

SWOT Analysis and Benchmarking Study

Lombardy Region

Part III Thematic Priorities

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III. Lombardy Region SWOT Analysis of the Chemical Sector

III. 1 : Restructuring and development of old industrial sites and chemical sites

Lombardy Region Chemical Industrial Sector is characterized by a qualified presence of small and medium enterprises and not by big Chemical Plants. That's a result of the tendency to abandon the "Base Chemistry" (Commodities) in Lombardy Region in favour of a more dynamic and flexible scenario represented by the SMEs.

The big Chemical Plants once located in our Region are more and more disappearing because of several reasons: from one side the global competition made less profitable the production of base chemicals, from the other side environmental and security factors gave a "bad image" of big chemical sites, considered a "danger" for the local population.

The tendency was therefore not much that of restructuring old chemical sites (even if there are few examples, like the recover of a hard polluted chemical site close to Milan carried out by BASF ITALIA), but to follow the natural vocation of Lombardy Region Entrepreneurship and finding new ways to answer to the global competition. Also the high costs represented by the plant restructuring, by the big productive settlements and by the high energetic/raw materials prices, supported this trend.

The result was that of having a new model of chemical industry, based on a high number of flexible small and medium enterprises spread on the whole territory. These enterprises are strongly customer oriented with a problem-solving approach: they offer specific products with a "just in time fulfillment" of the clients needs and requirements. Product adaptability and customization are two of the main strength features of Lombardy Chemical enterprises. Furthermore as "side effect" of this approach, we have a spontaneous and continuous "self-training", caused by the attempt to satisfy clients requirement transforming and adapting the product offered: the result is a "in – house" development of the enterprises know-how.

The scenario is therefore that of highly specialized SMEs that boast a worldwide leadership in their respective market niches. Products and processes have an always increasing content of Innovation and Quality, in particular with reference to fine and specialty chemicals.

Lombardy Region Government supported this scenario through the design of a "meta-Cluster" dedicated to Innovative Materials. Meta-Clusters are "virtual" areas not limited territorially but with strong inter-sectorial integration, grouped according to their production: they represent the edge of the technological advancement in Lombardy and a point of reference for the 'Made in Italy'; meta-clusters are areas of excellence strongly linked to research and innovation. These meta - clusters are an area of Intervention of different programs implemented by Lombardy Region, in order to reach in a transversal way several enterprises supporting through them Research & Innovation. The meta – cluster dedicated to "Innovative materials" affects, in an important way, the Chemical Enterprises.

The weaknesses and threats of Lombardy Region Chemical system can be summarized as follows:

- The high cost of productive settlements, that push enterprises to look for cheaper location outside Lombardy Region (East Europe and Asia), investing where production costs are lower and market demand is higher
- The low amount of public funds for Research & Innovation
- The high costs of plant restructuring for SMEs, in order to comply with European, National and Regional Security and Environmental legislation
- The bureaucracy chemical enterprises undergo: various and complex laws and very slow authorization procedures. There is an urgent need for a “better regulation”, oriented towards industrial competitiveness and balancing social, economic and environmental components
- The energetic costs are higher than in the rest of Europe (Italy renounced at the nuclear energy and has to cover its energetic need buying energy abroad)
- The high costs of security / environmental respect (i.e. the new European directive regarding R.E.A.C.H.), in particular regarding: new emerging markets with less strict legislations and less expensive labor force increase the global competition
- Current unfavorable change EURO/DOLLAR

To have a look at the opportunities this scenario offers, we can consider two main topics.

First of all there is a great “productive impulse” with regard to the “green chemistry”. Green chemistry is the use of chemistry for pollution prevention. More specifically, green chemistry is the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances. Green chemistry is a highly effective approach to pollution prevention because it applies innovative scientific solutions to real-world environmental situations. Promoting this new approach to pollution prevention through the environmentally conscious design of chemical products and processes must be the focus of Public authorities.

The main areas for the development of green chemistry have been identified as the following:

- Use of alternative feedstocks: The use of feedstocks that are both renewable rather than depleting and less toxic to human health and the environment.
- Use of innocuous reagents: The use of reagents that are inherently less hazardous and are catalytic whenever feasible.
- Employing natural processes: Use of biosynthesis, biocatalysis, and biotech-based chemical transformations for efficiency and selectivity.

- Use of alternative solvents: The design and utilization of solvents that have reduced potential for detriment to the environment and serve as alternatives to currently used volatile organic solvents, chlorinated solvents, and solvents that damage the natural environment.
- Design of safer chemicals: Use of molecular structure design and consideration of the principles of toxicity and mechanism of action to minimize the intrinsic toxicity of the product while maintaining its efficacy of function.
- Developing alternative reaction conditions: The design of reaction conditions that increase the selectivity of the product and allow for dematerialization of the product separation process.
- Minimizing energy consumption: The design of chemical transformations that reduce the required energy input in terms of both mechanical and thermal inputs and the associated environmental impacts of excessive energy usage

An important demand for new “environmental friendly products and technology” is a great driving force for the creation of new perspective affecting the chemical industry.

However, technologies “environment free” even if technically available are not yet adopted by Companies and Consumers:

- they face small immediate markets open to experiment their applications;
- they potentially substitute existing products or existing uses, so that they suffer competition and established interests from other traditional sectors;
- they need to be optimised, during the industrialisation phase.

To implement and to widespread selected clean technologies for the sustainable growth of the Lombardy Region Chemical system it is necessary to create the regional project “The Green Chemistry Program”, which will promote the research, development, and implementation of innovative chemical technologies that accomplish pollution prevention in a scientifically sound and cost-effective manner.

Furthermore Lombardy Region counts vital customers for new well-paid products and applications in different fields like ITC Products, Cosmetics/Beauty, Health, etc.

Numerous manufacturing industries, such as cosmetic and personal care, pharmaceutical, consumer products, processed foods and agricultural chemicals require research and development of products that is facilitated by an integrated knowledge of several basic physical, chemical and biological sciences and the relevant regulatory controls on consumer products. Formulation is an emerging core discipline for many industries offering fast product development of novel chemicals and new opportunities for exiting actives.

The Italian chemical enterprise suffers from a tarnished public image. Chemicals are associated in the public press, radio and television with bad things happening to the environment, to communities and to people. Often the word that is used to convey the notion that whatever it is that is creating a problem "has a chemical in it." To those in the field of chemistry these notions are as ridiculous as they are frustrating. They are not logical; nevertheless, they are widely used and repeatedly used by the uninformed.

Public perception undoubtedly has influence on other activities ranging from legislation governing the use of chemicals to the perception by young people of the field of chemistry as a career option. Much effort by industry and chemical organizations is directed toward a better public understanding and to dispel some of the misconceptions associated with chemistry.

Much work has been done in the past and continues today to educate the public about chemistry and its value to society and to bring balanced understanding about the benefits and risks of chemicals.

Several initiatives aim at recovering this image to present a new "idea" of chemistry.

1. EX – ACNA RECLAMATION (1990 – 1999)

BASF ITALIA (a German chemical enterprise) settled in an area north of Milan found there a hard polluted area. It decided (together with other firms settled there and in cooperation with the local government) to implement different interventions to reclaim the land in a secure way. The polluted land had to be isolated in order to avoid the contact with rain and river water and the polluted material was removed and stored in an adequate rubbish tip. It was an important reclamation work.

2. RESPONSIBLE CARE

The RESPONSIBLE CARE is a World Voluntary Chemical Programme adopted by more than 10.000 enterprises in 50 countries created in order to implement among enterprises safe behaviours with regard to Staff Health & Security, Environment Respect, Processes Security (in Italy the Programme is managed by FEDERCHIMICA and there are more than 170 enterprises involved).

Enterprises adhere to "leading principles" through the signature of a declaration and the appointment of a coordinator of the programme. They are engaged in considering health, security and environment as a fundamental part of the industrial policy, carrying out behaviours and practices oriented towards these values:

- Carrying out behaviours and practices oriented towards health, security and environment
- Transparent communication towards the external world
- Cooperation with suppliers and clients for the security of products and their residual
- Promotion of these principles through exchange of experiences with other firms

The targets reached also through this programme in 12 years (from 1989 to 2001) are:

- Poisoned water emission - 55/63%
- Poisoned air emission - 80/95 %
- Injuries occurred at work - 55.2%

The 8th Responsible Care Report, containing information from over 450 plants operated by 166 chemical companies in Italy, confirms the positive trend of action in the chemical industry and, above all, improvement in the high levels of performance achieved.

The chemical industry in Italy invested over 716 million Euro in the environment, health and safety in 2001.

3. "FABBRICHE APERTE" visitors enjoy a "hands on" experience of clean chemicals in Italy

Federchimica will be holding Fabbriche Aperte (**Open Door**) once again this year, opening chemical plants to the public all over Italy with the aim of demonstrating where chemical products come from and how they are used, testifying to the chemical industry's role in the protection of workers and citizens, in safeguarding the environment and safety in industry.

Fabbriche Aperte is a part of the Europe-wide **Open Door** initiative promoted by Cefic, the European Chemical Industry Council. Chemical plants in different countries on the continent will open their doors until December 2003.

The entire European chemical industry is dialoguing and responding to institutions and citizens, and demonstrating what it is doing to achieve the goal of sustainable development.

According to Federchimica Chairman Diana Bracco, "Fabbriche Aperte helps bringing together two worlds that don't know each other very well: on the one hand, citizens and consumers, who use the products of our companies' research and technological innovation every day, and on the other, the chemical industry: a sector of strategic importance for our country, with a turnover of 64.8 billion Euro in 2002, about 206,000 employees and an important contribution to make to economic, social, and civil progress and quality of life".

The Fabbriche Aperte initiative is a part of the **world-wide Responsible Care programme**, implemented in Italy by Federchimica since 1992.

III. 2 : Development and strengthening of cluster structures for the support of Innovation

In considering the development of chemistry in the recent past, and extrapolating into the immediate future, it is useful to consider the state of the chemical industry. Academic chemistry has always been closely connected with the chemical industry. In the first two-thirds of the last century, the chemical industry was itself very innovative. New products and new processes appeared regularly in fuels, commodity chemicals, performance chemicals (paints, surfactants, lubricants...), and industrial polymers. During this period, the pharmaceutical industry took the form that it now has.

In the last three decades, the pace of innovation has dropped throughout the chemical industry, and there have been relatively few fundamentally new processes introduced and fewer new products: the industry has, instead, focused on optimising its economic performance. The pharmaceutical industry has remained innovative in introducing new drugs, but the paradigm for drug development has been slower to change: this industry is also now in a period of active consolidation, driven in part by the scarcity and high cost of new “blockbuster” drugs.

The implications of the maturation of the chemical and pharmaceutical industries are important for academic chemistry. The industry itself depends less for change on innovation and revolutionary discovery than it does on optimisation and evolutionary development. It is, thus, more focused on financial metrics for performance, than it is on new technology, to guide its growth. It is better able to appreciate university research focused on development, than it is research that is potentially revolutionary. Even when a revolution has occurred (for example, the introduction of protein pharmaceuticals as the first products of biotechnology), the technology leading to these products was initially developed by universities, venture-financed start-ups and by public investment rather than by the established pharmaceutical industry.

As financial metrics become more important, R&D becomes less important, and industry is less willing to invest in long-term research not immediately relevant to products. This evolutionary change in the chemical industry—from a technologically innovative one to one focused on commodity products (products sold on the basis of price rather than performance) and on cash management—has influenced the character of the students best suited for industrial jobs, and the character of the academic research most relevant to industry.

Does the maturation of what was considered the “chemical industry” in the 1960s and 70s mean the end of chemistry? No: far from it. It does, however, mean that the targets of chemistry will change, and the style of chemical research most relevant to industry may also change. Major societal drivers for new technology are no longer the need for fuels for transportation and industrial/residential use, or the need for polymer-derived products such as paints, fabrics, films and structures. Instead, they are information, and environmental management, and public health.

The main feature of Lombardy Region in the support of Innovation is an inherent characteristic of the enterprises: a “research & innovation attitude”. Not only big enterprises dedicate resources to research, but also SMEs are very keen on it: every chemical enterprise makes its own “in house” research. We could call this cultural trait a “Natural technological Creativity”.

This cultural feature based on a valid “in house” research is supported by the existence of “Excellence Centers”, that are networks between universities. A strong tradition of co-operation between enterprises and universities complete the picture of research and innovation in the chemical Lombard industry. This last point has worsen in the last years, so that we now often speak about a “low integration between enterprises needs, “public research world” and private research. It seems that these three sphere doesn’t match and have separate and independent development patterns. Several Regional and European projects aim at recovering this situation, financing co-operation between enterprises and research centers. Furthermore the “Research European Networks” optimize the results of research, helping in overcoming the dimensional limits of SMEs. The target is to reach a structured research exploiting research capacities all over Europe.

To this weakness two other circumstances worsen the situation: the low amount of national innovation funding programs and the lack of dedicated Industrial Research Centers. Considering the always growing competition of the new emerging Countries, it is absolutely necessary to merge the efforts in order to answer in a more structured way to these challenges. Also the policies that affect the Chemical Research (i.e. Property Intellectual Rights and Royalties) should be considered as a transnational matter in order to ensure the protection of the industrial competitiveness.

1. RESCUE OF NERVIANO MEDICAL SCIENCES:

A strategic Italian Chemical Research Centre of Pfizer Italia located in Nerviano specialised in oncology, was acquired by Pharmacia Italia. Pharmacia wanted to close this Centre because it already had 25 Research Centres all over the world (of which three dedicated to oncology). Nerviano Research Centres had cost 180 Mio EURO for its building and counted 700 Specialised Researchers.

A Catholic Aggregation decided to acquire it in order to preserve the important activity the Centre was carrying out. The Agreement was reached through a negotiation which involved enterprises, the government (regional and national), and the Workers Union, in order to assure the continuity of the important scientific, technological and human heritage of the Centre.

2. EXPERIMENTAL STATIONS TO SUPPORT ENTERPRISES:

These Centres were created in order to support enterprises in the experimental phase at a pre-competitive stage (through chemical & technological analysis, studies, applied research, seminars/workshops/training, testing, Quality Certifications, inquiry, experimentation on pilot scale, experimental tests on productive processes, products applications, etc.). The experimental stations were eight in Italy, classified according to the material considered:

- leather and tanning (Napoli)
- glass (Venezia - Murano)
- fuel (Milano)
- cellulose, paper, textiles fibres – vegetable and artificial (Milano)
- essence and citrus derivative industry (Reggio Calabria)
- oils and fats (Milano)

- silk (Milano)
- tinned foods (Parma)

They offer a direct interaction with enterprises: analytic services to solve specific enterprises problems without the employment of own resources by the enterprises.

Recently (1999) they were transformed from public to private entities: every experimental station is an autonomous body, managing its own economic resources (the funding of the stations will be planned through the remuneration of the activities carried out, agreements/contracts with public/private entities, contribution by enterprises, etc.)

Before this reform the funding of an experimental station was made by:

- payment by the state (Industrial Ministry) of the administrative staff
- auto taxation made by the enterprises
- research contracts

3. SUPPORT SUSTAINABLE INNOVATION TOOLS

The RISE project (2002-2003) has the objective of finding out which tools and methods are commonly employed in the process of product development for small and medium enterprises. The results will be used to develop better tools and thus to facilitate the generation of innovative approaches.

III. 3 : Innovative approaches for the development of Human Resources

Lombardy Region has a good level of graduate/PHD students, that means a high quality of labor force in terms of medium productivity/added value per employee. The chemical industrial panorama offers to the graduates a very wide panorama of carriers opportunities with remunerative jobs, even if sometimes too qualified staff costs are too much for the enterprises, that prefer less expensive graduates than more specialized PHD young people. The solution to this non-sense should be a planned match between enterprises needs and research doctorates, that should be focused on industrial requirements.

Generally speaking Italian staff is considered - also from the point of view of foreign companies - creative, with a great initiative, the capacity to work under pressure and unstable situations and to defeat communications barriers.

The weakness Lombardy Region has to recover, is the negative idea Chemistry arouses in Italy because of few negative past experiences. The negative image not only feeds upon catastrophes like Seveso, Bhopal and Schweizerhalle. It also associates with the words 'artificial' or 'synthetic' that appear unsympathetic to many people. Synthetic fibre, artificial fertiliser, plastic or synthetic vitamin C etc. They suggest the unnatural, hostile to life one rather doesn't want to contact.

That caused in the past years a strong loss of registered university students. Now things seems to go better and several initiatives aim at showing the "environmental friendly" chemistry.

For the first time since its inception, Cefic's pan-European survey (PES) shows the overall image of the chemical industry across Europe is positive at 48% vs 44% negative (see image of chemical industry 2004 report).

With regard to the human resources, it is necessary to overcome the fragmentation of the research groups in order to achieve a "structured" research. Formulation is an emerging core discipline particularly for SMEs, this science is multi-disciplinary involving physical chemistry and colloids, but also ranging from process engineering to biology. Formulation science and the new frontiers of nano-tech and bio-tech require qualified staff, offering new jobs and perspectives, but an exchange of staff and experts between the European Regions is mostly important in order to strengthen the relative results of research. To keep competitiveness towards less expensive and qualified foreign human resources, only a cooperative approach among European researcher can lead to a successful excellence (the Chemistry "Eurobachelor").

1. THE YOUHT ORIENTATION INITIATIVES:

To recover the bad picture chemistry has in the collective imagination, meetings are organised in secondary schools in order to present different professional opportunities in the field of Chemistry. Representatives of the research and enterprise world explain the important role chemistry plays in our daily lives, its different application sectors, the various professional roles/carriers in the chemical area (also through funny testimonials!).

Currently chemistry departments of Universities are undergoing some quite essential restructuring. This creates room for the new, integration of new areas and more communication with the public.

The Department of Chemistry's annual open house, with its demonstrations and hands-on activities, attracts hundreds of science enthusiasts of all ages to campus each fall. Faculty, staff and students from the department volunteer their time on a Saturday in order to educate and entertain schoolchildren and others from the surrounding communities.

Summarizing the initiative aims at:

- Explaining on the overwhelming benefits chemistry brings to our daily lives. We often don't realise it, but whoever we are, wherever we live chemistry is present in everything we do, improving our lifestyle and the world about us. (i.e. cell phone, computers, motorcycle, sportive dresses, high-tech suit, packaging, manufacture of luggage, etc.)
- Explaining what chemistry is through experimentations, practical demonstrations and amazing special effects (chemistry for life, creative chemistry, etc.).
- To promote science literacy among the general public, demonstrate the relevance of chemistry in daily life and inform youngsters of the many career opportunities available to them within the discipline.

2. REGIONAL CHEMICAL GAMES:

These games are organised in order to let young people "play" with Chemistry. It is the first step for the qualification to the national selection, whose winner will participate to the "International Chemistry Olympiad". More than 500 students will participate next Year to the regional chemical games.

The 36th International Chemistry Olympiad have been held in Kiel from the 18th to the 27th July 2004, even though 260 young talents from 26 nations will be puzzling over chemistry tasks and experimenting in science labs. Theoretical and practical questions will be posed from almost all sectors of chemistry, which have to be individually solved within the scope of the regulations of the competition. A diverse and interesting visitors' program enables the participants to get to know Germany in its scenic and cultural diversity and as a location for chemistry in research, teaching, industry and technology.

3. INDUSTRIAL – UNION RELATIONSHIP:

A general innovative agreement between the National Chemical Industrial Association (FEDERCHIMICA) and the National Chemical Industrial Union (FULC) has been signed. The targets reached and the topics faced are of primary importance and of different nature: staff care (i.e. flexible working time, strengthening of training, health protection), production rules (flexible production prize, enhancement of employee productivity – NOT salary reduction, transparent information etc.), joint positioning (i.e. R.E.A.C.H.)