July 2007

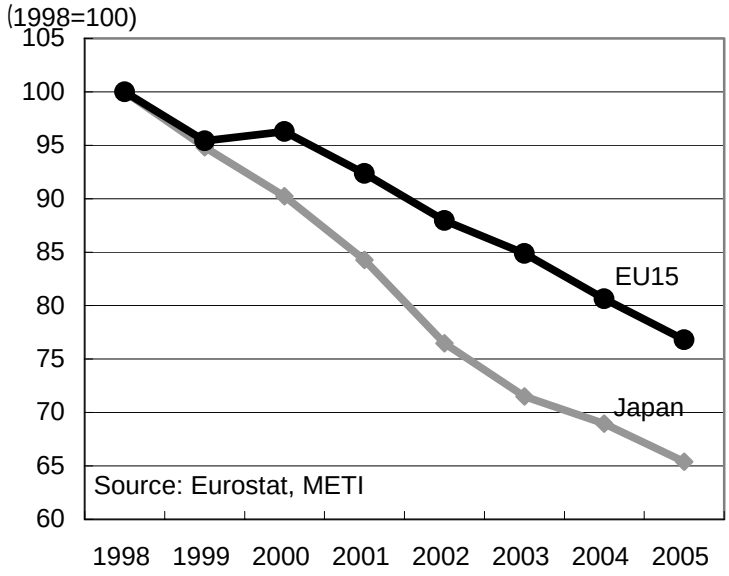
JCFA Study on European Textiles and Clothing (T&C) Industry
<Executive Summary>

I. Overview of European T&C (and chemical fiber) Industry

<European T&C industry on the decline in scale>

- As has been the case for the Japanese industry, due to increase of imports from low-cost countries, the European textiles and clothing (T&C) industry has been on the decline in scale with the decreasing production and numbers of companies and employees. However, when you look at the evolution of production index (with 1998 as 100), the European industry's index in 2005 was 77 compared to 65 for the Japanese industry, and the decline has been more moderate than the Japanese industry.

Figure 1: Production Index of European and Japanese T&C Industries



- The backgrounds of more moderate decline of the European T&D industry than the Japanese industry are as follows:
  1. Quotas on imports from China, T&C superpower, had been set, and import pressure on the European T&C industry had not been as strong as the one on the Japanese industry.

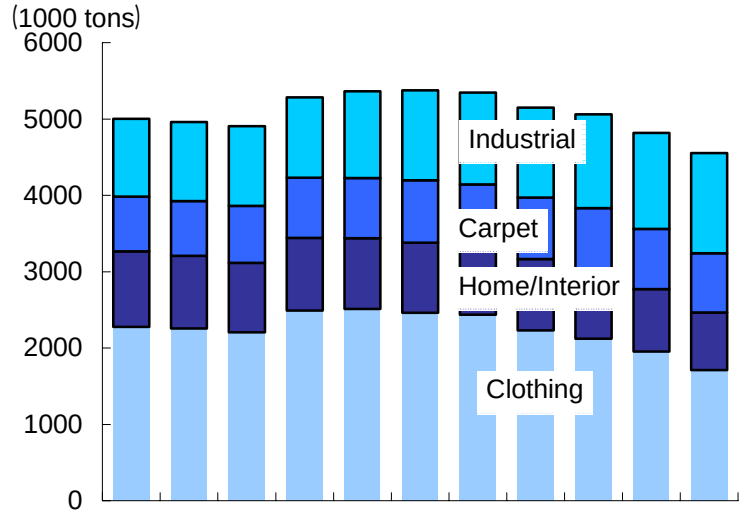
2. There have not been T&C giant countries in her neighborhood (distance from China).
3. The EU 15 countries' T&C industries have been taking advantage of neighboring low-cost countries such as Eastern European countries, Turkey and North African countries for their survival.
4. The European clothing industry has much stronger branding power and competitiveness in export markets.
5. Markets in Europe for technical textiles have been expanding.
6. The European T&C industry has efficient production systems.
7. The EU authorities have been taking agile trade policies.

- However, since 1st January 2005 with the termination of quotas under the WTO's Agreement on Textiles and Clothing (ATC), they have been suffering influx of imports from Asia centering on China. Imports from China have been calmed as a result of the EU-China agreement on quota re-imposition up to 2007, but this does not give grounds for optimism about whether or not the European T&C industry would be able to maintain its scale in the years to come.
- Under such circumstances as described above, the European T&C industry has been shifting her directions to non-clothing sectors. Mill consumption of industrial yarns/fibers in EU15 has increased from 1.02 million tons in 1994 to 1.31 million tons in 2004, and its share in the total fiber/yarn mill consumption went up from 20% to 29%. The combined fiber/yarn mill consumption for industrial and household/interior applications expanded from 54% to 62%.

  In her chemical fiber industry, this trend has been more noticeable, and the mill consumption for industrial applications was up from 820 thousand tons in 1994 to 1.19 million tons in 2004 with the share in the total chemical fiber/yarn mill consumption at 25% to 35%.

  For comparison, in Japan, chemical fiber/yarn mill consumption for industrial applications remains at the same level, namely 323 thousand tons in 1997 and 312 thousand tons in 2005. However, with drastic decline in the mill consumption for clothing applications, share of the mill consumption for industrial applications upsized from 24% in 1997 to 32% in 2004.

Figure 2: Fiber/yarn Mill Consumption by end-use in EU15

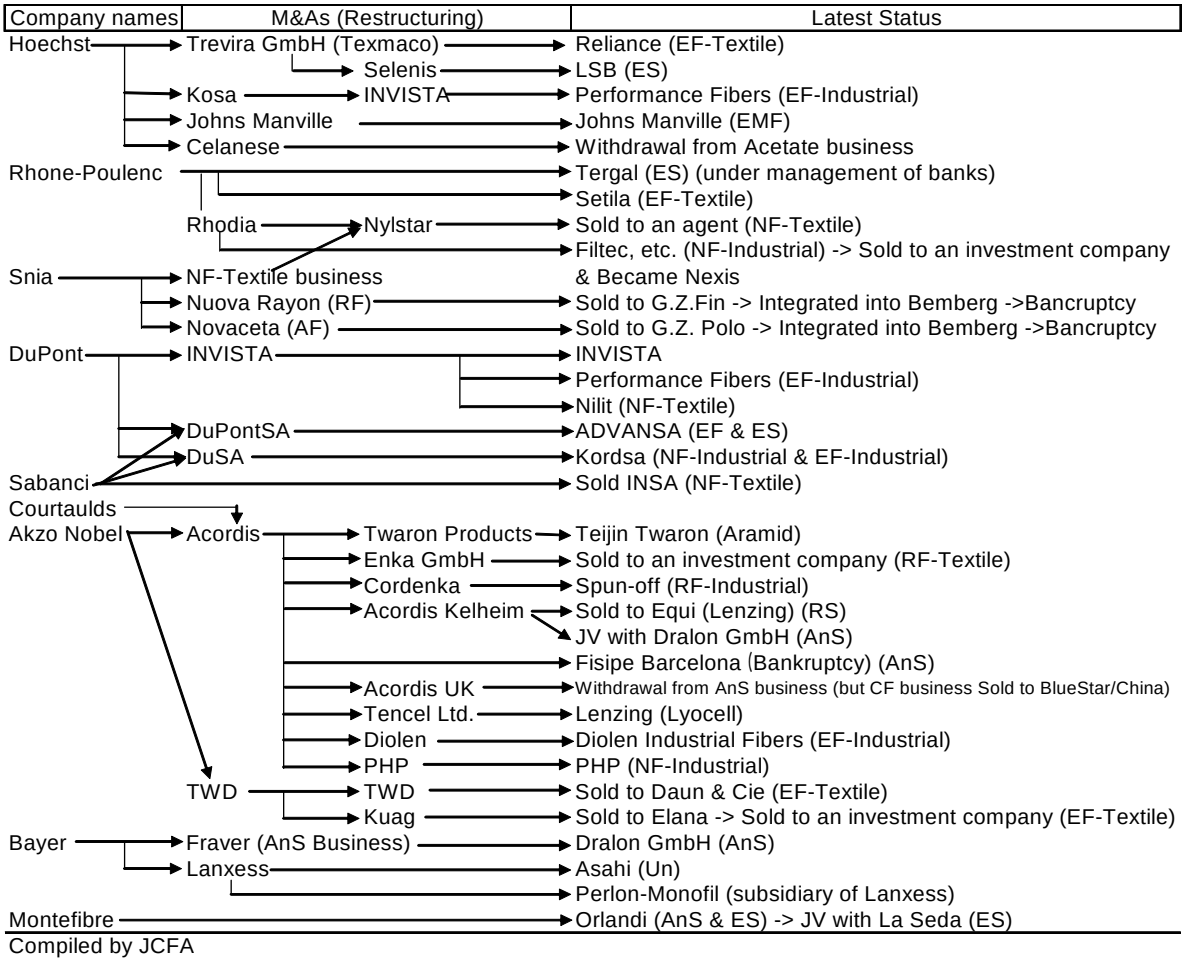


Source: CIRFS

<Structural changes in European chemical fiber industry>

- Chemical fiber industry in Europe had developed as a business sector of so-called "chemical majors" like Hoechst, ICI, Rhone-Poulenc and Akzo Nobel. Since 1990, under these companies' restructuring processes, their chemical fiber businesses faced withdrawal, spin-off or sale, which led to decrease in the production, increase of number of companies, investments by foreign companies, and so on.
- Under such circumstance, the European chemical fiber industry has been concentrating on higher value addition and higher functionalization, and "traditional" product businesses such as nylon textile filament yarns and polyester textile filament yarns (for ordinary clothing) and staple fibers for spun yarns have drastically deteriorated and bankruptcies and sales have continued to take place. On the other hand, higher value-added and higher functionalized industrial yarn/fiber manufacturers such as PHP, Diolen, Kordsa and Performance Fibers are delivering strong results. Lenzing, rayon giant, has also strengthening its functional products for non-wovens and its Lyocell and Modal brand products, and it expands production sites in Asia for its basic products.

Figure 3: Evolution of Chemical Fiber Businesses in European "Chemical Majors"



Compiled by JCFA

E: Polyester, N:Nylon, An: Acrylic, R: Rayon, A: Acetate, Un: Spandex, F: Filament yarns, S: Staple fibers

Figure 4: Chemical Fiber Production in Western Europe (EU15+Switzerland)

(thousand tons)

	2000(a)	2003	2004	2005(b)	b/a (%)
Polyester F Industrial	205.8	206.7	227.3	235.2	14.3
Other Synthetic F+S	48.0	53.0	58.0	53.0	10.4
Rayon S	345.0	341.1	353.6	355.7	3.1
Rayon F Industrial	42.0	37.2	41.0	42.4	1.0
Nylon F Industrial	69.6	71.2	69.1	68.3	-1.8
BCF	179.9	170.0	177.3	171.8	-4.5
Polyester S	470.0	448.4	435.8	398.6	-15.2
Acrylic S	622.0	578.6	547.2	448.7	-27.9
Nylon S	122.0	87.1	88.4	78.6	-35.6
Nylon F Textile	264.5	198.7	189.3	165.0	-37.6
Polyester F Textile	280.2	192.6	171.4	149.7	-46.6
Acetate F	30.0	22.2	17.6	13.5	-55.0
Rayon F Textile	40.0	21.0	18.1	13.6	-66.0
Total	2,719.0	2,427.7	2,394.0	2,194.1	-19.3

(Source) Fiber Organon & extimate by JCFA

Olefin fibers are excluded. Other Synthetic F+S are Spandex, Aramid, etc.

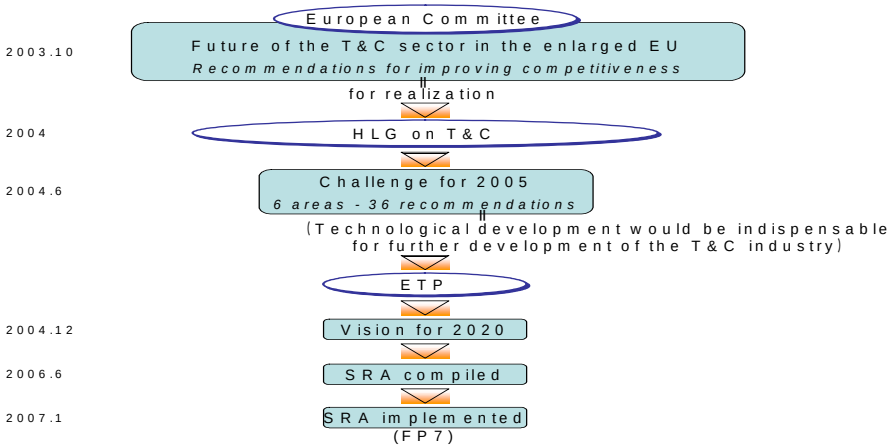
- The chemical fiber production reflects the aforementioned structural changes. Chemical fiber production in Western Europe (EU15+Switzerland) decreased by 19% from 2.72 million tons in 2000 to 2.19 million tons in 2005. The Production of textile filament yarns and of acetate filament yarns, most of which is for clothing applications, and the production of acrylic staple fibers show significant drop. However, the production for industrial applications either remains flat or increases, and the production of rayon staple fibers shows a slight increase. Regarding the production of polyester staple fibers, the one for non-wovens has been on the rise, but the one for spun yarns decreases drastically. For comparison, chemical fiber production in Japan from 2000 to 2005 experienced a 29% drop from 1.43 million tons to 1.02 million tons.

II. Industrial Policies for European T&C Industry

<EU's Industrial policies with long-term vision and emphasis on technology>

- Industrial Policies in EU are basically made and taken on the basis of cross-sectoral principle, however, the European Commission tries to take into circumstances of respective industries into account as much as possible in order to ensure the efficiency of their industrial policies. In EU, T&C industry has been positioned as an important industry because of its influences on employment and regional economies and also because of its technological innovation, and High Level Group on textiles and clothing, which was established in 2004 to discuss measures for improving competitiveness of the European T&C industry, discussed how EU's industrial and trade policies should be, and made 36 recommendations in 6 areas in June 2004.

Figure 5: Evolution of ETP



- The High Level Group understood that technological catch-up by China and India would be fast and that threat by China after Quota removal would be strong, the Group concluded that technological development would be indispensable for further development of the European T&C industry. The High Level Group then recommended the establishment of the European Technology Platform (ETP) for the Future of (EU's) Textiles and Clothing, and the ETP began its works in 2004.
- The ETP had drafted a vision for 2020 in December 2004, and compiled the Strategic Research Agenda (SRA) in June 2006, which gives what directions and research and development (R&D) roadmap that should be taken by the European T&C industry based on long-term forecast of social changes. The SRA has been implemented since January 2007, and a large amount of financial support by the EU and the member countries will be provided to the ETP.
- Long-term philosophy, emphasis on science, technologies and R&D and attention to high- and advanced-technologies are general characteristics of the EU's industrial policies, and the industrial policies for her T&C industry also focus on the support for R&D and innovation based on a long-term vision.

<Emphasis on Various Types of Co-operation>

- As there exists many policy-making entities in EU such as the European Commission, member countries, regional governments, various R&D institutes, trade organizations and individual companies, co-operation has been emphasized for efficient implementation of industrial policies. In the field of R&D, respective participants in R&D activities clarify their own roles/positions, and they try to be well aware of pursuing strategic, efficient and co-ordinated R&D activities instead of doing R&D activities separately among small- and medium-sized enterprises (SMEs). In R&D of technical textiles in particular, industry-government-academia co-operation among user industries, R&D institutes and universities have been emphasized, and platforms for such co-operation is available. This partly complements weakness of their T&C industries that mostly consist of SMEs, and multi-layered and unified support systems for facilitating such co-operation have been established by the EU as a whole, the member countries and regions.

<Combined Use of Industrial and Trade Policies>

- While EU uses trade policies to protect the internal industries, she uses industrial

policies to develop the internal industries. This is different from approaches by Japan which uses industrial policies only, and this also differs from USA that only has trade policies. In Japan, as trade policies have not taken for her T&C industry, penetration by imports by China was accelerated. In USA, on the other hand, structural reforms in her T&C industry have been delayed, and with rapid increase in imports from Asia centering on China after quota removal, the T&C industry is now on the verge of a catastrophe. The EU authorities will protect the internal industries by responding agilely to unfair trade practices, and at the same time, they will activate the internal industries by taking full advantage of their technological strength.

III. R&D in European T&C Industry

<Seventh Framework Programme (FP7) and R&D in European T&C Industry>

- With a target of 3% of the GDP for the internal R&D investment by 2010, EU nearly doubled the annual budget for the Seventh Framework Programme (FP7) from the previous one (FP6) to 50.5 billion Euros (= 1.15 trillion yen), and has decided to invest about 60% (32.4 billion Euros = 759 billion yen) of the total annual budget into co-operation programme.

- Under the FP7, the following nine priority themes for co-operation programme were set up, and among these themes, T&C researches are related to biotechnology, information and communication technologies, materials and new production technologies, environment and transport, etc., and the strongest relation is with materials and new production technologies. The European T&C industry estimates that it would take at least 1 billion Euros for three years from 2007 to 2009 (= 164 billion yen, which means about 55 billion yen per year) to implement the ETP, and that they would be able to implement the ETP with FP7 as the main financial source and also with other financial support on the basis of the entire EU, respective member countries, regions and enterprises.

Figure 6: Nine Priority Themes in Co-operation programme under FP7

Nine Priority Areas in Co-operation programme under FP7	Budget(*)
1. Health	6.1
2. Food, Agriculture and Fisheries, and Biotechnology > Sustainable products and processes with the use of biotechnology > Biomass technology for production of high value-added products	1.9
3. Information and Communication Technologies	9.1

Nine Priority Areas in Co-operation programme under FP7	Budget(*)
> Stability and safety of information infrastructure > Quality and reliability of electronic components	
4. Nanosciences, Nanotechnologies, Materials and New Production Technologies > Development of new multi-functioned materials > Renovative and sustainable production processes > Creation of new products and services with the use of nanotechnology	3.5
5. Energy	2.3
6. Environment (including Climate Change) > Tools and technologies for monitoring, prevention and mitigation of environmental pressures and risks including on health	1.9
7. Transport (including Aeronautics) > Aeronautics and air transport (reduction of emissions, etc.) > Sustainable surface transport (reduction of the impact of transport on climate change)	4.2
8. Socio-economic Sciences and Humanities	0.6
9. Security and Space	2.8

(*) Budget in billion Euros for 2007-2013

> Contents which have strong relations with textiles

<Characteristics of R&D in European T&C Industry>

- We found that the following characteristics of R&D in the European T&C industry:
  1. SMEs in mid-stream sectors (weaving, knitting, dyeing and processing sectors) have been main participants,
  2. R&D activities have been focusing on the development of technical textiles, as the industry realized that R&D for clothing applications would be difficult to recoup the investment,
  3. Focus has been on the development of process technologies that is more commercialization-oriented than that of materials, and
  4. Collaborative R&D among SMEs, public R&D institutes and universities has been active, as SMEs tend to face difficulty in having their own R&D facilities due to their financial limitations.
- The following table shows major T&C related R&D projects in force in EU. In EU, R&D for technical textiles by integration (or systemization) of T&C and electronics, bio- and nano-technologies, while R&D in the Japanese T&C industry centers on improvement of functions of materials. Another characteristic of R&D in the European T&C industry is active involvement in R&D for promotion of

efficiency in clothing production systems as seen in the LEAPFROG integrated project ((1) in the following table).

Figure 7: Major T&C related R&D Projects in EU

Project Name and Outline	R&D Cost and Term
1. "Leadership for European Apparel Production from Research along Original Guidelines" (LEAPFROG integrated project) Outline: Development of innovative clothing production systems based on improvement of production effeciency and intelligence of production systems, which can respond to shorter delivery time and market-in concept	Cost: 23.46 million Euros (= 3.8 billion yen) Term: Four years from May 2005
2. "Multi-functional textile structure driving new production and organization paradigms by textile SME inter-operation across high-added-value sectors for knowledge-based product/service creation" Outline: Development of multi-functional textiles and related processing technologies by 31 SMEs from 10 countries	Cost: 12.28 million Euros (= 2.0 billion yen) Term: Four years from March 2005
3. "Protection e-textiles: micro-nano-structured fibre systems for emergency-disaster wear" Outline: Development of emergency-disaster wear with utilization of micro-nano-structures fibre systems	Cost: 12.79 million Euros (= 2.1 billion yen) Term: Four years from February 2006
4. "Digital programmed jetting of fluids for multi-functional protective textiles" Outline: Development of multi-functional protective textiles with digital programmed polymer jetting technology	Cost: 12.69 million Euros (=2.1 billion yen) Term: Four years from May 2006
5. "Bio-sensing textiles to support health management" (BIOTEX project) Outline: Development of innovative textiles which can remotely manage human's life related information (pulses, blood pressures, etc.) by integration of textile materials and small-sized sensors	Cost: 3.11 million Euros (= 500 million yen) Term: About three years from September 2005

- In EU, partners for T&C related R&D projects, namely public R&D institutes and universities, are well-positioned depending on target R&D fields. For example, in Germany, DITF (Deutschen Institute für Textil- und Faserforschung, Denkendorf) specializes in R&D for yarn spinning and biomedical fields, and TUD (Technische Universität Dresden) are in charge of R&D for composite materials. With this

clear compartmentalization, companies can easily select R&D partners, and un-duplicated and effective collaborative R&D activities are possible. As each R&D entity's specialized fields are clear, governments and enterprises can provide financial support to interested R&D bodies easily, and consequently, R&D entities have been able to function as the core of collaborative R&D activities with their excellent facilities and equipments, which individual companies would not be able to afford to possess. Moreover, companies have been participating in the management of interested R&D entities, for instance, by pooling certain percentages of participating enterprises' sales for using such pooled fund as operational expenses of the R&D bodies. When a R&D body inaugurates a new project, discussions with its interested/supporting companies is required, and also opinions by these companies are reflected to intermediate evaluations of the project. In this R&D structure, most of the R&D projects in EU consequently are "practical and commercialization-oriented", and many cases of the R&D projects accomplish the tasks that interested/supporting enterprises wish to have. Furthermore, R&D institutes and universities in EU have business minds to meet the requests/directions from enterprises, and their independent efforts, such as using commission fees for the use of their equipments and income from technological licenses as their operational expenses, have been made.

Figure 8: Major T&C related public R&D institutes and universities in Germany and their specialized R&D fields

Name and Location	Specialized Fields
DITF (Deutschen Institute für Textil- und Faserforschung) / Denkendorf	• Polymer and spinning technologies • Process engineering • Bio-medical
STFI (Sächsisches Textil forschungsinstitut) / Chemniz	• Textiles development • Process engineering
ITA (Institut für Textiltechnik der RWTH Aachen) / Aachen	• Textile machinery • Process engineering
DWI (Deutsches Wollforschungsinstitut) / Aachen	• Polymer and spinning technologies • Bio-mimetic and bio-material
Hohensteiner Institute / Bonnigheim	• Medical and health-care • Testing and evaluation technologies and measurement technologies
TUD (Technische Universität Dresden) / Dresden	• Composite materials

- Councils for networking and promotion of collaborative researches have been set up

in EURATEX (European Apparel and Textile Organisation), CIRFS (Comité International de la Rayonne et des Fibres Synthétiques - International Rayon and Synthetic Fibres Committee), Gesamtverband textil+mode (Confederation of German Textile and Fashion Industry), etc. There also exists such support organizations with co-ordinating functions as TECHTERA in Rhone Alpes, France.

- In addition, in EU, financial support systems for collaborative R&D are separated as follows:
    1. Basic and fundamental researches with high investment risks and requiring mid- and long-term engagements are mainly supported by EU as a whole and respective countries,
    2. Application and commercialization researches are mostly supported by companies, and
    3. R&D for production technologies required by SMEs is centered on by national and regional governments.

  There are various financial support systems for basic to application/commercialization researches depending on the sizes of interested companies and degrees of development risks, etc., and public support funds (on the basis of entire EU and each country) also exist.
- Regarding R&D in the European chemical fiber manufacturers are estimated to have been done in the forms that respective companies concentrate on their specialized fields such as on cellulosic fibers/yarns or industrial polyester and nylon (tyre-cords and air-bags, etc.).

  We do not find that the European chemical fiber manufacturers have been involved in collaborative researches. However, when JCFA study mission visited Europe in February 2007, the mission received voices from the European chemical fiber manufacturers that they would expect to have new engagements regarding collaborative R&D, as they, as a part of the textile chain, would be able to participate in support framework for the collaborative R&D under the FP7.

IV. Environmental Policies in EU and Influences on Chemical Fiber Industries

<Environmental Policies affecting World>

- Regarding environmental policies in Europe, we found the following:
    1. An idea has becoming widespread that even if difficulties in technical and economic aspects might be expected, prevention of damages in environment should result in reduction of social costs, and

2. Another idea has also been permeated in their societies that environmental regulations are necessary, as they not only require costs, and also enable people in Europe to develop environmental technologies, so that their international competitiveness could strengthen. Moreover,
3. EU's decision-making systems emphasize ideals and they can easily react to her political decisions, although policy-making for environmental regulations generally tends to be difficult due to conflicts of interest, and
4. As EU is the world largest market and has strong political influence, the world would be influenced by the European environmental regulations in the future too.

- One regulation in the beginning deals with only inside the EU, however, it is highly likely that under the globalization, regulation frameworks similar to the EU's will spread to the world. Such global standardization of the EU's regulations has been beneficial to the European companies. Recently, for example, the European-originated Oeko-Tex standard has spread globally, and the REACH regulations will be likely to follow.

<Responses by Japanese Chemical Fiber Industry>

- The Japanese chemical fiber manufacturers so far have promptly corresponded to the European environmental regulations such as "Eco-Management and Audit Scheme", "Oeko-Tex" standard, etc., and have continued to show the superior technical power that is harmonious with the global environment both from production side and product aspects.
- From now onwards, correspondence to REACH will be the task for the Japanese chemical fiber manufacturers, and it is expected several years later that the "Directive on Eco-Design of Energy-using Products" (provision of data regarding eco-friendly materials) will influence them centering on their electrical appliance related materials. Furthermore, future core of environmental regulations will be measures for global warming. Global warming issue is a task to be tackled on the entire world basis, and regulation framework on the global basis will be discussed. Under such circumstances, there will be possibilities that proven European regulation frameworks, for example, the ones for introduction of environment tax and also for greenhouse effect gas emissions trading system, will spread to the world, and the Japanese chemical fiber manufacturers need to continue monitoring

the developments in EU.

- The Japanese chemical fiber manufacturing industry is required not only to monitor environmental regulations in the future including the afore-mentioned, but also to timely obtain various peaces of information on the developments in Europe and promptly correspond if necessary. Consequently, JCFA is required to keep contacts with the European chemical fiber and other related T&C organizations such as CIRFS, EURATEX, CEFIC (European Chemical Industry Council), etc. for exchanging environment related information, so that JCFA can keep providing the member companies with the latest information.
- In addition, activities/approaches to maintain superiority of the Japanese chemical fiber industry should be proactively taken by international standardization of environmental technologies that the Japanese chemical fiber industry has been in superior positions to her counterparts in Europe and U.S.A., such as drafting of JIS (Japan Industrial Standards) for eco-friendly chemical fibers and their proposition to ISO, etc.
- Activities/approaches only to “protect” the industry are not enough. Strategic activities/approaches with “aggressive” elements such as taking the lead in R&D for eco-friendly materials and recycling technologies should also be required to the Japanese chemical fiber industry that has excellent environment related technologies, so that the international competitiveness could be further strengthen with the superior environment related technologies as the basis.

V. Conclusion

<Directions for T&C industries in Japan and Europe>

- Through this business year’s study on the European chemical fiber industry, several common points between the Japanese and European T&C industries became clear.
- First point is continuation of quantitative long-term declining tendency. Both in Japan and Europe, reduction in production volume, etc. has been advancing quickly. When Japan and Europe are compared, speed of decrease in the European industry is slower than that in the Japanese industry, however, after the quota removal by EU on the Chinese imports from 2008, situation is uncertain.
- Second point is consistent increase in proportions of non-clothing applications in end uses. Situation in U.S.A. is similar. When you look at the European chemical fiber manufacturers, the ones whose production ratio for clothing

applications is high have been facing hard times, however, the ones whose main products are for industrial applications such as PHP, Diolen, Kordsa and Performance Fibers, etc. have left relatively steady business results.

- T&C industries in developed countries not just Japan and Europe are facing threat of imports from developing countries. In order to avoid competition with imports, T&C industries in developed countries have been pursuing differentiation, higher value addition, quick delivery approach, etc. for their survival.
- Under further progressing globalization with the above-mentioned circumstances, how much T&C production for traditional clothing applications will stay in developed countries is uncertain. Even if the domestic production remain centering on branded products, materials for high-end traditional clothing are mostly natural fibers, therefore, it is not clear if supply of products for traditional clothing applications will be a survival approach for chemical fibers. On the other hand, T&C products for industrial applications require high level of technologies and strict specifications, the import pressure is weak, and the markets are expanding. As a result, we presume that T&C industries in developed countries will further shift to their production for industrial applications.
- When you compare T&C industries in Japan and Europe, the most different point is evolutions of their chemical fiber manufacturers. The Japanese chemical fiber manufacturers had to experience reductions in production volumes, however, there has not big change in the players. Vis-a-vis that, in Europe, so-called “chemical majors”, previous main players, disappeared, and as a result of continuing spin-offs, selling-off in peaces and split-ups, her chemical fiber industry now consists mostly of small-to-medium-sized companies. Backgrounds of this difference are the differences in corporate cultures, positioning of chemical fiber businesses, etc.

<Characteristics of Japanese and European T&C Industries>

- By comparison with the Japanese T&C industry policies, characteristics of the European T&C policies are:

  1. Based on long-term vision,
  2. Compiled with ideals and dynamic, which is the characteristic also in their environment related policies, and
  3. With large amount of budget injected into priority fields.

  Their industrial policies emphasize R&D and innovation, and the total cost estimated

to be needed for 2007 to 2009 under the ETP for T&C is over 1 billion Euros (= 16.4 billion yen). All of the estimated total cost will not come from public support, however, the cost per year becomes around 5.5 billion yen, and it is huge amount compared with financial support for the Japanese T&C related technological development projects at 4.9 billion yen (= 980 million yen per year).

We can say that the above-mentioned difference is because financial support in Japan tends to be decided through consensus-oriented adjustments.

- In Europe, "textiles" are clearly divided into technical textiles and traditional textiles. Technical textiles are a term used for textiles with high-technologies and functionality, and they include not only textiles for industrial applications, but also textiles for high-functional clothing applications such as protective clothing, high-functional sportswear, etc.
- Among a decline in the European T&C industry's scale, the annual growth of her technical textiles production for the last 10 years on a fiber basis were 2.3%, the production reaches at 1.35 million tons, and the annual average growth on a value basis is expected at around 3% level in the future. Regarding the European T&C industry's framework, through paradigm shift, it is positioned as a growth industry, and efforts have been made to improve the image, intensive injection of resources and securing of human resources.

<R&D Systems in Japanese and European T&C Industries>

- As to R&D systems in the Japanese and European T&C industries, in Japan, R&D centers on large-scale enterprises in up-stream sectors (fibers/yarns). In Europe, on the other hand, industry-government-academia collaboration with partnership among SMEs in mid-stream sectors, public R&D institutes and universities is active.
- Backgrounds for active industry-government-academia collaboration in the European T&C industry are:
  1. Weakening of R&D capability in the up-stream sector,
  2. Independence of the mid-stream sector as they traditionally did/do not have alliance with up-stream sector, while the Japanese mid-stream sectors have been processing on commission under assistance agreements with the up-stream sector,
  3. Excellent R&D facilities and equipments in the public R&D institutes and

universities with financial support by national and regional governments and enterprises,

4. Participation of enterprises in operation of public R&D institutes and universities,
5. Clear compartmentalization of R&D fields, sectors and roles, and
6. Sharing of strategic R&D roadmap, etc.

- In Europe, although up-stream manufacturers with strong R&D capabilities that used to develop new materials seem to have disappeared, mid-stream sectors center on R&D activities through industry-government-academia collaboration, and have been strengthening technical textiles field.
- We examined whether the Japanese type of T&C related R&D on which large-scale companies center or the European type with collaboration among mid-stream sectors is more appropriate for R&D for technical textiles, and came to a conclusion that the European type of R&D is appropriate with the following reasons:
  1. Since technical textiles have wide variety of applications, need different technological backgrounds, and focus on niche markets as primary targets, it is difficult for the Japanese type of R&D, in which certain large-scale enterprise(s) take(s) the lead, to cover all requirements.
  2. “Knowledge” of mid-stream sectors that are closer to markets plays an important role, as exploitation of application is a key to R&D.
  3. R&D for technical textiles needs synergy with other industries and cannot be completed by participation of T&C industry only, etc.
- In Japan, in order to maintain competitiveness against other Asian T&C giants such as China, development of higher value-added and functional products are more and more important, and constant R&D with industry-government-academia collaboration is more important. We, the Japanese T&C industry, have the following challenges for improvement of the industry-government-academia collaboration systems:
  1. Collaboration among/portalization of R&D resources all over Japan by taking full advantage of existing R&D hub such as Shinshu University. In addition, Clear compartmentalization of roles and specialized fields/sectors in respective universities and R&D institutes, and focus on upgrading/expanding of each entity’s infrastructures (facilities, equipments and human resources).
  2. Set-up of industry-government-academia discussion opportunities on a regular

basis for deepening of mutual understanding and of exchange among researchers, and also establishment of organizations with core functions and co-ordinator functions. In particular, formation of system(s) that can reflect opinions of enterprises regarding selection of R&D themes, etc., so that "practical and immediate commercialization-oriented" collaborative researches can be promoted.

3. Reinforcement of public support to promote industry-government-academia collaboration.

<Co-operation with European T&C Industries>

- The most interested proposition in this study is how collaboration in R&D in the European T&D industry has been taking place, in particular, the role of the up-stream sectors (material producers).
- Enterprises in mid-stream sectors of the European T&C industry have strong willingness to develop technical textiles, and they have energetically been working on technological development focusing on their specialty, namely process technologies. Consequently, they have been producing and marketing new technical textiles with their own marketing/developing powers, and Porcher industries in France and Royal Ten Cate in the Netherlands are two good examples of such mid-stream companies in Europe.
- At present, mid-stream companies in the European T&C industry have been working on technological development intensively. JCFA study mission, which visited Europe in February this year, heard many voices from them that they are concerns about weakening of the up-stream sectors, and that they have keen interest in collaborative engagements with the Japanese chemical fiber manufacturers. The Japanese chemical fiber manufacturers originate from rayon and cotton spinning, and they traditionally have stronger relationships with mid-stream sectors than the European and American counterparts which originate from chemicals. With the backgrounds, the Japanese chemical fiber manufacturers have R&D capabilities from polymers to textiles as their strength.
- The Japanese chemical fiber manufacturers with R&D capabilities from polymers to textiles are in complementary relationships with mid-stream sectors in the European T&D industry with strong R&D desires and also with the European R&D institutes and universities with excellent facilities and equipments. Therefore, we believes that the above three have base that can establish win-win partnerships.

- Enterprises in Japan, where cost is high and market is shrinking with decreasing population, cannot survive without selling high value-added products to the world. In order for the Japanese T&C industry to expand its sales of high value-added and functional products in years to come, Europe is important as a market and also from R&D points of view. The EU-wide support measures for technological development have inaugurated. In EU, they have systems of basic research such as bio- and nano-technologies. The Japanese chemical fiber manufacturers whose corporate profitability largely depend on high value-added products should aggressively pursue collaboration with the European T&C industry.

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