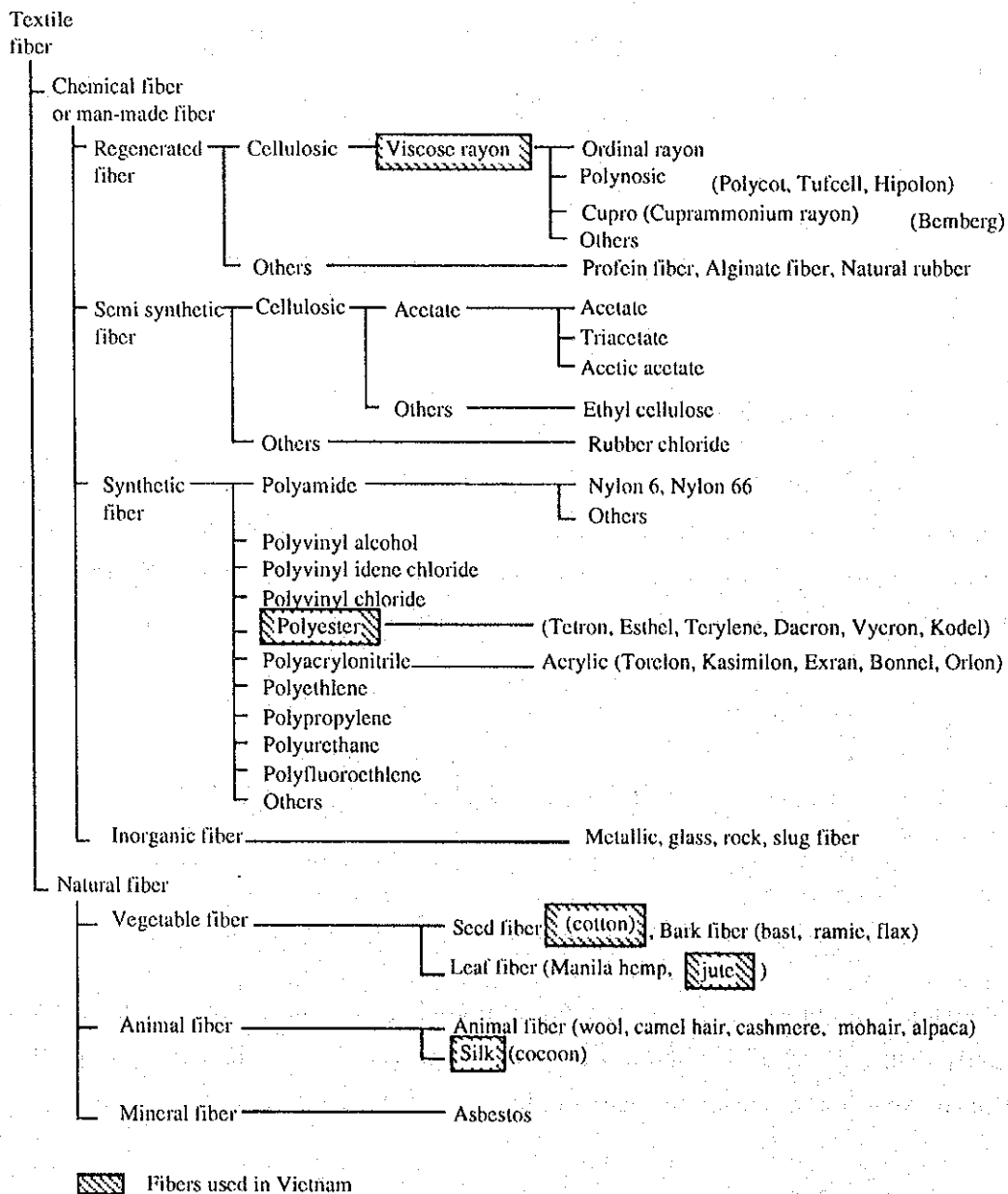
This plan appears to be rather modest, if GDP grows and exports increase more rapidly than experienced in the last 5 years. However, TEXTIMEX claims that the planned expansion of the textile / garment industries is difficult due to lack of financing.

(3) Materials

Vietnam produces about 3,000 tons/year of cotton; however, this is far less than the demand of 32,000 tons/year. Consequently, about 90 percent of cotton is imported. The total consumption of spun fibers is estimated as follows:

Cotton	32,000 tons/year
Synthetic	28,000 tons/year
Wool & Acrylic fiber	1,000 tons/year

The figure below shows the classification of fibers, among which cotton, silk, viscose, rayon and polyester are used in Vietnam. The others have not yet been utilized.



About 50% of cotton is used for 100% cotton woven or knitted fabrics such as sheeting, shirting, poplin, etc. The rest is blended with polyester. Viscose rayon is used for women's clothing such as "ao dai" and blouses. Wool and acrylic fiber are used for carpets and wool / acrylic knit wear. Most carpets are exported to Germany, Russia and the Middle East.

Consumption of raw material fiber is estimated as summarized below:

	Consumption tons/year	Domestic Production tons/year	Import tons/year
<u>Spun Fibers</u>			
1. Cotton	32,000	3,000	29,000
2. Synthetic	28,000	0	28,000
3. Wool & Acryl	1,000	0	1,000
<u>Filament Fibers</u>			
4. Viscose Rayon	1,200	0	1,200
5. Polyester	300	0	300
6. Silk	500	500	0
Total	63,000	3,500	59,500

Cotton

At present, Vietnam produces about 3,000 tons/year of cotton and intends to expand this to 57,000 tons/year in 2000. The international cotton price has remained between 1.5 ~ 2.0 US\$/kg during the last 20 years. The current price of Vietnamese domestic cotton is presumed to be about 0.2 US\$/kg, therefore domestic cotton is attractive to the textile industry.

The southern highlands of Dong Nai and Binh Thuan provinces produce cotton. The Government intends to expand cotton fields in the existing maize cultivation area of Dong Nai and Binh Thuan. In order to realize the expansion, the domestic cotton price should be increased to provide incentive to farmers, but the price should still remain attractive to the industry.

Quality of Vietnamese cotton is not ideal to produce fine yarn of less than 45's, because it does not have sufficient spun length, strength or fineness. The climate in the cultivating area causes this disadvantage. Other characteristics of cotton such as spotlessness, maturity, uniformity, absence of foreign matter and color, are also not

comparable to the international standard of quality at present. Considerable improvement of cotton growing technology will be required.

Synthetic fibers and filaments:

Vietnam has not yet started production of synthetic and rayon fibers and filaments. The demand for synthetic and rayon textiles is expected to increase in the future for women's garments such as Aodai, blouses and pantaloons. Filament is produced by extrusion of material and has the gloss of silk. At present, three companies in southern Vietnam and one company in northern Vietnam weave fabrics of rayon viscose filaments. The consumption of filament yarn is estimated to be 1,500 tons/year.

TEXTIMEX has a plan to construct a polyester fiber yarn plant with the capacity of 40,000 tons/year by 2000, of which 20,000 tons/year is filament. It is noted, however, that synthetic fibers are overproduced in the Asian market. The new plant is expected to meet tough competition from Chinese and Thai producers.

(4) Spinning

Spinning equipment in Vietnam includes about one million spindles, of which 800,000 ~ 850,000 are considered operable. Machines aged over 20 years old account for 32 % of the total and those under 10 years for 49 %. Spinning machines will have to be replaced.

TEXTIMEX is planning to modernize 200,000 existing spindles and replace 300,000 out-of-date spindles. In addition to this plan, construction of the new spinning factories with 300,000 spindles in northern Vietnam and 150,000 spindles in southern Vietnam with corresponding expansion of weaving, knitting and garment facilities, are planned. There are other plans to construct integrated spinning, weaving and dyeing factories in Hanoi, Nam Dinh and Ho Chi Minh City with a total production capacity of 200 million m², as well as knitting and garment factories with a total capacity of 20,000 tons/year for export.

Production of yarns by existing spindles is assumed to be about 50,000 tons/year, produced by about 850,000 spindles. TEXTIMEX's plan to modernize and to expand the number of spindles is a necessary to meet future demand for textiles; however, the existing textile enterprises do not have enough financial resources to realize it.

(5) Weaving

Total weaving equipment in Vietnam includes 43,000 looms, of which 28,000 looms were manufactured over 20 years ago. Among these looms, 15,000 are actually operating. But their operation rate is estimated to be only 60 ~ 70 %. Most of these looms are of the shuttle type with weaving width of 36", while already modernized looms have widths of 48" or 52". 3,500 ~ 4,000 shuttle-less type such as Rapier and Airjet looms are operating in Vietnam. These Rapier and Airjet type looms are mainly operating in southern Vietnam for weaving viscose rayon filament fabrics.

A cloth is woven by warp and woof. Warp is dipped in mixed starch and agents which stick to the warp yarn to improve weaving properties; however, sizing equipment is obsolete in Vietnam. Small production of filament fabrics has already commenced in Ho Chi Minh City. Gingham type fabrics are exported to East Europe. In this area, the industry has already achieved a certain level of technology.

(6) Knit

Knit wear is one of the growing products in the world. The production capacity of knitting in Vietnam is 15,000 tons/year (circular knit: 13,600 tons/year, warp knit: 1,400 tons/year) and its operation rate is estimated to be 80 %. Knitted products are completely different from woven products in characteristics, processing methods, technologies and application. The value of knit wear depends on delicate and difficult processing. In order to recover profitability on the product, the enterprises in Hanoi should develop more advanced technology.

(7) Dyeing and finishing

In dyeing and finishing factories, only 17.5 % of the existing machines are operable. And also part of necessary process in dyeing and finishing is lacking, because there is no adequate equipment. Dyeing and finishing are important processes to add value to fabrics, so that the industry should strengthen this area.

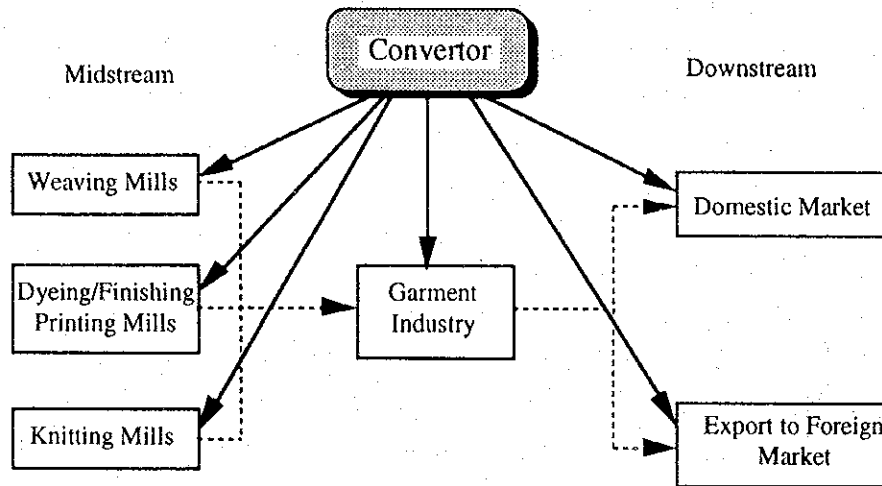
(8) Garment

The garment industry has grown on the basis of the extremely low wages of workers; however, growth of the economy will inevitably result in higher wages in a longer term. Development of high productivity is an urgent task of the industry.

The garment industry is depending too much on commission base contracts for export. This type of business has less commercial risk but less profit.

3) Proposed Improvement of Textile / Garment Industry

(1) Convertor



Business Flow of Textile and Garment Industries

Midstream and downstream parts of the industry must respond quickly to fashion trends in the market. Generally, the young generation changes its fashion more frequently and rapidly, so the textile and garment industries should pay keen attention to the young generation. It is recommended to establish a convertor for this purpose.

The business flow in the textile and garment industries is illustrated above. Convertors act as fashion leaders and coordinators among textile and garment industries. Functions of a convertor are as follows:

- (i) Keep track of and create new fashions.
- (ii) Provide information on the market to manufacturers.
- (iii) Procure various kinds of fabrics from production companies and provide them to the garment industry.
- (iv) Procure wear from garment companies.
- (v) Provide design and specification to the garment companies.
- (vi) Act as an interface among fabric producing factories, garment factories and selling firms in terms of delivery, customer service, quality, etc.

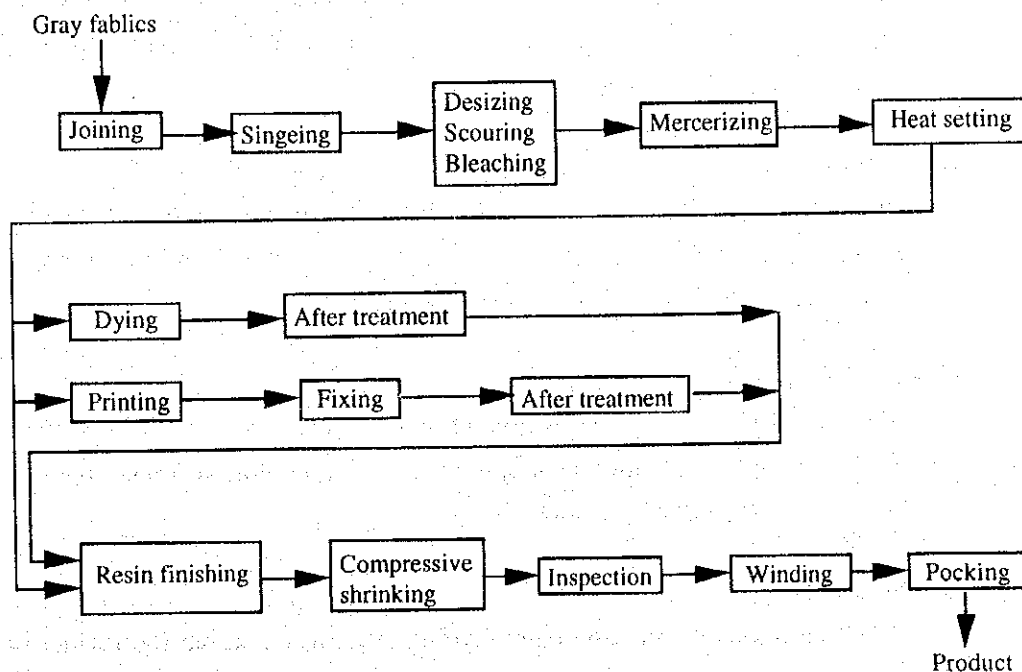
Convertors increase the value of textile and garments by coordinating and leading the industries efficiently to meet the requirements of the market. A convertor can be established as a department in a textile enterprise. However, it is recommended that a convertor be established as a company independent from any textile or garment enterprise. A convertor should lead fashion, free from pressure from any textile industry or union. Likewise, legal restrictions should be removed from the convertor; otherwise it cannot be competitive in the international market. A convertor cannot be a section or department of the government nor government affiliated organizations, because it has to be operated by fashion sensitive and creative staff, and they cannot work under any bureaucratic management.

(2) Reinforcement of the midstream

It is unfortunate that Vietnam imports good materials from abroad, but their value is spoiled midstream and turned into cheap products in the garment industry.

In the textile industry, the most critical processes used to increase the value of the product are dyeing and finishing. However, these processes are poor in the Hanoi area. It is strongly recommended to improve these processes up to the international level in order to compete in the international market.

Following is an illustration of the midstream processes normally adopted in the industrialized countries.



- Joining

Several pieces of gray fabric are joined by specialized sewing machines. The length of each piece is about 110 m and the ends are joined to each other.

- Singeing

Naps on the surface of gray fabrics are burnt off with a gas burner flame from a singeing machine. The operating speed is normally 80 ~ 100 m/min.

- Desizing - scouring - bleaching

Using a desizing - scouring - bleaching machine, sized stuffs remaining in gray fabric are removed, and the fabric is dipped in a bath of caustic soda and chemicals to remove all stains, nep, grease, wax, glue etc., after which they are bleached in a chemical stuff bath of hydrogen peroxide (H_2O_2) or sodium chlorite ($NaClO_2$) to whiten and bleach the fabric.

- Mercerizing

Bleached fabrics are passed to a mercerizing machine in order to add silky properties and do a dimension - set in caustic soda solution (e.g. at conditions of 25°Be, 25°C)

- Heat setting

For synthetic / cotton blended fabrics, the synthetic fiber part is set using hot air (e.g. 180 ~ 220°C) to fix its dimensions and to improve dyeing properties with a heat setter.

- Resin finishing

The fabrics are finished by a resin finishing machine to add special properties such as softness, wash and wear, strength and fluorescent whiteness using resin, softeners and other chemicals.

- Compressive shrinking

Physical shrinking treatment is given to the fabrics in the warp direction to engender them with non-shrinking characteristics and softness using a compressive shrinking machine.

- Dyeing process

Both continuous dyeing and batch dyeing systems exist, but the former is more popular. There are many dyeing machine types and dyeing

procedures corresponding to various kinds of dyestuff and chemical agents. Adequate selection of dyeing process is important to achieve good results.

- Printing

Bleached fabrics are printed in different ways according to the kinds of fabric and design / pattern as follows:

(i) Flat screen printing system with engraving equipment and polyester screen: This system is used for complicated pattern of fine clothes for lady's wears.

(ii) Rotary screen printing system with engraved porous screen: This system is widely used for mass production. Advanced machines and technologies have been developed by the Stoke Company, in the Netherlands.

(3) Productivity improvement in the textile industry

Productivity of the textile industry is extremely low; it is assumed to be about 1/140 of the advanced country's productivity. The difference is difficult to explain by difference of equipment and technology. As a matter of fact, productivity varies among Hanoi's textile enterprises. The best one has about 50% better than the average and the worst has less than 50% of the average. Therefore, exchange of information on management among enterprises will improve productivity. The result of a factory visit revealed that some enterprises have already achieved a certain level in management, but others have not. Management of each enterprise should seriously examine its management and find solutions to improve productivity.

(4) Productivity improvement in the garment industry

The garment industry does not require large investment. Virtually, underdeveloped counties start with this business, by utilizing the cheap labor force. Industrialized countries also have garment industries, however, they are rather difficult to maintain because of competition with countries of cheap labor force, so the industry produces specialized and high added value products in the counties.

Vietnam will be able to utilize cheap labor, maybe up to 2010. However, growth of GNP will cause difficulty in the availability of cheap labor force in the future.

Under the centralized economy, production was evaluated simply by volume. However, under a market-oriented economy, it is not adequate because the value of a

product is decided by customers in the market. The textile and garment industry should be more aware of this fact precisely because products in the industry have a large influence from fashion. For this reason, the convertor mentioned in previous section must have fashion sensitive and fashion creative staff in their enterprise. These people can only be found in a private company free from any obligation or regulation.

It is difficult to evaluate products by ways other than the sales value which the customers accept in the market. Therefore, as mentioned before, productivity in industry should be evaluated and compared by net product value expressed in monetary terms.

4) Development Strategy of Textile / Garment Industry

(1) Strategy up to 2000

It is difficult to predict the future growth of Vietnam; however, if growth of the economy continues at the same rate as experienced between 1989 and 1993, the Vietnamese GDP in 2000 will be about 1.6 times the GDP in 1993. The Government has a target to double GDP by 2000. On this basis, the textile and garment industries should produce 60-100 percent more for the domestic market. It does not appear to be difficult to achieve this target by improving productivity.

When production increase in domestic cotton is successful, the cotton should be utilized to produce course count yarns; then the textile industry should produce heavy fabrics such as sheeting, shirting, poplin, denim, towels, jeans, etc. using domestic cotton yarn.

Direct investments of foreign competitors will have a large impact on the industry, because they might realize higher productivity than the existing Vietnamese industry. There might be more direct investments to the Ho Chi Minh area than the Hanoi area by foreign investors. Then, competition with Ho Chi Minh based industry will be harder. The industries in Hanoi should take such a situation seriously into consideration and prepare for the competition by improving productivity.

The Government is planning to organize a "general textile company" which absorbs all state textile enterprises, and form one company. This new system is not adequate for the market oriented economy, because it is a sort of monopoly or cartel organization. However, if the new general company reorganize the industry to group enterprises which are competitive in the market, the company will contribute to the future development of the industry. The general company should be a sort of temporary

organization for privatization of the industry, and should be separated again into adequate scale competitive companies as soon as possible.

The textile and garment industry exports about 300 billion Dongs worth of products from the Hanoi area. This corresponds to about 48% of total sales. The textile and garment industry is an export-oriented industry. The industry imports most raw material and fabrics, which costs foreign exchange. The import-export balance has not been calculated, but it might be slightly on the deficit side at present.

More garments should be exported during the early stage of economic development, while Vietnam can export garments based on cheap labor force. Fortunately, the garment industry does not require large investments. In the case of the textile industry, investment should be more prudent, because this industry requires comparatively large investments.

(2) Strategy up to 2010

When GDP per capita exceeds 600 US\$, cheap labor-based industry may encounter with difficulties. Consequently, the industry should quickly move to higher value added products. Convertors will become more important at this stage.

In order to increase export at this stage, it is recommended to open antenna shops in major cities around the world. Fashion mode information obtained through these antenna shops are important.

Demand for synthetic materials will not reach at an amount that makes it worthwhile to start production for domestic market. ASEAN countries and China have already operated plants to produce synthetic materials for the textile industry, so that hard competition and overproduction are unavoidable, if Vietnam starts a new production plant for similar products. By avoiding competition, Vietnam should join ASEAN market with new products; otherwise it is risky to produce synthetic material in Vietnam.

Vietnam should prepare for self sufficiency and export of garments from 2000 up to 2010. In production for export, importance should be placed more on high quality than low price.

F.4 Chemical Industry

1) General Background

The existing chemical industries in the Hanoi area are: (i) fertilizer, (ii) paint, vanishes and lacquers, (iii) pharmaceuticals, (iv) soap and detergent, (v) rubber products, and (vi) plastic molding.

Because of a large market in close proximity to the factories, and a sufficient work force available, it appears to be promising that such factories as (i) paint, vanishes and lacquers, (ii) pharmaceuticals, (iii) soap, detergent, cosmetics and other toiletries, (iv) rubber products, (v) plastic molding, and (vi) adhesives and glues are located in the Hanoi area.

On the other hand, factories which have high environmental risk because of high population density should not be considered as promising in the Hanoi area, for example: (i) petroleum refinery, (ii) petrochemical plant producing synthetic resins and other petrochemical products, (iii) basic industrial chemicals, and (iv) fertilizer.

Petroleum refineries and petrochemical plants are more promising to be located close to a seaport where a large volume of crude oil can be unloaded. Petroleum refineries use crude oil as a raw material and petrochemical plants should be located near refineries, since the naphtha coming from the refinery is used as a raw material. Gas-base petrochemicals, such as methanol and ammonia production, are also not suitable for the Hanoi area. These factories require a relatively small number of employees if compared with their large investment, because automatic operation is widely applied in modern plants. From an environmental viewpoint, these large scale plants should not be located in the Hanoi area, where population density is high.

Basic industrial chemical and fertilizer factories, which use a large volume of chemicals and emit huge amounts of gas and water, are not appropriate to be located in the Hanoi area. Accordingly, chemical factories suitable for the Hanoi area are generally consumer goods chemical factories. New factories producing consumer goods should be promoted further in the Hanoi area. It is additionally noted that Ho Chi Minh City has a higher population and buying power than Hanoi. Therefore, in the chemical industry of consumer goods, serious competition with the Ho Chi Minh City area will be inevitable.

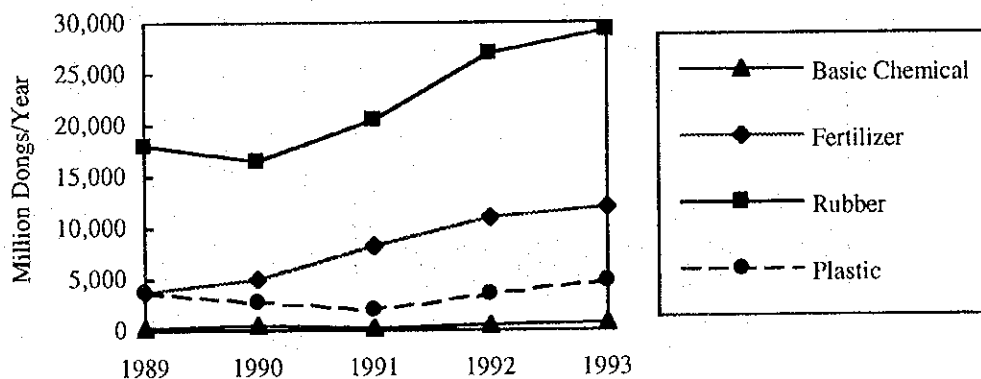
Consumer goods enterprises are of small or medium size, and accordingly, Hanoi should be considered as a small center of the chemical industry in the country.

2) Current Situation

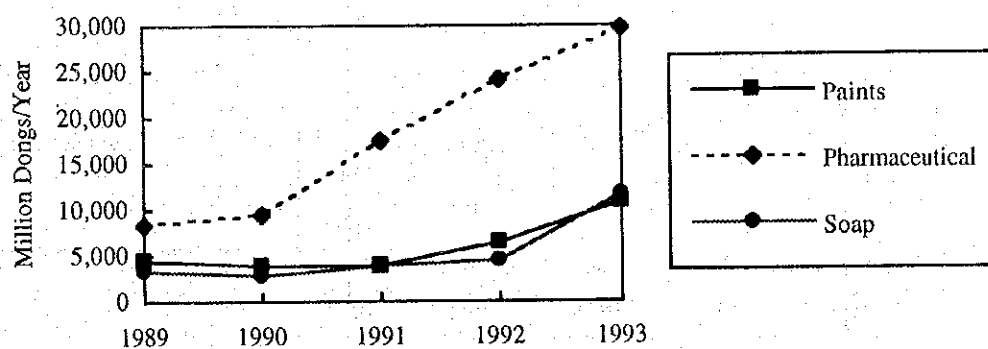
According to the enterprise list provided by HPC, there are over 40 chemical industries in the Hanoi area. Among them, 22 chemical enterprises replied to the questionnaire survey conducted by the Study Team. All of these enterprises, except for one fertilizer enterprise and two basic industrial chemical enterprises, are manufacturing consumer goods. Total annual sales of those chemical enterprises amounted to 390 billion dongs in 1993. About 5,600 workers are employed by these chemical enterprises.

The two figures below show the sales amount of the chemical industries by category. Since 1990, rubber, fertilizer and pharmaceutical factories have significantly increased their sales. Paints and soap factory's sales have also slightly increased. Sales of basic chemicals and plastic molding factories have not shown significant change.

CHEMICAL INDUSTRY(1): SALES AMOUNT AT 1989 PRICE



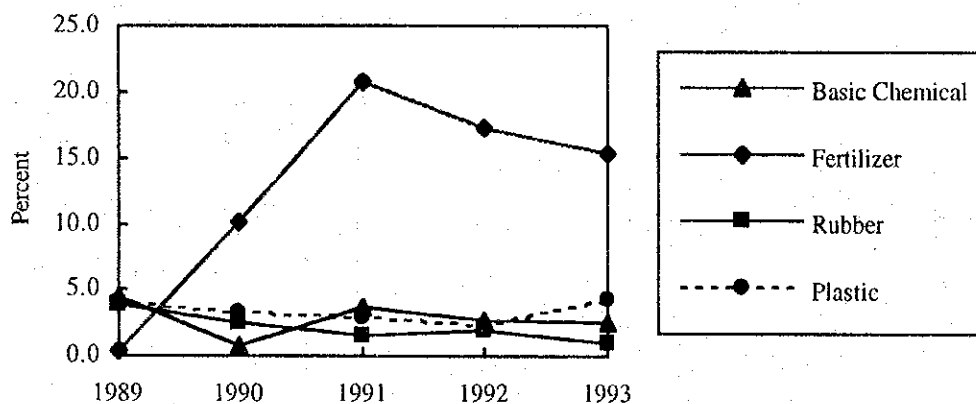
CHEMICAL INDUSTRY(2): SALES AMOUNT AT 1989 PRICE



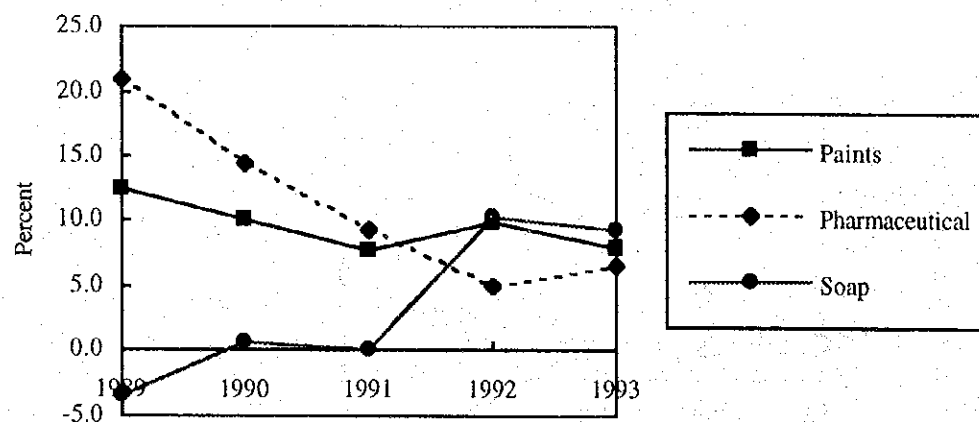
Profit per sales of the chemical industry by category is shown below. The profit per sales of the fertilizer factory increased in the period between 1989 and 1991, after which it decreased slightly. But, it still remained at a level of 15% in 1993 supported by strong demand. The rubber, plastic and basic chemical factories are staying at a profit level of 2% to 4% which may be caused by over production and comparatively weak demand. Paint factories have maintained a high profit level of 8% to 12% since 1989. Pharmaceutical factories have decreased their profit per sales from 20% in 1989, to 6.5% in 1993. Soap factories had no profit up to 1991, but they have increased their profit per sales to more than 10% since 1992.

As indicated above, each category of the chemical industry has comparatively high profit per sales, except rubber, plastic and basic chemical factories.

CHEMICAL INDUSTRY(1): PROFIT PER SALES

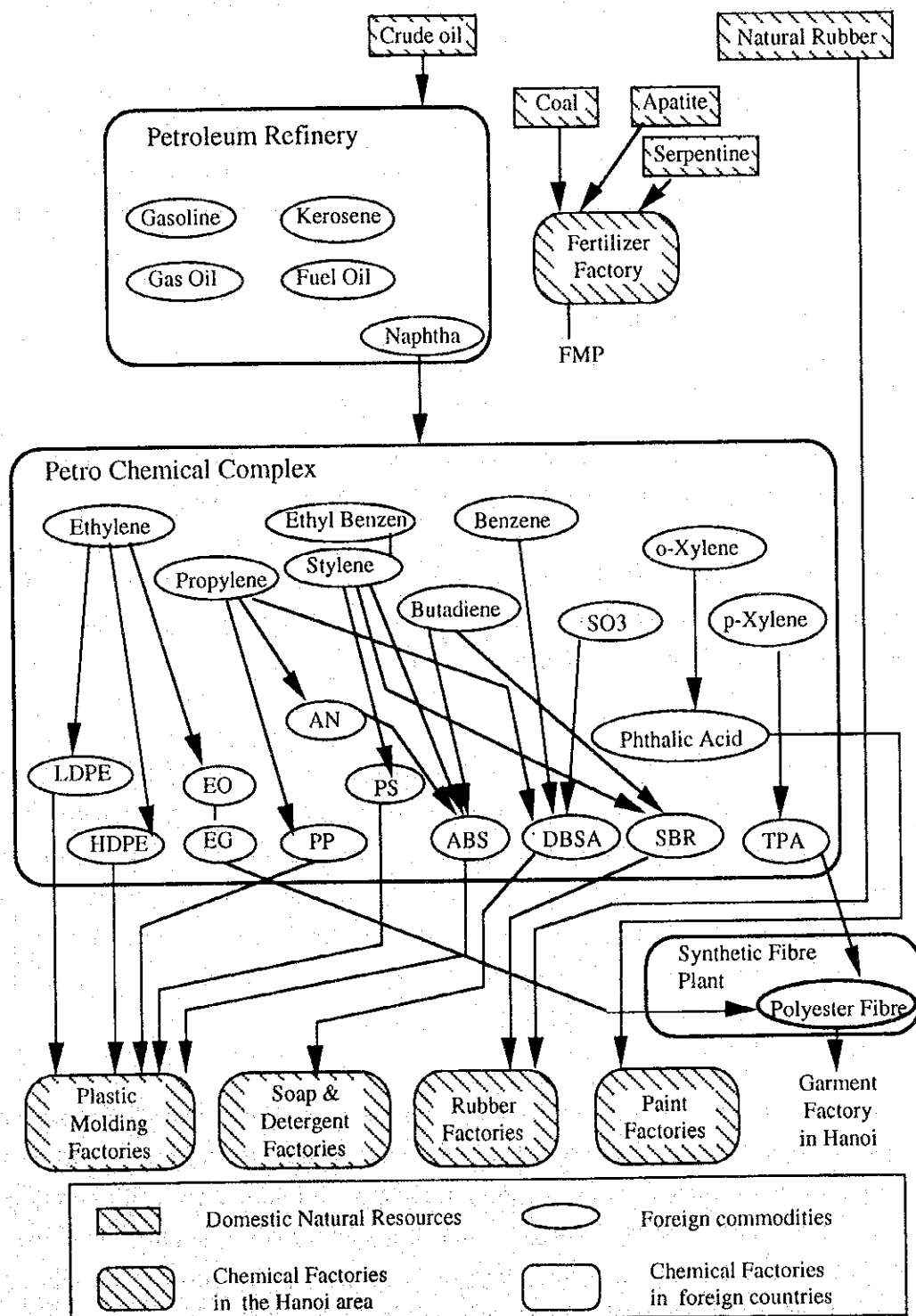


CHEMICAL INDUSTRY(2): PROFIT PER SALES



3) Materials and Flow Scheme

Undertakings of Hanoi's chemical industry in the overall industry scheme are illustrated in the diagram presented below. The diagram indicates that Hanoi's chemical industry depends on imported raw materials with the exception of a fertilizer factory which manufactures FMP fertilizer from domestic materials.



Material and Overall Flow Scheme for the Chemical Industry

Vietnam has no petroleum refineries nor any petrochemical plants yet. Consequently, most factories in Hanoi's chemical industry import petrochemical products as raw materials as shown in the above diagram.

The plastic molding factories import resins such as LDPE (Low density polyethylene), HDPE (High density polyethylene), PS (Polystyrene), PP (Polypropylene), ABS (Acrylonitrile-butadiene-styrene resin), and make their products from injection molding. The detergent factories import DBSA (Dodecylbenzenesulfonic acid) as their main raw material, and produce their products from reactions with caustic soda. The rubber factories import synthetic rubbers like SBR (Styrene butadiene rubber), in addition to domestic natural rubber. These rubbers are reinforced by textiles and formed into tires by heating and pressing for vulcanization.

4) Fertilizer Manufacturing

(1) Current situation

There is one fertilizer factory in the Hanoi area manufacturing FMP (Fused Magnesium Phosphate) and NPK fertilizers. This factory has operated its plant very well with its own know-how. However, the product (FMP) contains only 15-16% P_2O_5 , which is quite low if compared with TSP (Triple Superphosphate, P_2O_5 content: 45-47%), DAP (Diammonium Phosphate, P_2O_5 content: 53.8%) and MAP (Monoammonium Phosphate, P_2O_5 content: 61.7%).

According to the available data, on a nutrient base, 603,000 tons/year of nitrogen fertilizers, 147,000 tons/year of phosphate fertilizers and 25,000 tons/year of potash fertilizer were consumed in Vietnam in 1993, while only 46,000 tons/year of nitrogen fertilizer, 86,000 tons/year of phosphate fertilizer and no potash fertilizers were produced. The deficient volume of nitrogen fertilizer and phosphate fertilizer, and total amount of potash fertilizer were imported. The rate of domestic supply is 8%, 59% and 0% for nitrogen, phosphate and potash fertilizers, respectively.

(2) Major constraints

FMP fertilizer and NPK fertilizer are produced in the Hanoi area. NPK fertilizer is made by bulk blending of nitrogen, phosphate and potassium fertilizers. FMP is a good phosphate fertilizer that can supply magnesium to improve the soil as well as P_2O_5 as a nutrient. However, its P_2O_5 content is quite small as pointed out above. This is a clear disadvantage in quality. Imported DAP and NPK fertilizers are preferred in South Vietnam. This is considered as an indication of the market trend.

Supply and Demand of Fertilizer in Vietnam

	Unit : 1,000 tons			
	1990	1991	1992	1993
<u>N</u>				
Production	10.9	20.2	38.0	46.0
Imported	401.7	573.8	488.4	560.8
Total Supply	412.6	594.0	526.4	606.8
Demand	413.9	596.1	527.5	603.3
<u>P₂O₅</u>				
Production	51.2	61.4	66.7	86.3
Imported	61.7	69.6	82.4	69.0
Total Supply	112.9	131.0	149.1	155.3
Demand	120.8	126.4	140.8	147.4
<u>K₂O</u>				
Imported	-	20.0	25.0	25.0
Demand	-	20.0	25.0	25.0

Source : MOHI, MAFI

As shown in the above table, a large amount of phosphate and nitrogen fertilizers is imported. Domestic production of phosphate and nitrogen fertilizer should be increased to save hard currency.

(3) Proposed improvements of fertilizer industry

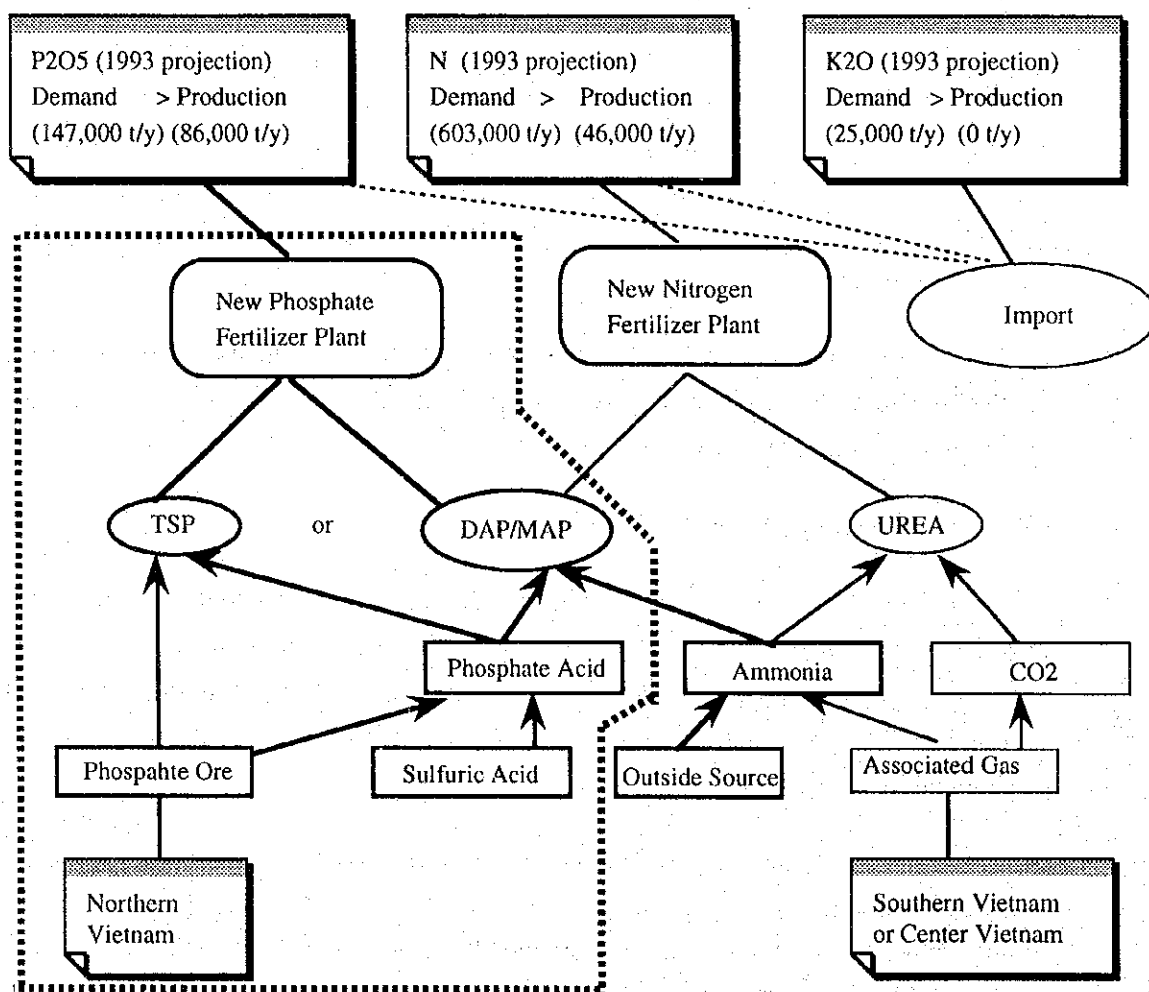
It is clear that new nitrogen and phosphate fertilizer plants should be constructed in Vietnam to replace imported fertilizers and meet increasing demand. As for the nitrogen fertilizer plant, using natural gas as a raw material for ammonia is the most economical way. The plant should be located in South Vietnam, where natural gas can be supplied by pipeline.

On the other hand, North Vietnam is better than South Vietnam for phosphate fertilizer production, because phosphate ore, i.e. apatite, is produced at Lao Cai in Hoang Lien Son Province. It is recommended to select higher P₂O₅ fertilizers than FMP (Fused Magnesium Phosphate) or SSP (Superphosphate) among phosphate fertilizers such as TSP (Triple Superphosphate) or a combination of DAP (Diammonium Phosphate) and MAP (Monoammonium Phosphate). Higher content fertilizer reduces handling and transport weight. DAP and MAP contain nitrogen and phosphate.

Phosphate ore and sulfuric acid are necessary for production of TSP, MAP or DAP. Phosphate ore can be transported to the factory from Lao Cai by rail. Sulfuric acid can be supplied from another factory or may be produced in the phosphate fertilizer plant. In addition, ammonia is necessary to produce DAP and MAP. It can be transported from the ammonia plant by rail.

The existing FMP plant in Hanoi has been blamed for environmental pollution in spite of the utmost effort by the enterprise to reduce pollutants. A new fertilizer plant should be prepared with more complete facilities for pollution prevention and located outside the Hanoi area.

Recommendation on Fertilizer Industry



(4) Development strategy of fertilizer industry

A feasibility study on a new TSP plant at Lam Thao has already been concluded; however execution of the project has not been initiated. The delay may be attributable to financial difficulties. The Government should place higher priority on developing the project, because it will contribute to both agricultural development and reduction of foreign currency flow-out.

The existing fertilizer factory at Van Dien should continue its production and enforce environmental protection, but it should not expand its capacity. The factory should close down after the new factories have satisfied the demand in the country.

5) Paint Manufacturing

(1) Current situation

Two state enterprises are manufacturing paints and varnishes in the Hanoi area. Their products are mainly of the alkyd resin and amino-alkyd resin types. All products are sold in the domestic market.

Both enterprises have excess workers, however they are employed temporarily for manufacturing paint cans. The factories are gradually replacing old machines with new imported ones to improve their process. The factories intend to introduce a new manufacturing process for automobile paint with the cooperation of foreign companies.

(2) Major constraints of paint industry

The following constraints have been observed:

- In Vietnam, there are 8 paint factories with a total rated capacity of 20,000 tons per year. There are 3 factories which are larger than those in Hanoi; two of them are located in Ho Chi Minh City and one is in Hai Phong. Both factories in Hanoi are of medium size. The factory in Hai Phong has fewer workers, in spite of a larger production capacity, than the factories in Hanoi. In addition, it has better manufacturing and testing facilities. Shipbuilding factories, which are large consumers of paints, are located in Hai Phong.
- The manufacturers in the Hanoi area have not yet applied adequate technologies for car paint manufacturing. Demand for this type of paint by the automobile assembly industry will increase.

- Molds heavily contaminate buildings and houses in the Hanoi area. The paint manufacturers should develop technologies for anti-fungus paints.
- Both enterprises should reduce excess workers. At present, excess workers are manufacturing paint cans and some workers are manually filling paint in cans, but these works are quite inefficient. The enterprise should reduce these workers by improvement and utilize them to other work.

In the Hanoi area, there is an increasing demand for paints in new building projects, renovations of existing buildings and bridges, manufacturing and repair of cars and motorcycles, etc. The following data show the actual and projected demands for paints in the Hanoi area.

Demands for Paints in the Hanoi area

Unit : 1,000 tons/year						
Actual			Estimated	Projected		
1990	1991	1992	1993	1994	1995	2000
1,944	2,222	2,431	2,980	4,300	5,800	13,000

Data Source: HPC

Demand will reach 13,000 tons/year in the year 2000, according to the above data. Total production capacity of Hanoi's two paint factories is 5,000 tons/year at present. Consequently, according to this projection, the current production capacity has to be expanded.

The paint industry produces paints from imported resins and pigments. Paints are mostly used for walls of buildings. Paints for machines are also produced but in not so large quantities.

In line with the advancement of painting technology, various new kinds of paints will be required. Most conventional painting uses a brush; however air spraying and airless spraying are common methods of painting at present. In the Hanoi area, air spraying is prevalent. Airless spraying improves paint use and efficiency, so it is used by the shipbuilding and steel construction industries. This method will be more utilized in Vietnam in the near future. In the following section, advanced method of painting will be explained.

For the mass production of plywood, color steel sheet, etc., a flow coater or a roll coater is used. These systems can paint products automatically and continuously. In the system, paint loss is minimized by automatic recycling. Electrostatic painting prevents paint loss by attracting spray paint with high voltages of kV order. Paint makers in Hanoi should prepare adequate paints for these methods. Further, they

should provide good advice to their customers on modern painting technology, as an important marketing activity.

As a method for painting electrical equipment, containers, machines, etc., powder coating (PC) is becoming popular. In this method, a hot melt type powder paint such as epoxy resin, acrylic resin and polyester resin paint, is used. Paint is sprayed, melted by a flame or coated by an electrostatic powder spray. It is also applied to mass produced parts by placing them in a fluid bed of paint powder. This method requires rather expensive facilities, however it is safe because there is no solvent and it also realizes high quality painting easily.

Electrophoretic coating is prevailing among automobile makers, aluminum sash makers, etc. This method uses gel formed paint dispersed in water. Paint particles are attracted to a metal surface by electrophoresis. Paint is applied in a tank in which the paint is diluted with pure water. This method has many advantages such as, (i) easy automation, (ii) coating thickness control, (iii) no danger of air pollution and explosion, (iv) small loss of paint. This method may be adopted after several years of industrial advancement in Hanoi.

(3) Proposed improvements of paint industry

Paint and varnish factories in Hanoi are of medium size for the following reasons: (i) a comparatively small amount, but large variety of paints and varnishes are requested by users, (ii) technology and facilities for manufacturing paints and varnish are suitable for development by a medium size enterprise, and (iii) batch system production is applied, so that scale merit is not expected.

The factories should improve the following points:

- (i) To utilize excess workers effectively to be cost-competitive.
- (ii) To improve inventory control by using computers in order to reduce working capital.
- (iii) To research market demand continuously and to apply market information to production planning and development planning of new products. Market research and R & D have important functions for this purpose. Test apparatuses such as accelerated weather testers should be introduced as a tool of R & D.
- (iv) To start manufacturing automobile paints for car assemblers in Vietnam.
- (v) To make effective anti-fungus paints. Such paint seems to be in great demand, judging from the abundance of moldy walls of buildings and houses in the Hanoi area.

(4) Development strategy of paint industry

The following development strategies are recommended:

- To increase production capacity to meet the demand in the Hanoi area by 2000.
- To expand business in new fields to absorb excess workers as soon as possible. Field painting and shop painting work are possible fields for expansion.
- To purchase advanced technology licenses for automobile paints and anti-fungus paints from foreign companies by 2000.
- To establish a good R & D organization to promote the introduction of new technologies by 2010.

6) Synthetic Detergent and Soap Manufacturing

(1) Current situation

Three enterprises are manufacturing powder and paste laundry detergents in the Hanoi area. In addition to detergents, one enterprise is producing some inorganic chemicals and pure and pharmaceutical chemicals, and another one is producing beauty soaps, washing soaps and toothpaste, and has decided to establish a joint venture with a Dutch-based international company, UNILEVER.

(2) Major constraints of synthetic detergent and soap industry

The table below indicates the projected demand, current rated capacity of production of powder detergent and beauty soap in Hanoi.

Detergent and Soap Production in the Hanoi area

	Unit : tons/year			
	Projected Demand		Rated Capacity	Current Production
	1995	2000		
Powder Detergent	15,000	20,000	NA	14,000
Beauty Soap	1,000	3,000	400	200

Source: HPC

Note: NA= Not Available

Powder detergent production in Hanoi accounts for one-third of total production in Vietnam. However, beauty soap production in Hanoi is only one-sixth of total production. It is projected that the Hanoi area will consume powder detergent at the

rate of 15,000 and 20,000 tons per year in 1995 and 2000 respectively. No significant expansion of powder detergent production is needed according to this estimate.

An increase in powder detergent consumption relates to the increase of washing machines. At present, it is reported that less than one percent of families have washing machines, even in the center of Hanoi city. Consequently, consumption of powder detergent per capita is quite small. Inadequate water supply and low income are major reasons for the limited number of washing machines. However, if washing machines spread in the Hanoi area in the future, more washing powder will be consumed in proportion to the number of washing machines. Until the market changes in this way, factories should postpone large investment to expand production capacity.

The rated production capacity of beauty soap is only 400 tons per year, which is smaller than the projected demand of 1,000 tons per year in 1995 and 3,000 tons per year in 2000. Further, there is no manufacture of shampoo or kitchen detergent in the Hanoi area. Consumers are using shampoo and kitchen detergent imported or produced in other areas of Vietnam. No actual consumption data are available for either beauty soap, shampoo, or kitchen detergent, probably because these products used in the Hanoi area include a considerable amount of smuggled goods.

Another constraint is the employment of excess workers. These excess workers are just filling detergent into plastic bags in the factories.

(3) Proposed improvement of synthetic detergent and soap industry

Most Vietnamese detergent factories use ABS (Alkylbenzensulfonate), which is called a hard type, as a main raw material. This material is used commonly worldwide, because it is cheap and has strong washing power. However, ABS included in washing waste water contaminates rivers and lakes, because it cannot be decomposed by bacteria. In Japan, many environmental problems were caused by ABS in the 1960s. Foam from detergent defiled many rivers and interfered with waste water treatment. In order to avoid such problems, hard type alkylbenzensulfonate was replaced by soft type alkylbenzensulfonate, i.e. LAS (Linear Alkylbenzensulfonate) which is easily decomposed by bacteria. The hard type detergent used in Vietnam should be shifted to the soft type one as soon as possible in order not to cause environmental problems.

Detergent generally includes various kinds of additives, called builders, in addition to main constituents such as ABS and LAS. Builders themselves have no washing power but have functions, typically promoting the function of the main constituents such as washing power, dispersion and emulsification; improving foam

stability; protection of users' hands; pigment and perfume functions, etc. Detergent factories should investigate the effective use of builders. Sodium tripolyphosphate ($\text{Na}_5\text{P}_3\text{O}_{10}$) was once globally used as a good builder, but its utilization was stopped in the 1970's because it caused the eutrophication in lakes, ponds and rivers. Negative effects of builders must also be investigated by the industry.

In Japan consumers tend to prefer compact type powder detergent in which special enzymes are added to enhance washing. The required washing power can be obtained from a smaller amount of the compact type powder detergent, compared with a conventional powder detergent. Recently, Japanese consumers also tend to have a preference for detergents which are mainly made of higher alcohols from vegetable oils. From an ecological viewpoint, many consumers prefer an image of natural materials instead of alkylbenzensulfonate and high alcohols made from petroleum products. Vietnam produces vegetable oils such as coconut oil. These oils are good for producing higher alcohols.

(4) Development strategy of synthetic detergent and soap industry

For the development of the soap and detergent industry in the Hanoi area, it is recommended to :

- (i) Expand beauty soap production in the Hanoi area by 2000,
- (ii) Start manufacturing shampoo and kitchen detergent in the Hanoi area by 2000,
- (iii) Delay the expansion of powder detergent plants until the further spread of washing machines, and
- (iv) Investigate new types of detergents with advanced functions and environmentally safe.

New technologies are required to realize such expansion and new product manufacturing. The joint venture with UNILEVER is a good measure to introduce foreign technologies. Other enterprises should also introduce advanced technologies from foreign companies.

Besides the above introduction of technology, enterprises should establish their own organizations for R & D. Developing new products is mandatory for keeping continued prosperity. If a consumer goods manufacturer does not create any new products for over a decade, it cannot survive in the market economy. An enterprise must satisfy consumers with research and development of new products.

7) Medicines and Pure Chemical Industry

(1) Current situation

Ten pharmaceutical enterprises replied to the questionnaire survey, conducted by the Study Team, though probably only two of them are medicine makers (or mixing companies). Other pharmaceutical enterprises are trading or storing medicines.

There is a pure chemical factory in Hanoi. This factory is purifying chemicals using small scale apparatuses.

(2) Proposed improvement of medicine and pure chemicals

Recent advances in medical science have been quite remarkable all over the world. The medical industry should follow the advancement without delay and place more effort on effectively introducing new medicines in Vietnam, however at the same time it should pay more attention to avoiding disasters caused by harmful side effects. International collaboration is quite important in this area.

Vietnam produces a wide variety of herbs. Medical effects of herbs have not been analyzed well, however their effects are appreciated everywhere in the world. The pharmaceutical industry in the Hanoi area can contribute in this area.

(3) Development strategy of medicines and pure chemicals

Demand and utilization of medicines depend much on the pharmacy system. Pharmacies have an important role for people's health. In other developing countries, pharmacies are performing an important role, especially in areas where no medical doctors are available. The Government should develop a good education system concerning pharmacies and a better medicines delivery system by 2010.

The herb industry should be developed and high quality herb products should be exported.

8) Rubber Products

(1) Current situation

In the Hanoi area, there is one rubber tire enterprise, manufacturing the following tires:

- Motorcycle tires : 300,000 /year
- Bicycle tires and tubes : 3,500,000/year

- Automobile tires and tubes : 13,000/year
- Bicycle inner tubes: 2,000,000/year

The main product is bicycle tires and tubes, but their demand is decreasing as shown in the table below. This decrease has been caused by a slump in bicycle manufacturing which cannot compete in price and quality, with the bicycle industry in China. It is reported that the Union of Hanoi Bicycle and Motorcycle Factories (LIXEHA) recently went bankrupt. If the Vietnamese bicycle industry does not recover, demand for bicycle tires and tubes will be further decreased due to distinction of local bicycle production.

Demand for Bicycle Tires and Tubes in the Hanoi area

Unit : 1,000 sets/year

Actual			Estimated	Projected		
1990	1991	1992	1993	1994	1995	2000
7,451	6,892	6,442	6,100	6,300	6,400	8,000

Data Source: HPC

It is reported that Vietnam's demand for automobile tires and tubes was 300,000 to 350,000 nos. in the year 1992 when Vietnam had about 250,000 automobiles. The number of cars has increased since then and it will continue to increase. It is expected to reach 700,000 to 800,000 in the year 2000.

Production of automobile tires and tubes is concentrated in the Hanoi area, but Hanoi's production corresponds to only a few percent of the demand in Vietnam. More than 90% of automobile tires and tubes are imported. Demand for motorcycle tires is increasing, but there are no reliable data.

As for raw material supply, this factory depends on natural rubber produced in South Vietnam, and on imported synthetic rubber and chemicals.

(2) Major constraints of rubber industry

The current main products of the rubber tire enterprise are bicycle tires and tubes. However, demand for bicycle tires and tubes is decreasing due to a slump in the domestic bicycle industry. The enterprise is also producing motorcycle tires, automobile tires and tubes. But there are technical constraints for their production, especially automobile tires.

(3) Proposed improvement of rubber industry

The enterprise should improve the existing automobile tire manufacturing line, which does not work effectively, in order to improve product quality and productivity. In addition, the enterprise should study the introduction of new rubber products such as industrial belts and seals.

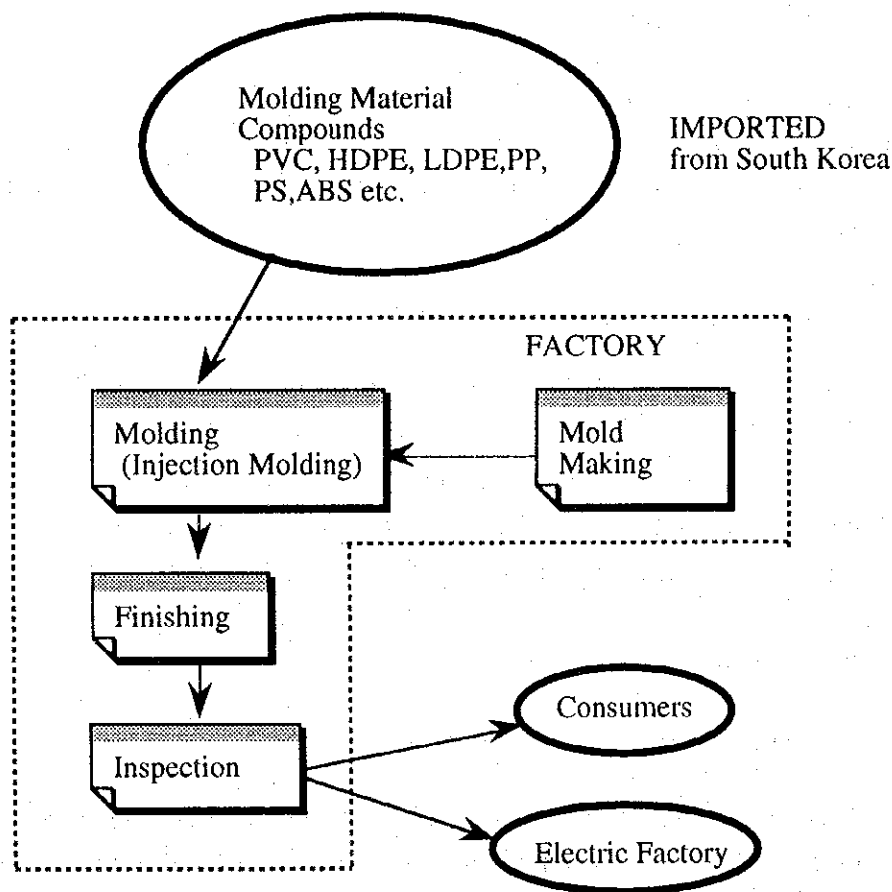
(4) Development strategy of rubber industry

For improvement of the existing automobile tire manufacturing line and development of new rubber products such as industrial rubber belts, the enterprise should purchase technical licenses from foreign companies. Facilities and technology should be improved in the areas of vulcanization, chemical additives and textiles for reinforcement in order to achieve export quality for the products by 2010.

9) Plastic Products

(1) Current situation

There is one factory specializing in plastic molding. Apart from this, there are a few factories which have plastic molding machines for plastic toys, plastic stationery, plastic bags, plastic string, etc. Their production process is illustrated below.



A small portion of plastic products is produced in Vietnam from imported resins, however most plastic parts are imported to Vietnam attached to commodities which include plastic parts and packages. Accordingly, the total consumption of plastic goods is difficult to estimate from the available data.

Vietnamese plastic consumption is preliminary assumed to be 0.1 ~ 0.2 kg/year/capita at present. It is expected that total consumption of plastic goods will reach a level of 100,000 tons/year in 2010.

(2) Major constraints of plastic industry

Raw materials are formed into shape by molding. The quality of plastic products depends largely on the quality of molds. The visited factory was manufacturing its molds with acceptable quality. The factory is using injection molding machines for thermoplastic resins (no compression molding machine). Its production is limited to goods made from thermoplastic resin, such as PVC, HDPE, LDPE, PP, PS and ABS.

(3) Proposed improvement of plastic industry

Assembly of electric appliances by CKD will increase in the Hanoi area. This appears to be a good opportunity to manufacture and supply plastic parts to electric appliance factories. The electronics industry also requires highly insulated plastic parts. Phenolic resin and Melamine-formaldehyde will meet such requirements. Compression molding must be introduced to mold these plastics.

(4) Development strategy of plastic industry

Plastic products can be used in a wide range of fields, but current products in the Hanoi area are quite limited. Enterprises should conduct market and technology surveys for new applications of plastic goods. It is recommended that compression molding be introduced by 2000.