POLITECNICO DI TORINO

4st School of Engineering

Master of Science in Management Engineering

Graduation Thesis

Implementation of a QHSE management system, Criteria and methodologies

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Introduction

Since the beginning of the 1980s, along with economic development, environmental issues have become increasingly critical to the extent of global impact. It is a serious threat to the survival and development of mankind. Especially for the economic development, sacrificing the ecological environment with the pursuit of development or short-term profit definitely will lead to environmental, economical and social disaster in the future. Thus sustainable production, as a very important issue, is a trend for the promising future economy that every company has to follow.

On the other hand, according to International Labor Organization statistics, every year there are 200 million people were dead because of the injury at work or from the work-related diseases. 1.6 million workers are infected and have a disease from work, fatal or non-fatal accidents at work are as high as 2.7 million each year, resulting in thousands of billions Euros of economic losses equivalent to 4% of annual world GDP. Accidents and diseases in the workplace bring huge losses for employers dealing with the early retirement, the loss of skilled workers, labor shortages.

The reason of introducing the environmental crisis and workers health and safety is that they all contribute to the quality of the product as the concept of the product quality is not only related to the production line but all the factors that bring an non-ignorable effect on the final integrating quality.

Sistema Ambiente has drawn my attention since it is designed and developed for the long-term development of the company based on these two sectors. It is a new way of thinking to guarantee and furthermore enhance the quality of the product as well as process which will be fully introduced in this thesis to present an innovative management way in the production process.

Chapter 1: Management systems and their integration

Liability in connection with quality, environment, occupational health & safety is increasingly important for the company image. By having certified management systems covering these areas, the companies give a signal of liability and concern for stakeholder relations.

The three types of management systems are briefly presented in the following with focus on their development towards an increased compatibility.

1.1 Different management systems and their correlation

Quality management systems (ISO 9000 series)

The first two editions of the ISO 9000 series, published in 1987 and 1994, had the focus on enabling the firms to produce the same quality every time by specifying the policy, procedures and instructions in a quality handbook. With the revision of ISO 9001:2000 the focus on the customers and on continuous improvements has become stronger. The circles and arrows in ISO 9001:2000 symbolize a dynamic and continuous process (see figure 1.1). ISO 9001:2008 basically renarrates ISO 9001:2000. The 2008 version only introduced clarifications to the existing requirements of ISO 9001:2000 and some changes intended to improve consistency with ISO 14001:2004 in order to enhance the compatibility of the two standards for the benefit of the user community. ISO9001:2008 promotes the adoption of a process approach when developing, implementing and improving the effectiveness of a quality management system, to enhance customer satisfaction by meeting customer requirements.

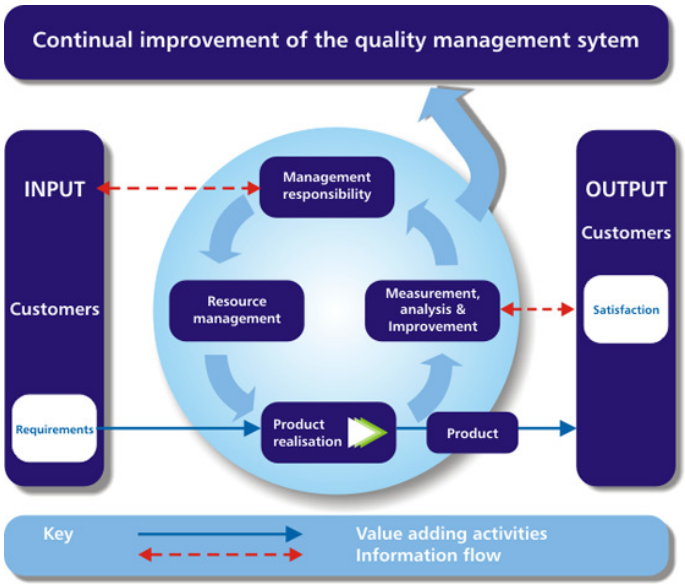

Figure 1.1 ISO 9001 process-based quality management system

Environmental management systems (ISO 14001 series)

The first edition of ISO 14001 is published in 1996 and the latest revision is ISO 14001:2004. An environmental management system can be defined as: "A number of interrelated elements that function together to achieve the objective of effectively and efficiently managing those activities, products and services of an organization which have (or can have) an impact on the environment". ISO 14001 is based on the management system principles of ISO 9000 series of quality system standards. It is mentioned in ISO 14001 that ISO 14001 not necessarily needs to be established independently of existing management systems and that it in some cases will be possible to comply with ISO 14001 by adapting existing management system elements. The requirements of ISO 14000 are an integral part of the European Union‘s Eco-Management and Audit Scheme (EMAS).

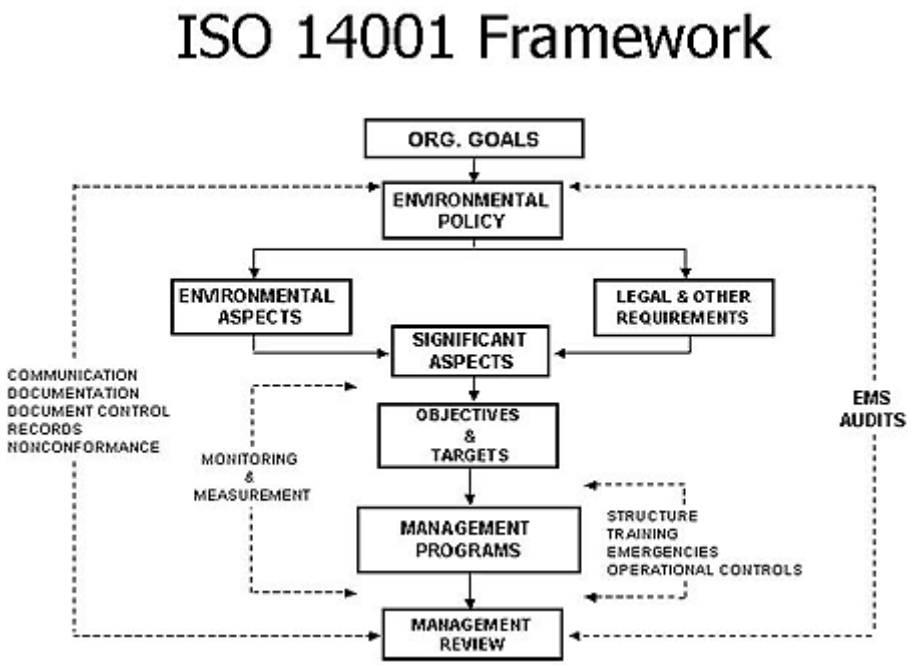

Figure 1.2 ISO 14001

Occupational health and safety management systems (OHSAS 18001)

OHSAS 18001 was formulated by international certifying bodies with the basis in BS 8800 and published in 1999. Its purpose is to help all kinds of organizations put in place demonstrably sound occupational health and safety performance. OHSAS 18001 can be described as a de facto standard and is used as basis for certification of occupational health and safety management systems. ISO have two times voted about

whether to develop an ISO standard in this field and both times the proposals was voted down. Currently, the International Organization for Standardization has no plans to prepare an ISO standard for occupational health and safety. OHSAS 18001 has been developed to be compatible with ISO 9001:1994 and ISO 14001:1996 in order to facilitate the integration of quality, environment as well as occupational health and safety management systems by organizations if they wish to do so. With the new ISO 9001:2000 and ISO 14001: 2004, OHSAS 18001 has been revised because it is based on these two standards and should remain compatible.

In Italy, a Management System of Health and Safety in the Workplace (SGSSLL: Il Sistema di Gestione della Salute e la Sicurezza nei Luoghi di Lavoro) is designed and implemented in accordance with the international standard OHSAS 18001 as a tool that, starting from thorough understanding of what are the risks to health and safety at work (risk assessment), brings the organizations to identify appropriate prevention and protection, and to implement a management of these risks (risk management), according to the vast and complex legislation, in spirit of recent European directives and national codes, taking a number of advantage in:

- reduction in the number of accidents and injuries at work
- reducing the costs to the interruption of working activities
- reduction of costs related to damage of company property
- growth of employee satisfaction
- monitoring of legislative requirements in practice
- reducing the possibility of sanctions by the responsible authorities

Correlation among the three management systems

The emergence of the three management system standards: Quality, environment and health and safety is to adapt to the market integration of the world economy underlining the social responsibility of business organization. Quality Management System(QMS) is to ensure the production of qualified products gaining the customer satisfaction; Environmental Management System (EMS) is to ensure the resources conservation and environment protection in the production process gaining social satisfaction; Occupational Health and Safety Management System (OHSMS) guarantees organized and environment-friendly production and strengthened security within the enterprise, gaining the employee satisfaction. The objects of these three management systems are different; nevertheless the goal to achieve is the same. These three systems are acting

on the production process of the business organization sharing a close intrinsic correlation. According to the guideline, the three management systems follow the same management principles:
(1) from focus on technology solution to the organizational and management responsibilities solution; (2) from focus on the terminal control to control the whole process; (3) requires the development of management principles and to make a commitment for the overall goal of the management system; (4) requires to establish and maintain a hierarchical documents system; (5) emphasize on records and traceability; (6) emphasize on "focusing on prevention and continuous improvement"; (7) requires the usage of appropriate management techniques; (8) practicality and effectiveness of the system.

Considering the similarity according to the system operation mode, three management systems are in common following the Deming cycle (PDCA cycle) to achieve the continuous improvement of the management system. The similarities are referred to:

- Top management commitment
- Documentation and records control
- Definition of a policy
- Planning of objectives and targets
- Procedures for training of employees
- Communication procedures
- Audits
- Control of non-compliance
- Corrective and preventive actions
- Management review

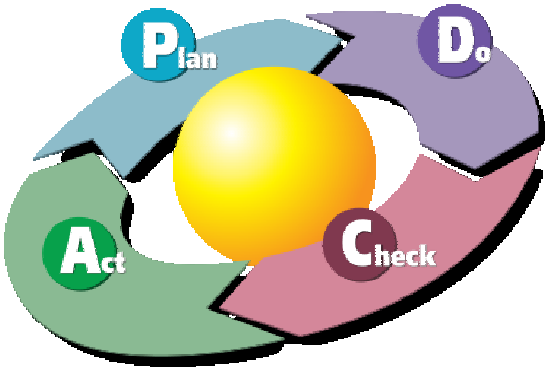

Figure 1.3 Deming Cycle

1.2 Integrated management system(IMS) and its importance

With the revision and new editions of the different standards for management systems, the systems have an increased number of similarities. Although a standard for an Integrated Management System is still absent in ISO, the following initiatives are promoting the integration: ISO 9001:2000 have more focus on continuous improvements, being one of the foundations of the environmental as well as the health & safety management systems.

The new edition of ISO 14001 has been developed to improve the coherence with ISO 9001:2000. OHSAS 18001 is developed to be compatible with ISO 9000:1994 and ISO 14001:1996.

Taking into account that ISO considers a standard for social responsibility, the question is whether the time has come for ISO to develop a standard for integrated management systems, which includes the four areas of concern. Instead of increasing the compatibility of each standard further towards a unified structure and content, a common standard could be developed based on the same core aspects of and stressing that all firms today have to be innovative with focus on continuous improvements. The IMS standard can be based on a common framework, extended with standards for quality, environment, occupational health & safety and social accountability which should only cover the specific demands for one area. It should not be possible to be certified only according to the common standard, as there would be no substance in the system. A certification only makes sense in connection with certification of at least one of the specific standards.

The necessity and importance to establish an integrated management system

Quality, environment, health and safety are three aspects of an un-separated part of management possessing the need of systematic, documented establishment and great support from the Deming mode management system which is in accordance with the continuous improvement. However, this does not mean that the companies should establish several sets of individual management system to run in parallel. From the practice of ISO9000 and ISO14000 standards implementation and development trend, enterprises establish an integrated management system is feasible and necessary.

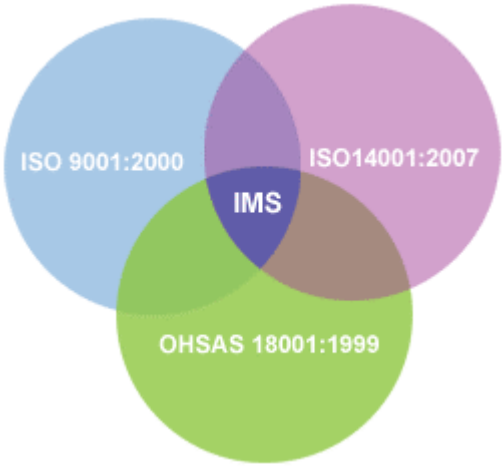

Figure 1.4 Integrated Management System (IMS)

1. Integration could avoid duplication of work and bureaucracy.

   Establishing three sets of management system according to each standard means that enterprises should set up three sets of organization structures; prepare three sets of system documents which will inevitably cause the overlapping and confusion of responsibility and authority leading to duplication of work and waste of resources thus document control become difficult. This actually increases the complexity and disorder of the enterprise management system reducing the system function and efficiency of management. From a management system point of view, it would be appropriate to merge the three types of management systems into one system, because it reduces duplicate work and bureaucracy.

   The main advantages are:

   - ✓ Minimization of documentation and records (paper-work)
   - ✓ Less bureaucracy and less confusion between standards
   - ✓ Cost savings by optimization of time and resources assigned to the systems
   - ✓ Simplification of internal and external audits

2. Integration is the requirement of the management system principle.

   If in the organization exist three independent parallel management systems, it is against the principle of management system. According to the system point of view, to best achieve the organization's management effectiveness, all management activities must be integrated into an overall consideration, which means that any management subsystem should operate as a part of the organization management systems, so as to achieve the management resources conservation goal as well as to improve the overall benefits.

3. Integration reflects the internal relationship of the three management systems.

   Quality, environment, safety and health, these three management systems have the same guideline and present the same management principles in the system operating mode. Three sets of management systems act on the production process at the same time, being complementary, mutually reinforcing and intrinsically inseparable to each other. The 5M1E factors that affect the quality contain man factor and environmental factor. In the on-site management of the construction project, it is difficult for manager to tear apart quality, environment-friendly construction and production safety. From the establishment of an integrated management system, it is reflected the intrinsic link of the three.

4. Integration is trend of the management system standards development.

ISO has recognized that the establishment of several sets of management systems and the implementation of multiple certifications will bring a heavy burden and management inconvenience to the organization. If the main purpose is not simply for a certification, we can absolutely combine ISO9000 and ISO14000 standards for the further implementation in a way that help enterprises reduce the burden and they can have a unified consideration on the consistency and integrity of the organization quality and environment management system. Some scholars propose a comprehensive management standard system (GMS) is: QMS + EMS + OHSMS—GMS For this comprehensive system, only once auditing and authentication is needed by the integrated management system certification institute. In fact, ISO is actively preparing for the integration of the management system. It is confirmed also by the latest quality management systems requirements ISO 9001:2008. In the process of development of this standard, in into consideration the interests of users, it takes into account the similarity with ISO14001: 2004 to enhance the compatibility of the two standards. For the coming management system standards promulgated in the future, the ISO will make effort to resemble them in structure, terminology, technology and mode of operation as to form a consistent and common structure to implement the requirements of different standards, so as to contribute to the ultimate achievement of management system integration for the significant benefit of the enterprises.

1.3 The approaches of integrating management systems

To establish a quality, environment, safety and health integrated management system, according to different situations of the enterprises, they can choose different approaches:

1. Start from the very beginning and establish a new integrated management system. This approach is adapt to the enterprise with incomplete, imperfect original system or without any management system at all. In this way enterprise can refer to the successful model of the quality management system, combine with the environment management system standards and safety and health management requirements, and gradually establish an applicable integrated management system. This practice is a once and forever solution and lay a good foundation for the long-term development of the enterprise. But on the other hand the disadvantage is that the process is complex and with great difficulty to pre-effect is not so obvious.

2. First to establish individual management systems, and then proceed the integration. For example, you can establish a quality management system to obtain ISO9000 certification. After running for a while, take the advantage of the successful experience in implementing ISO9000 to establish ISO14000 environmental management system in order to obtain ISO14000 certification. Finally integrate the two systems progressively. The characteristics of this approach is the simplicity at the first place and turn to complexity in the later part, straightforward and easily applicable, obvious pre-effects. The drawback is that it takes longer time and very costly.

3 The third approach is to add other management elements in the successful management system, and gradually integrate into a comprehensive management system. For example, an enterprise who has already established ISO9000 quality management system which has been run successfully, a new element the environment and safety and health management can be included based on the original management system in such a way that the previous successful experience can be used in the operation of other various management elements achieving a smooth transition. This approach is feasible and practical, but it could happen that the integration remains shallow as well as incomplete or primary and secondary system appears instead of an integrated single system. These should be especially noted and avoided as it has a great probability to occur.

Whatever the integration approaches are, the principle is in common: through the system documents sharing and generalization to gradually achieve the formation of integration documents. For the reason that different management system must operate through the program documents, the symbol of management system integration is the systematically connection between management system documents at all levels, so that to attain total and complete integration from the system manual, program documents to job documents. However, the documents integration does not refer to a pyramid structure. Due to the different objectives of the system, also taking into account the reality of the current system certification, each system manual can remain individual in the form; nevertheless ensure the consistency in structure, organization goals and operating mode. For the integration of the program documents, use the reference table form is a way to illustrate the relationship between the program documents with each department and the further interface coordination and

optimization work has to be done; For job documents, they must be completely integrated, not only be consistent in document contents, the format and numbering, but also to achieve the integration in jobs operations and execution process.

1.4 The information system as a central tool for the integration of the managerial functions

If we see how a company, even where all the activities are best performed, organizes its prevention documents, we find a large amount of cabinets full of files, folders, subfolders and hard disks piled up high. Much worse in the situation if the company is preparing to obtain or has already obtained the ISO certification.
Suppose the search for a document or information is complex even to the one who is in charge of it in the company then it will be almost impossible to be accessible to anyone else. Not only that, nowadays the information becomes the result of sequences of copy and paste, which do not guarantee the actual update at all.
Moreover it is easy to be wrong in omissions because of the cumbersome nature of documents. In addition, all the documents, files, information which theoretically should almost always be shared and accessible to more departments in the company (personnel, purchasing, production and prevention) are often duplicated and difficult to be updated.
Many times the document is received already in electronic form (for example via e-mail) and then printed on paper, but possibly will follow different routes of delivery and storage in other departments. Today, the electronically scanned document needs to be printed and recorded if their official status should be ensured and clarified. Not to mention the problems related to documents that need to be periodically updated (for example such as those documents provided for the certifications).
Nowadays the company prevention documents only plays a static and supporting role justified above which is a real yet not deniable fact.

Document Management system (DMS) is able to automate all the processes of information sharing, exchanging, reporting and storing following a workflow that meets the requirement of the organization business and allows a real circulation of "knowledge" among the main actors in the life of organization.

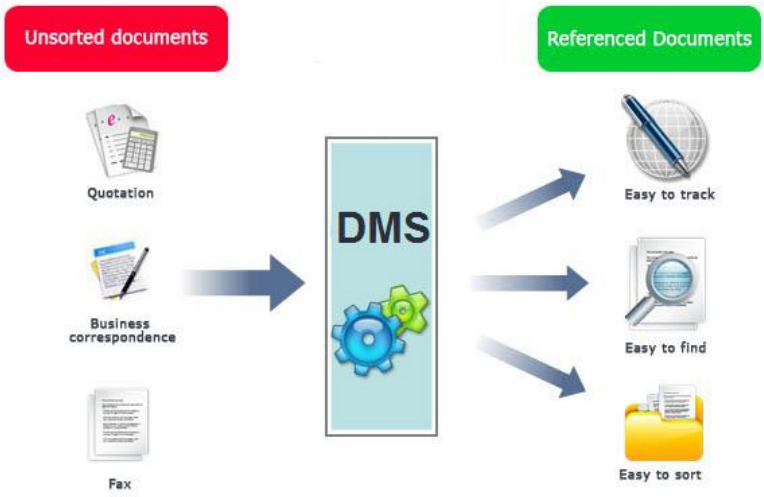

Figure 1.5 Document Management System (DMS)

DMS allows the total management of information and decision-making flows; based on the definition of flows that describe the process of approving and / or communication of any document type and the profiling of individual users or roles within the company, allows you to circulate the business information and to notify all of the parties concerned in real time wherever you are.

Sistema Ambiente, as later will be fully introduced, is a program based on the DMS. It stores and manages a large amount of data, providing and updating in real time many documents (personal data, reports, safety analysis pages, registers). These data and documents can be shared and utilized by all enterprise functions (RSPP, Environment, Fire Prevention, HR, Production, Maintenance, Quality, Chemical Laboratory, Purchasing, Inventory, Head of department, etc.). Many of these documents must be known at different levels of the company, so it can allow access for consultation.

Not all documents that serve to prevention system are stored in SA: there are a considerable amount of documents that the company often received in paper format or they are/can be digitized (such as Internal administrative data, suppliers and contractors data, manuals, drawings, etc..) which are managed by other business functions. Basically there are many paper or digital files stored in the folders that make it very complicated to information searching or sharing.

The only document management system that works is usually the one connected to the accounting (active and passive cycle) for service reasons: it is, however, a static storage, not a dynamic information system and it is a work flow only aimed at administrative approval procedures.

System Environment has prepared its functions in order to feed a document management system shared by all department in the enterprise, with the possibility of rapid and complex research and consultation, capability of unifying, from those technical information to administrative information.

1.5 Risks and problems in the integration process

Integration Risks:

A risk of integration is the creation of different rankings of the different aspects, e.g. that more attention is paid to the quality aspects than to environmental aspects. On the other hand the potential is that environment, health & safety will get higher up on the agenda of all the companies with an ISO 9000 quality system. Typically, the company has a quality management system and later integrates the environment in their present quality procedures.

If the environment is integrated by "search and replace" this approach creates a risk of neglecting the environmental issues compared to quality issues. For companies producing products with high quality demands and massive documentation requirements, for instance in the car manufacturing industry, it is recommended to handle the quality issues in a separate management system. The level of integration that a company decides to pursue in the design of its management systems will depend on both the complexity of its current management systems and on the will of the company to pursue integration.

Although the target of various systems is to promote each other to some extent, the integration of different factors is feasible in the management logic, still in practical work, there are a number of factors that will affect the progress of the integration under certain conditions, such as:

1. Different systems' targets are objectively in possible conflict. For example, the requirement of enhance the quality of a particular part would probably increase the public's environmental impact. This is the basic problems present in the integration process.
2. To achieve the respective goals for different systems elements, the specific measures and technical means demonstrate their own characteristics and diversity.

3. Each system is subjected to a variety of external influences. If the stakeholders groups or superior authority imposed on the importance of one system more than the other, enterprise is under such external pressure, or even the impact of external resources. This may impede the integration progress.

4. Internal personal subjective influence. If managers have subjectively priority requirements for different systems, varying the consideration at different stages, then there is a personal impact on the system integration.

Integration Problems:

Incorrect understanding of integration, which is common in the real process of management system integration in the organization, will lead to failure:

1. Integrated management system is considered simply to reduce the workload and reduce the cost of certification

Many companies are not so clear about the purpose of integrated management system with an one-sided idea that the integrated management system is simply to reduce the workload and reduce the cost of certification. In fact, the purpose of the integrated management system is mainly for better economic effectiveness and management efficiency. Of course, for an enterprise to obtain quality system certification, environmental management system certification and occupational safety and health management system certification, the sum of the total costs is greater than the cost of one integrated management system certification, but this is only the something superficial. From the point of view of standard contents: the quality management system requirements are on behave of customer; environmental management system requirements are on behave of the society; occupational safety and health management system is mainly on the perspective of the employees. In the society of nowadays, the goal pursuit of the enterprise can no longer simply positioned to meet one certain aspect, but must be considered to meet the various demands. Therefore, enterprises must follow the basic principles of management science, and start from the overall planning, streamline management mechanisms, integrated management system to achieve the overall management of the enterprises, so as to meet the expectations and demands of customers, employees and the society to achieve a total system optimization goal as well as the best economic and social benefits.

2 The integration management system is considered equal to the superposition of three management system

In addition to the quality management system (QMS), Environmental Management System (EMS), and the Occupational Safety and Health Management System (OSHMS), a complete enterprise management system should have a financial management system. It is suggested that there should be also an operation management system, human resource management system and so on. In fact, they have been integrated into the quality management system (QMS), reflected in the requirements of ISO9000:2008 standard. So, simply believe the enterprise management system is completed superimposing the quality management system (QMS), Environmental Management System (EMS) and Occupational Safety and Health Management System (OSHMS) is both one-sided and incorrect.

While the core concept for integration approaches is:

Integrate in a functional and effective way to the objectives of enhancing business productivity, quality of work and the contribution of workers reducing the environmental impact of processes and products, leading technological and organizational innovation.

As a conclusion, integrated management system is not a simple superposition of three management systems, but an organic integration. Reducing the cost is just one aspect of integrated management system integration, but the aim is to improve the organization's working efficiency and management efficiency in order to enhance the market competitiveness of the organization. On the other hand, the organization should be fully aware of the quality management system, environmental management system and occupational safety and health management system is only part of the organization‘s management work, not all. Therefore, in the integration process, great attention should be paid to the interface between these three management systems and the entire enterprise management system.

Integration process can not be accomplished overnight. A wise enterprise should carry on management system integration as a long-term goal. In practical work, it should be noted to take advantage of the favorable factors to promote integration, in the mean while avoid or coordination unfavorable factors which hinder integration. To be pragmatic, progressively carry on as planned.

Chapter 2: Management systems related to different organization context

2.1 Management model's change: From Fordism to Post-Fordism

2.1.1 Fordism and the static organization

Around the end of the nineteenth century and the beginning of the twentieth century, a range of management professionals, especially engineers, started to develop what was later to be called the classical management model. Among them, one can emphasize the contribution of the American engineers F. W. Taylor and H. Ford.

The compilation of knowledge concerning the organization of work, based on technical and scientific methods was developed, first of all, by F. W. Taylor. It was based on the division of work, with the breakdown of tasks into simple and routine movements, with clear differentiation between the activities of planning and execution.

Taylor argued that the fundamental purpose of scientific management is seeking the highest labor productivity, the highest efficiency of employers and employees to achieve common prosperity based on an important means to achieve the highest efficiency instead of experience in management with scientific, standardized management.
Whereas Taylorism (on which Fordism is based) seeks machine and worker efficiency, Fordism seeks to combine them as one unit, and emphasizes minimization of costs instead of maximization of profit. After the second industrial revolution, the Fordist mode of production is adopted by many companies. It is a rigid production mode which is market-oriented and based on the division of work and specialization. The main features of this mode of production are: firstly, mass production. In a competitive market environment, a capitalist must improve labor productivity to sell his product at a lower price so as to expel other capitalists out of the market. It is realized by a finer division of work, more comprehensive use and improvement of machines. These results in inevitable effect: the division of work leads to further division of work; adoption of machines lead to a wider adoption of the machines; mass production will lead to a even larger mass production. Secondly, products are standardized. Under the guidance of the principle of Taylorism, the intensified division of work and standardization of work together with highly specialized machines can produce a standardized product. Thirdly is the vertical organizational structure. Production process is based on the division of work and specialization, to achieve greater efficiency and cost saving, the only choice is careful planning and

decision-making, a strong command and control as well as strict supervision to ensure the efficient operation of the production line. This forms a vertical hierarchical organizational structure in the large enterprises. The Fourth point is the rigid production, namely, labor skills, management structure, organizational boundaries and products, and other aspects shows the rigid characteristics. In the organization of production aspect, the rigidity is: (1) each production process is completed within the same enterprise. (2) The closed nature of the system: that each part of the product is completed within the same enterprise. These require the companies to have a comprehensive and powerful function.

Based on the Taylor's scientific management and Fordism, the main features of organizations at that time can be summarized as a static organization:

- ✓ overlap between ownership and management
- ✓ strong verticalized management
- ✓ workers with prevalent execution role
- ✓ repetitive operations
- ✓ stable technology and procedure

The Fordist system was afraid of possible collapse unless it could control unforeseen events. The main limit of the Fordist model lies in it being so rigid. This lack of flexibility was the root cause of the failure of the system.

First of all, the market had begun to get saturated. Rigid behaviour also appeared in the labour force. The problem emerged when the internal and external conditions changed, when markets became saturated and the labour force stopped accepting the discipline imposed by the Fordist environment. At the end of the 1960s, in the industrialised world, there was a real mass revolt and uprising against the characteristics of Fordism and Taylorism, against the alienation of the worker. As a consequence of the above, a technological revolution took place, one that made the mechanical technology of the assembly line obsolete.

All these facts together were the roots of the crisis of the Fordist model. Its costs became too high; its lack of flexibility became intolerable. The Fordist model started to reveal certain weaknesses and problems related to the management /control of its own workforce, to market growth and expansion and to increased world competition.

2.1.2 Post - Fordism and the dynamic organization

In the late 1960s, Fordism went into a crisis that would lead to its downfall and its replacement by industrial models generally defined "post-Fordism" or "Toyotism". The

Toyotist model breaks with the Fordist model and upstages its major characteristics. Centralization of the production process is replaced by outsourcing, looking for external suppliers or sub-supplying systems. This is followed by the establishment of decentralized global networks of production.In a rigid system, the regularity of the production flow was hit by any unforeseen event such as a wildcat strike. And if the workers worked more slowly than expected, they jeopardized the functioning of the overall organization.

Toyotism's main goal was to reduce costs and to make the whole production process more agile. The environment is a turbulent one: the uncertainties coming from outside are so many and so varied that they can no longer be kept under control as in the Fordist environment.

After the 70s, when post-Fordism begun, markets became more rigid and in some cases started to be saturated. On the output side, signs of rigidity emerged. This rigidity had a backlash that influenced all the steps in the system, first of all its goals. Once markets are overflowing and saturated with products, the targets become uncertain, fragmented and less predictable.

The fundamental changes in the international economy forced firms to switch from mass production to a new tactic known as flexible specialization. Factors such as the oil shocks of 1973, increased competition from foreign markets (especially Southeast Asia) due to globalization, the end of the post-World War II boom, and increasing privatization made the old system of mass producing identical, cheap goods through division of labor uncompetitive.

Instead of producing generic goods, firms now found it more profitable to produce diverse product lines targeted at different groups of consumers, appealing to their sense of taste and fashion. Instead of investing huge amounts of money on the mass production of a single product, firms now needed to build intelligent systems of labor and machines that were flexible and could quickly respond to the whims of the market.

Production became less homogeneous and standardized and more diverse and differentiated as organizations and economies of scale were replaced with organizations and economies of scope.

In consequence, companies must equip themselves to meet fluctuating demand that might either suddenly increase or suddenly shrink. For selling products customers' expectations have to be met. Customers' preferences and needs must be quickly understood and rapidly introduced in the production process. Planning in advance was not

possible anymore and manufacturers had to adjust models and production methods very quickly. This change affected the targets, the goals and the objectives of the company.
In this time, the organization has to be structured dynamically to be survived in the market:

- ✓ increasing autonomy of the manager or delegation to managers from shareholders
- ✓ de-centralized management
- ✓ increasing role of the intellectual function and specialization
- ✓ strong fragmentation of the executive work
- ✓ greater availability of innovation
- ✓ strong interaction with the market specialization of products

2.1.3 Human resources plays a more important role in the organizational development process

The company is made flexible then it expects the worker to be equally flexible.
In the Fordist model, workers did not have the fundamental tools they had in the previous handicraft system of production, namely their skill, their wisdom, their knowledge, their experience. Prior to Fordism, workers had been able to control the production cycle and the technology.
In Fordist factories targets were pre-determined and planned in advance. The direct consequence of this managerial structure was the creation of fixed rules/regulations. Workers had to comply with the established formalities and merely carry out their work on the basis of procedures that had been decided by the top and mid management structures. The workers in such a highly regulated environment were usually unskilled: they did not have to think; they simply had to perform very simple actions accurately.
Just like the typical slogan change of the twentieth century from "you're not paid to think," to "the quality depends on you." the meaning behind it is obvious and profound
In the context of Post-Fordism, which is based on the “just in time” philosophy and the “lean production” approach, workers must be able to adapt, to change production objectives very quickly. Workers must not simply carry out a job to meet pre-determined goals or targets following formal procedures. The factory can become flexible and responsive to markets only with the “active/flexible” participation of the workers.
Ohno calls this mechanism “autonomation”. It means not just automation of processes, but also autonomy of workers. The workers must be able to decide independently, to adjust or change something in the production process, in order to make production and product as flexible as possible. The Ohno’s philosophy calls on workers to be more active, not just to

move their bodies, but also to put their souls and intelligence at stake for the benefit of the company.
Workers are no longer asked just to screw a bolt or weld two components together. Workers have to pay active attention, be psychologically responsive to the working environment and able to identify faults or defects of production and, if they find any, they must take the decision to stop the production flow and revise quickly their tasks and consequently their skills.
Workers are asked to become controllers who monitor production. This means that, in addition to their practical duties, they must also control, monitor, test and inspect their production. They must contribute to the improvement of the final product and of the overall production.

The Attitude Of Top Management Versus Workers Also Changes:

They now have realized that no-one knows how to improve things better than the worker, that the worker knows how to make the whole process as effective and efficient as possible. This aspect has an implication with management practices related to active workers' participation and "quality circles" team exercises.
If Fordism considered the "intelligence" of the worker as an obstacle, Toyotism considers the "intelligence and know how" of workers as a strategic resource for its survival. The workers are expected to adopt irregular behavior if this favors production. In the Fordist factory, the idea that a worker could interrupt the production flow by pressing a button and stopping the assembly line was unthinkable.
The post-Fordist factory is a factory that can adapt daily to ever-changing market needs: this is why workers are asked to take an active part in the work they perform. The worker is no longer a "machine" that has to perform the same operation over and over again. The worker is now "alive", with his/her own personality and capacity, and puts all this at the disposal of the factory, to the advantage of the company, so that the company can survive in the market and become more competitive.

2.2 Diversity of the characteristics of a management system in the dynamic organization

It becomes more and more conspicuous these days to invest primarily the quality of the work. The contents become less manipulative and more cognitive, tasks tend to be less executive and alienating, but more cooperative and engaging, and knowledge are

generally less specialized and more versatile. The operational requirements are no longer mandatory and inflexible as yesterday, so the work tends to be less leveled and standardized and therefore less flat and impersonal.

Since information technologies facilitate all processes generated by lean production, an increasing number of people, in every kind of work, will also work physically on the network and will have to "pay attention" and develop a "knowledge network". No worker and no company can remain closed because the post-Fordism produces and requires more flexibility, both in functional and mental aspects. Moreover, the quality of the product requires workers' adaptability to grow over the job rotation and enlargement of the tasks. The overall result is a greater autonomy for those working with the dependencies. It has reflected especially in the request to individual worker to identify the obstacles and solve problems that arise while at the first is forbidden. This new autonomy, moreover, is imposed by the quality of the product and the service, and depends primarily on the intelligent cooperation of workers, namely the invaluable participation in the work the Dublin Foundation called "direct participation".

Stable environments suggest mechanistic structures that emphasize centralization, formalization, standardization, and specialization to achieve efficiency and consistency. Certainty and predictability permit the use of policies, rules, and procedures to guide decision making for routine tasks and problems. Unstable environments suggest organic structures which emphasize decentralization to achieve flexibility and adaptability. Uncertainty and unpredictability require general problem solving methods for non-routine tasks and problems

Therefore, we need a management system that can recognize the complexity involved in understanding human and organizational system so as to be effective where planning, organizing, leading, and controlling must be tailored to the particular circumstances faced by an organization.

As a matter of disappointing fact, a satisfactory management system on environment, occupational health and safety that taking into account the dynamics of the work organization and center on the contribution of human resources as a way for better quality currently still not exists.

Sistema Ambiente, as will be introduced in the following chapter, is developed as an approach built on the basis of previous research and practice which extend the findings to develop an understanding of how contextual, organizational, and human dimensions are integrated. Specifically, we draw ideas from classical management theory regarding the

structuring of organizations to increase efficiency and productivity, acquiring the knowledge about human needs and motivations that can lead not only to increased productivity but also to enhancement of the working environment, identifying the context in which organizations operate, thus enabling managers to understand the environment and how the parts, or subsystems, of the organization are interrelated.

Chapter 3. Sistema Ambiente

3.1. The idea behind SA

3.1.1 Current situation in environment and safety management

URGENCIES

The necessity to take into account all the financial and economical aspects of every enterprise has been accompanied by an objective undervaluation of its environment implications for the world. The speedy process of next decade that is coming along in the industrialized countries especially in developing countries will be determinant in the reaching of a dangerous point of no return in the environment or, on the contrary, creating the base for a maintainable development.

After the first and the second industrial revolution (that pointed at the technologies for resolving the quantitative productions issue), nowadays the productive apparatus takes the measures to make technologies and materials consistent with the maintenance of environment conditions requested for the ecosystem. So are born worldwide legislations of reduction of pollution, laws intended to reduce the risks for the safety for both workers and populations, parameters for valuation and rules of environment management of production processes and of products.

So the problem sets itself as a speedy re-conversion of industrial consolidate apparatus and as a necessary diffusion of technologies in their «clean» and «consistent» versions, in order to avoid self-destruction caused by globally «lethal» and incontrollable instruments. This concerns either great firms; or the huge archipelago of under-equipped middle and small firms; or, most generally the long winded apparatus of small and very small firms situated everywhere and moving everywhere in searching of markets.

ENVIRONMENT COMPETITION

The cultural limit (with important actual implications) has since now inclined to consider the safety and environment consistency parameters either to be “administrative duties” or “image calls”: namely, to the appearance but not to the essence of environment quality in processes.

On the other hand, States’ direction has often been in the terms of “political smoke”, or of sanctions systems without a programmed direction provided by economical and structural instruments.

The positive feature of willingness of control systems may perhaps be faster and with its results be more effective: if environment re-conversion becomes a desired thing, the

market allows priming a competition in which the reaching of objective (as technological quality) may condition the simple element of economical and financial strength.

CURRENT SITUATION AND PROBLEMS

Different pushes have arisen in the business world since the approval of Directive 391/EEC (Introduce measures to encourage improvements in the safety and health of workers at work).

First we have to understand at least three main facts.

- The first is that prevention is still limited and safety still in the low qualification state in the early years when Dir. 391/EEC appeared;
- The second one is the application to work with method and responsibility.
- The third and the most serious problem is that too many things are done unfortunately without conviction.

The first stage, still well known and to be surpassed, has been the alarm and urgency to fulfill bureaucratically the “document” duty.

Without 391/EEC, an important strengthening and a significant qualification of the firm cadres engaged in the safety division could not happen. The information and training action, most generally, the workers’ involvement, has been surely more formal. If the action carried out in the analysis stage has been bureaucratic, in the same way the election (and very often rather a “designation”) of the workers’ representatives for Safety and the characteristics they assumed in firms is certainly bureaucratic.

Another feature of the problem has shown a basic weakness too. Too often the strength the staff devoted to vigilance is completely insufficient and devoid of the means to take an organic action able to urge the fulfillment to rules and to direct prevention actions and methods.

But now reality has changed, and in a positive way:

- Some of the firms has “detected” or “redetected” 391/EEC as a great resource that flows positively in all firm features and represents an indication of method of work and management too;
- Second kind (nowadays much more consistent) is ready to “accomplish again” the course to make it more concrete and incisive by involving directly more and more firm resources;

- The rest of the firms, which unfortunately remains the majority, that carry on, with an undervaluation of qualitative features, an improper “competition” towards the most engaged firms.

We must give a similar valuation if we have a look on the environment engagement of firms, which is another great bet for all European industry. If we turn to public administration, we unfortunately observe that the will and the engagement of public administrators has not been different: except for a certain important field, similarly a great quantity of local organizations and public companies have delegated outside (as it were really possible and useful) all the business.

SA is a mean aiming at the good management of safety and environment, as it appears to be extremely crucial for a larger quality jump in order to face the reality and not only the appearance of the problem.

All the subjects are directly concerned in the matter knowing that the attention paid to the work condition and work ways is a main resource: it is why the method, the one of the concrete involvement to prevention in the work place, becomes effective.

THE NEED OF SHARED METHODS AND PARAMETERS

Legislation quality still clash with a too large differentiation of analysis methods and valuation parameters. Anybody, in any place he may find a way of analysis and prevention organization on the basis of his experience and of his acquired competence. Reality shows that, even with a high competence, methods and parameters are not only been brought out by an individual effort.

ISPESL (Italian Department of Industrial Hygiene) has contributed a great effort to provide elements of knowledge and means as a basis of a common knowledge of prevention and it starts producing a very large documentation wealth. However, an availability to provide knowledge, to communicate experiences, capability to increase intervention ability of each single person is still not enough while are equally important.

The aim of the program is mainly the one to give a directed system of information collection and of organized proceedings that give to consumer a base of starting and work in which is condensed the experience of a hundred safety operators.

From a world of words and papers, safety and environment management are becoming behaviors, proceeding and knowledge: “Sistema ambiente” is the tool designed for this aim.

"Sistema Ambiente" can practically be used by all the firm functions that will be able, in this way, to work and particularly "contribute" positively to safety. But it would be wrong if many people use "at once" the program. The program must be put into effect gradually, starting from work and knowledge that the S. P. P director (servizi di protezione e prevenzione) transfers in it, to put into motion other functions by degrees afterwards.
The program may be very well used for separate fields. The advantage of the gradual starting is that as soon as we put specifications into it, they are just ready to be shared with others with no need of repetition.
An important "collaboration" is the one with the firm information files, from which the program can import many specifications and to which it can give back many processed and organized data.

It is necessary, for this to happen, to weigh heavily on management systems and on self-control ability of the firms (not only big or middle, but also the smallest ones): this means methods and instruments of management, innovation of technologies and of processes.
"Sistema Ambiente" as a program for the information management of the prevention on work places and of environment quality of the firm is contributing to this process.
'Environment budget' concept is introduced. It is not a simple "economical computation", but a qualitative and effective "account" of the adjustment objectives and of the reached results. The way to reach the environment budget and to make it a consciously acquired mean is the proposal offered to who employs "Sistema Ambiente". It is a way to be really interactive and full of all available competences.
The business "environment budget" is the base for new reading of States social budgets not only connected with monetary and fiscal movements, but also protect the patrimony of material and social resources.
SA setting is not built starting from specific laws in specific countries, but responds promptly to the problems what are indicated by this or that rule, in this or that country. Therefore the implementing legislation will not require the SA to update continuously, since SA is already updated.
What changes, from country to country, are the formal aspects and forms, SA especially provides the information and scripts that can be used in different ways. SA also has its own format, in some cases it proposes different versions, to facilitate the formal diversity.
Since 2004 SA has implemented its functions so that it can be used in multiple languages with versions in French, Italian, Spanish, Portuguese and be proposed already in many

areas of Europe, Africa, South America and North America. The English and Chinese is on the way to be completed.

3.1.2 A new solution provided by Sistema Ambiente

Sistema Ambiente is a program for the risk management of work place and environmental compatibility of the firm. It's a tool for the correct management of the safety on job, of the accounting and the environmental budget usable for every firm.
This solution provides a possibility of reducing greatly the cost of the prevention management. The availability of the program Sistema Ambiente's usage not only permits the registration of the data, but also provides a method, guidance and a tool for the planning and management. It will realize also the cost reduction in consultation of a huge amount which still remains useful only for some specific technology. Furthermore the real time data of the firm its own will be available whenever it is necessary and can export the renewed processing for any internal or external control. The application of the program can be either limited to a single procedure (for example, risk analysis o waste management) or, afterwards with the data already inserted, be applied in all the parts. The protection of the data is guaranteed by password, through which the firm will see exclusively his data and the data can be seen only by the firm that belongs to it.

1. Enhancement of the active role of human resources

In a complex system, a variety of factors are involved: technical (relating to the internal organization, communication), organizational (work organization, decision-making procedures, production planning, and commercial planning), economic (relating to the supply, cost of production, distribution and financial planning), management (relating to professional skills, to maintain quality of resources), strategic (on markets to innovation and investment).
These factors are closely interdependent and can determine the success or the difficulty of the company, to the point that the wrong evaluation of one of them may result in ineffectiveness of all others (eg. the wrong choice of a product, l ' marketing mistake, inadequate technology, etc.).
However, the crucial part of any company is the people who carry out the operations, now called "Human Resources", which guarantee volume and quality of production and which are the backbone of the real manufacturing system.

Over the past two decades, several studies show that decreased attention to 'work organization, professional skills, and especially to working condition, all management weaknesses are often due to false labor organizations and the creation of large imbalances in the definition of tasks.
The effects of this situation are manifested negatively on production and even more in the occurrence of injury, of diseases and work in discouraging professionalism. The renewed attention to the condition of employment with the Italian law according to European Directive has brought to light aspects that over the years have become more serious, so it is pointed out that the company's system, unprepared for this issue, was addressed mainly to administratively manage the damage already occurred and not to apply a method of prevention.
The same activity deployed to implement safety measures and equipment (personal protective equipment) has been proved inadequate, and unable to avoid the negative effects on people.
Here, then, in front of serious signals that have continued to emerge in the world of work, has become an area of a comprehensive concept of prevention that can be contained in the term "ergonomics" namely 'adaptation of work to man ("to fitting the job to the worker "Murrel) the current goal is to contribute to the design of objects, services, living environment and work to promote respect for the limits of man and potentiate operational capabilities.
We realized that in today's lacking communication between the scientific and technical knowledge that dominate the product and operational knowledge and biological properties that are contained in the execution of production, the lack of communication between these two key areas of 'company has depleted all corporate activities.
The program is based on research and analysis of the historical experiences of bargaining 60s (in the textile and rubber), where they appear the first elements of workers' interests and bargaining workload (assignment of machinery) and health protection, particularly in large engineering company. In fact, the prof. Ivan Oddone, occupational physician and then Professor of Work Psychology at the University of Turin, with the participation of trade unionists and members of the then Internal Commissions, set up a working group which was proposed in the first place to reconstruct the knowledge of working condition, starting from the experiences provided by workers from different workplaces.
Knowledge of the working condition also implies a deepening of new technology, the different organization of work.

The problem arises of how to relate the need to change the working condition expressed by the workers with the company methodologies and parameters, it is therefore to develop a "scientific" analysis model of the work.
The resulting model is based on the protection of health and the relationship between working conditions (working environment and work organization) and health effects. The views expressed by the workers are subjective as well as the technical evaluations. In order to make these two assessments meet and exchange you need to provide the model of objective tools.

Ergonomic Studies

“Sistema Ambiente” has a module for dealing with specifica ergonomic conditions.
This method allows the definition of objective parameters measurement for each job in a defined, homogeneous way showing the human capacity to interact with the technical means and organization of existing work.
For the various aspects of verification, quantifiable elements have been identified, which is assigned a value that takes into account the psycho-physical state of a person in good health, age group belonging and optimal environmental conditions.
Since we have defined value of each parameter in an uniform way, some indexes are processed in the interaction between variables of different parameters, to better identify the actual operating condition and its effect on the psycho-physical balance.
The measurement does not offer an immediate evaluation, as this is possible only on the basis of the verification of the general health of the person by the occupational doctors and the actual environmental conditions with the active participation of the workers concerned.
Values (weights) of measurement allow us to better understand the quantitative level of risk (higher or lower) depending on the change in the operating condition and the qualitative characteristics of the risk.
Too often, wrong planning of the operational phase (after the fact) creates damages that led to imbalances which will cause a productive worker to malfunction and the corporate hierarchy is often not prepared or unable to correct.
The design which cannot only be the sum of homework well done, but it must be clear about the centrality of the protection of health and safety of the worker..

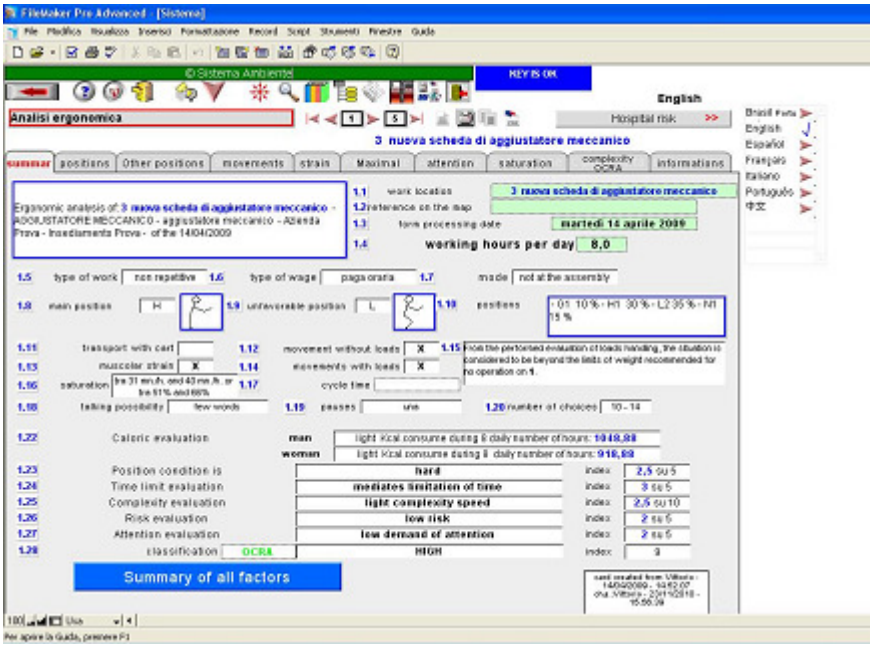

Figure 3.1 Ergonomic Function in SA

2. Adaptation to the dynamic organization

- ✓ **Homogeneous group risk analysis**

The first element of overcoming the subjectivity is given as a reference not from the individual worker, but the homogeneous group of workers who are in a specific environment to perform a specific job.

The second element is the search for objective indicators: environmental data (measurable) and health data or biostatic data.

"Sistema Ambiente helps to think about the organization of work, how different tasks in a given process with specific technologies interact to carry out their activities a well defined phase of the business cycle.

This is a critical step to apply an ergonomic approach, which requires intervention tools on working organization and technology.

European Law introduces the responsibility of workers as the backbone of security, which means that the employee is required to capitalize on their knowledge of the labor process, its characteristics and its anomalies that have produced harmful effects or not, help improve the safety conditions relating to it. "Sistema Ambiente" is not limited to the identification of personal protective equipment for the definition of procedures for safe working, but introduces two specific tools to enable effective participation.

The first of these tools is the questionnaire group (Figure 3.2, 3.3)

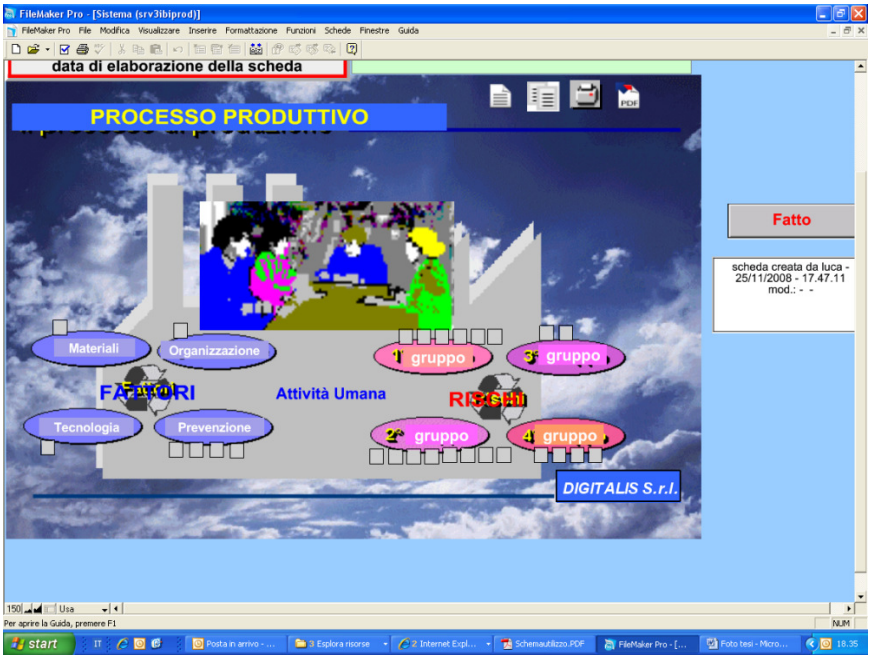

Figure 3.2 Questionnaire Group Page: to collect information directly from workers

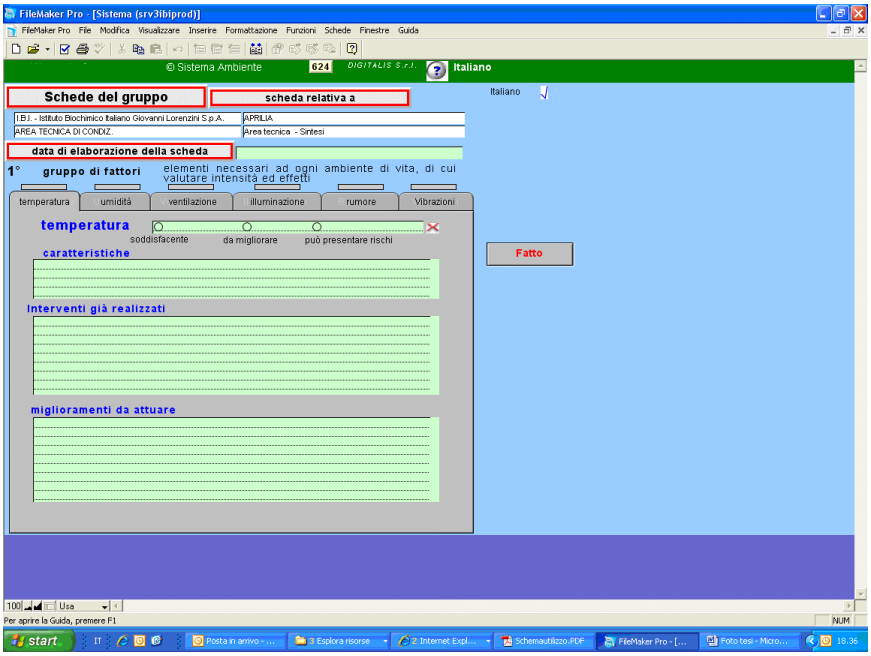

Figure 3.3 Questionnaire

Each homogeneous group of workers can express their own risk assessment highlighting the possible effects on health and safety and provide their proposals for correction. This tool helps the RSPP to consider knowledge that is often not available and which are necessary for the study of risk and its overcoming.

✓ **Four groups of factors for risk analysis**

The second tool is the application of a model of 4 groups of factors, an empirical model based on the approach to the environment (any environment, not just work):

1. The first group of factors are those relating to noise, light, aeration, temperature and humidity: factors that are essential to life, but that if the density is too high or too low can lead to discomfort and eventually damage to health.

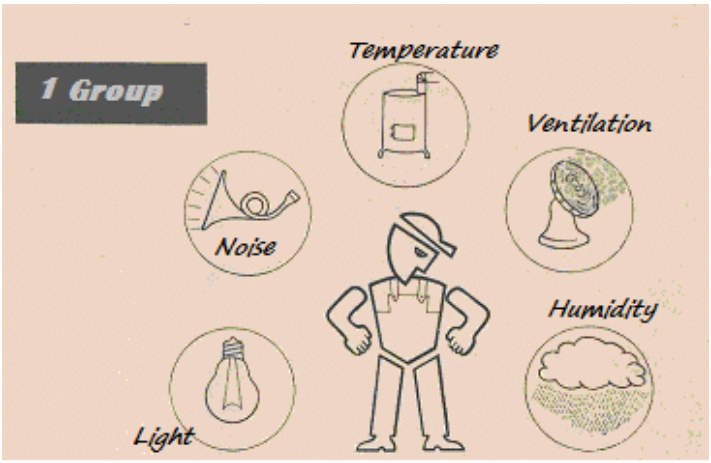

Figure 3.5

2. The second group of factors is those relating to the smoke, vapors, gases and radiation, which relate to the use of chemicals: control if each of these factors is above certain life-threatening value.

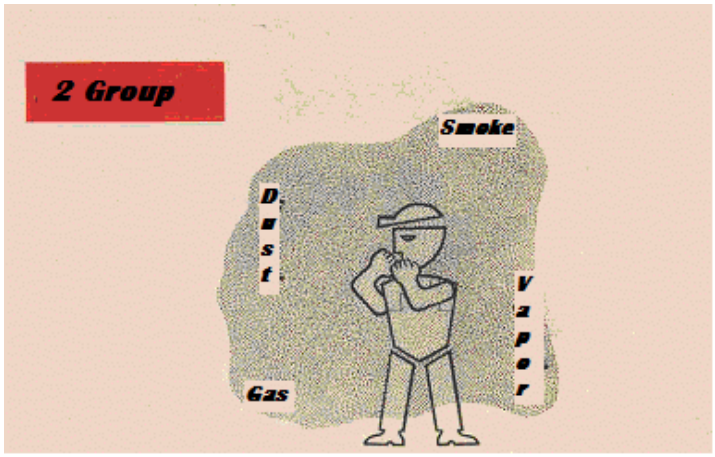

Figure 3.5

3. The third group of factors relates more specifically to how the work is done, namely the tiring effects mainly arising from physical fatigue.

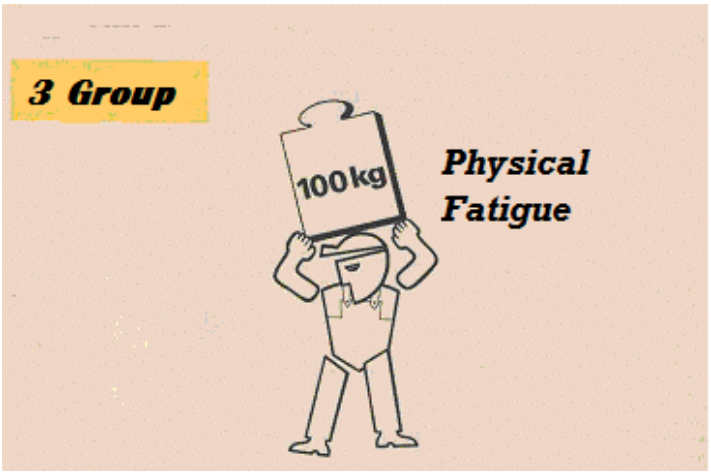

Figure 3.6

4. The fourth group of factors refers organization of work and the characteristics of rhythm, monotony, lack of exercise, anxiety, stress, job positions, and risk of injury: each of these factors can result in serious effects reversible or disabling of many components of 'body.

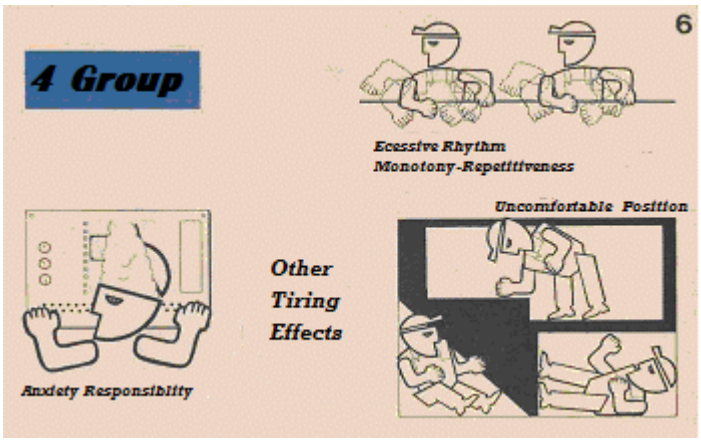

Figure 3.7

The function of the model is firstly to facilitate the understanding of the risks in analytical terms and functional to their correction; the second function is to classify the risks in terms which best allow the verification of the effects on health status; the third function is that of a more organic relationship between health disorders and identification of its cause.

In the period we are talking about were recognized occupational medicine only for the so-called "occupational disease" defined by DPR 303/56, that is, those of centuries of human experience had confirmed the injury or illness in connection with certain materials or substances. Only later, and in particular with the European Law, the concept of disease from work expands to all possible diseases from work.

The model has anticipated this concept, just starting from the consideration of the human body unit.

It was also necessary to define a method that would allow a positive comparison between

workers and technicians. The method was based on a first phase of elaboration of the so-called "raw maps", namely recording on an outline of the judgments and observations of the group, because raw yet based on objective data on perceptions of the group.
In second place was introduced the Health and Risk individual booklet, that is, the historical record of the occupational hazards and health problems and diseases of the individual.
The following figure 3.8 is a view structured on the basis of the classification of the four groups of factors, which compares the technical analysis conducted by the RSPP with validation by workers.

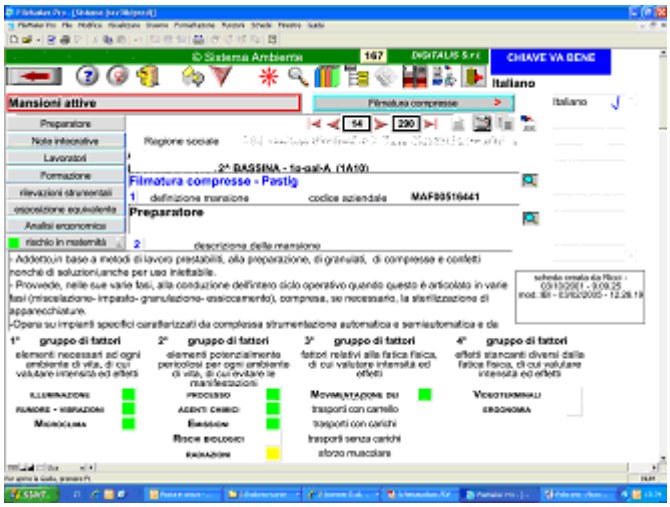

Figure 3.8 Technical analysis of risks based on the 4 goups of factors

This calls into question on the one hand the ability to listen to RSPP and on the other hand the representation system for security (RLS), whose function is mainly to analysis with each group of workers and to develop proposals and solutions as well as technicians.
This latter aspect has been presented as problematic, mainly the RLS had come from or were simultaneously RSU, in other cases they did not have any preparation.
Health and safety is not a matter of bargaining or can be exchanged with other matters of employment, the risk is not mediation, if anything, and we can discuss corrective actions and the timing of their implementation. The other aspect highlighted is that of transparency of the data and their communicability: the reading of the documents (text and tables) of the system must allow an understanding of the situations, this is against the internal organs (Audit) and external (ASL) controls, both with regard to officers and employees.
"Sistema Ambiente" works as an information tool and allows, depending on the permissions, the vision of risk processes, machinery, materials and information to help correct decisions that affect people (training, work history).

The choice of the use of the database is also derived from the need to better identify the relationship between the processes and the environmental impact.

- ✓ **Risk individualization**

"Sistema Ambiente", is a system developed for the analysis and management of risks and training, as part of wider functions of testing, planning, management of all activities that have a bearing on the health and safety of persons and with the environmental impact.
The system takes into account many of the issues we've talked about this and was able to anticipate much of the processing and the subsequent evolution of the decree.
The first problem that we had to consider was the opening phase of a risk analysis in a large number of companies where there were no experts in many companies where the experts were mainly prepared to handle the administrative aspects of the risks and effects on health and safety of persons, it was therefore in the first place to provide a scheme of analysis and a method.
First, the method of identifying risks, which provides for the segmentation of the company until individualization of minimal risk: from the factory to individual rooms, the phases of processing, machinery and their components.
The criterion based on the consideration that only a specific identification of risk and its physical source allows the control and elimination.
However, the success of this policy has met with 4 models in consolidated companies:
1. The first is the acquired habit to identify the workplace according to the administrative division of the company (departments, sectors) that do not correspond to the identification of the processes from the point of view of the risks;
2. The second used to assess the risks based on their alleged presence in macro reality;
3. The third is the sector-wide approach to risk without attempting to see the interactions with others;
4. The fourth is to ignore the context of working organization where the risk occurs.
In the initial phase, it is tended to think more about the responsibility of the individual than on the objective conditions of risk, to the point of considering the injury almost exclusively dependent on the breach of rules or the carelessness of the worker and the disease as a result of failure to use personal protective equipment.
"Sistema Ambiente", developing the methodology proposed by the European guidelines and those developed in all countries, has introduced analysis of the various types of risk according to checklists that have been enriched as applying to different sectors.

The checklists are designed to help address the possible aspects of a risk and stimulate anomaly detection and corrective action to be taken.

The checklists "Sistema Ambiente" is based on a structured method of analysis of the actual status that also provides empirical indicators and that "force" the one who fill out the form to reflect on the analysis. (Figure 3.9, 3.10)

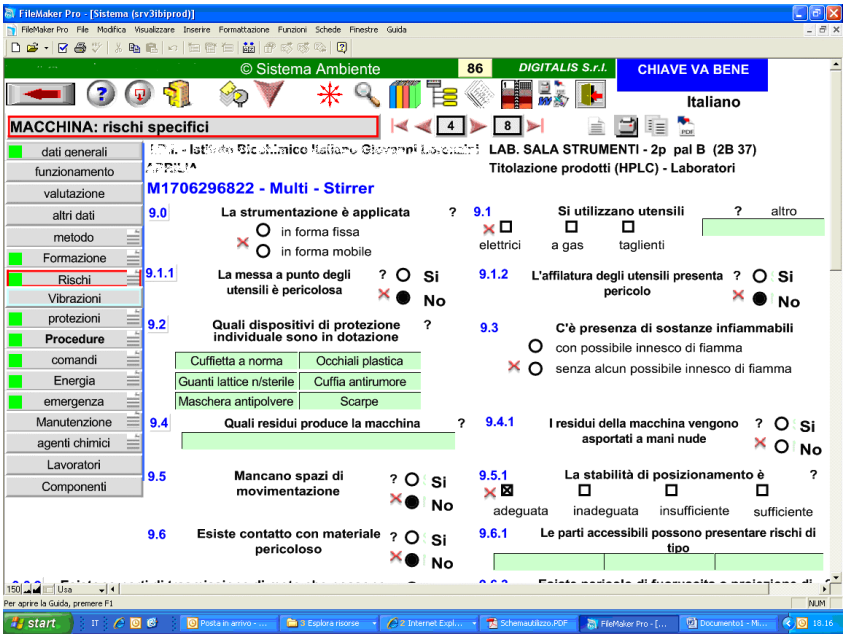

Figure 3.9 Risk Analysis Checklist (1)

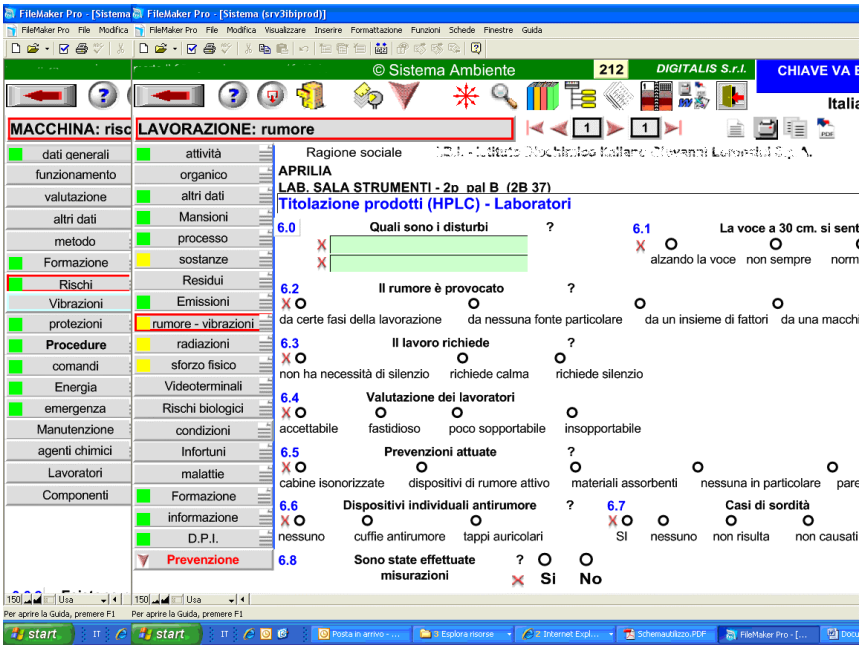

Figure 3.10 Risk Analysis Checklist (2)

This leads us to consider the risk not as a general and especially to consider related to the possible effects on the 'body of people and their behavior, as well as conceiving the Act, regardless of the parameters provided by law. For example the noise is fixed a limit of 85

decibels, however, if you are to perform work of attention, a much quieter noise can disturb if the worker continued.
The system has made sure that the data enterer could refer not only to paper documents, but also to electronic ones.
Experience has shown that if the data enterer has a background derived from a good knowledge of production processes and technology, the method is well used; the data are entered quickly and with good reason. On the contrary his legal education or administrative difficulties in the use of the method will lead to the rejection of the registration and organization of data.

3.2 Main functions of SA

❖ Firm structure

Every firm, industrial one, administrative one, firm for services, small or large, has a structure that from the point of view of danger detection can be divided in:

- Settlements
- Work places (premises or areas);
- Working phases
- Machinery/ Equipment/ Tools

The first task for the one who makes analysis is exactly to define the firm lay-out, the detection of homogeneous risks and the flow of working activity. This development is often different from the administrative one (departments, services, divisions, etc.).
“Self-analysis” (the part of the program for the risks analysis) allows keeping the parallelism between the two ways to divide the firm, by using the administrative variables.

❖ The analysis method

For performing the analysis, the System provides some questionnaires that can be used by the directors of each unity, in order to obtain a collection of information as deep as possible and above all real. The questionnaires questions are numbered as the questions we find in the different visual display units.
The correct method to perform analysis with the aim to be adapted to a safety culture (not a bureaucratic and expensive “document”) is exactly the one to involve the firm functions distributed in the activity, to who give back afterwards the results and from whom to obtain in real time the reporting of problems and changes.

The System's excellence is the ability to monitor all (and not only to find out at a fixed moment what is out of its function); this for two main reasons:

- Every aspect in that moment "seems" to work well but it must be monitored with the time*;* And they can appear to controllers or to workers of a different nature, so we must pay attention that we look through them in all their features;
- The ones who control must be able to have analytical vision of all, in order to be able to expose in fullness their judgments; to be ignorant of some aspects is not a favorable fact. Probably the analysis is been taken at the first time a bit more carefully, but it allows by the time less labor work to monitor conscientiously.

➢ **Work places (premises and areas)**

The program allows a directed analysis from questions and answer lists that are used for what concerns the reality we are analyzing.

The System can, after a just three years experimentation in every field, be adopted to the most different situations and permits the adding of pieces of useful knowledge.

Work premises are analyzed in a wide way and particularly there are references to laws of safety and Fire prevention.

Work places are associated with specific terms in the program like:

- Fire prevention management;
- Planned control of furniture;
- Management of buildings maintenance;
- Management of the specific authorizations concerning the place;
- Files of maps, drawings, specific photos.

➢ **Working stages**

In working stages we can analyze all the risks for the workers considered by 391/CE, subdivided for items. Risks analysis is surely referred to laws of safety that considers to be a risk every feature, may affect workers' health.

The risks can be esteemed by texts (sentences of CE file or created by the compiler) that define the argument followed for valuation. Automatic or arithmetic formulas are absolutely excluded, though they seem to be objective, for they are actually arbitrary and problematical. Working stages are connected with:

- Files for recording of instrumental observation data;
- Files to read again the analysis data according to the subjective item of the four groups of risk factors historically used by workers;

- Files for an ergonomics analysis of work placements, from the point of view of position, of labor, of backbone strain, of stress;
- Management of specific authorizations connected with the activity;
- Files of maps, drawings, photos, specific films.

➢ **Machinery / Facilities / Equipments / Means**

Machinery is analyzed with a problem. The System however allows us to produce the whole safety file of the machinery, particularly:

- By introducing the description of working process that must be known by worker;
- By putting direct questions to a database about safety;
- By consulting wide files of laws about safety;
- By adding to analysis the indication of requirements of all machinery Instruction taken into account.

The safety file is then connected with:

- Files for the management of components to keep under control;
- Files and proceedings for the management of maintenances, of controls and of observation of indicators measures;
- The management of particular authorizations;
- The possibility to fill the technical file for CE marking;
- Files of drawings, photos, specific films.

❖ Materials cycle

➢ **Energy**

The control over energy use (electric energy, gas, water) allows acting by technologic changes, of proceeding and of organization, in order to reduce them or to recover them.

It is one of the main points in 1836/CE Rule linked about environment audit that connects in a visible way the aim to limit the use of environment resources to the aim to reduce costs. Energetic management is a part of 1999 bringing up to date.

➢ **Files of matters safety**

The System automatically works out the data put in safety files to 16 points of the matters employed, that have to be at disposal for several subjects.

➢ **Compatibility between matters (stocking and processing)**

The System allows checking possible additive risks that can derive from the contact between different matters.

➢ **Supplies**

The System allows to fill in a safety file for no chemical matters, half worked ones, productions and consumer products that are used in the firm (D. P. I. included).

➢ **Residues**

The System allows to point out the residues nature for each proceeding and to act on them an elaborated management, by compiling their characteristics and producing an advice file for management.

➢ **Products**

The System consents to fill in safety file of the products provided by the firm; every product deserves this consideration, an immaterial product too (how much security or insecurity has produced, for instance, an immaterial activity like the consultation or the training for Dir. 391/CE).

➢ **Purchases**

A purchase proceeding allows to verify if what we want to buy has been analyzed from the S. P. P. Director and if it has been given his approval.

➢ **Storeroom**

Storeroom management permits to note on the file of each worker the materials he has received (for instance D. P. I.).

❖ Outside companies and moving enterprises

It is possible to fill in, by using the analysis data included in the program, the document of risk analysis to control, with outside companies, and to produce the united check file.

It is also possible, by using both analysis data of the firm and specific files, to insert the stages of a moving enterprise (either a firm or a building site), to affect a safety planning, to produce the possible notification and the check files that the coordinator for the work execution have to record.

❖ Workers' Information

➢ **Register file**

The worker register file, besides all the requested data, is suitable for:

- Recording working history;
- producing the file of individual risk;
- producing the individual course of health management;

- recording the eventual accidents;
- calculating the individual lep.d (Daily personal noise exposure)and lep.w (Weekly personal noise exposure) expected about noise;
- verifying the worker training;
- verifying the D. P. I. received.

➢ **Accidents**

It is possible to fill in the accidents report according to the INAIL item, to produce the accidents register according to the item in force, to pull out reasoned statistics on the base of the variables and the working situation.

➢ **Judgment files about workers**

The Program offers a paper file and an electronic file for subjective description of risks for the workers' groups; the item used is the one of four factors groups.

The function allows providing important knowledge that often remains not expressed, to the qualified doctor and to the S. P. P. Director, but especially offers an instrument and a work method to the workers representative for safety, who generally has nowadays an actual rule nearly formal.

➢ **Reports**

The System allows the formal recording of reports on meetings, expected by 391/EEC and, if wanted, secretary compilation in real time, giving to this important fulfillment of 391/EEC an actual certification.

❖ Work organization

➢ **Duties**

Duties require at first a specific description of work organization. The System takes into account the variation it can have in the time; duties in their stages of working put in evidence their beginning description and the actual changed one.

Same duties from the risk point of view do not exist (the same duty carried on in different environments involves different risk values), and the System allows a reading of the duty in the different realities where it is carried on.

It is possible for each duty:

- To fill in the required training planning;
- To fill in the health file that will be applied for workers who carry on this task;
- To indicate requested D. P. I;
- To create and bring up to date Lep.d and Lep.w required by specific laws.

Lep.w expected about noise. Indeed a worker can carry on at the same time several duties and this will be contained in his working history. The System allows finally verifying if the worker has received the training required for the duty.

➢**Duties risks**

Each duty can be read in the separate context of risk and can be verified with the party concerned.

➢**Training**

It is possible to define the training planning for duty, to manage training forms planning, to record workers' participations to courses or to training forms.

➢**Responsibilities diagram**

The System produces and brings up to date in real time the diagram of responsibilities at different levels to refer to for safety management.

❖ Outside environment risks

➢**Waste**

The Program, on the base of the recent European legislation, allows: to fix waste for each settling;

- To define and bring up to date its characteristics;
- To bring it into line by percentage with the working stages produce it;
- To fill in quickly registers with present and very complete data;
- To produce the form for transports;
- To keep under control stocks.

➢**Emissions**

A program function permits to create the file of each single chimney and to manage both the authorization and renewal procedure, recording recurrent analyzes too, and producing, moreover, a register of emissions. (The five following functions are a part of next two years bringing up to date).

➢**Drainages**

The control of water drainages and of pollution risks of water layers.

➢**Environment impact**

The check of compatibility the settlement and its activity have with environment and population, in order to point out eventual corrective interventions.

➢**Participation to territory risks and to emergency**

The risks present in the area that could have negative effects in the case of a calamity, or provoke accidents. Means and competences recourses the area can put at disposal in case of calamity.

➢ **Environment budgets**

Environment objectives have to implicate all firm subjects; each of them, for their own competence, is able to control or to reduce risks gravity.

➢ **Environment balance**

It will be possible, in real time and only when we will have a full utilization of the program, to extract the data that a function will elaborate in the terms of environment budget and control of the attainment of the viewed compatibility objectives.

❖ Health management

The System allows the qualified doctor to see in real time all the risk data and risk files of workers. A qualified doctor has a wide responsibility on the base of 391/CE, that is not limited to the execution of periodical controls and to definition of general fitness. The doctor must know specifically risks, must intervene in cases of specific unsuitability and even elaborate “anonymous and collective health data”.

Informative systems in real time, wide documentation the employer must put at disposal, and timely reports to direct the prevention action the firm needs, are required.

The item of biostatistics data register accidents statistics management, ability to link workers’ subjective judgments to objective data, the continual risks check and their chronological arrangement, are characteristics of the program for the ones want to work well and consciously.

Following managements are then simplified:

- Visits of work examinations medicine (that arranges historically data in the time);
- Health file;
- Expiries of clinical analyzes and of vaccinations;
- Management of communications to the firm and to the worker.

Database characteristics allow the doctor to obtain any kind of statistics or of elaboration for risk groups

➢ **Organization**

All interventions that have to been kept under control and that are concerned with executive responsibilities that have to be granted, are recorded in an expiries engine:

- Authorizations;

- Building maintenance;
- Furniture maintenance;
- Machinery maintenance;
- Facilities components to replace;
- Visits of work medicine;
- Clinical analyzes;
- Check up of outside firms and of moving enterprises;
- Emissions management;
- Planning of any other kind of expiry (training meetings and any other action we want to recorder).

Expiries engine allows an expiries search extremely selective, the printing of expiry lists and, above all, the automatic planning of the periodic expiries for all the present year.

➢ **Registers**

All the law registers can be produced automatically by the program:

- The accidents Register;
- The exposed ones to Noise Risk Register;
- The exposed ones to Biological Risks Register;
- The environment Data Register;
- The biostatistics Data Register (anonymous collective data);
- Waste Registers;
- Emissions Registers.

❖ Usefulness

➢ **Questionnaires and proofs**

It is possible to obtain on paper the check lists for risks analysis, for the observation on machinery board of machinery Directive, for the recording on machinery board of maintenance and of measures, for the version of safety and emergency manuals.

➢ **Typologies**

It is possible to create premises, work proceedings and machinery typologies, in order to fill in automatically and at once a not definite number of similar situations, and then to modify the different data only.

It is also possible to modify at once and automatically on lists of files one or more data with typologies. Typologies are used too to compile services and building sites stages.

- **Files**

There are files, partly provided with the System and partly to compile by consumer, from which one can take sentences or texts without writing them anew or only by partially modifying them. For messages: It is possible to send letters to Workers, to Firms and to Suppliers, by compiling them or by taking from file elaborated standard letters; it is possible moreover to keep the files of all letters sent.

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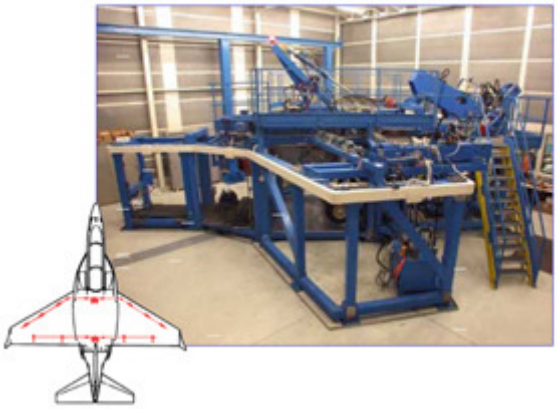
Chapter 4: Implementation of Sistema Ambiente

4.1 Application in an aeronautic company

---- On Chemical Risk Evaluation

4.1.1 Company Introduction

The enterprise is a diversified global provider of highly engineered innovative flight critical products to the aerospace and defense industries and a leader in the aerospace sector for aircraft and satellite components and assemblies. The company is organized with three plants. The staff is highly qualified by having attended specific courses on manufacturing quality and safety that are held with periodical frequency.



Even before the European Law, Enterprise used to make various risk analysis with the trade union representatives, regularly verified during the periodic Safety meetings. With the enforcement of the European Law, relations enhanced and a written global risk analysis was drawn up with the RLS (*Rappresentante dei Lavoratori per la Sicurezza*: workers' health and safety representative), and then assessed by the various managements and by the RLS themselves.

The risk analysis has been handed in to ASL (*Azienda Sanitaria Locale*: Local Sanitary Agency) and to the American Group and it has been accepted with no change. The analysis itself, with the related action plan, has been judged very positively both by Italian and American bodies. It must be considered that not only the Italian regulations, but also the procedures issued by American Group are applicable to Enterprise.

Considering the complexity of the system and the extreme articulation of company issues, it has decided to use a computerized management system and in the year 1997 the “Sistema Ambiente” by Digitalis S.r.l. has been selected. During these years, the system proved to conveniently meet all modifications and upgrades of risk analysis and, at the same time, it allows quick reference, fully compatible with the organization of both the Italian and the American Corporation.

The program is managed by 5 company functions belonging to the Health & Safety and Risk Prevention Service: HR, Fire Prevention, Chemical Processing, Mechanical Machining and Inspection System Supervisors, EH&S Supervisor and H&S Manager; the latter, together with the Chemical Processing Supervisor, is also in charge of the environmental aspects. “Sistema Ambiente” has also promoted the coordination among the various divisions, with the assistance of database sharing.

Since 1997, the use of the computerized system network has gradually been extended also to the other plants.

The Computerized System allows all employees (Supervisors, Purchasing Office, Workers, etc.) to obtain real-time information by Web (the program resides on the company Intranet) and at the same time it acts as a filter to stop material and machine purchases and DPIs not authorized by the H&S Service.

Safety is managed by adopting procedures concerning inspections and audits. The levels of involvement during the periodical *steering committee* meetings are: operator, machine/system, supervisor, technical foremen and/or managers, senior managers and employer. Obviously, nothing is left to chance, because if non-compliances are found during the inspections, they are reported to the H&S supervisor by a dedicated form for corrective actions to be taken according to predefined dates and schedules. The H&S supervisor personally follows up the schedule progress, issues reminders and makes sure that all corrective actions are completed within maximum the second reminder. Therefore, the direct involvement of the Chairman is evident, as he always attends the *steering committee* meetings and is always updated on progress (even through the Web publication of data and records) and therefore he can give real-time directives. In

this context, the usefulness of a conveniently organized real-time computerized system available to all company levels is highlighted.

4.1.2 Implementation of Sistema Ambiente

The program is managed by 5 company functions belonging to the Health & Safety and Risk Prevention Service concerning system safety analysis and management; chemical risk; fire prevention management; environmental management- energy parameters and many other functions. However, the overall applications of the Sistema Ambiente program will not be introduced one by one in detail leading to a massive thesis. Only the chemical risk part will be introduced thoroughly.

A flowchart of how the chemical risks management is done between each relevant department within the company and how Sistema Ambiente is applied to facilitate the management is illustrated in the next page.

The types of chemicals necessary for the production are decided by the head of the production department after careful control of the chemical safety data sheet provided by chemical producers. Prevention and protection, SPP (*Servizio di Prevenzione e Protezione dei rischi*: risks prevention and protection service) also plays a very important role in making choice of the chemicals needed. Even though the final decision is reserved only for the head of the department, but SPP actively involves in the selection process verifying in every detail the composition of each chemicals and evaluate the potential risks if they would be applied in the real production process. Another important work they do is to furnish the desired chemical safety data from the producer to the database of Sistema Ambiente program.

After information collection and complex data processing, the analysis of chemical risks is completed. According to the analysis, the purchasing department can make consultation to make the decision of chemical acquisition always in contact with head of production department with the acceptance and final authorization of whom can the purchase process be concluded.

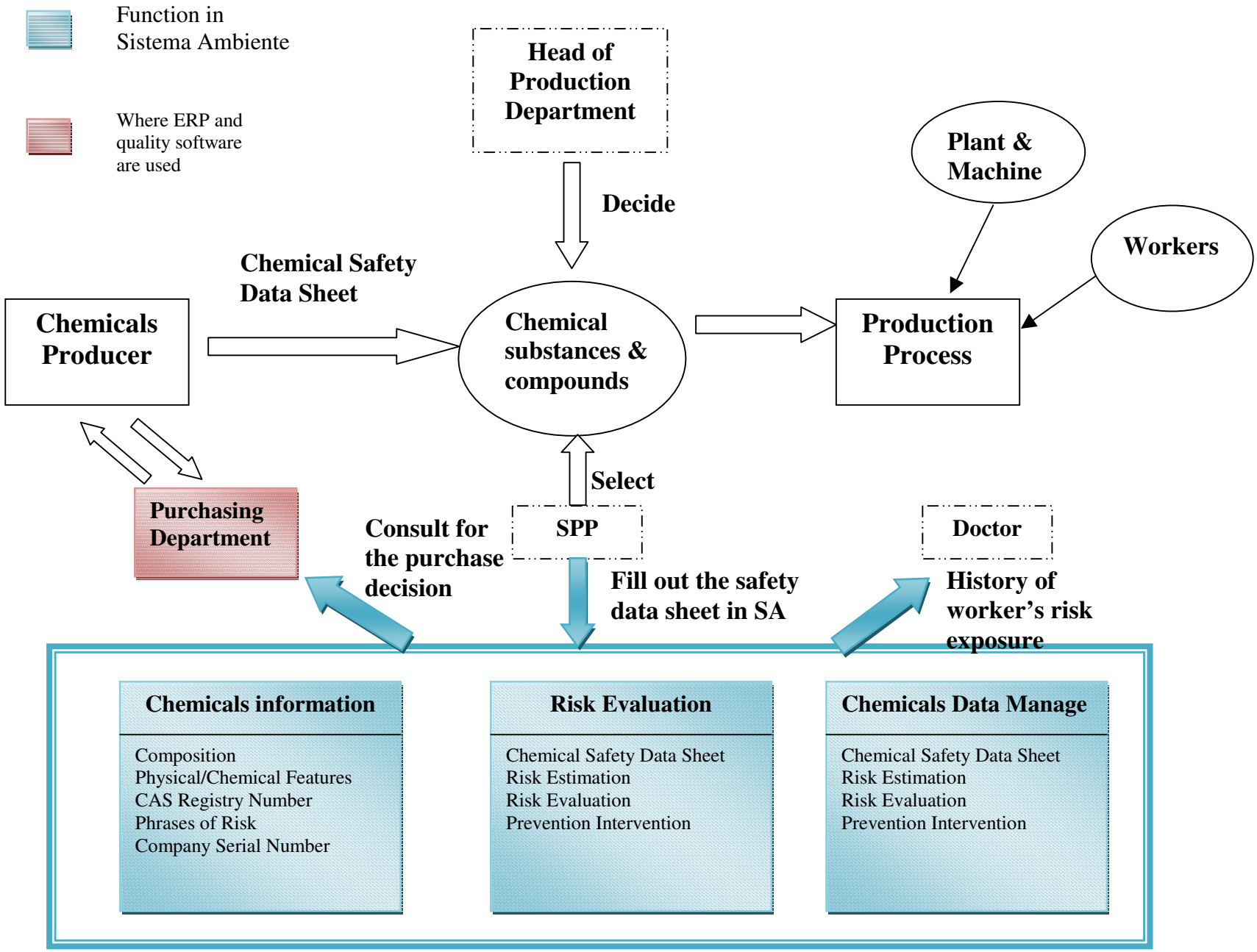


Figure 4.1 Implementation of Sistema Ambiente

1) Information about chemicals

The chemical risk can be accessed directly from the Safety Menu and from the Environment Management menu. The data sheet allows the registration of a chemical product, its identification data, its composition and particular information about the symbol of danger.

The main Chemical Risk management item is the entry of Chemicals Safety data sheet, which are strictly required to Suppliers according to regulations. The data sheet is structured in 16 points as expected by CE. The information used in the system are the chemical and commercial denomination, CAS (Chemical Abstracts Service registry number to every chemical described in the open scientific literature), Einecs (European Inventory of Existing Commercial chemical Substances) and components.

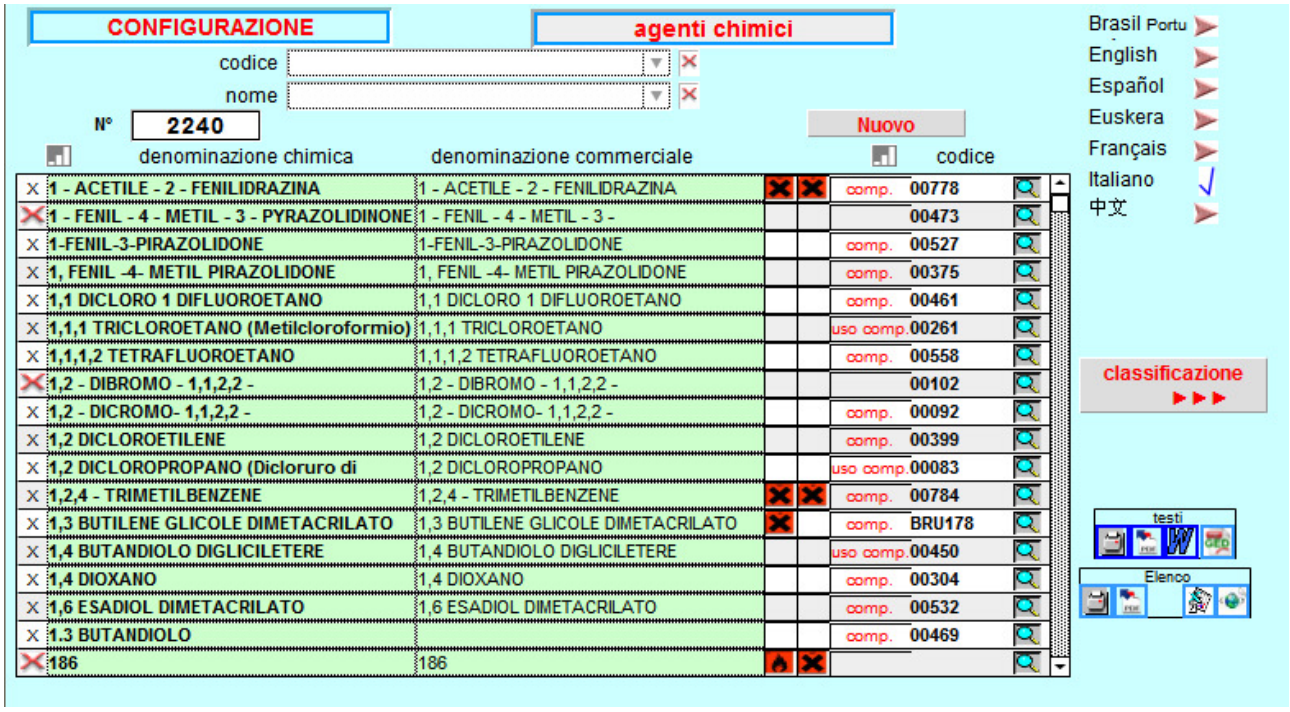


Figure 4.2: Main page of chemicals

The chemicals are defined as substances if it is a basic chemical element or compound if it is composed of more than one substance. Shown in Figure 4.2, a compound named Loctite 640, the same in chemical and commercial denomination, is composed of 6 substances and is Xi irritant. The percentage, CAS number and Einecs(will be given only if the substance is commercialized) of each substance are given. The detailed substance information like the chemical and physical information, TLV

(threshold limit value) or the Maximum Acceptable Concentration can be found by clicking the magnifier symbol.

Focusing only on the chemical safety issue as well as for the simplicity reason, in this thesis, other subjects will not be introduced as the transportation, exposition, disposal, and emission of the substances even if their data are present in the database of this aeronautical product company. All the other information can be selectively provided by the company according to their analytic requirement.

Figure 4.3: Composition and characteristics Page of Chemicals

This chemical safety data sheet has to be submitted and updated with the time from the suppliers or producers. In case that the information from the supplier is not complete, they should be requested formally.

2) Evaluation of chemical risks

Figure 4.4 gives us a general view of the chemical risk evaluation in a aeronautic component production process. In this specific process, 51 kinds of chemical substances and compounds are used.

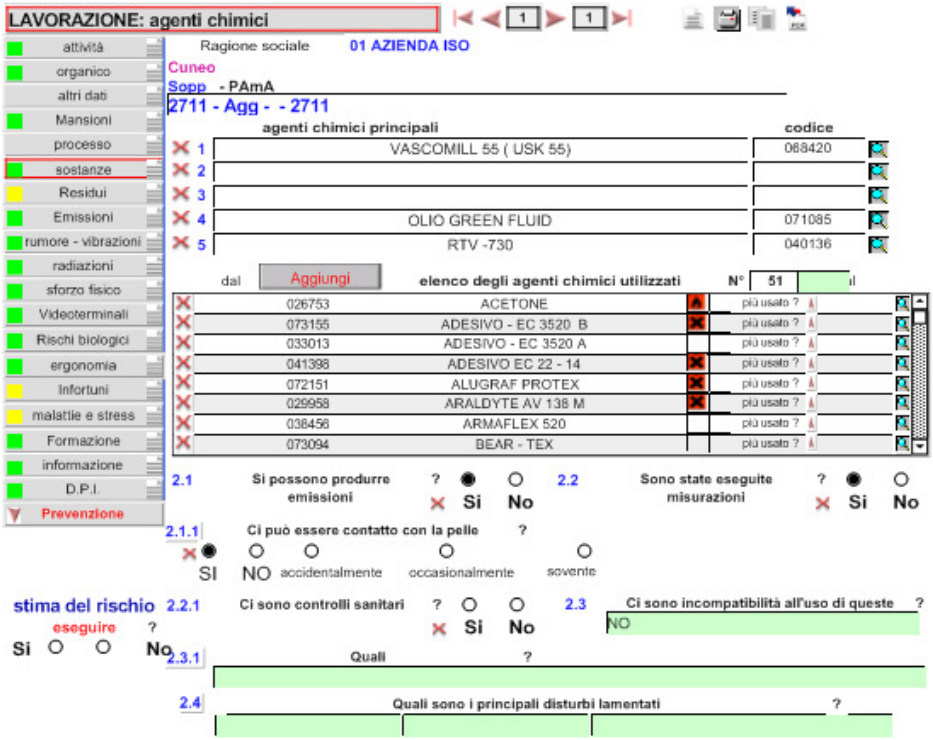


Figure 4.4: Chemical risk data sheet in a production process

Instead of making a risk matrix by assigning numbers from 1 to 10 for the level of severity to risks by imagination, which varies from one individual to another, as an usual method adopted in any other companies, Sistema Ambiente has a logical and analytical risk estimation model to evaluate the potential level of risks thus propose possible effective measures if in need. The main idea is to individuate the total risk to the process into each source which would possibly generate risks. It is a real and practical method rather than the assigning some numbers to risks without any scientific reasoning behind.

The risk estimation is based on a model applied by Piemonte Region, in collaboration with Turin University, Polytechnic University of Turin and Arpa Piemonte. This model is coherent with the European Community documents.

A) Severity:
Is calculated based on the risk phrased in the used substances:
Class 1 - index 1- Minimal – reversible effect: R22, R36, R37, R38, R66;
Class 2 - index 2- Minor – potentially irreversible effect: R20, R21, R25, R34, R35, R41, R65;

Class 3 - index 3- Moderate – irreversible effect: R23, R24, R28, R43, R67;
Class 4 - index 4- Major– severe irreversible effect: R26, R27, R42, R62, R63, R64, R68;
Class 5 - index 5- Severe– potential lethal effect: R33, R39, R40, R47, R48, R60, R61;

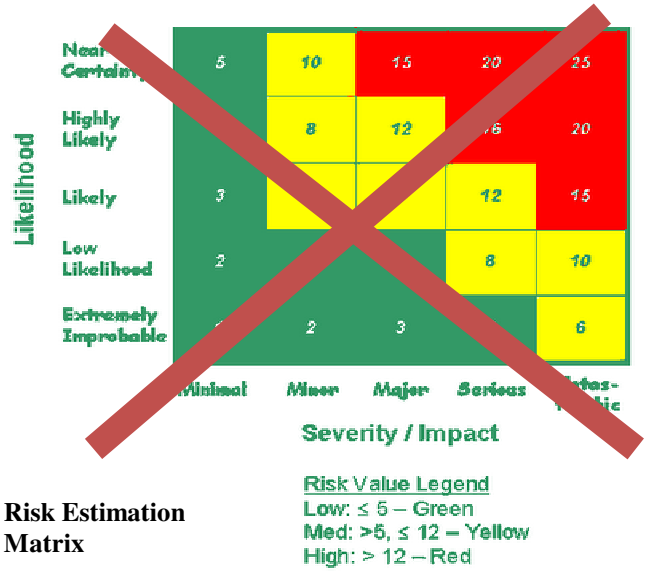
B) Duration:
Index 0,5 - rarely - < 1% of the working hour
Index 1 - occasionally- < 10 %% of the working hour
Index 2 - frequently - 11-25 %% of the working hour
Index 3 - usually - 26-50 % of the working hour
Index 4 - always - 51-100 % of the working hour

C) Exposure level:
Is calculated considering:
C1) QUANTITY of the material used for the worker in a week
Index 0,5 - ≤ 0,1 Kg. or liter
Index 1 - > 0,1 ≤ 1 Kg. or liter
Index 2 - > 1 ≤ 10 Kg. or liter
Index 3 - > 10 ≤ 100 Kg. or liter
Index 4 - > 100 ≤ 1000 Kg. or liter
Index 5 - > 1000 Kg. or liter
C2) PHYSICAL STATE
Index 0 - liquid with boiling temperature > 150° C
Index 0,5 - liquid with boiling temperature 50-150° C
Index 1 - liquid with boiling temperature < 50° C
Index 0 - Solid non-breathable (granules or flakes)
Index 1 – Solid breathable
C3) PLANT TYPE
Index -3 - closed-loop and sealed
Index -2 - Closed cycle but with manual loading and unloading
Index -2 - closed-loop but with regular and limited manual intervention
Index -1 - Closed-loop but with manual loading and unloading and with periodical and limited manual intervention
Index -1 - process operators with effectively remote-control
Index 0 – manual
Index +1 - manual in not adequate operating conditions
C4) PROCESS TYPE
Index 0,5 - in pressure
Index 0,5 - through transfer of thermal energy
Index 0,5 - through transfer of mechanical energy
C5) TECHNICAL PROTECTIVE DEVICES
Index -1 – exists planned maintenance program
Index - 0,5 - structurally suitable, but no planned maintenance program
C6) POSSIBILITY OF SKIN CONTACT
Index 1 – YES
C(C1+C2+C3+C4+C5+C6) THE LEVEL OF EXPOSURE FACTORS RESULTING FROM the sum of INDICATED FACTORS is evaluated like this:
EVENT EXPOSURE OPERATING CONDITIONS
Sum = 0.5 - negligible - negligible exposure / operating conditions highly protective
Sum = 1 - slight - slight exposure / operating conditions highly protective
Sum = 2 - moderate - moderate exposure / protection conditions

Sum = 3 - medium - average exposure / operating conditions little protective
Sum = 4 - high - high exposure / operating conditions very little protection
Sum = 5 - very high - very high exposure / operating conditions were not protective

THE RISK RANGE IS PRESUMED BY THE PRODUCT BETWEEN INDICES OF SEVERITY x DURATION x EXPOSURE LEVEL (A x B x C):
result = 1-10: Low - unnecessary protection or prevention
result = 11-25: moderate - adequate prevention and protection measures in the medium term
result = 26-50: medium - protection and prevention appropriate in the short term / necessary in the medium term
result = 51-75: high - protection and prevention are essential in the short term
result = 76-100: very high - urgent protection and prevention

The process of risks estimation in Figure 4.5 is exactly as described in the model taking into consideration 3 important aspects: impact of the chemicals on human body; working hour; workers' exposure level to the chemicals. The characteristics of the process and chemical substances, compounds used are transformed to the detailed data into the program and after processing all the data, the program will automatically gives the estimated risk level as low, moderate, medium, high, very high.



Risk Estimation Matrix

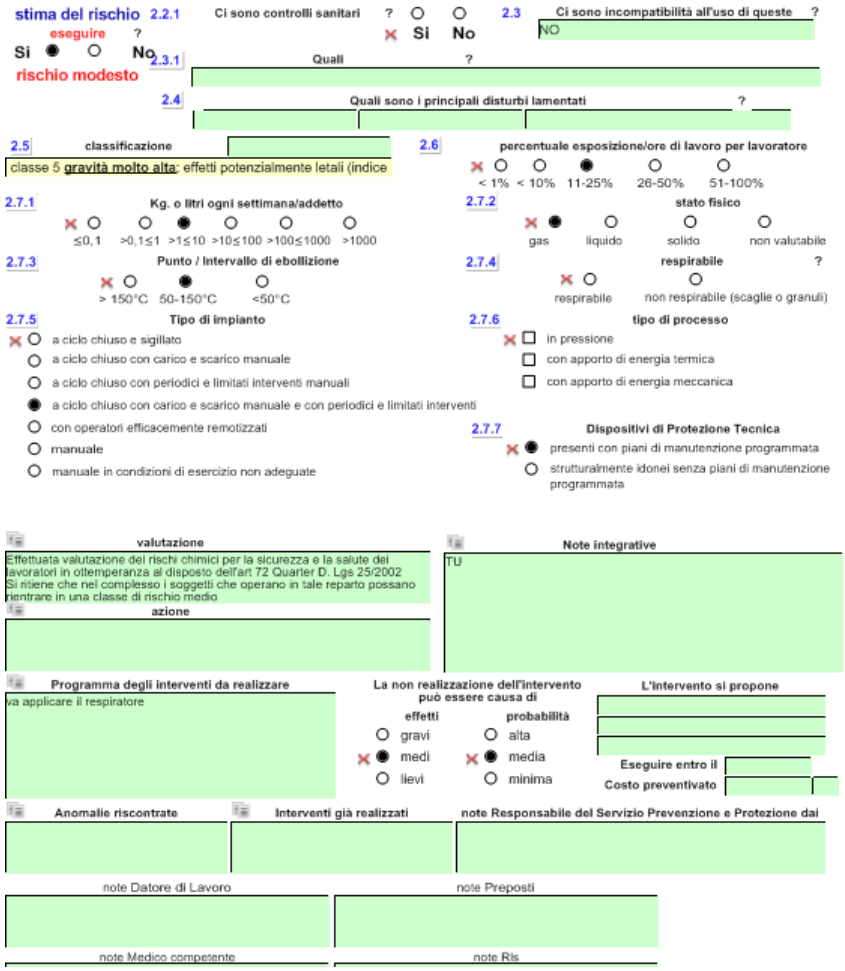


Figure 4.5: Chemical risk estimation in SA

In the bottom of the Figure 4.5 is the evaluation and proposed measures for risk prevention. It is highly recommended by Sistema Abiente to give an overall evaluation by the managers, doctors, workers, anyone who's involved in the chemical risks, not only by manager himself. At any time, the Doctor and H&S supervisor can have a synthetic insight on risks related to each processing material. The reason is that each staff has its own knowledge field according to his function inside the enterprise, the manager can only give the evaluation on his point of view based on his knowledge background. The limited view cannot brings out a good evaluation.

On the basis of risk level estimated, certain required prevention intervention can be planned as suggested in the model or according to the real need in the company.

3) Data management of chemicals

Aiming at reducing the useless effort on searching for one specific element among enormous and massive data as the chemicals information accumulation each day, the chemicals data management function has been developed to solve this problem.

The classification function helps to check the used or required substances. Knowing the physical/chemical characteristics of the chemicals present in a certain production process, the corresponding all possible chemical substances and compounds can be easily found.

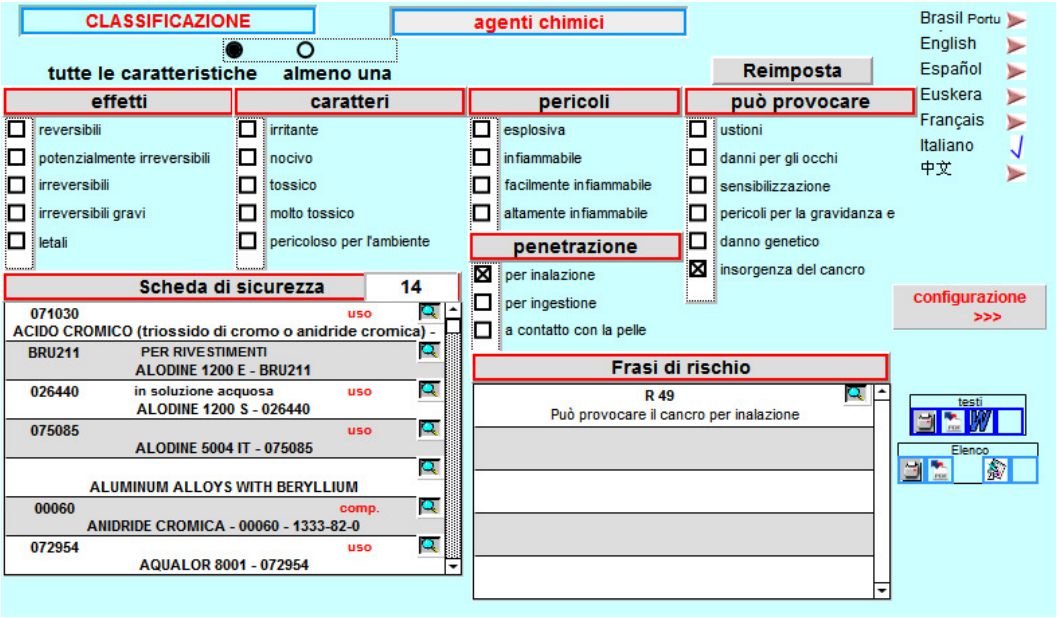


Figure 4.6: Chemicals classification

The phrases of risk also can be used as a searching key word. The chemicals have the same phrase of risk are grouped and shown, more over which production process they belong to is also given for a searching convenience. The searching also can be performed by entering CAS registry number, company serial number, Einecs number, denomination, usage, components, risk phrases, suggestion phrases (S phrase) as in the Figure 7 below has demonstrated.

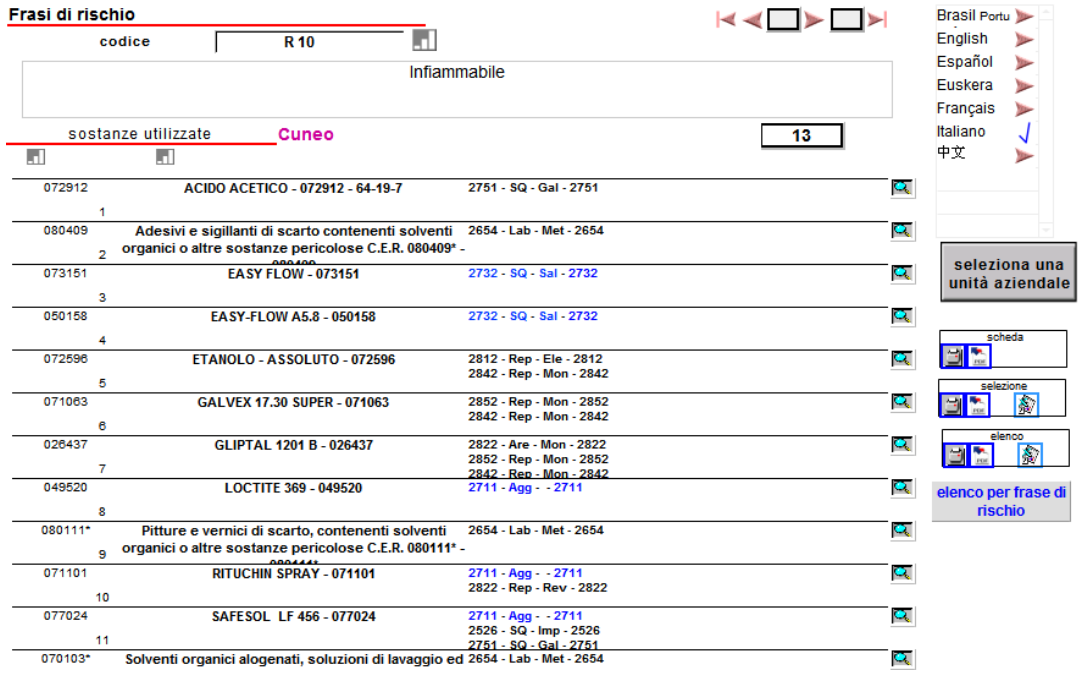


Figure 4.7: Chemicals classified by phrases of risk

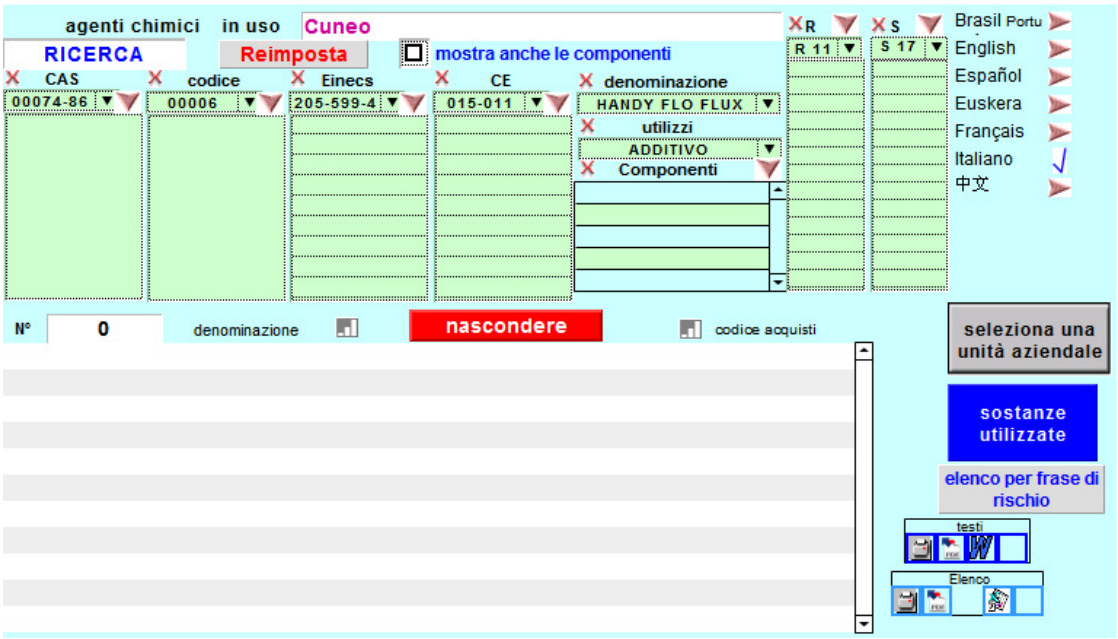


Figure 4.8: Chemicals classified by other way

In the situation that an accident has happened in a process, from the impact it brings, a certain range of chemicals can be found; to substitute the chemicals in use as its potential risk and further damage to the health of the worker is revealed or in the situation that the quality of one kind of chemical substance is not acceptable any more… The chemical data management function is a rapid solution to know the 'where,

how and why' of the chemicals in the production process compared to the other safety management program managed in excel.

4) Interface with ERP and quality softwares

The Safety data sheet can be displayed in real time on the Web from each department and are binding everybody, including Purchasing Department. There is another interface in the SA accessible for other departments in the company who need the information and data as input for their function. The interface is as Figure 4.9. It does not make a big sense for the other departments to go into the very detail of how the safety data sheet is filled in, therefore through this search, the overall information concluded after careful analysis is shown as a report form. Still, for the transparency for the whole company, the important data are still displayed to be under control of many.

Figure 4.9: Key work search accessible to every department

For example, the purchasing department receives a purchase order from the production department of a chemical compound Locitite, the research information can help them to control this compound is being used in the indicated department or not? The purchasing reason is for the exhaustion of this compound or the process will introduce this new chemical in the production? All the final purchase has to be accepted and approved by the head of the production department.

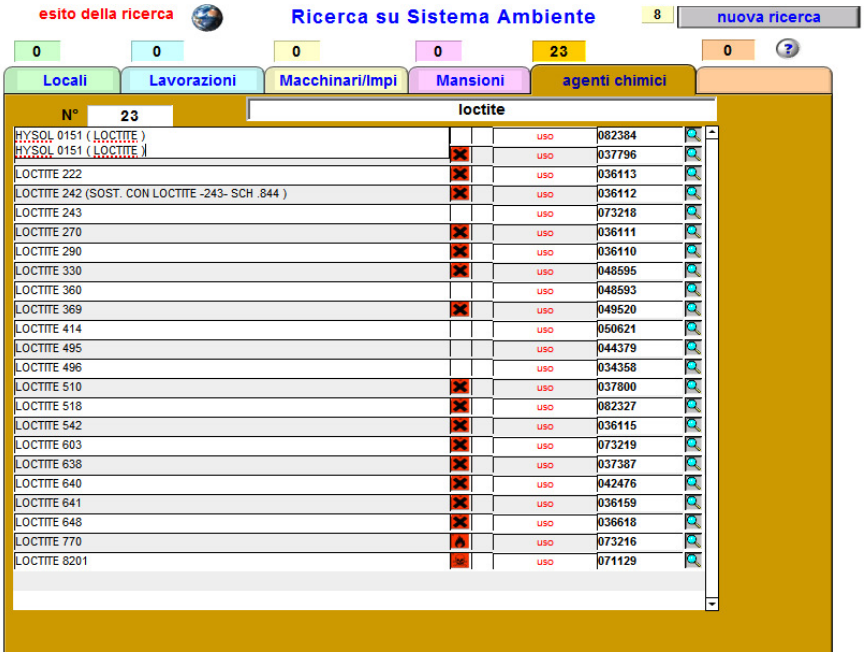


Figure 4.10: Relevant information for the search of a chemical

If a planner in the product development office wants to understand the risk about a particular process, by entering the name of the process, all the information about workers, machines, chemicals, organization chart and fire prevention is shown. (see Figure 4.11).

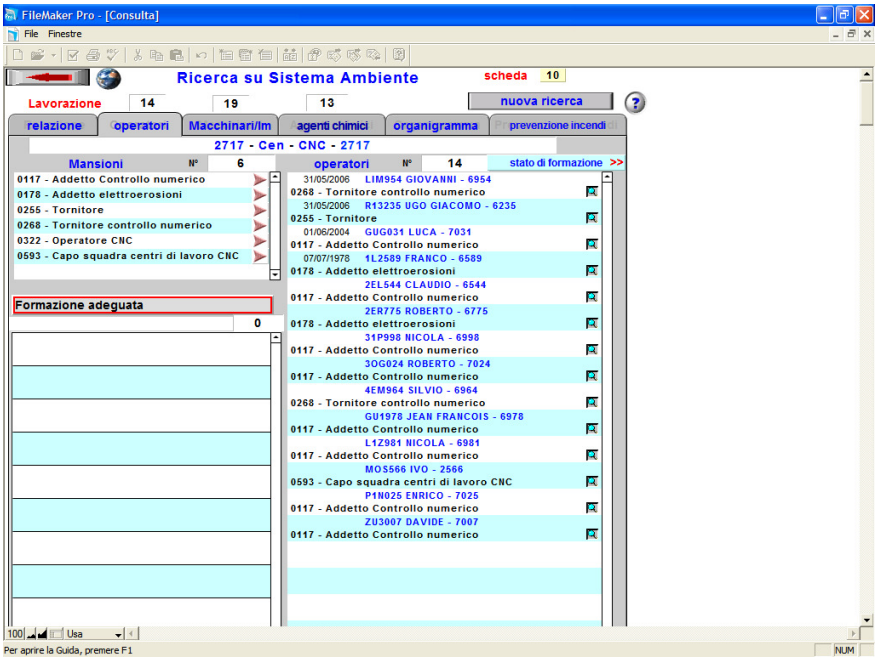
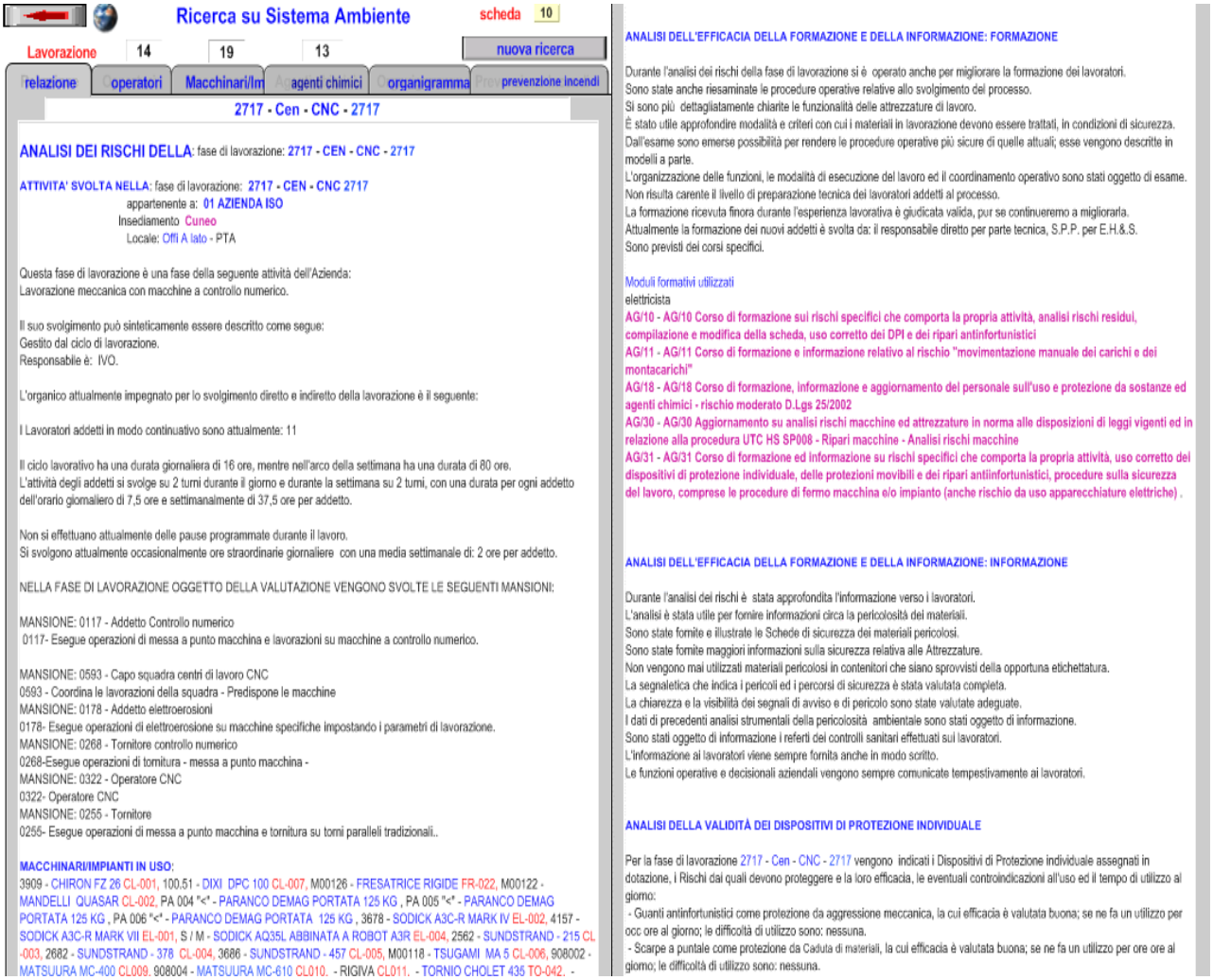


Figure 4.11: Relevant information for the search of a certain process



Ricerca su Sistema Ambiente scheda 10

Lavorazione 14 19 13 nuova ricerca

relazione operatori Macchinari/Im agenti chimici organigramma prevenzione incendi

2717 - Cen - CNC - 2717

ANALISI DEI RISCHI DELLA: fase di lavorazione: 2717 - CEN - CNC - 2717

ATTIVITA' SVOLTA NELLA: fase di lavorazione: 2717 - CEN - CNC 2717
appartenente a: 01 AZIENDA ISO
Insediamento Cuneo
Locale: Offi A lato - PTA

Questa fase di lavorazione è una fase della seguente attività dell'Azienda:
Lavorazione meccanica con macchine a controllo numerico.

Il suo svolgimento può sinteticamente essere descritto come segue:
Gestito dal ciclo di lavorazione.
Responsabile è: IVO.

L'organico attualmente impegnato per lo svolgimento diretto e indiretto della lavorazione è il seguente:

I Lavoratori addetti in modo continuativo sono attualmente: 11

Il ciclo lavorativo ha una durata giornaliera di 16 ore, mentre nell'arco della settimana ha una durata di 80 ore.
L'attività degli addetti si svolge su 2 turni durante il giorno e durante la settimana su 2 turni, con una durata per ogni addetto dell'orario giornaliero di 7,5 ore e settimanalmente di 37,5 ore per addetto.

Non si effettuano attualmente delle pause programmate durante il lavoro.
Si svolgono attualmente occasionalmente ore straordinarie giornaliere con una media settimanale di: 2 ore per addetto.

NELLA FASE DI LAVORAZIONE OGGETTO DELLA VALUTAZIONE VENGONO SVOLTE LE SEGUENTI MANSIONI:

MANSIONE: 0117 - Addetto Controllo numerico
0117- Esegue operazioni di messa a punto macchina e lavorazioni su macchine a controllo numerico.

MANSIONE: 0593 - Capo squadra centri di lavoro CNC
0593 - Coordina le lavorazioni della squadra - Predispone le macchine
MANSIONE: 0178 - Addetto elettroerosioni
0178- Esegue operazioni di elettroerosione su macchine specifiche impostando i parametri di lavorazione.
MANSIONE: 0268 - Tornitore controllo numerico
0268-Esegue operazioni di tornitura - messa a punto macchina -
MANSIONE: 0322 - Operatore CNC
0322- Operatore CNC
MANSIONE: 0255 - Tornitore
0255- Esegue operazioni di messa a punto macchina e tornitura su torni paralleli tradizionali..

MACCHINARI/IMPIANTI IN USO:
3909 - CHIRON FZ 26 CL-001, 100.51 - DIXI DPC 100 CL-007, M00126 - FRESATRICE RIGIDE FR-022, M00122 - MANDELLI QUASAR CL-002, PA 004 "<" - PARANCO DEMAG PORTATA 125 KG , PA 005 "<" - PARANCO DEMAG PORTATA 125 KG , PA 006 "<" - PARANCO DEMAG PORTATA 125 KG , 3678 - SODICK A3C-R MARK IV EL-002, 4157 - SODICK A3C-R MARK VII EL-001, S / M - SODICK AQ35L ABBINATA A ROBOT A3R EL-004, 2562 - SUNDSTRAND - 215 CL -003, 2682 - SUNDSTRAND - 378 CL-004, 3686 - SUNDSTRAND - 457 CL-005, M00118 - TSUGAMI MA 5 CL-006, 908002 - MATSUURA MC-400 CL009. 908004 - MATSUURA MC-610 CL010. - RIGIVA CL011. - TORNIO CHOLET 435 TO-042. -

ANALISI DELL'EFFICACIA DELLA FORMAZIONE E DELLA INFORMAZIONE: FORMAZIONE

Durante l'analisi dei rischi della fase di lavorazione si è operato anche per migliorare la formazione dei lavoratori.
Sono state anche riesaminate le procedure operative relative allo svolgimento del processo.
Si sono più dettagliatamente chiarite le funzionalità delle attrezzature di lavoro.
È stato utile approfondire modalità e criteri con cui i materiali in lavorazione devono essere trattati, in condizioni di sicurezza.
Dall'esame sono emerse possibilità per rendere le procedure operative più sicure di quelle attuali; esse vengono descritte in modelli a parte.
L'organizzazione delle funzioni, le modalità di esecuzione del lavoro ed il coordinamento operativo sono stati oggetto di esame.
Non risulta carente il livello di preparazione tecnica dei lavoratori addetti al processo.
La formazione ricevuta finora durante l'esperienza lavorativa è giudicata valida, pur se continueremo a migliorarla.
Attualmente la formazione dei nuovi addetti è svolta da: il responsabile diretto per parte tecnica, S.P.P. per E.H.&.S.
Sono previsti dei corsi specifici.

Moduli formativi utilizzati
elettricista
AG/10 - AG/10 Corso di formazione sui rischi specifici che comporta la propria attività, analisi rischi residui, compilazione e modifica della scheda, uso corretto dei DPI e dei ripari antinfortunistici
AG/11 - AG/11 Corso di formazione e informazione relativo al rischio "movimentazione manuale dei carichi e dei montacarichi"
AG/18 - AG/18 Corso di formazione, informazione e aggiornamento del personale sull'uso e protezione da sostanze ed agenti chimici - rischio moderato D.Lgs 25/2002
AG/30 - AG/30 Aggiornamento su analisi rischi macchine ed attrezzature in norma alle disposizioni di leggi vigenti ed in relazione alla procedura UTC HS SP008 - Ripari macchine - Analisi rischi macchine
AG/31 - AG/31 Corso di formazione ed informazione su rischi specifici che comporta la propria attività, uso corretto dei dispositivi di protezione individuale, delle protezioni movibili e dei ripari antiinfortunistici, procedure sulla sicurezza del lavoro, comprese le procedure di fermo macchina e/o impianto (anche rischio da uso apparecchiature elettriche) .

ANALISI DELL'EFFICACIA DELLA FORMAZIONE E DELLA INFORMAZIONE: INFORMAZIONE

Durante l'analisi dei rischi è stata approfondita l'informazione verso i lavoratori.
L'analisi è stata utile per fornire informazioni circa la pericolosità dei materiali.
Sono state fornite e illustrate le Schede di sicurezza dei materiali pericolosi.
Sono state fornite maggiori informazioni sulla sicurezza relativa alle Attrezzature.
Non vengono mai utilizzati materiali pericolosi in contenitori che siano sprovvisti della opportuna etichettatura.
La segnaletica che indica i pericoli ed i percorsi di sicurezza è stata valutata completa.
La chiarezza e la visibilità dei segnali di avviso e di pericolo sono state valutate adeguate.
I dati di precedenti analisi strumentali della pericolosità ambientale sono stati oggetto di informazione.
Sono stati oggetto di informazione i referti dei controlli sanitari effettuati sui lavoratori.
L'informazione ai lavoratori viene sempre fornita anche in modo scritto.
Le funzioni operative e decisionali aziendali vengono sempre comunicate tempestivamente ai lavoratori.

ANALISI DELLA VALIDITÀ DEI DISPOSITIVI DI PROTEZIONE INDIVIDUALE

Per la fase di lavorazione 2717 - Cen - CNC - 2717 vengono indicati i Dispositivi di Protezione individuale assegnati in dotazione, i Rischi dai quali devono proteggere e la loro efficacia, le eventuali controindicazioni all'uso ed il tempo di utilizzo al giorno:
- Guanti antinfortunistici come protezione da aggressione meccanica, la cui efficacia è valutata buona; se ne fa un utilizzo per occ ore al giorno; le difficoltà di utilizzo sono: nessuna.
- Scarpe a puntale come protezione da Caduta di materiali, la cui efficacia è valutata buona; se ne fa un utilizzo per ore ore al giorno; le difficoltà di utilizzo sono: nessuna.

Figure 4.12: Summary report of overall risk analysis of this certain process (1)

Figure 11 and 12 is a very useful summary report of the process concerning its overall risk analysis, final conclusion of evaluation and prevention intervention proposed. If a safety problem comes out in the production, there is no need to run here and there to search for the RSPP (Manager of protection and prevention) or doctors for the problem solving. Even a worker can know the risk in his work, in his process, even in the whole plant thanks to the availability of the risk information as a consequence of the transparency of the program.

PIANO DI AZIONE PER QUESTA FASE DI LAVORAZIONE
intervento da fare

ANALISI DEI RISCHI RELATIVA A CARATTERISTICHE DEL PROCESSO
fase di lavorazione **2717 - Cen - CNC 2717**

Il processo di lavorazione è di tipo meccanico meccanico.
Lo svolgimento delle diverse fasi di processo avvengono secondo la seguente descrizione:
Lavorazione meccanica con macchine a controllo numerico

Sono state esaminate le possibili cause di pericolo verificando eventuali incidenti occorsi negli anni scorsi e si è verificato che:
Non si è mai verificata alcuna fuoruscita di gas.

Non si è mai verificato alcun incendio.

Non si è mai verificata alcuna esplosione.

Si è già verificata fuoruscita o spandimento di liquidi più di una volta a causa di rottura tubazione - Abbiamo provveduto tempestivamente ad eliminare le cause di possibili fuoruscite e spandimenti di liquidi che si sono verificate e provvediamo normalmente a compilare una relazione scritta su tali episodi..

Non si è verificato mai alcun tipo di crollo.

Non si è mai verificato alcun tipo di caduta di materiali.

CONCLUSIONI DELLA VALUTAZIONE:
I rischi sono sotto controllo ad un livello accettabile, conformemente alle norme della Comunità ed a quelle nazionali.

ANALISI DEI RISCHI RELATIVA A AGENTI CHIMICI

Nella fase di lavorazione 2717 - Cen - CNC 2717 viene utilizzata la sostanza denominata: BLASOCUT 4000 con numero identificativo: 048669.
Nella fase di lavorazione 2717 - Cen - CNC 2717 viene utilizzata la sostanza denominata: EDM FLUID 108 con numero identificativo: 073452
Nella fase di lavorazione 2717 - Cen - CNC 2717 viene utilizzata la sostanza denominata: VACTRA N. 4 con numero identificativo: 050509
Nella fase di lavorazione 2717 - Cen - CNC 2717 viene utilizzata la sostanza denominata: VAQUOLINE 1409 con numero identificativo: 050504
Nella fase di lavorazione 2717 - Cen - CNC 2717 viene utilizzata la sostanza denominata: VELOCITE 3 OLIO con numero identificativo: 050502
Vengono utilizzate complessivamente 13 sostanze: BLASOCUT 4000, BLASOCUT VASCO USK 10, VASCOMILL 55 (USK 55), CERTIBLOT, EDM FLUID 108, MOBIL DTE 24, MOBIL DTE 25, MOBIL DTE 26, MOBIL GEAR 629, VACTRA N. 4, VAQUOLINE 1409, VELOCITE 3 OLIO, Spolvero (miscela acquosa di tensioattivi e glicoli eteri).
FRASI DI RISCHIO: R 22, R 36, R 38, R 65.
Esistono occasionalmente rischi di contatto degli agenti chimici con la pelle degli addetti.
Esistono rischi di emissione nell'aria provocate dagli agenti chimici.
Il motivo di incompatibilità nell'uso degli agenti chimici è:
no.

Figure 4.13: Summary report of overall risk analysis of this certain process (2)

4.2 Application in an aluminum recovery company
---- On waste management

4.2.1 Company Introduction

Due to the ever-increasing demand of metals and due to the ever decreasing supply, scrap metal recycling has become necessary. Recycle scrap metal constitutes about 8% of the total materials recycled. Italian industry of secondary aluminum is very important in the industrial economy. In Europe it is second only to Germany as far as production tonnage is concerned. This aluminum recovery company can boast a leading position in refining aluminum in Italy.

Built in 1975, this company is a factory in refining aluminum providing a wide range of secondary aluminum alloys for foundries. It produces aluminum alloys from secondary smelting which means that, unlike producers of primary aluminum alloys who use ore as raw material, they refine aluminum scraps through a smelting process. It is now possible to transform scraps of every kind and shape, “polluted” with iron, other metals, plastics and oils; scraps coming from industrial processing waste, collection of old material, and aluminum skimming from other producers of this sector thanks to our recent investments in terms of new plants. Residues of the processing cycle can be completely recovered thanks to the constant updating of the production techniques, to their long experience, acquired through years, and to the particular care put into laboratory researches.

Scraps are processed through the modern plants, till they reach the correct dimensions, shape and purity degree, that allow them to be used in smelting process. The most important aspect of the whole process is to identify and make the most of every incoming lot of material. In this way it can reach a high quality level, in respect of the strictest standards.

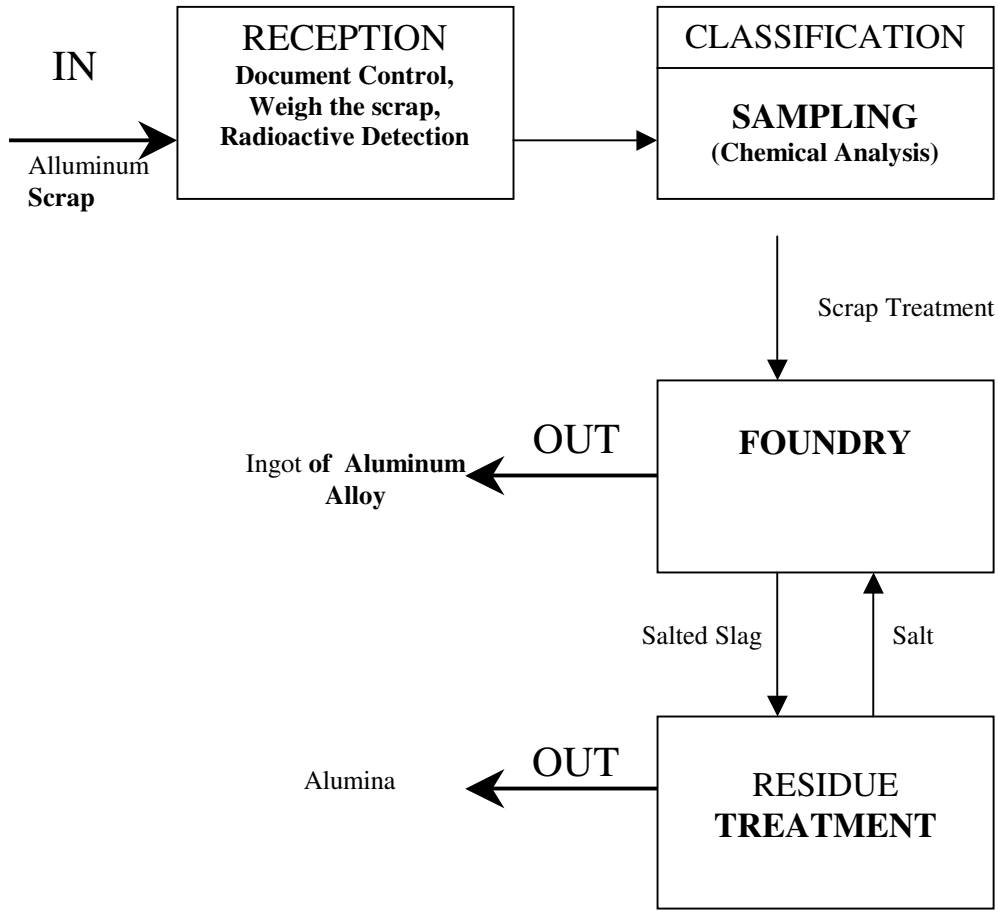
Besides this, the company is always ready to examine any chemical specification proposed by the Client, and not included in our range of production, as well as to study and realize alloys for specific purposes.

The production cycle develops through precise processes defined by quality manuals, according to UNI EN ISO 9001:2008 certification. Moreover it is constantly verified by our Quality Control Staff. Their concept is that quality and experience should be “at hand”. This is the reason why they have a modern and efficient organization, able to guarantee a top-level service, with a particular care for human relationships with Clients.

Productive process

The below flowchart gives a brief yet clear illustration of the productive process in the company. For better understanding, a more detailed description will be given in the following. Only by knowing well the process flow of the total production, can we understand how the Sistema Ambiente is implemented in an adapt way inside the company tracking the production process and can we appreciate the value that Sistema Ambiente has added for the benefit of the company.

Figure 4.14 Flow chart of the productive process:



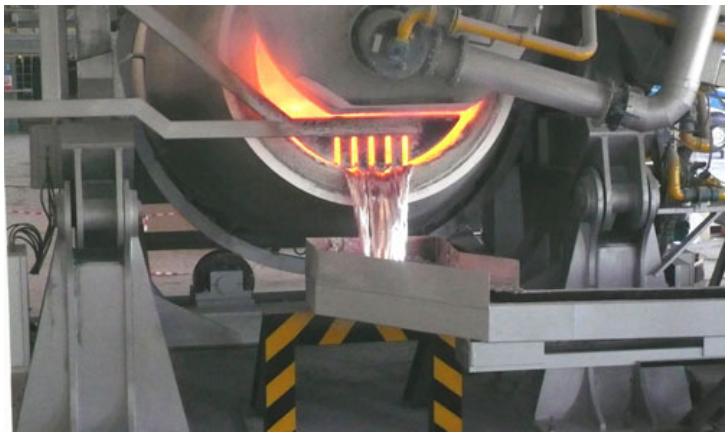
Description of Productive process:

The whole production cycle begins from the reception which is an important and in-ignorable unit. These scraps, collected from the household as well as from the different industries coming from all over the world, are transported here by the truck. The reception is in charge of control the documents (if the truck has arrived in the right company, what kind of scraps is brought..), weigh the total weight of the scrap and detect the radioactivity of the scrap. If all the requirements are met, the scraps are unloaded; otherwise the truck will bring back the scraps to where it comes from. In the same time the data are inserted both in an excel file and pre-registered in Sistema Ambiente and at the same time the personnel who do the registration work will find these data automatically in the Sistema Ambiente thanks to the transparency and data sharing function of the program.

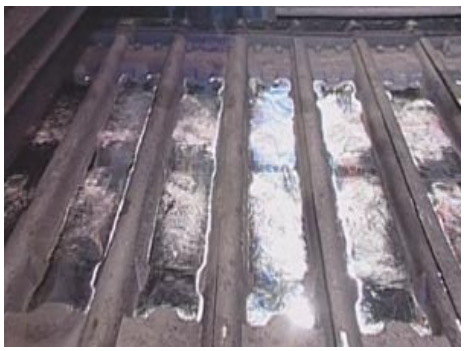
1) In the second step, the unloaded scraps are classified and differentiated according to type. The scraps containing iron or lead are taken out as they are not useful for the later alloy process, while maintain the scraps with copper, magnesium or other chemical composition inside. After the scrap sampling, in which the yield is studied and chemical analysis is done, the scraps are processed in hot flow and cold flow. Finally the scraps are stocked according to type and waiting for recycling or disposal, in the meanwhile, the residue management is also completed.

2) The scraps are, later, heated and smelted in a rotary melting furnace at very high temperature and pass through a melting furnace basin in which the small ingots of copper, magnesium, and silicon are added into the molten scraps for the alloy. Sodium chloride is also added to avoid oxidation of the metal. The

sodium chloride is then recycled after recovery. The quantity of each kind of ingots depends on the requirements and specifications of the clients through appropriate and careful chemical treatments such as degassing, refining, together with modification and correction of the bath and is coupled with the composition percentage of the molten scrap. Accurate quality control procedures allow them to satisfy every requirements from clients.

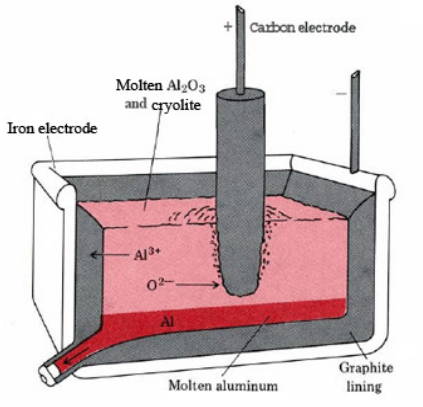


Aluminum alloys are usually supplied in form of ingots, or in liquid state, using particular ladles loaded on appropriate trucks. They have four lines of casting: two of them gave molded ingots, and the other two, of new conception, gave continuous bar. All lines of casting then end at so-called automatic stacker, whose task is to stack the bars or ingots produced, all in line and without interruptions. With a system of refractory pipes there is the possibility of sending the liquid aluminum, from all the basins, to the various lines of casting.



3) The salted slag is produced from the foundry. After the cooling process, the slag is solidified and become very hard. It has to be cracked, crushed and ground for

the further use. The fine slag powder is dissolved into water. After the stirring and inert process, the insolvable residue is precipitated and become alumina after the drying process and ready to be sent to the domestic or foreign cement manufacturers. While the salted water above the insolvable residue passed through evaporation and crystallization process to extract salt for the reuse supply to the foundry.



4.2.2 Implementation of Sistema Ambiente

A flowchart of how the Sistema Ambiente is run in each department of the company and the information flow is illustrated in the next page

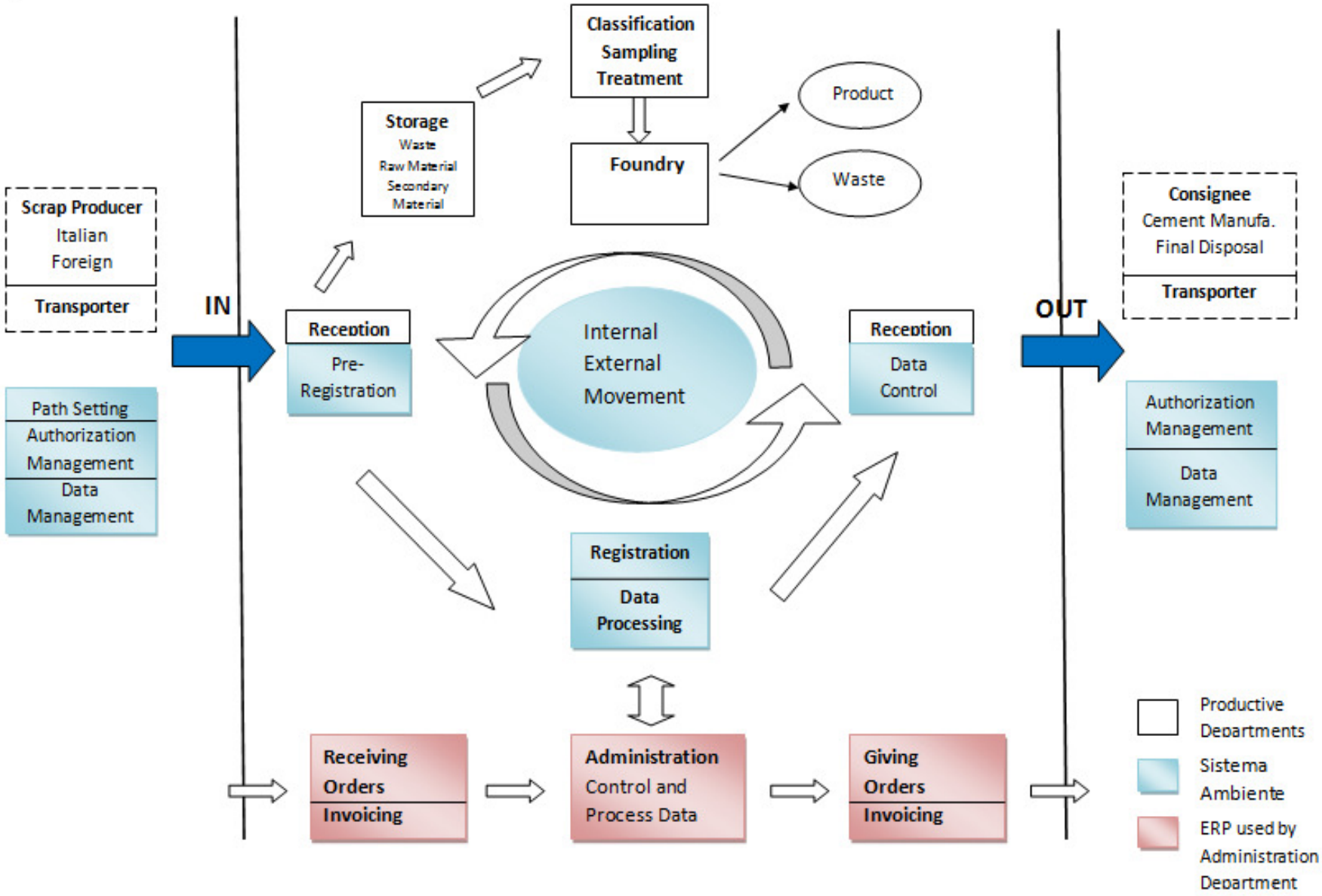


Figure 4.15 Implementation of SA and its Interaction with other management systems

This aluminum recovery company has a great number of unloading and loading movement within the factory and with outside of the factory. According to Italian laws, all the movements have to be registered officially. Yet, since the foundation of the company from the year of 1975, they have always registered all the information (information about numerous suppliers, transporters, consignees; control if they have official authorization; control if their certifications are renewed with time…) by hand filling out hundreds and thousands of forms on paper or later in excel. Documents not easily be managed, high possibility of human errors, all these problems have become increasingly severe and crucial which hinder the business progress and future development of the company, especially in the great difficulty in controlling the quantity flow of waste, raw material and secondary material storage before or after the scrap treatment process. Therefore an efficient and effective management system, other than paper documents prepared by hand or some excel tables which cannot help simplify the work from all the productive process, is required urgently by the company. Fifteen years ago, it started to introduce Sistema Ambiente.

The whole process of how the Sistema Ambiente is adopted for use of the waste management is as the following:
Firstly, the receptionists do the pre-registration work through Sistema Ambiente. For each incoming of truck loaded with scrap, thanks to the powerful database already established inside the program, the receptionists can choose from hundreds kinds of the waste already listed and encoded according to a Europe waste classification C.E.R (Catalogo Europeo dei Rifiuti) number with a simple click, for example: 170407, mixed metals; 170405, iron and steel; 130205, mineral-oil based but non-chlorinated waste from engine, gear and lubrication… and so on as show in the Figure 4.16. The same way applies also to the transporters selection due to the long term relationship with many transportation companies. If the transporter's name is not on the list as they have newly started the business relationship with this alumina recovery company, the procedure to create a new account is also very easy.
According to waste flow in or out of the company, the receptionist can go to the receiving or sending-out page to fill out all the information necessary in the form as it is shown in the Figure 4.17. The usual information required to be filled out is

indicated in a red exclamation mark which are essential for the official registration, such as date, at what time, license plate number of the truck. The other information is optional to the receptionist to supply or not. The pre-registration is now finished and clicking on ‘registration’, all the information will be shared to all the departments and the personnel inside the registration office will view from her Sistema Ambiente to complete the official registration work.

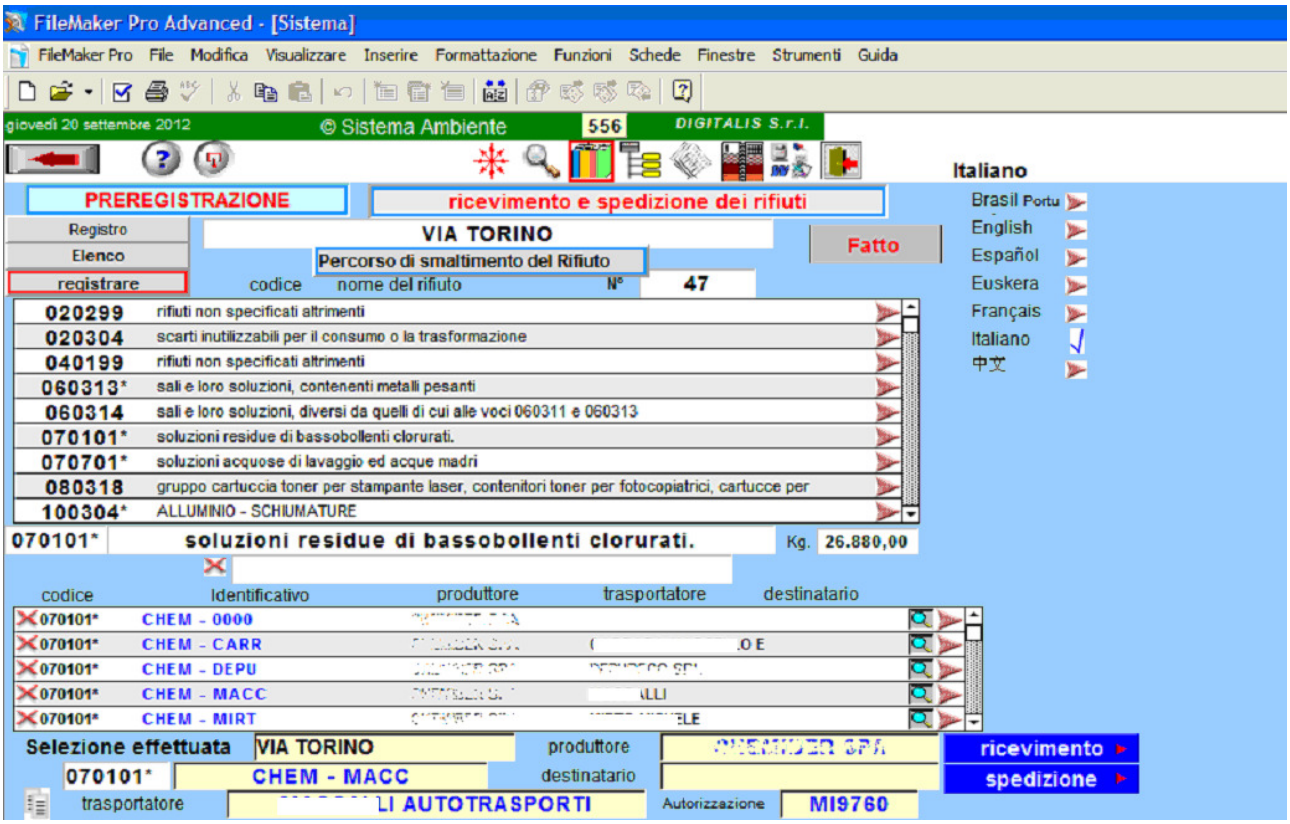


Figure 4.16 Waste Pre-Registration

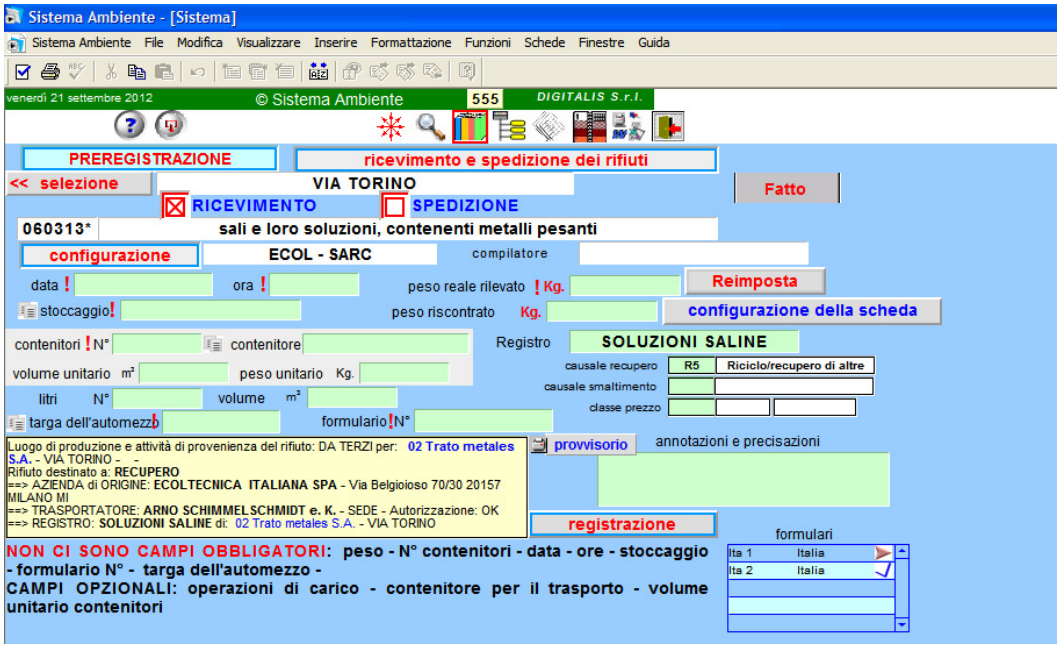


Figure 4.17 Waste Pre-Registration

Basically, the registration staffs are currently in charge of mainly control the data coming from the receptionist and complete other information such as observed weight and unload information as shown in the Figure 4.18. The summary of all the information filled out in the form can also be viewed automatically in the bottom of the page. In addition, the staff also has to use the deadline programming plan function in Sistema Ambiente to control the authority deadline of each scrap producer, transporter and supplier.

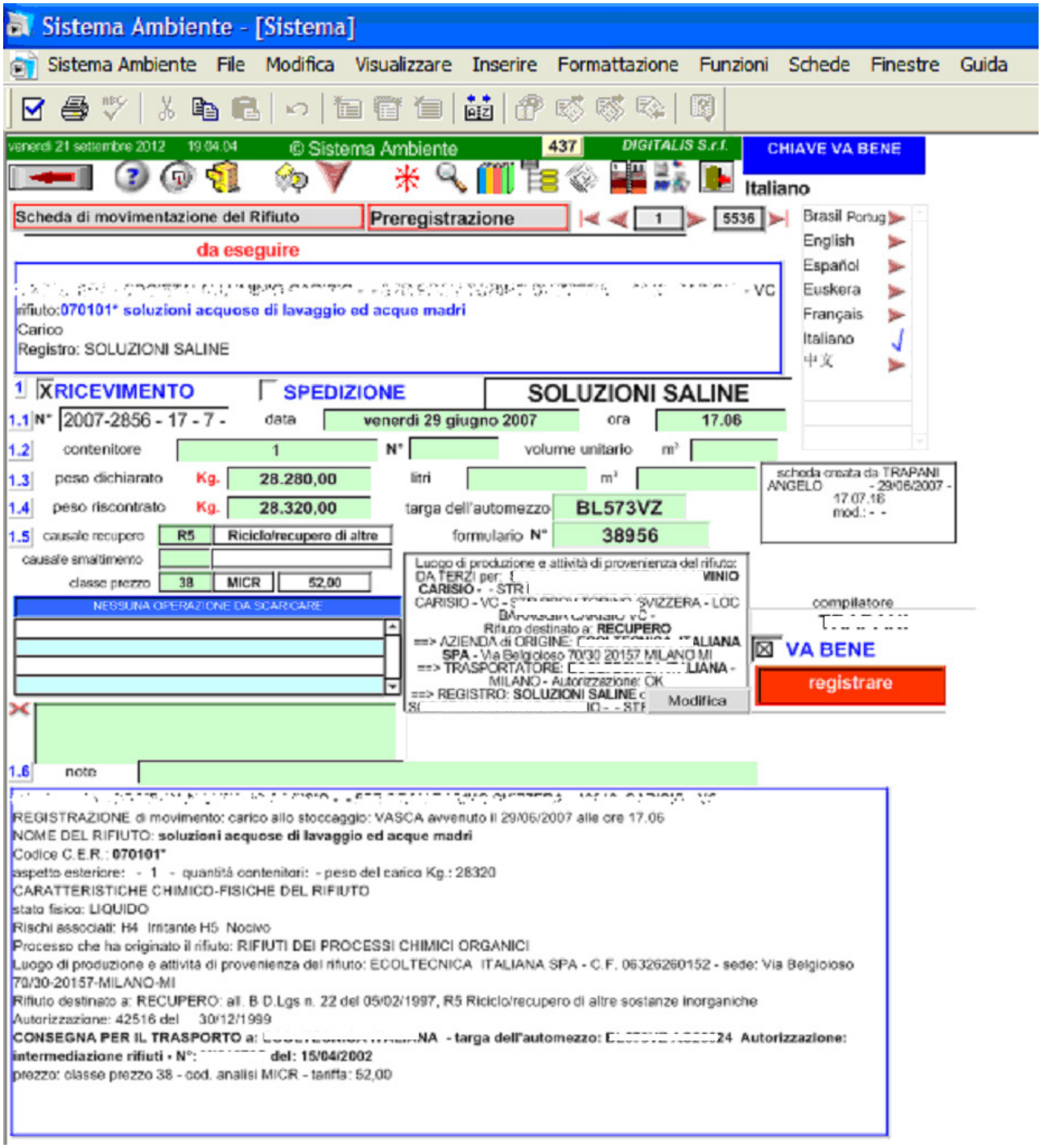
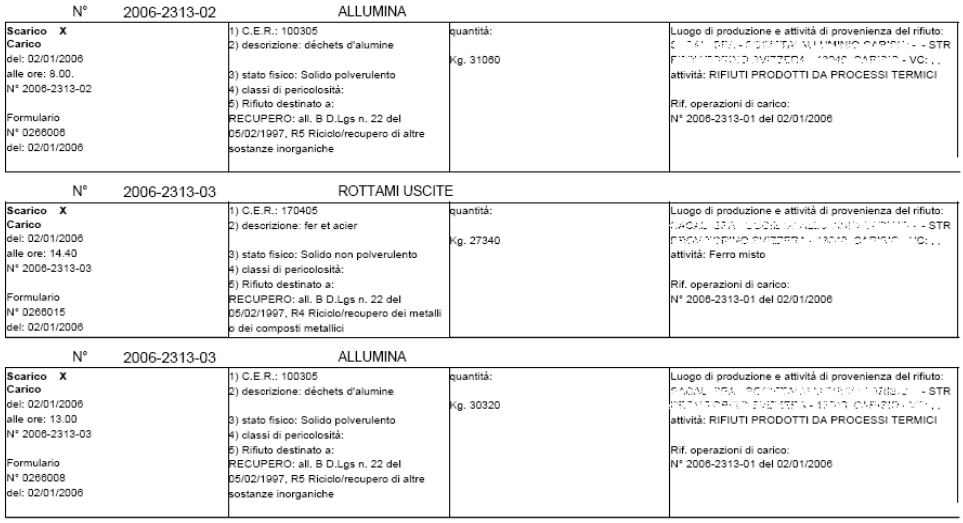


Figure 4.18 Waste Registration

Once the registrations are completed in the program, they have to be printed into a register which should be handed to the province office each year for control and approval stamp. A one-page official waste register document is shown in Figure 4.19 as an example.



N° 2006-2313-02	ALLUMINA		
Scarico X **Carico** del: 02/01/2006 alle ore: 8.00. N° 2006-2313-02 Formulario N° 0266006 del: 02/01/2006	1) C.E.R.: 100305 2) descrizione: déchets d'alumine 3) stato fisico: Solido polverulento 4) classi di pericolosità: 5) Rifiuto destinato a: RECUPERO: all. B D.Lgs n. 22 del 05/02/1997, R5 Riciclo/recupero di altre sostanze inorganiche	quantità: Kg. 31060	Luogo di produzione e attività di provenienza del rifiuto: [illegible] - STR [illegible] - VC: , , attività: RIFIUTI PRODOTTI DA PROCESSI TERMICI Rif. operazioni di carico: N° 2006-2313-01 del 02/01/2006

N° 2006-2313-03	ROTTAMI USCITE		
Scarico X **Carico** del: 02/01/2006 alle ore: 14.40 N° 2006-2313-03 Formulario N° 0266015 del: 02/01/2006	1) C.E.R.: 170405 2) descrizione: fer et acier 3) stato fisico: Solido non polverulento 4) classi di pericolosità: 5) Rifiuto destinato a: RECUPERO: all. B D.Lgs n. 22 del 05/02/1997, R4 Riciclo/recupero dei metalli o dei composti metallici	quantità: Kg. 27340	Luogo di produzione e attività di provenienza del rifiuto: [illegible] - STR [illegible] - VC: , , attività: Ferro misto Rif. operazioni di carico: N° 2006-2313-01 del 02/01/2006

N° 2006-2313-03	ALLUMINA		
Scarico X **Carico** del: 02/01/2006 alle ore: 13.00 N° 2006-2313-03 Formulario N° 0266008 del: 02/01/2006	1) C.E.R.: 100305 2) descrizione: déchets d'alumine 3) stato fisico: Solido polverulento 4) classi di pericolosità: 5) Rifiuto destinato a: RECUPERO: all. B D.Lgs n. 22 del 05/02/1997, R5 Riciclo/recupero di altre sostanze inorganiche	quantità: Kg. 30320	Luogo di produzione e attività di provenienza del rifiuto: [illegible] - STR [illegible] - VC: , , attività: RIFIUTI PRODOTTI DA PROCESSI TERMICI Rif. operazioni di carico: N° 2006-2313-01 del 02/01/2006

Figure 4.19 Official Waste Register

At the very beginning of introducing the Sistema Ambiente, the registration staffs have dedicated a large amount of time for the preparation work to complete the waste safety information which is mandatory by law. This prophase work, facilitate the later registration, includes general information as description of the characteristics of these specific waste, principle compositions, potential dangers; and original processes. Finally, the program will provide a possible waste cycle management proposal synthesizing all information about this specific waste coming from not only these safety information pages but also from all the other relevant pages in other part of the program. Thanks to their hard work, the accumulation of various wastes listed in the C.E.R European waste catalog brings to an enormous reference base which can be located easily.

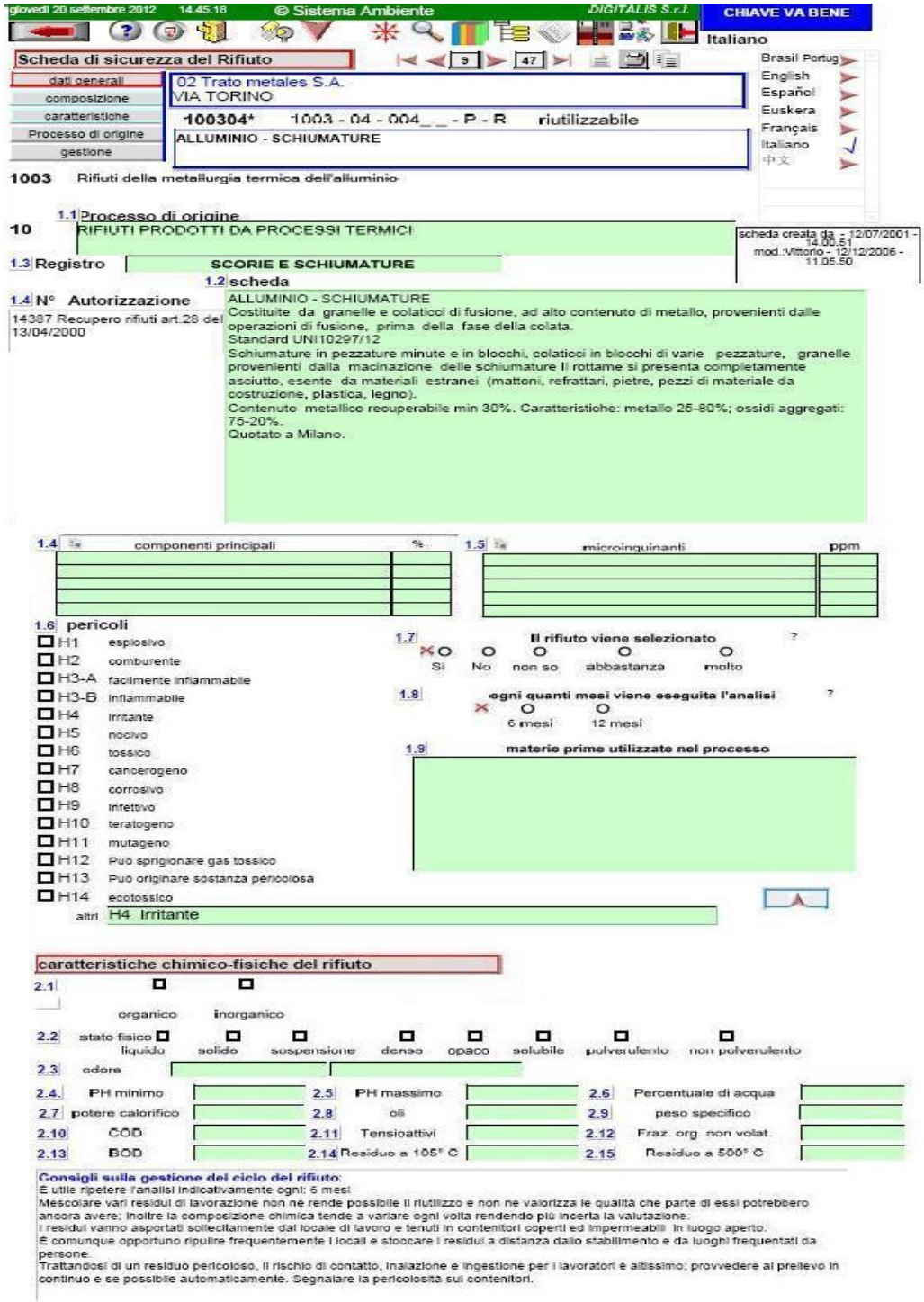


Figure 4.20: Waste Safety Information

Pursuing information transparency in the company, the register information is accessible to each department inside the company. The summary report of registration, from different point of interest, can be viewed directly or be transformed to pdf, word, excel for the further processing or be printed if in need. From the total movements inside or coming/to the outside company to storage; from transporter to consignee; from final usage to type of

disposal, the needs of different groups are satisfied to have a clearer view of the registration information.

RESOCONTO DELLA MOVIMENTAZIONE DEI RIFIUTI

SMALTIMENTO FINALE DEI RIFIUTI

[illegible] **13.593.000,0 Kg.**

ARESE

170405 fer et acier				*13.593.000,0 Kg.*
2003				1.464.140,0 Kg.
gennaio				*29.020,0 Kg.*
06/01/2003	2003-1223-037	conferito:	29020	
febbraio				*94.120,0 Kg.*
13/02/2003	2003-1259-381	conferito:	31390	
27/02/2003	2003-1273-541	conferito:	31060	
28/02/2003	2003-1274-549	conferito:	31670	
marzo				*181.730,0 Kg.*
03/03/2003	2003-1277-564	conferito:	30070	
10/03/2003	2003-1284-623	conferito:	29450	
10/03/2003	2003-1284-624	conferito:	29910	
11/03/2003	2003-1285-637	conferito:	31300	
12/03/2003	2003-1286-650	conferito:	30480	
26/03/2003	2003-1300-790	conferito:	30620	
aprile				*161.880,0 Kg.*
04/04/2003	2003-1309-885	conferito:	32010	
08/04/2003	2003-1313-913	conferito:	33160	
23/04/2003	2003-1328-1048	conferito:	32270	
24/04/2003	2003-1329-1057	conferito:	32510	
29/04/2003	2003-1334-1111	conferito:	31930	
maggio				*71.920,0 Kg.*
08/05/2003	2003-1343-1179	conferito:	32800	
28/05/2003	2003-1363-02	conferito:	39120	
giugno				*130.610,0 Kg.*
10/06/2003	2003-1376-01	conferito:	34760	
11/06/2003	2003-1377-01	conferito:	34080	
12/06/2003	2003-1378-02	conferito:	31310	
17/06/2003	2003-1383-02	conferito:	30460	
agosto				*56.880,0 Kg.*
26/08/2003	2003-1453-01	conferito:	29200	
29/08/2003	2003-1456-01	conferito:	27680	
settembre				*137.140,0 Kg.*
01/09/2003	2003-1459-02	conferito:	26040	
01/09/2003	2003-1459-03	conferito:	27420	
12/09/2003	2003-1470-01	conferito:	27680	

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Figure 4.21 Summary Report

Going back to the flowchart of Figure 4.15, Sistema Ambiente is applied in the productive department while the administration department uses ERP system. As the original target in the development of SA is to have seamless joint with other information systems already existing and running in the company, all the relevant information and data can be easily extracted from the Sistema Ambiente for the further processing in the administration department.

SA is not only adopted and also been modified with time according to the real need of the company. At the very beginning, SAis not designed or structured for the treatment company (residues in and new residues out) but only for the company who is the sole residues producer. To solve this problem, an additional function named material movements is created based on the original waste management function so as to distinguish two kinds of flow: flow of material and flow of the waste both inside and connection between inside and outside producer, supplier and consignee.
On the other hand, the company has not exploited all the advantages that Sistema Ambiente offered. They have been benefited by the wasted management inside and outside the company while taking less attention to the safety management. Initially, it has also utilized SA for the internal risk analysis for a while, yet they find it difficult to obtain the certification by themselves through all the study of the risk. They have decided to ask the help from a consulting company to let them be in charge of all their safety issues. This is not suggested by the developer of SA for the reason that even they gain the convenience and ease of not taking any care about how to manage their safety problems or how to go through many complicated procedures to obtain the ISO18001 certificate, however if we have a long-term perspective for the company, the company may lose their autonomy to know the real situation of safety management due to a high dependence on the consulting company. The developer of SA has suggested the company to initially have at least one personnel specialized dedicated to the safety management implementing SA and at the same time keep in relationship with the consulting company. With time when this personnel has matured his experience on safety, the relationship with the consulting company can be terminated and this person can choose the right external technicians or consulting companies if in need.

4.3 Application in a pharmaceutical company

---- On worker training management

4.3.1 Company Introduction

This pharmaceutical company dedicates its activities to the development of new therapeutic applications and is now well established both in Italy and abroad, with about 290 employees. It is a leader in sterile injectable antibiotics, exports about half of its production abroad and is one of two companies outside American territory, to have received FDA approval to produce sterile penicillin for the U.S. market.

The working cycle of the plant consists of the production and packaging of pharmaceutical products for human use, in the form of ampoules, granules, tablets, powders, ointments, suppositories. The unitary processes which are used for the production are the standard ones normally used for pharmaceutical preparation. And then, in relation to the various products: weighing, sieving, kneading, mixing, dissolving, filtration, emulsion, precipitation, granulation, drying, compression, bottling, freeze-drying, sterilizing, capping, ginning, packaging.

In addition to the main activity for the production of medicines, there are also activities of secondary character necessary to the preparation, characterization, finishing of the product and its processing, and packaging of the finished product and raw materials processing.

The production is supported by the analytical laboratories physical-chemical and microbiological analysis for quality control of raw materials and finished pharmaceutical products and laboratories of technological development for the development of new methods and processes and the search for new molecules for pharmaceutical use.

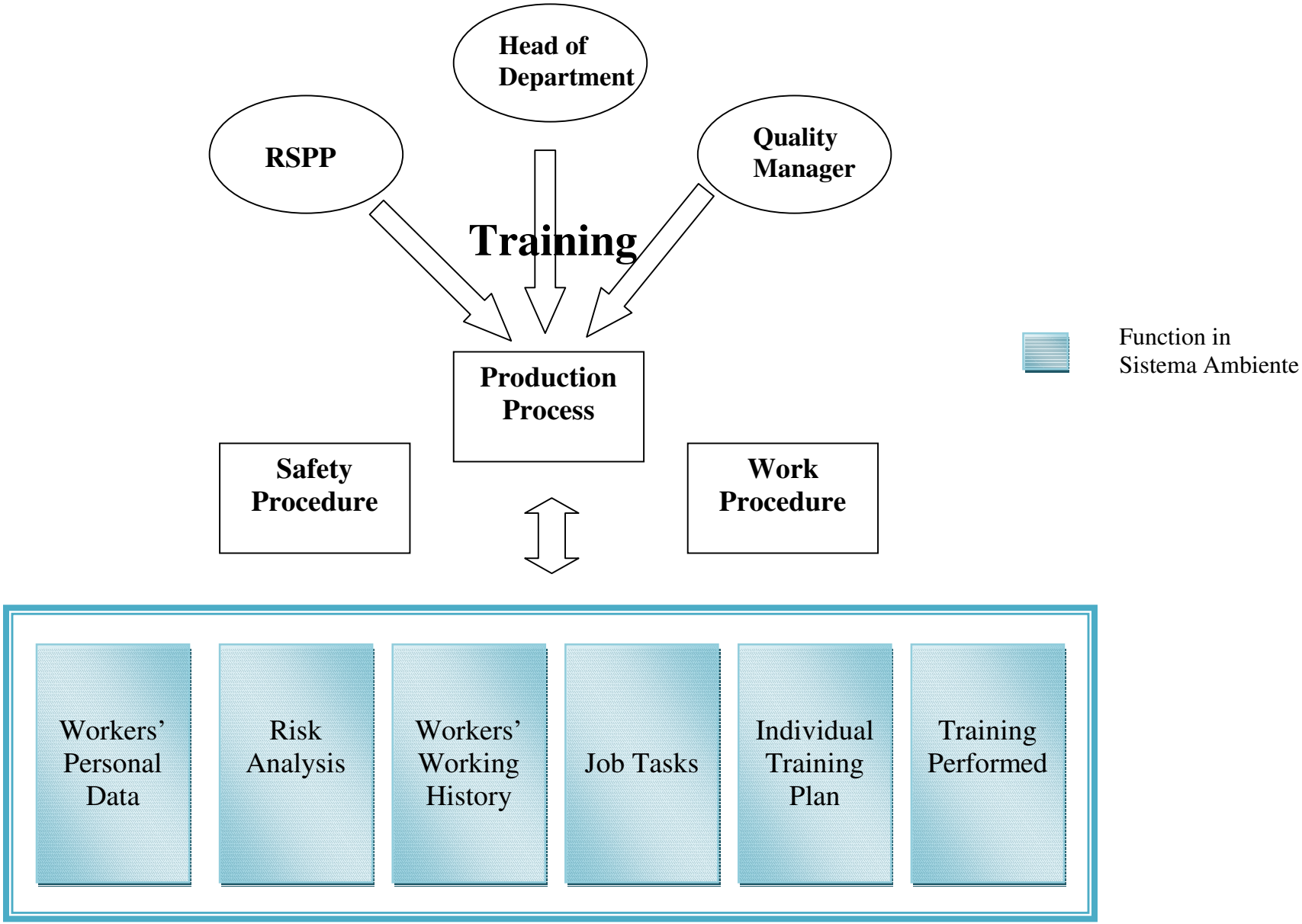
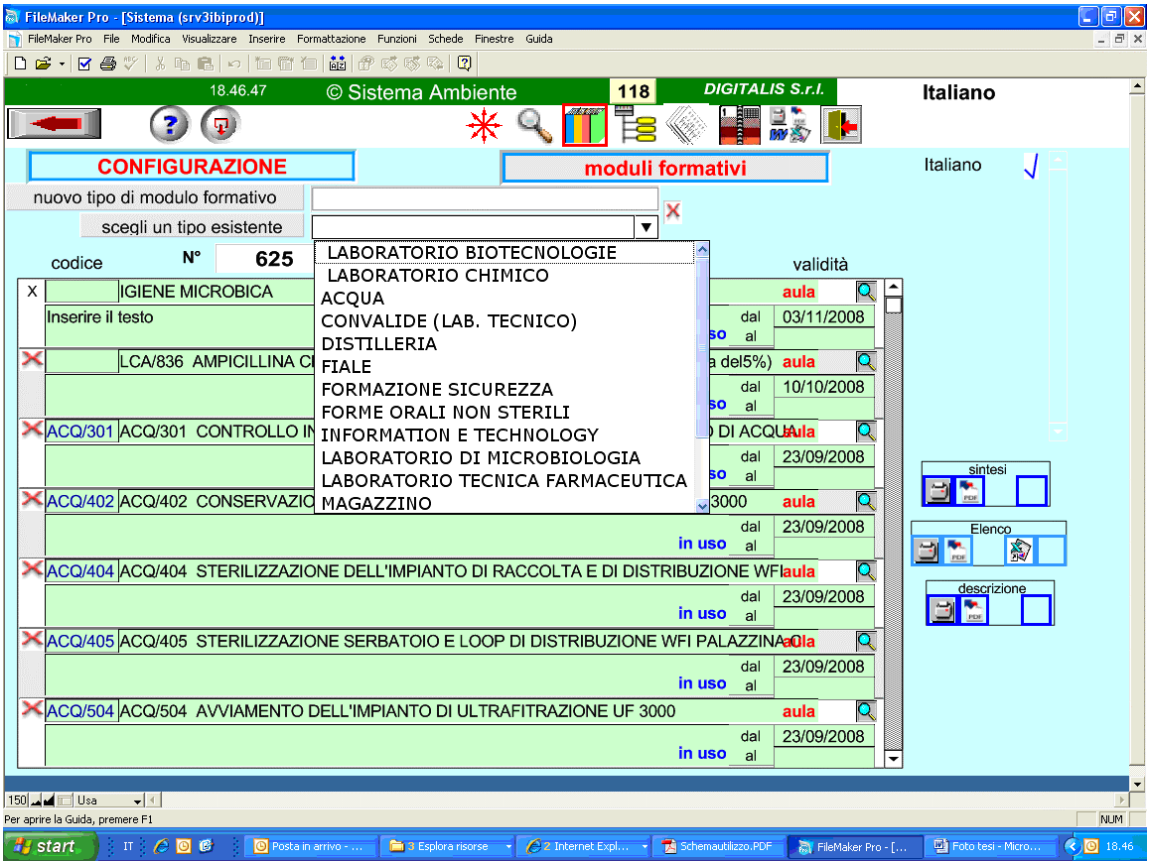


Figure 4.22 Implementation of Sistema Ambiente in the enterprice

4.2.2 Implementation of Sistema Ambiente

An important issue that has been addressed, by this pharmaceutical company is training: training of workers is not only a necessity for prevention but also for the quality and assurance of the product.

Therefore training modules also the operating procedures of the various departments and different tasks are set up that were already designed for safety (Figure. 4.23).



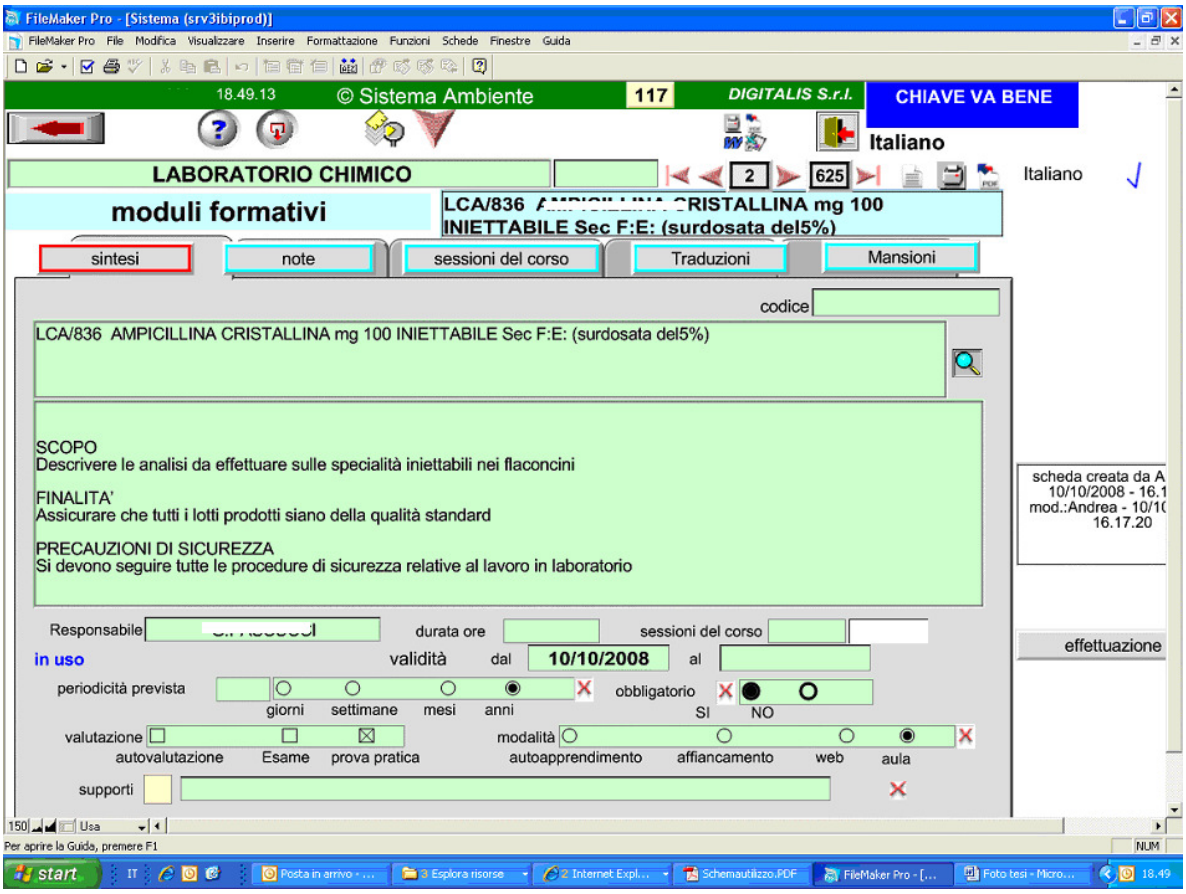


Figure 4.23 Training Modules

Tasks are also been set from the point of view of training required for the execution of work procedures and jobs have been structured in a better way in order to take into account not only the general professional knowledge but also those specific ones (see Fig 4.24).

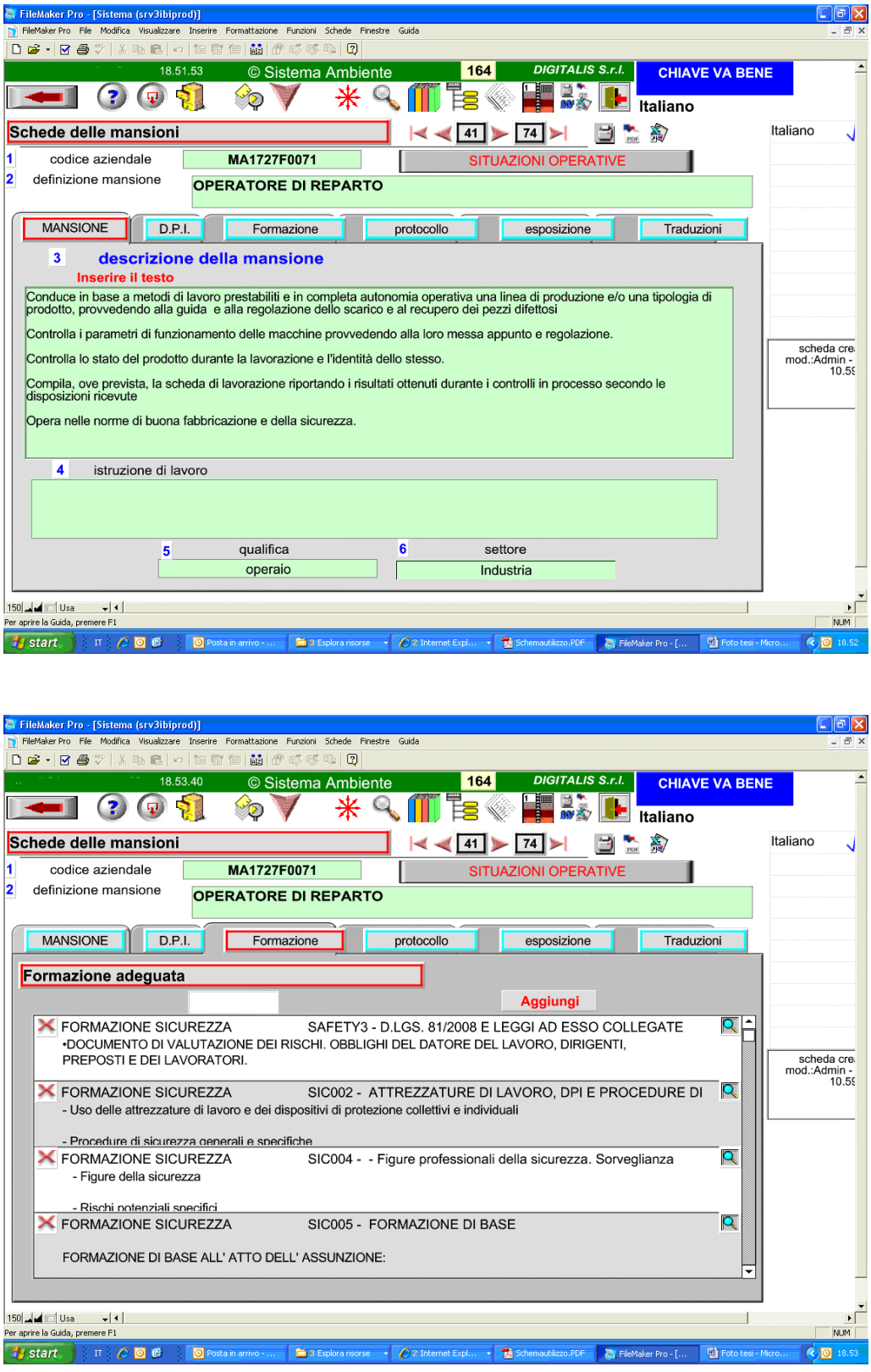


Figure 4.24 Trainings been set up according to the specific execution of work

A function has been created to give the possibility to self-training using the intranet within the company and the possibility of consulting the explanatory and illustrative documents of working ways. In addition, a function has been created for the head of the department for

better understanding and checking the status of workers' training procedure before assigning tasks or modifying the tasks of a worker (Figure 4.25,26,27,28).

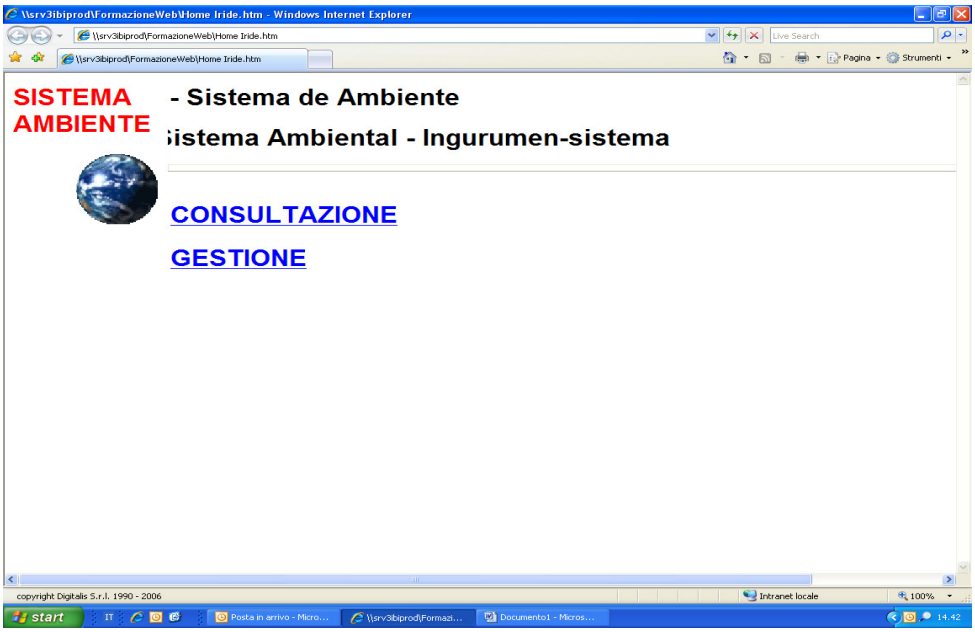


Figure 4.25 checking the status of workers' training procedure

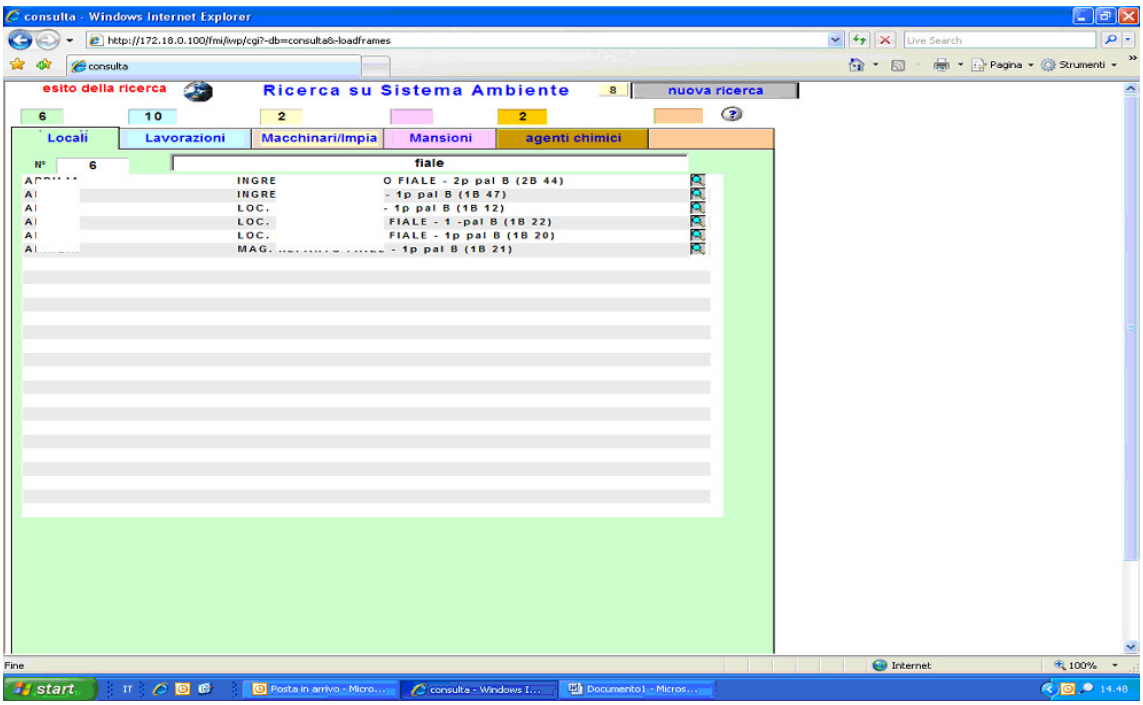


Fig.4.26 Searching according to premises

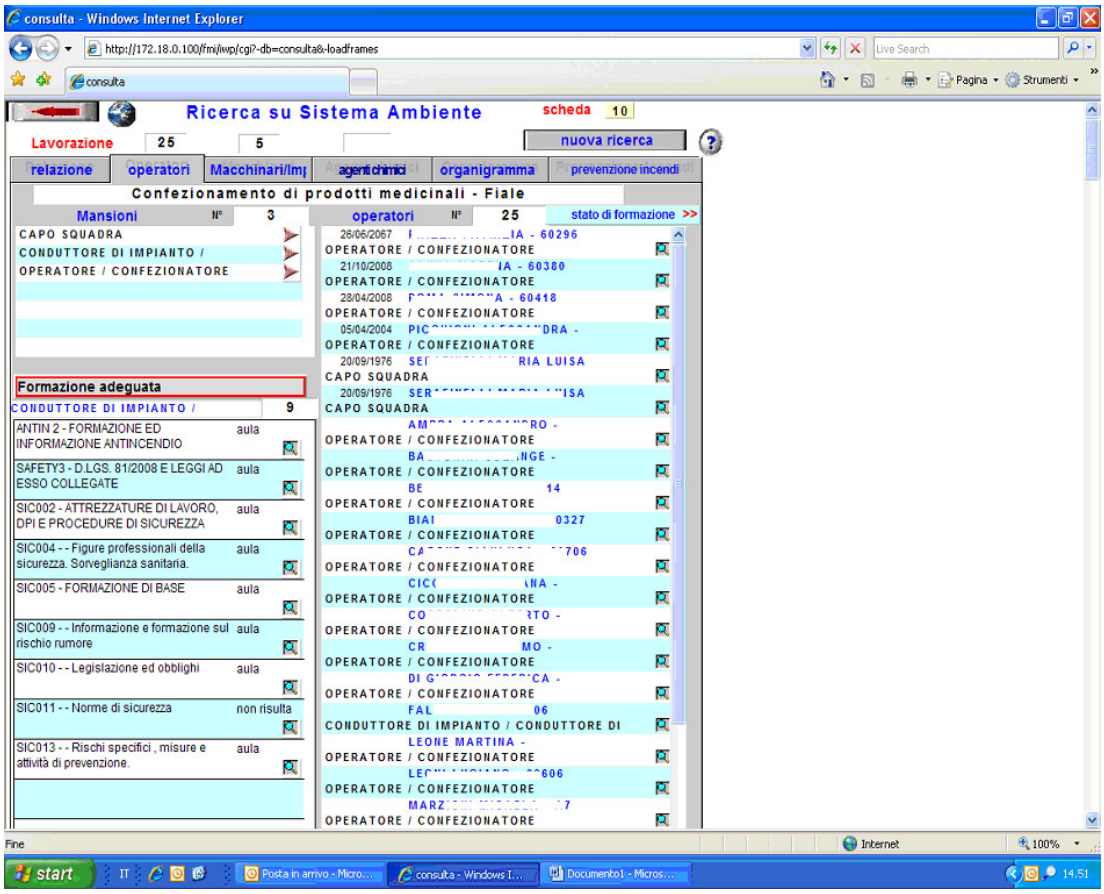


Fig.4.27 Record form of one task

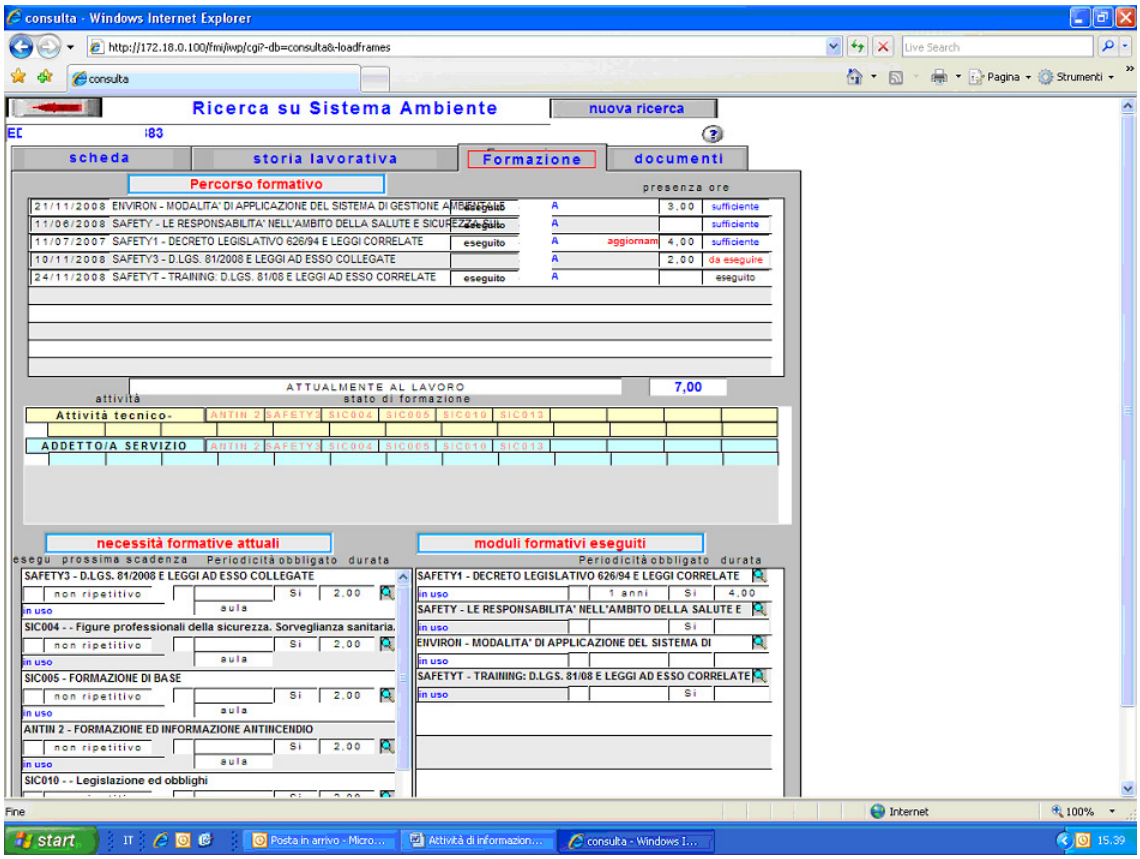


Fig.4.28 Workers record form

Another aspect concerns the procedures for inspection and maintenance. Currently the registration of these procedures is mostly on paper which brings difficulty to focus on problems of anomalies or breakdowns in a preventive way.
In this case, the system has developed functions that allow to set up the procedures, operating instructions and possible measures to detect, permitting the execution scheduling and the results recording in detail for each unit of equipment or place. The system also allows you to report directly anomalies and record the performance of extraordinary interventions.
The use of the system has made it possible to detect aspects not only in case of the occurrence of faults or the occurrence of accidents.
The need for a single information system, able to organize data, to establish the connection between different data and provide shared information is the main aspect that led to the introduction of the "Sistema Ambiente" inside the pharmaceutical company.
As we said at the beginning, for a complex reality like the company to acquire a unitary information tool is a strategic choice.

Chapter 5: Conclusion

Even though the integration of quality, health, safety, environment management system has been studied for a long time, still there does not exist a comprehensive integrated management program that really reacts in a dynamic way according to the ever changing company's organization of work.

Thus, this thesis is mainly dedicated to an innovative management program 'Sistema Ambiente' starting from its ideology of development to the real implementation in several companies so as to present a systematic methodology in environment and occupational health and safety field.

The ideology, according to which the Sistema Ambiente is developed, is that the prevention of risks and health and safety protection is the result of analytical work and a concrete methodology instead of trying to simplify things or do some superficial work. It is the real and specific company production processes we have to go deep into.

Not only the ideal theory out of long time study in the documentation, the understanding of the real situation and critical problems existing in the company, from the empirical aspect is also indispensable for the completion and improvement of SA. So that the idea to individuate risks to each single element and improve the risk prevention not starting from the regulational side like the other programs do but from the point of view of 'who does the job' have been integrated into the functions of SA to guarantee the product quality in a new way. What's more, the voices from the workers are not considered individually but collectively as a homogeneous group. In this way the real working situation and potential problems can be better understood heading for an effective and efficient production.

Collaborating with other systems involved in daily business activity in the company like ERP and quality management systems, the strategic move to adopt Sistema Ambiente will help the company to realize progressive reorganization and continuous improvement which is the ultimate goal of each company in nowadays competitive market.

REFERENCES

1. ISO 9001:1987 - Model for quality assurance in design, development, production, installation, and servicing was for companies and organizations whose activities included the creation of new products.
ISO 9001:1994 - Model for quality assurance in design, development, production, installation and servicing.
ISO 9001:2000 - Quality management systems -- Requirements
ISO 9001:2008 Quality management systems — Requirements

2. ISO 14001:1996 - Environmental management systems. Specification with guidance for use.

ISO 14001:1996 - Environmental management systems. Requirements with guidance for use.

3. OHSAS 18001:1999 - Occupational Health and Safety Management Systems Specification
OHSAS 18001 : 2007 - Occupational Health Safety Management Systems Requirement

4. Integrated Management Systems: A Practical Approach to Transforming Organizations (Operations Management Series) Thomas H. Lee , Shoji Shiba, Robert Chapman Wood, November 2, 1999

5. Taylorism: http://en.wikipedia.org/wiki/Taylorism
Fordism: http://en.wikipedia.org/wiki/Fordism
Post-Fordism: http://en.wikipedia.org/wiki/Fordism

6. Fordismo e postfordismo. Il pensiero regolazioni sta, Boyer Robert, 2007

7. Nuove tecnologie e azione organizzativa. Riflessioni teoriche e casi aziendali, Masino Giovanni, 2000

8. Toyota Production System *, Taiichi Ohno,1998*

9. Lean Thinking: Banish Waste and Create Wealth in Your Corporation, Revised and Updated, James P. Womack, Daniel T. Jones, 2003

10. Psicologia Dell'organizzazione Della Salute - Ivar Oddone
http://www.eliminablediseases.eu/anticamera(xcvbnm)/ita/ergo2000.html

11. *La salute nelle fabbriche* , Baldasseroni Alberto, 1969

12. *Mal da lavoro. Storia della salute dei lavoratori*, Carnevale Francesco, 1999

13. *Tavola rotonda sulla misurazione e sulla contrattazione dei ritmi e delle condizioni ambientali di lavoro nell'azienda industriale*, Di Gioia Angelo, 1966.