

Summary

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SUMMARY

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The Pirelli SpA Environmental Report 2000 has adopted the guidelines of the *Global Reporting Initiative* internationally accredited system for producing environmental reports.

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CHAIRMAN'S LETTER

A sustainable present.....a sustainable future

Electrical energy, communications and transport are three of the main foundations of our modern society and Pirelli is deeply involved in bringing all three necessities into people's lives.

The publication of the first Pirelli SpA Environmental Report confirms our commitment to develop products, technologies and management tools which allow a sustainable industrial and economic growth.

We are achieving accreditation for all manufacturing operations worldwide to the international standard for environmental management systems ISO 14001. Over three quarters of our plants are now accredited, and operate annual improvement targets. The target is always moving as we acquire new businesses, and bring them to the Pirelli standard of environmental operation. Environmental Due Diligence is an essential part of our acquisition strategy. Where local legislation is below European standards (or does not exist at all), we require European standards to be complied with.

Precise choice of the definition of new technologies and products include the use of Life Cycle Assessment results - which we have completed on several of our product ranges.

In the Tyres Sector, the development of the new production process, MIRS, will allow reduction in energy consumption, and in emissions and raw material use during both the production, and distribution phases. Specific environmental improvement actions are underway for our tyre products, such as the substitution of aromatic oils, and reduction in use of zinc oxide. For several years our "Energy" tyres, which allow a reduction in fuel consumption due to reduced rolling resistance, have been marketed.

In the Cables and System Sector the development of product groups like the Ecology Line represents a first step in developing environmentally improved cables. Undergrounding completely eliminates the visual impact of power lines, and makes it possible to use innovative designs to reduce or eliminate exposure to electromagnetic fields.

I believe that employee involvement, research and development activities, and dedicated company resources have undoubtedly provided results of environmental value. We have done much and there will always be much to do, but in my view the road of sustainable development is the only path for the successful business of the third Millennium.



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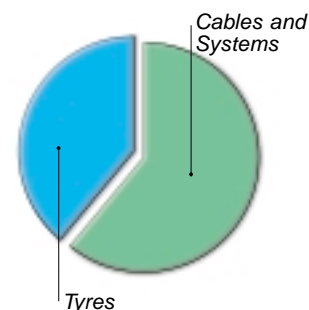
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PIRELLI SPA

Pirelli SpA's activities at 31 December 2000 were centred on two sectors, Cables and Systems, and Tyres (accounting for 61% and 39% respectively of sales), with branches in 24 countries in 5 continents.

Sales were split between Europe 54.6%, North America 16.2%, Central and South America 16.5%, Australia, Africa and Asia 12.7%.



Pirelli SpA in figures

	2000	1999	1998
Consolidated sales revenue (millions of Euro)	7,477	6,482	5,487
Number of employees	41,914	40,103	38,209
Number of plants	87	87	73

Pirelli SpA sales in 2000 by sector and geographical area

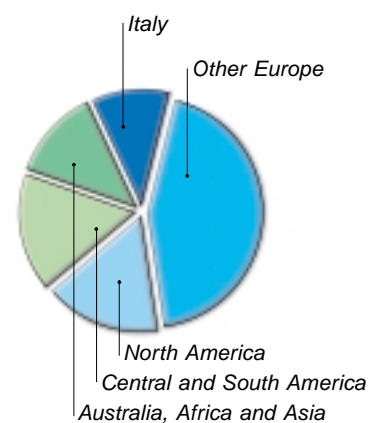
Pirelli SpA Operating Units Worldwide

Cables and Systems

Argentina	France	Ivory Coast	Spain
Australia	Germany	Malaysia	Turkey
Brazil	Holland	Portugal	United Kingdom
Canada	Hungary	Rumania	United States
China	Indonesia	Slovakia	
Finland	Italy	South Africa	

Tyres

Argentina	Germany	Turkey	Venezuela
Brazil	Italy	United Kingdom	
Egypt	Spain	United States	



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CRITERIA USED IN PRODUCING THIS REPORT

As this is the first Environmental Report of Pirelli SpA, it is appropriate to present background details on some of the initiatives which the company has undertaken over recent years, some already completed, others still underway. This information is contained in the chapters on "Sector Activities".

In the chapters on "Production and Quantitative Data", specific environmental parameters and figures are included for each production type, for both 1999 and 2000.

At the end of year 2000, following important growth in the Cables and Systems Sector and recent international acquisitions, and in order to improve the strategic focus and the management efficiency of the Sector, Pirelli has decided to separate the Energy activities from Telecommunication. The report still presents the previous situation; future reports will reflect the division of activity.

The Report covers the Operating Units of Pirelli SpA worldwide at 31 December 2000. Figures have not been included this year regarding the two Operating Units which produce cable accessories and one Operating Unit producing moulds for curing tyres, in view of their small size, nor the two Operating Units of Romania and Ivory Coast. The sites bought in 2000 from the *BICCGeneral* industrial group have also been excluded. All these Units will be in future reports.

It has not been possible to collect all the intended data from all the Operating Units when, for example, they are recent acquisitions, or have been closed or sold, or when for legal reasons it is necessary to use different methodologies in some countries.

To gather the information Pirelli introduced a uniform methodology in 1998 based on schedules which were sent to all Operating Units. The data collected have been analysed using a data-base built in 1999.

Even if sometimes differing in the degree of detail, the quantitative data contained in the Report are sufficient to give a reasonably comprehensive picture of Pirelli's environmental *performance*. The information database is constantly being worked on to make possible further analysis of the data in future years.

PIRELLI ENVIRONMENTAL POLICY

The Pirelli Group considers environmental protection as one of the essential elements of its activities.

To this end the Pirelli Group has adopted the following principles:

- to identify the environmental impact of its activities in order to eliminate or minimize them, complying with existing legislation in different countries as a minimum requirement;
- to manage its production activities by adopting Environmental Management Systems in compliance with international standards;
- to abide by the principle of "sustainable development" and undertaking to put it into practice;
- to assess the environmental impact of its products adopting a "full life cycle" approach and to promote the development of products to reduce their impact on the environment;

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- to contribute to preserving natural resources also by re-using, recycling materials or by recovering energy from materials;
- to promote the use of the most advanced technologies in order to achieve excellence in the environmental field, maintaining contacts with international scientific circles;
- to actively involve all levels of the organization and all Group employees;
- to ensure that its business locations are in harmony with their natural and human surroundings;
- to communicate and spread environmental information internally and externally, developing co-operation with customers, suppliers, the public and the other interested parties.

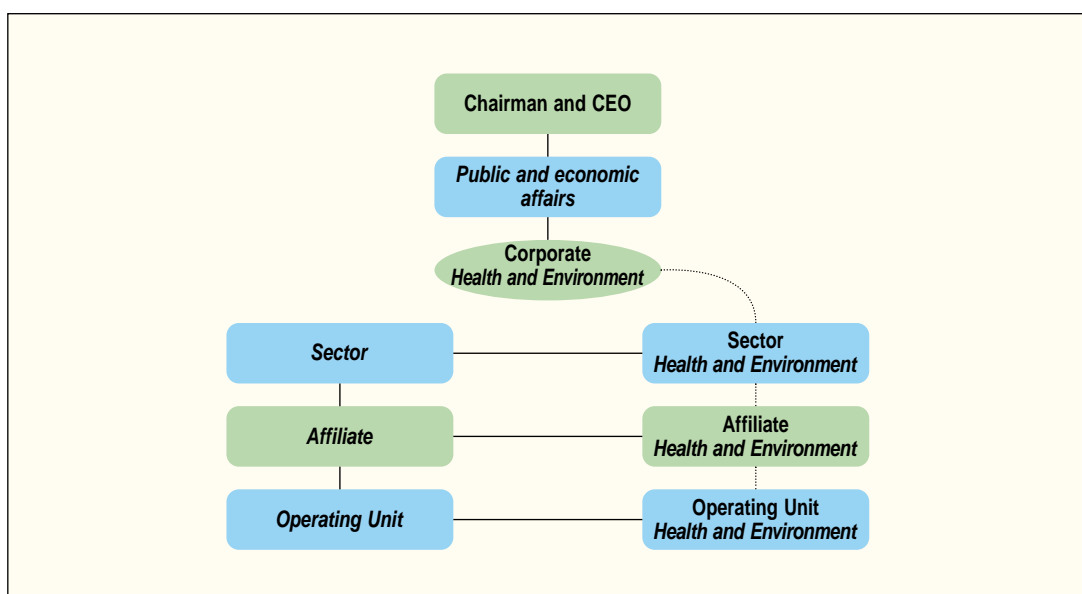
THE ORGANIZATION

Managerial responsibilities in the field of the environment have been defined on the basis of the skills required, and then delegated to operational departments. Specialist skills, and the associated responsibilities, are held by *Corporate Health and Environment* (which answers directly to a member of the Board) and by other *Health and Environment* departments in the company.

The *Corporate* department has the job of leadership, coordination, and control, as well as being the centre of excellence for resolving particularly complex problems.

At the level of geographical area (South America and the United States/Canada) Health & Environment departments have been set up reporting to the area CEO, but reporting functionally to *Corporate Health & Environment*. The Sector structures report to the Sector Operations Director, and also report functionally to the Corporate Department. The Health & Environment professionals at Sector level interpret and adapt Company guidelines to the industrial context they are serving. At Affiliate, or Operating Unit level, a *Health & Environment* structure reports locally according to local requirements – this can be under Operations, Human Resources or directly to the Affiliate Head Office – but the functional reporting line is to the *Health & Environment* Sector leader.

The overall resources which Pirelli devotes to the management of environment, health and safety currently amounts to approximately one hundred people.



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VOLUNTARY ACTIONS

To put the principles of the Environmental Policy into action, in Spring 1997 the following general objectives were set:

- to adopt an Environmental Management System in all Operating Units, defined at Group level and following the criteria set by ISO 14001;
- to assess the environmental impact of products across the whole life cycle, using the Life Cycle Assessment methodology defined by ISO 14040.

To reach these objectives, Pirelli has chosen a unified approach, centralizing planning and selection of the methodologies and tools, and monitoring progress of the programme.

The definition of specific objectives for environmental improvement, and their implementation, is the responsibility of the individual Affiliate in line with local legislation, together with the particular needs and environmental aspects of each case.

In respect of specific production processes, Pirelli has established, on a voluntary basis, specific objectives regarding the most significant emissions into the atmosphere. For the production of optical fibre, for example, precise target limits were set for emissions of chlorine, hydrochloric acid, hydrofluoric acid (where present) and dust.

The Environmental management system

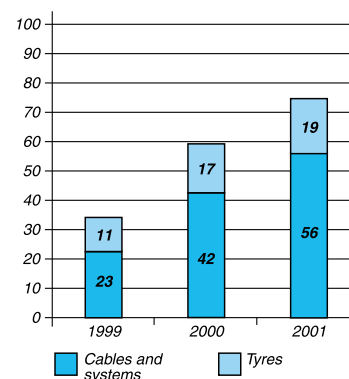
The need to ensure correct environmental management, using an approach of continuous improvement, was reflected in the adoption of an Environmental Management System conforming to ISO14001.

The initiative was launched by the General Managers of the two Sectors.

In September 1998, the "Environmental Steering Committee" was set up, run by the Corporate Health & Environment department, and including representatives from the Health & Environment departments of the two Sectors. Its task is to oversee the implementation of the Environmental Management System.

Certification is carried out by a single body, (SGS Yarsley), in association with a Pirelli auditing team. The Pirelli auditing team is comprised of suitably qualified personnel from both Sectors, as well as Corporate, and a homogeneous audit methodology defined by the Environmental Steering Committee is used. At the end of 2000, the Pirelli Team contained 15 auditors already qualified and 4 auditors under training.

At the end of 2000, 59 Operating Units had been certificated (nearly 70%). For 2001, it is envisaged that a further 16 Units will be certificated, while the objective is for the remaining factories to gain certification in 2002.



ISO 14001 - Operating Units certified (1999-2000 and the objective for 2001)

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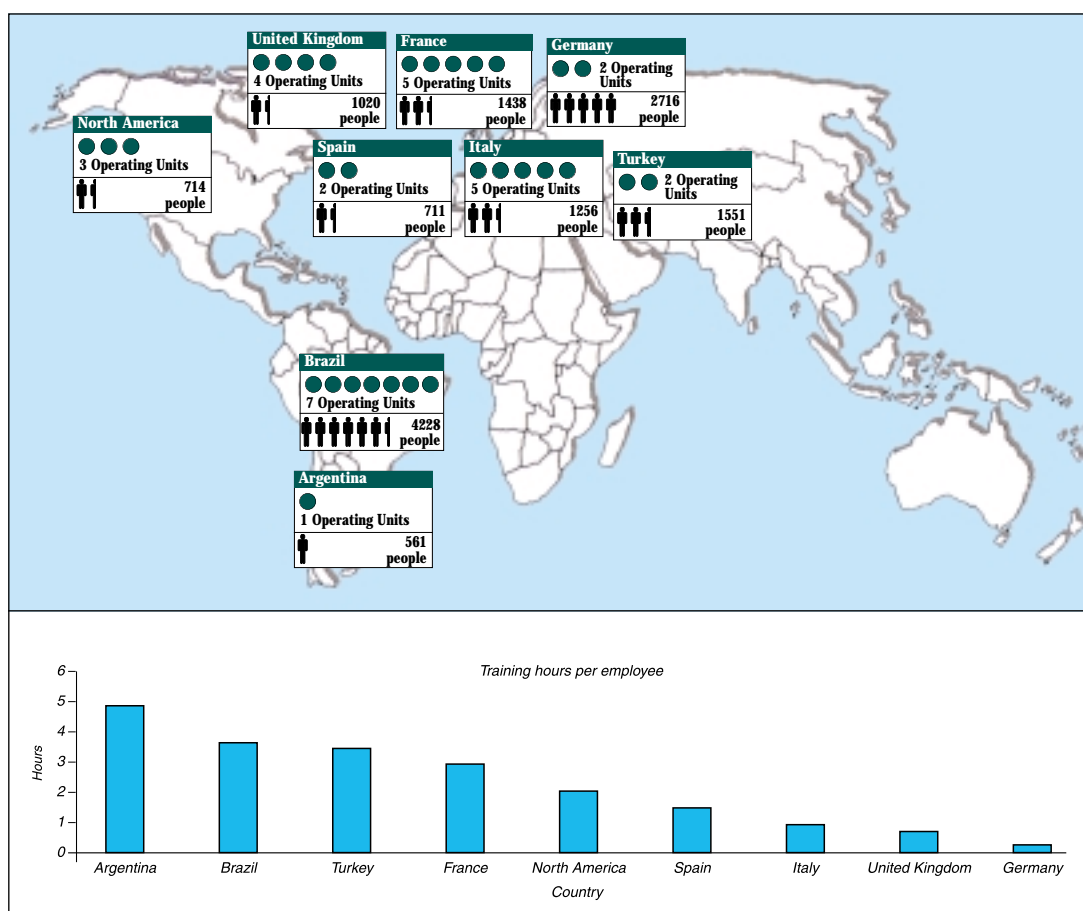
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Environmental information and training activities

To implement the Environmental Management System, information and training activities were carried out which involved staff at all levels, and included staff from external companies with direct environmental impacts on the Pirelli businesses. Staff received copies of Group and Affiliate Policies, and participated in a first information session on the characteristics of the System, including the role and responsibilities of individual departments. The departments more directly involved in environmental management received specific training geared to their expected operational duties.

ISO 14001: Information and training carried out to obtain certification (1998 - 2000 period)¹ - Operating Units and staff involved



¹ Figures and 52 Operating Units out of the 59 Units certified at the end of 2000

Environmental programmes

As described in the introduction, the task of defining specific environmental objectives and programmes has been delegated to individual Affiliates. As a typical example, the actions already taken or underway at Pirelli Tyres in Brazil are described below:

The Brazilian state of Acre, population 400,000, and mostly covered by the Amazonian forest, is one of the world's chief producers of natural rubber.

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By 1997 Pirelli had already signed an agreement with the local government for the training of the "seringueiros" in a new, and more efficient, method of gathering latex (the "seringueiros" are the several tens of thousands of workers engaged in the extraction of natural rubber).

This project is continuing, with the aim of promoting reforestation programmes, improving work and living conditions, encouraging economic growth, and safeguarding the Amazonian forest environment, while at the same time allowing the local population to continue to live in the forest and develop local jobs.



A "seringueiro" worker in Brazil

Pirelli's commitment in Brazil received an important recognition with the award of the "Ação Verde" prize, given during the Eco Rio Conference in 1992, for implementing a large scale project for the reduction of emissions to air from the Santo André tyre plant.

Main environmental programmes carried out in some Brazilian Operating Units (1996-1999)

Year	Operating Unit	Project	Objective	Result	Cost (Euro)
1996-1999	Campinas (Tyres)	Construction of a new water treatment and recycling plant	Reduction of the pollutive effect of liquid effluent and waste discharges	Improvement in the quality of discharge. 60% reduction in volume of discharge	380,000
1998	Santo André (Tyres)	Construction of a new water treatment plant	Reduction of the impact of discharge on surface waters	Reduction of the quantity of pollutants discharged	180,000
		Improvement in the industrial waste storage area	Prevention of soil and subsoil pollution	Optimisation of waste management	200,000
1999	Gravatái (Tyres)	Construction of a dedicated area for the storage of carbon black	Reduction of environmental impact (discharges and emissions to atmosphere)	Optimisation of storage and movement of material	120,000

Main environmental programmes carried out by some Brazilian Operating Units, for completion in 2000 - 2001

Operating Unit	Project	Objective	Investment (Euro)
Campinas (Tyres)	Optimisation of water treatment and recycling systems	Reduction of the quantity of water discharged, by recycling 70% of the waste water	110,000
	Replacement of superheated steam with nitrogen in the curing chambers	Reduced energy consumption (11%) and water (8%)	1,200,000
Gravatái (Tyres)	Separation of the main sewer networks (industrial/residential/drains)	Optimisation of waste treatment systems	120,000
Feira de Santana (Tyres)	Separation of the main sewer networks (industrial/residential/drains)	Optimisation of waste treatment systems	110,000
	Improvements to the storage area for carbon black	Reduced impact on the environment	100,000

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LCA: Life Cycle Assessment

In 1997 Pirelli Cables and Systems began a series of studies to evaluate the environmental impact of products using the Life Cycle Assessment (LCA) methodology of ISO 14040. Between 1999-2000 these activities continued, involving suppliers and customers, with the aim of identifying gaps in information and data.

The programme aims to set up Life Cycle Assessment studies on different products, so as to consolidate the methodology as a tool for evaluating and comparing products' environmental performance, and identifying potential areas for improvement. Details regarding these activities are contained in the relevant Sector chapters.

As well as carrying out LCA studies, Pirelli collaborates with public and private bodies at national and international level, participating in work groups and initiatives aiming to develop the LCA field in respect both of standards and in terms of methodology.

Management of environmental risks

During 1998 Corporate *Health & Environment* defined a protocol for data gathering to ensure that the Operating Units provide the Centre with homogeneous data on environmental performance. Particular attention is paid to information regarding water discharges, the presence of asbestos, and to potential contamination of the soil deriving from previous activities and from underground tanks.

A programme was initiated in 2000 for all Operating Units to check underground tanks and containers to identify possible future environmental problems, and to define the actions which will be appropriate to deal with such problems. This programme has been 50% completed, and will be concluded during 2001.

In order to manage risk, all purchases of activities or plants are preceded by *Environmental Due Diligence*, to identify potential risks, and to serve as a repository of information and knowledge which is important for deciding subsequent corporate choices. This activity is carried out by a specialist team co-ordinated by Corporate Health & Environment.

Environmental Due Diligence is important in aiding the acquisition decision in Pirelli, and in planning both management of the main environmental issues and any eventual requirements for local remediation.



Campinas (Brazil) tyre factory

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Property management

A number of Pirelli SpA Operating Units are currently sited in urban city centres: Pirelli's policy is to relocate as far as possible into dedicated industrial zones, restoring the areas it previously occupied to the level required for residential and commercial use.

The most significant and in many ways outstanding intervention in recent years, (one which is still underway), is the restoration of the 600,000 square metres of **Bicocca** in Milan - the historical location of Pirelli since the end of the 19th century.

The main restoration measures which have been taken, (at a cost of more than 11 million Euros), are:

- removal of asbestos insulation from more than 80,000m of piping;
- removal of more than 100,000m² of asbestos-cement roofing;
- more than 44,000 tonnes of soil have been either remediated or disposed of in landfill;
- disposal of 160,000 kg of transformers and capacitors containing PCB;
- environmental investigation of, and restoration of, old plant.



Bicocca university residence



Inside Bicocca University

Another example of relocating industry out of the city and restoring the land is that of **Guelph** - a Canadian town which has grown rapidly over the last few decades. Pirelli has transferred its production of power cables at Guelph to a designated industrial area, and restored the 32,500 m² original site, at a total cost of around 900,000 Euros.

The most significant restoration activities carried out are:

- removal of asbestos insulation from around 4,500 meters of piping;
- disposal of factory perimeter walls (650 m³) because they were potentially hazardous waste due to the presence of lead based paint;
- disposal of 3500 m³ of soil contaminated primarily by mineral oils.

The Kyoto Protocol: An agreement with the Environment Ministry in Italy

In December 1998 Pirelli signed an agreement with the Italian Environment Ministry to achieve concrete objectives in the context of implementing the Kyoto Protocol.

Pirelli's production processes

Through the agreement, Pirelli is committed to reduce by 14% the quantity of CO₂ emitted by its Italian plants by 2003 (relative to 1998 figures). Each Operating Unit will implement an energy plan involving re-evaluation and restructuring of energy sources, minimisation of energy losses, and close management of energy consumption. This programme will be carried out, despite the fact that Pirelli production technologies are not energy intensive.

Emissions of CO₂ (t/year) caused by energy consumption of Pirelli plants in Italy: the situation in 1998 and future objectives (at parity of production)

1998	2003
250,000	215,000 (-14%)

Initiatives in the Tyre sector

These initiatives are aimed mainly at reducing vehicle fuel consumption by reducing tyre rolling resistance, and also to pursue sustainable development for the tyre market in Italy.

As regards the first initiative, Pirelli research into the development of low rolling resistance tyres has significantly contributed to the reduction of emissions from vehicle fuel consumption. To pursue sustainable development for the tyre market, initiatives have been set up to reduce the intensity of use of non-renewable resources in product manufacture, to increase the useful life of the tyre, and to recover tyres when they reach the end of their life cycle.

For example, to extend the lifecycle of tyres, a programme is underway to increase retreading of used truck tyres, to reach 20% retreads per year by 2003.

Emissions of CO₂ (t/year) deriving from the use of Pirelli tyres in Italy from vehicles using Pirelli tyres²: situation in 1998 and future objectives (at parity of vehicle numbers)

1998	2003	2010
4,800,000	4,350,000 (-9%) ³	3,350,000 (-30%) ⁴

Initiatives in the Cables and Systems Sector

Electricity transmission through power cables is accompanied by the dissipation of energy through the heating of the conductors (*the Joule effect*). For a number of years Pirelli has been involved in research into materials which drastically reduce *the Joule effect*-superconductors.

The viability of these cables is coming ever closer, and trial cables in live networks are under installation in the USA. As a world leader in this Technology, Pirelli is continuing to improve the materials used to allow operation at higher temperatures, in order to reduce costs and improve the overall efficiency of the system.

In traditional cables, Pirelli is developing new designs and materials, as illustrated in the following Section. For example, the development of thermoplastic materials to substitute cross-linked products results in reduced energy use in production. In addition, thermoplastic materials are easier to recover and can be recycled, thereby reducing energy use and emission of pollutants in manufacturing new products.

² deriving from fuel consumed in overcoming tyre rolling resistance, relative to the vehicles circulating in Italy, and in proportion to Pirelli's market share

³ figure calculated on the basis of the increase in sale of new products with reduced rolling resistance and based on Pirelli's overall market share, and assuming that the vehicle technology, and the number of vehicles circulating on Italian roads, remains unchanged

⁴ see previous note

Cables and Systems Sector

Sector activities

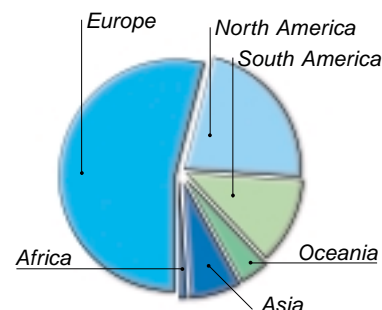
Production and Quantitative Data

CABLES AND SYSTEMS SECTOR

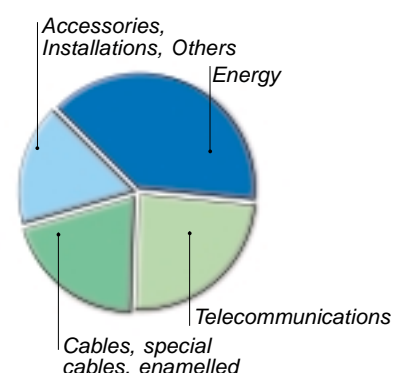
The **Cables and Systems Sector** has 65 Operating Units (44 in Europe, 6 in North America, 6 in South America, 9 in Australia, Asia and Africa) and 20,637 employees, with 4,591 million euros of sales.

A real technological partner for its customers worldwide, Pirelli Cables and Systems has a fully integrated range of products, components, systems, engineering and installations for global turnkey projects, especially in the fields of telecommunications and energy transmission.

The commitment to correctly managing the environment and improving performance has led in recent years to the company making substantial investments in the Operating Units: at the end of 2000, 45 Operating Units had been certificated under ISO 14001.



Sales in Cables and Systems Sector by geographical area and product type

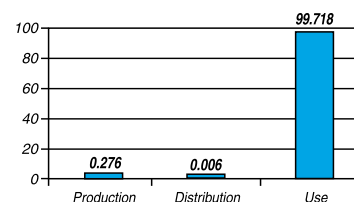


SECTOR ACTIVITIES

Results of Life Cycle Assessment Studies

In June 1997 Pirelli Cables and Systems began a series of Life Cycle Assessment studies, conducted according to ISO14040. The first studies, using aluminium and copper power cables, showed the potential of this methodology, its limits, and the conditions under which to use it, and identified areas for possible improvement.

The LCA methodology was subsequently used for other products (*building wires, overhead lines, enamelled wire*).



Energy Consumption: percentage contribution from the various phases of the cable life-cycle (the example is a low voltage copper energy cable)

The use phase is always that which gives the most severe environmental impact because of the heat emissions due to the *Joule effect*. The next most important factor is the production of raw materials, especially copper, which, if recovered at the end of its life cycle, provides a not insignificant reduction of the overall impact.

Programmes in progress include an enlargement of the LCA studies and the development of procedures to better integrate LCA in the decision making process for new products. To continue the development of knowledge and skills in LCA, Pirelli Cables and Systems is working with experts, with customers and with the European cable industry in the Environment Group of *Europacable*.

Cables and Systems Sector

Sector activities

Production and Quantitative Data

The *Ecology Line*TM product range

There is widespread use of lead-based compounds in thermoplastic materials, mainly as a stabiliser for the base polymer.

The main environmental problems arising from the use of lead compounds in polymers are the potential dangers deriving during the production process and especially the end-of-life of the cable. The presence of lead makes waste incineration environmentally undesirable, and renders recovery or reuse of the compound problematic.

To address this issue, Pirelli has, since 1996, been producing a new range of products known as the *Ecology Line*TM, whose insulation and sheath are lead free.



The *Ecology Line* products

Installation

Underground cables

More than 95% of electricity transmission cables are above ground: in Italy alone there are more than 60,000 km of installed overhead lines. This type of installation has for some time been under debate because of its possible environmental impact. An alternative is to use underground cables which completely eliminate the visual impact of power lines above ground and, more importantly, make it possible to use innovative designs to reduce or eliminate exposure to electromagnetic fields produced by the passage of the electricity. The undergrounding of lines must be done so as to be compatible with the environment, and to minimize the damage to the ecosystem. Pirelli Cables and Systems has developed and patented innovative products and techniques for undergrounding.

Novel products include the “Airbag”TM cable which is designed to be buried, but which eliminates bitumen and all metallic armouring (lead or steel wire) from its’ construction.

For undergrounding, a new machine has been developed to carry out “One shot laying”TM, which enables the trench to be dug, the cable to be laid and the trench refilled with the same soil - all in a single operation. This substantially reduces laying times, and simultaneously greatly reduces installation energy consumption while eliminating excavation waste.



A mechanical underground cable layer system

Cables and Systems Sector

Sector activities

Production and Quantitative Data

Sub-sea cables

The laying of sub-sea cables is carried out by the company's cable ship, the *Giulio Verne*, which recently underwent modifications in line with the most modern criteria for environmental protection. Investments included the installation of new treatment equipment for organic waste and waste water. Stainless steel tanks were introduced for the recovery of fluid lost from the cables during the jointing process, thus preventing dispersion into the environment, and allowing re-use of the fluid.



The *Giulio Verne* sub-sea cable laying ship

The use of unpainted drums

The delivery of medium and high voltage cables is usually carried out using wooden drums which are then returned to Pirelli for reuse.

In 1994 Pirelli began to use wooden drums with data burnt on. This avoids having to paint some million and a half square meters of drums a year, corresponding to an annual reduction of emissions into the atmosphere of about 70,000 litres of solvents (this eliminated more than 25% of the total consumption of solvents in the Cables and Systems Sector).



Medium and high tension wooden cable drums

Recycling

Copper in cables is recovered at the end of the life cycle. The remaining materials are usually landfilled or incinerated. More recently, specialist recycling plants have increased in number and are developing new technology which permits the separation and reuse of non-metallic materials.

The traditional method for recycling involves the comminution of the cable and subsequent use of mechanical and hydro-gravimetric methods to separate out the different materials. Separation of the metals is now at a high level, and the resulting non-metallic residue can be more than 99% pure, making further separation possible. Polyvinyl chloride and polyethylene may be easily separated and reused, (usually not in cable applications), but in shoe soles, carpet backings etc. Crosslinked materials have a restricted range of possibilities for recycling, but may at least be incinerated to recover energy.

New generation Pirelli cables have been designed so as to facilitate recovery and recycling both through the elimination of hazardous materials (e.g. lead and blocked conductors) and through using specific novel designs (AirbagTM).



A section of the Air Bag cable

Cables and Systems Sector

Sector activities

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PRODUCTION AND QUANTITATIVE DATA

Power and Telecom Cables

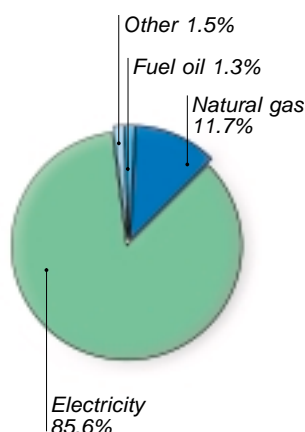
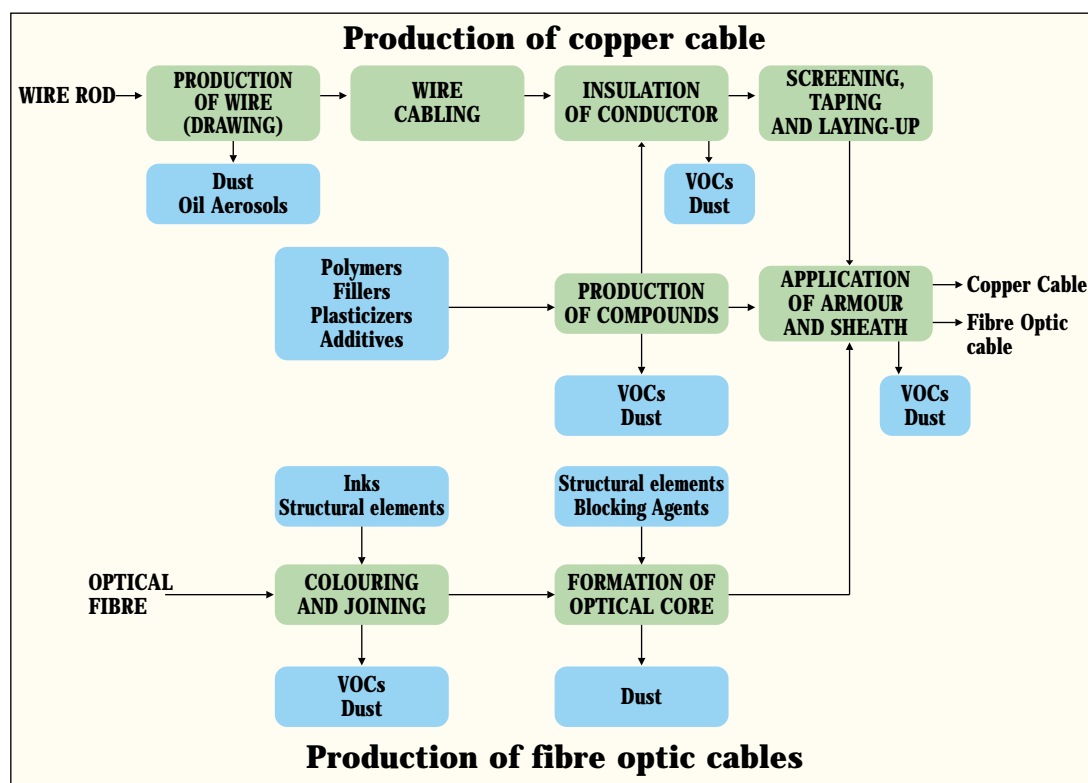
Pirelli produces cables for power transmission - from high to low voltage, for land, sea and aerial applications, - and a wide range of accessories. For telecommunications, Pirelli is a leading producer of advanced optical fibres and fibre optic cables.

The production process varies according to the type of cable and its intended use. In general terms, the main processes and the main *inputs* and *outputs* related to cable production are shown in the figure below.



Production of sub-sea cable at Erith, England

Main production phases and main inputs and outputs in the production of a cable



Energy consumption by energy source by power and telecommunication cable production Units (2000)

QUANTITATIVE DATA

In the Operating Units which produce power and telecommunication cables, more than 95% of **water consumption** derives from cooling and steam, while the rest is used for general and sanitary purposes. The differences in consumption per tonne of production in the different geographical areas is due partly to the different production mixes, and partly to the degree to which water recycling is employed in the units.

Cables and Systems Sector

Sector activities

Production and Quantitative Data

As there is no discharge of process water, the polluting **impact** is negligible. Nevertheless, all Pirelli Operating Units carry out regular checks of waste water to ensure conformity with regulations.

Cable production consumes only low levels of **energy**. The increase of the energy consumption per tonne of product in South America is due to a slight overall increase in energy consumption together with a slight decrease of production.

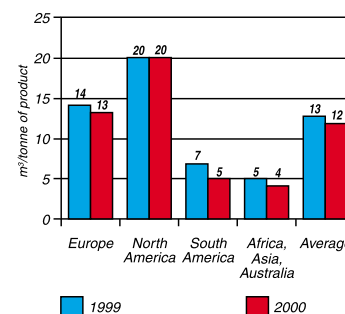
There is also a very reduced use of **solvents**: the differences regarding the use of solvents in the various geographical areas are in practice relatively minor in relation to the overall quantities involved, and result essentially from differences in the product mix.

The currently reported high figure for non-hazardous **wastes** found in North America is linked to the demolition activities carried out in the two year period. On the other hand, the increase in hazardous wastes in South America is a result of one-off disposal activities in 2000, and in improvement projects during the implementation of the Environmental Management System.

Consumption of water by power and telecommunication cable production Units⁵

	1999		2000	
	(m ³)	(m ³ /tonne of product)	(m ³)	(m ³ /tonne of product)
Europe	8,634,043	14	8,711,345	13
North America	2,326,776	20	2,514,681	20
South America	619,774	7	407,475	5
Africa, Asia, Australia	277,228	5	363,362	4
Total/Average	11,857,821	13	11,996,863	12

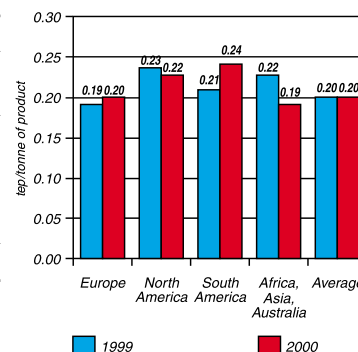
⁵ 1999: excluding South Africa (1 Operating Unit), Hungary (3 Operating Units)



Energy consumption by power and telecommunication cable production Units⁶

	1999		2000	
	(tep)	(tep/tonne of product)	(tep)	(tep/tonne of product)
Europe	123,464	0.19	134,234	0.20
North America	26,098	0.23	27,220	0.22
South America	17,627	0.21	18,697	0.24
Africa, Asia, Australia	12,185	0.22	16,232	0.19
Total/Average	179,374	0.20	196,383	0.20

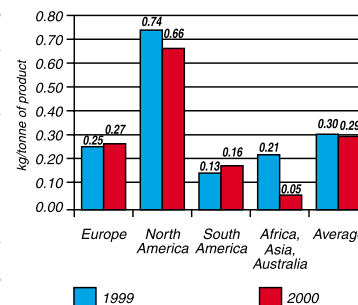
⁶ 1999: excluding South Africa (1 Operating Unit), Hungary (3 Operating Units)



Consumption of solvents by power and telecommunication cable production Units⁷

	1999		2000	
	(t)	(kg/tonne of product)	(t)	(kg/tonne of product)
Europe	157,1	0.25	182,0	0.27
North America	84,1	0.74	82,2	0.66
South America	10,8	0.13	12,7	0.16
Africa, Asia, Australia	11,3	0.21	4,3	0.05
Total/Average	263,4	0.30	281,2	0.29

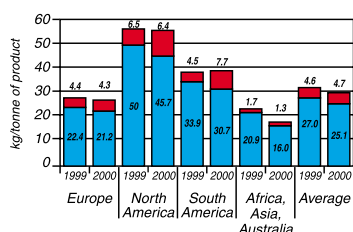
⁷ 1999: excluding South Africa (1 Operating Unit), Hungary (3 Operating Units)



Cables and Systems Sector

Sector activities

Production and Quantitative Data



■ Non-hazardous waste ■ Hazardous waste

Waste produced by power and telecommunication cable production Units^{*} (classified according to the categories of the European Union)

	1999				2000			
	Hazardous waste		Non-hazardous waste		Hazardous waste		Non-hazardous waste	
	(t)	(kg/tonne of product)	(t)	(kg/tonne of product)	(t)	(kg/tonne of product)	(t)	(kg/tonne of product)
Europe	2,824	4.4	14,323	22.4	2,737	4.3	13,453	21.2
North America	738	6.5	5,704	50.0	806	6.4	5,702	45.7
South America	374	4.5	2,820	33.9	615	7.7	2,445	30.7
Africa, Asia, Australia	77	1.7	943	20.9	71	1.3	866	16.0
Total/Average	4,013	4.6	23,790	27.0	4,229	4.7	22,466	25.1

^{*} 1999 and 2000: excluding China (2 Operating Unit), Indonesia (1 Operating Unit), South Africa (1 Operating Unit), Hungary (3 Operating Unit)

Optical Fibre

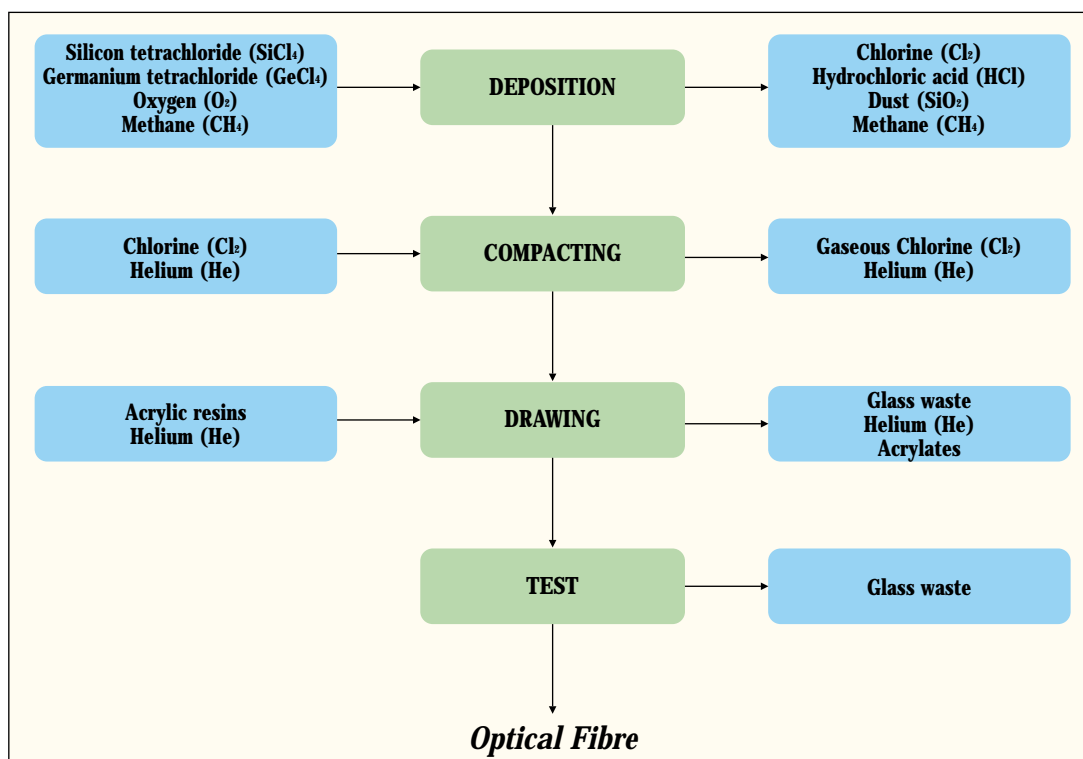
Optical fibre production is carried out in 4 Operating Units of the Cables and Systems Sector: two in the UK, one in Brazil and one in Italy.

The processes differ between Units in that they are each based on specific patents.



The deposition phase of an optical fibre production

Optical fibre – Main production phases and main inputs and outputs (with reference to the Battipaglia FOS Operating Unit)



EMISSIONS TO ATMOSPHERE

During 1998 the Cables and Systems Sector set concentration and emission limit objectives for all the Operating Units producing optical fibre. The limits are measured on the basis of production quantity (mass flow), and correspond to Italian standards (the most severe). The limits must be respected by all newly formed Operating Units. Existing operating Units have programmes to align with the targets.

Atmospheric emission limits set by the Cables and Systems Sector for Operating Units producing optical fibre (limits imposed by Italian legislation)

Emission	Mass flow (g/h)	Concentrations (mg/m ³)
Chlorine	≥ 50	5
Hydrochloric acid	≥ 300	30
Hydrofluoric acid	≥ 50	5
Particulates	≥ 500	50
	≥ 100	150

For the enlargement of the Italian FOS Operating Unit in Battipaglia, technologies adopted allow compliance with more severe concentration limits defined by the Regione Campania.

QUANTITATIVE DATA

In respect of **atmospheric emissions**, the limits set by the Sector have always been met, except for a parameter in one Operating Unit (for which measures have been adopted to rectify the situation – see note 9).

Atmospheric emissions – Average concentrations of pollutants relative to the limits set by Pirelli

	1999 (mg/m ³)	2000 (mg/m ³)	Reference limits (mg/m ³)
Chlorine ⁹	1.3	0.9	5
Hydrochloric acid	5	3	30
Hydrofluoric acid ¹⁰	0.9	0.3	5
Particulates	16	18	50

⁹ The levels of chlorine shown in the table are for three Operating Units. One UK Operating Unit shows levels above the Sector limits (39 mg/m³ of chlorine in 2000): specific measures have been taken which will quickly rectify this situation.

¹⁰ The figure refers only to Operating Units in which the pollutant is present.

Consumption of water and energy by fibre optic production units

	1999	2000
Water consumption (m ³ /km fibre)	0,10	0,08
Energy consumption (tep/1000 km fibre)	3,8	3,4

Cables and Systems Sector

Sector activities

Production and Quantitative Data

Waste produced by Operating Units producing optical fibre (classified according to the categories of the European Union)

1999		2000	
Hazardous (kg/1000 km fibre)	Non hazardous (kg/1000 km fibre)	Hazardous (kg/1000 km fibre)	Non hazardous (kg/1000 km fibre)
14	190	11	163

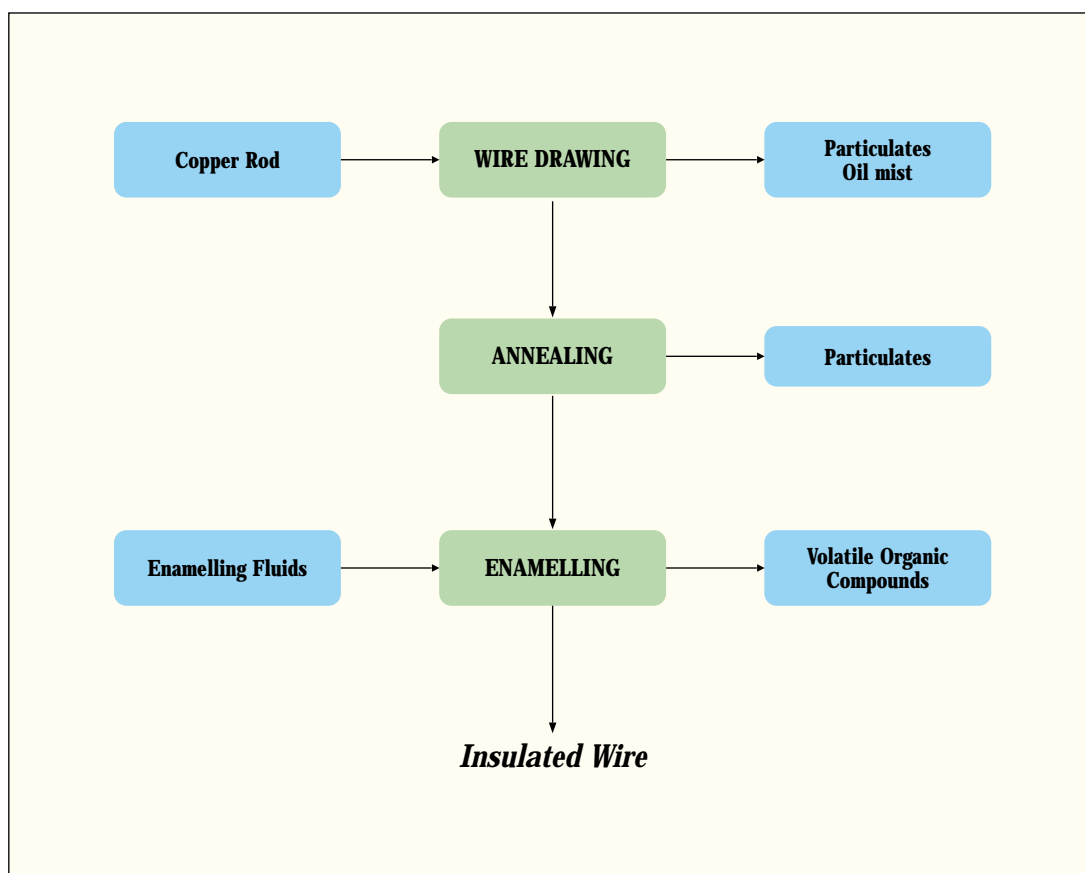
Enamelled wires

The Cables and Systems Sector produces copper wire with enamel insulation, which is used for production of electric motors and windings. Production is carried out in 4 Operating units, two of which are in Italy, one in Brazil and the other in Spain. Although this production represents only 4% of the Sector's revenues the information has been added to the Report because of its impact on the environment.



Reels of enamelled wires

Enamelled wire - Main process phases and main inputs and outputs



ATMOSPHERIC EMISSIONS

Atmospheric emissions from enamelling processes may cause a problem due to the very low olfactory threshold of the substances emitted. For this reason, for example, the *Invex* Operating Units at *Quattordio (Italy)*, were equipped with post-combustion catalytic systems, which, in addition to giving a more effective reduction in emissions, also make it possible to achieve a good level of energy recovery.

The *Invex* units have signed a specific agreement regarding emissions with the municipality of *Quattordio*, and have committed themselves to the regular exchange of information.

QUANTITATIVE DATA

The technology for producing enamelled wire uses **water** only for cooling machines and for producing steam. As there is no process water, pollution from waste water is negligible, although in any case it is subjected to regular checks.

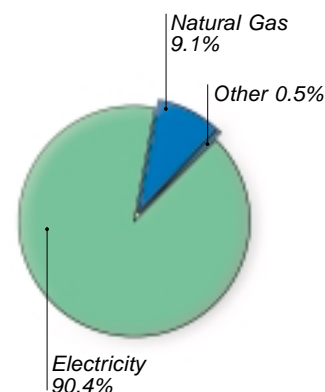
Compared to other types of production in the Cables and Systems Sector, there is greater use of **solvents** and **energy consumption**, because of the characteristics of the production process.

Water consumption by enamelled wire Production Units

1999		2000	
(m³)	(m³/tonne of product)	(m³)	(m³/tonne of product)
281,684	4.3	337,995	4.7

Consumption of energy by enamelled wire Production Units

1999		2000	
(tep)	(tep/tonne of product)	(tep)	(tep/tonne of product)
28,343	0.43	30,207	0.42



Energy consumption by
enamelled wire Production Units
(2000) by energy source

Consumption of solvents by enamelled wire Production Units

1999		2000	
(t)	(kg/tonne of product)	(t)	(kg/tonne of product)
3,540	54.3	3,819	53.0

Waste produced by enamelled wire Production Units (classified according to the categories of the European Union)

1999				2000			
Hazardous waste		Non-hazardous waste		Hazardous waste		Non-hazardous waste	
(t)	(kg/tonne of product)	(t)	(kg/tonne of product)	(t)	(kg/tonne of product)	(t)	(kg/tonne of product)
698	10.7	3,679	56.4	772	10.7	3,251	45.1

Cables and Systems Sector

Sector activities

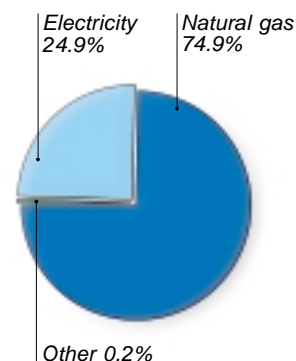
Production and Quantitative Data

Water consumption by copper rod manufacturing Units

1999		2000	
(m³)	(m³/tonne of product)	(m³)	(m³/tonne of Product)
23,469	0.31	24,488	0.32

Energy consumption by copper rod manufacturing Units

1999		2000	
(tep)	(tep/tonne of product)	(tep)	(tep/tonne of product)
5,315	0.07	5,903	0.08



Energy consumption copper rod manufacturing Units (2000) by energy source

Consumption of solvents by copper rod manufacturing Units¹¹

1999		2000	
(t)	(kg/tonne of product)	(t)	(kg/tonne of product)
212.8	2.8	207.2	2.7

¹¹1999: excluding South Africa (1 Operating Unit), Hungary (3 Operating Unit)

Waste produced by copper rod manufacturing Units (classified according to the categories of the European Union)

1999				2000			
Hazardous waste		Non-hazardous waste		Hazardous waste		Non-hazardous waste	
(t)	(kg/tonne of product)	(t)	(kg/tonne of product)	(t)	(kg/tonne of product)	(t)	(kg/tonne of product)
345	4.5	241	3.2	200	2.6	195	2.6



Production of enamelled wires

Tyre Sector

Sector activities

Production and
Quantitative Data

TYRE SECTOR

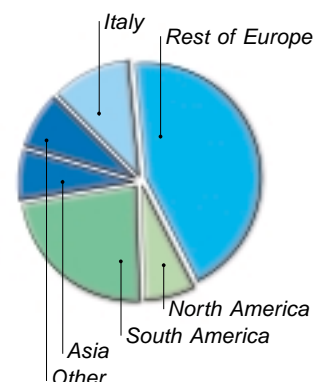
The **Tyre Sector** has 22 Operating Units and 20,637 employees in Argentina, Brazil, Egypt, Germany, Great Britain, Italy, Spain, Turkey, Venezuela, and the United States, alongside which is a global commercial network operating in 120 countries. The company is one of the top 5 producers worldwide, with 2,880 million euros of sales.

Substantial investments have been made in the Tyre Sector to reduce the environmental impact of the Operating Units, especially through the ongoing implementation of environmental management systems.

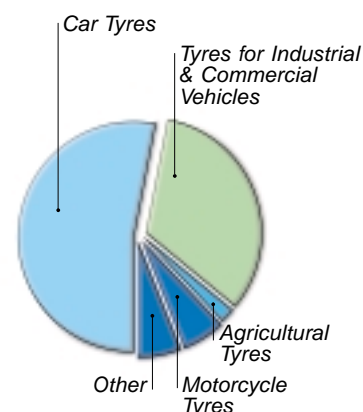
For the Operating Units, investments for environmental improvement, for working environment improvement and for fire prevention totalled 4.5 million euros in 1999 and 2.2 million euros in 2000. The 1999 data reflects relevant activities carried out for ISO 14001 certification.

However, the data does not include investments which have been carried out to improve industrial efficiency, but which have coincidentally resulted in an improvement in environmental performance.

Further investments were made in research and development for new processes and products, some of which are described in detail in the following chapters.



Tyre sector revenues in 2000 by geographic area and product type



SECTOR ACTIVITIES

MIRS

In December 1999 Pirelli launched a completely new technology for the production of tyres: MIRS – Modular Integrated Robotized System. This is currently being piloted for industrial production.

How MIRS works

The traditional way in which tyres are made involves 13 process stages, in addition to the preparation of the polymer compounds. All 13 are separate operations, carried out by large machines. At the end of each operation the semi-finished product must be sent to a cooled store, and, if necessary, covered with protective coverings and anti-tack additives.

In the MIRS process the number of production stages is reduced to 3: preparation of the semi-finished product, tyre building and curing, and finishing.



The use of the MIRS technology reduces the environmental impact of tyre production

Tyre Sector

Sector activities

Production and Quantitative Data

Semi-finished materials are produced by extruding compound in strips to continuously feed a robot system, which, in turn, deposits the material onto a rigid drum on which the tyre is built.

The last robot builder takes the drum with the raw tyre to be cured. This takes place in a “wheel” synchronized to the building times. The cured tyre then arrives at the finishing area.



The MIRS factory at Bicocca

New mini-factories

The MIRS technology uses “mini-factories” in many locations. The whole production process is concentrated within an extremely limited area, drastically reducing the need for storage between the various stages. In the traditional process, only 12% of the materials are being processed at any given moment while with the MIRS process there is no interruption between stages. The average transit time for the materials (which traditionally is 6 days) is reduced to 72 minutes.

The environmental value

To calculate the real benefit in terms of reduced environmental impact which derives from using the MIRS process, Pirelli has conducted a preliminary environmental balance sheet, with the help of the Department of Environmental and Territorial Science of the University of Milan at Bicocca, comparing the MIRS process to traditional methods.

The results show at factory level:

- an 18% reduction in the energy needed for production because of lower dispersion losses;
- reduced wastage, dropping to 1% from 2.5% in the traditional process. This reduction in waste also results in an additional 1.5% reduction in energy consumption and emissions.

In addition, it should be emphasised that MIRS, at parity of production, makes it possible to reduce the surface area taken up by the factory plant and, potentially, to reduce the impact of the vehicles used for transporting the finished product, by giving the possibility of local production being carried out near the place where the tyres are needed.

Main input/output differences in the MIRS process and distribution compared to the traditional process

Production

- *Compound production*: pelletisation of compound is eliminated (and consequently so are the anti-tack agents, cooling water, and transport of the pellets and pellet compound), plus there is a reduction in heat energy used in the last phase of compounding
- *Semi-finished*: solvents, polyethylene, varnish eliminated; cooling of the semi-finished materials no longer required; 90% reduction of waste fabric and 50% reduction in waste compound.
- *Tyre Building Process*: unchanged.
- *Curing*: painting eliminated, less heat needed by the curing oven.
- *Finishing*: compound eliminated.

Distribution

- 10% reduction in journeys for vehicles, assuming an economic model with new production units built around the country

Tyre Sector

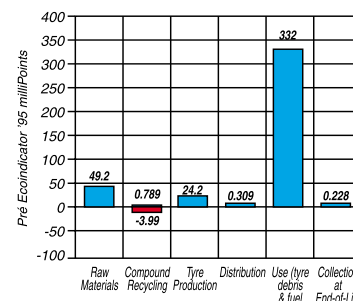
Sector activities

Production and Quantitative Data

The results of Life Cycle Assessment

Pirelli Tyres began its first *Life Cycle Assessment* study using the ISO14040 methodology and the *Sima-Pro*TM software produced by *Pré Consultants*. The first LCA study focussed on a widely used product, namely the P2000TM, 165/65 R14 passenger car tyre. The study has been developed with reference to the Italian scenario.

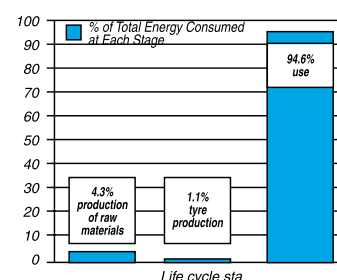
The results show that the stage when the tyre is in use has by far the most significant environmental impact. This impact mainly derives from the consumption of fuel necessary to overcome rolling resistance and, for a small part, for tyre debris from abrasion.



Results of the Life Cycle Assessment on a car tyre

This study was subsequently broadened, including the results of the LCA conducted on steel cord, and postulating four different end-of-life scenarios, namely:

- the recovery of steel and the rubber powder obtained by granulation of the mixture at low temperature ("powder recycling" scenario);
- tyre combustion in a modern technology incinerator ("modern incinerator" scenario);
- the production of fuel from waste (CDR, *Combustibile Da Rifiuto*) according to *Pirelli Ambiente* specifications, and its use as alternative fuel in power stations ("CDR-Pirelli" scenario);
- tyre combustion in cement kilns ("cement kilns" scenario).



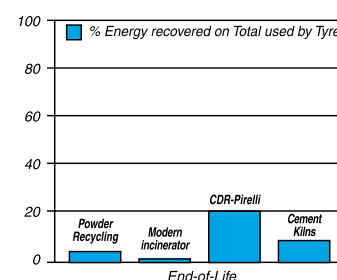
Percentage contribution of the various stages of the car tyre life cycle to energy consumption

The energy percentages expressed in the figure represent what has really been saved in the 4 different scenarios, net of eventual energy consumption arising from the recovery process.

On the basis of the first results obtained, it has been decided to develop a research project in collaboration with the Department of Environmental Sciences of the University of Milan-Bicocca, with the objective of studying in depth the potential environmental impact of tyre debris.

At the same time, studies on design have been further developed, aiming at maximising the reduction of the rolling resistance index, while still guaranteeing safety and performance requirements.

Together with other European tyre producers, a new project on LCA has been funded to evaluate the environmental impact of a typical vehicle tyre in the context of the European scenario.



Energy recovered from a tyre in the various end of life scenarios (referring to a car tyre)

Tyre Sector

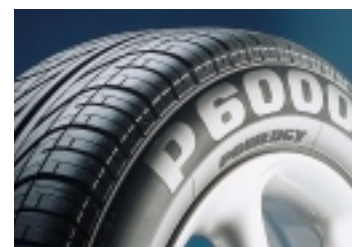
Sector activities

Production and
Quantitative Data

The ENERGY tyre range

Products with lower rolling resistance have been on sale since 1996. These use a compound mix which contains silica instead of carbon black. The compounds obtained in this way give fuel savings of 1% to 3%.

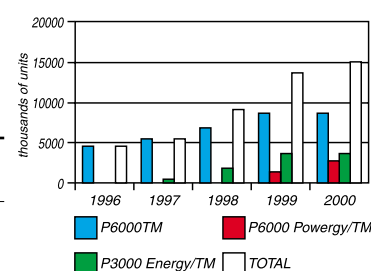
In addition, for the development of new products like *P6™*, *P6 four seasons™* and *P7™*, a new and sophisticated system has been implemented: ELRR (Extra Low Rolling Resistance), allows further reduction in rolling resistance through specific modifications to all tyre components, particularly to the belt, sidewall and carcass compounds.



P6000 Powergy, with silica compound tread

Reduction of the coefficient of rolling resistance¹² obtained by modifying the tread rubber (compared to a P6000™ tyre with tread rubber from a carbon black-based compound)

	Reduction of coefficient of rolling resistance (%)
P6000™ with tread rubber using a compound of 50% carbon black and 50% silica	- 9%
P6000™ with tread rubber using a compound made entirely from silica (P6000 Powergy™)	- 22%



Sales of the "Energy" range of tyres

Tyre Debris

A tyre loses about 10% of its weight during its life due to abrasion from the road surface. The material which is worn off is dispersed into the environment in the form of micro-particles, known as tyre debris.

The impact of these particles on the environment is currently under study. In a research study carried out with other European tyre manufacturers debris from new tyres was collected and analysed using chemical as well as biological tests. The tests which have been carried out in independent laboratories, so far indicate that the debris is basically innocuous. Concentrations of substances found at the roadside, which might be considered toxic, are considerably below the levels regarded as critical for the environment¹³.



Finished product control

¹² Calculated at 80 km/h (ISO 8767 tests). The table shows the % delta value expressed in kg/ton.

¹³ These results are being published in a technical journal.

Tyre Sector

Sector activities

Production and
Quantitative Data

Results of chemical tests carried out on *tyre debris* extract

pH a 20°C	7.3
COD	2100 mg/kg
BOD5	650 mg/kg
COPPER	< 0.1 mg/kg
ZINC	11.0 mg/kg
PHENOL (index)	0.2 mg/kg
AROMATIC POLYCYCLIC HYDROCARBONS CARCINOGENS CLASSIFIED BY THE EUROPEAN COMMUNITY	< 0.001 mg/kg

(*) Leaching done using the ISO 8213 method (100 g/l, 24 hours)

Results of eco-toxicological tests carried out on *tyre debris*

INHIBITION (tests on type <i>S. Capricornutum</i> algae; ISO 8692 method)	
CE 50 (72 hours)	15,000 mg/l
CE 50 (96 hours)	15,000 mg/l
MOBILITY (tests on <i>Daphnia Magna</i> ; ISO 6341 method)	
PRE TEST	TOXIC
CSOE 50 (24 hours)	73,000 mg/l
MORTALITY (tests on <i>Brachidanio Rerio</i> ; ISO 7347 method)	
CL 50 (24 hours)	68,000 mg/l
CE 50:	concentration which reduces algal growth by 50%
CSOE 50:	maximum concentration at which no effect is visible
CL 50:	concentration which causes the death of at least 50% of the animals exposed to it

Research is currently under way with the Department of Environmental Sciences at the University of Milan-Bicocca with the following objectives:

- 1) To establish the form and dimension of the *tyre debris* deposited on road surfaces;
- 2) To define a distributive model of *tyre debris* relative to the various environmental sectors in order to identify where it finally ends up;
- 3) To evaluate the aquatic eco-toxicological impact using standardized methods of elution of tyre compound scrapings (tyre debris produced artificially).

Tyre Sector

Sector activities

Production and
Quantitative Data

Aromatic oils

Aromatic oils are used by the tyre industry as polymer softeners and extenders. Their significance derives from their being classified as carcinogenic by the European Community.

Pirelli has replaced its aromatic oils with non-toxic products for its truck tyres, which is possible because of the specific characteristics of these tyres.

Aromatic oils were replaced in winter truck tyres by oils with lower environmental impact, because at low temperatures the new oils still perform well and give good levels of safety. For the other tyre types substitution is more problematic in technological terms, and currently is not possible. Laboratory studies on alternatives are in progress which will be followed by field tests.



Pirelli Winter, Snow Control, with silica based mix

Zinc oxide

Zinc oxide is used as an activator in the vulcanisation process. Pirelli, with other European tyre producers and the European Association of Zinc Producers (ZOPA), has set up a work group to provide technical support to the European Commission, currently carrying out a *risk-assessment* of material. Together with European partners it has presented the project "*Reduction of Zinc in rubber products for a better environment*", which has been approved by the European Commission and officially started in February 2001. The objective is to see if it is possible to drastically reduce the presence of zinc oxide in rubber products by up to 50%.

Disposal of tyres at the end of their life

This problem is being tackled by the tyre industry together in ad hoc work groups under the aegis of the trade associations or national consortia rather than by the companies separately. The disposal of old tyres is strictly controlled by waste disposal legislation or specific standards. It is envisaged that a ban on waste disposal will be introduced within a few years (by 2006 in Europe) and manufacturers will be obliged to collect and recover their tyres.

It is in this context that the classification "End-of-life tyres" fits, deriving from the new classification in the recent "Waste Catalogues" of the Basle Convention and the European Commission. This classification distinguishes EoL tyres from "Used Tyres" (used tyres still have some life in them and can be reused).

Tyre Sector

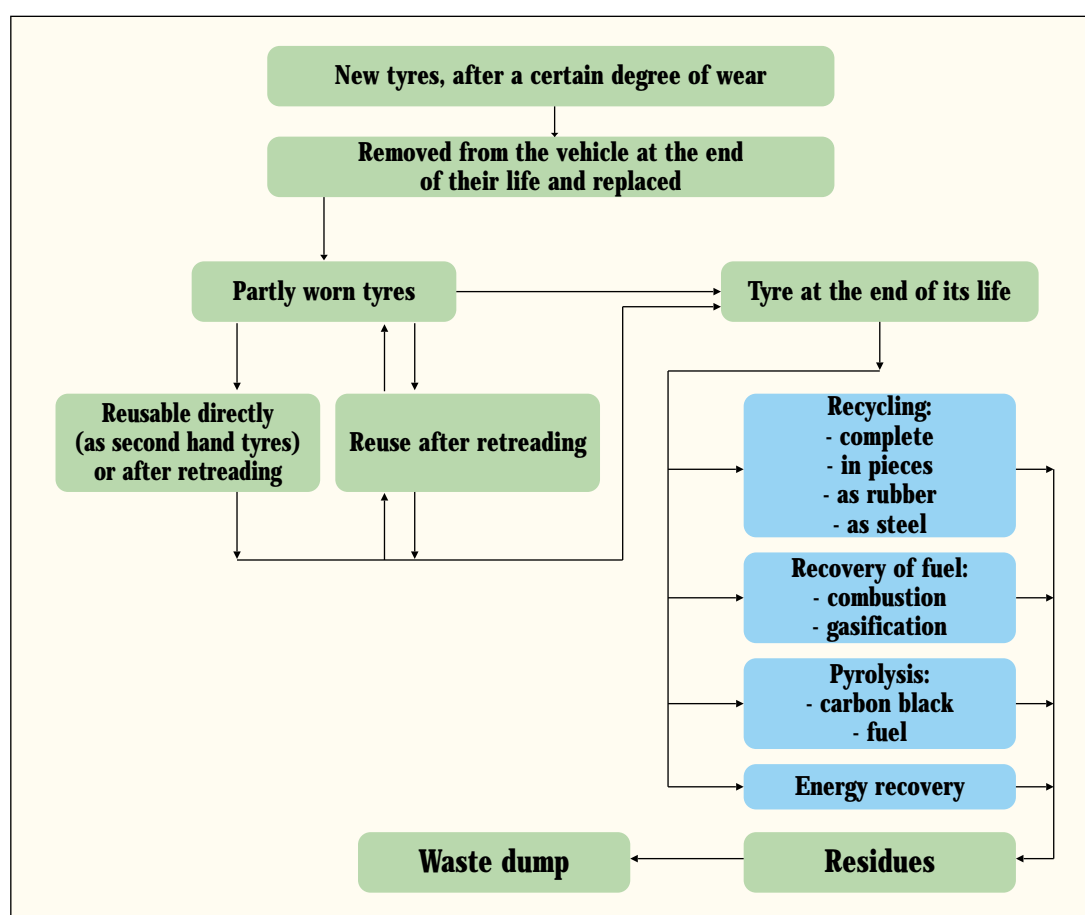
Sector activities

Production and
Quantitative Data

At the moment, the possibilities for recycling materials or parts of tyres is relatively limited because of the lack of technologies for large scale reuse.

The main waste disposal technology involves energy recovery, exploiting the fact that tyres have an energy potential similar to good coal. Energy recovery is achieved by using tyres at the end of their life in existing or dedicated plant, or through adding tyres to solid urban waste destined for incineration. This latter technique (CDR) was developed and patented by *Pirelli Ambiente*.

Different types of used tyres and their possibilities at the end of their life



Tyre Sector

Sector activities

Production and Quantitative Data

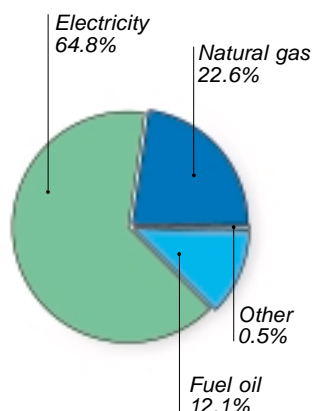
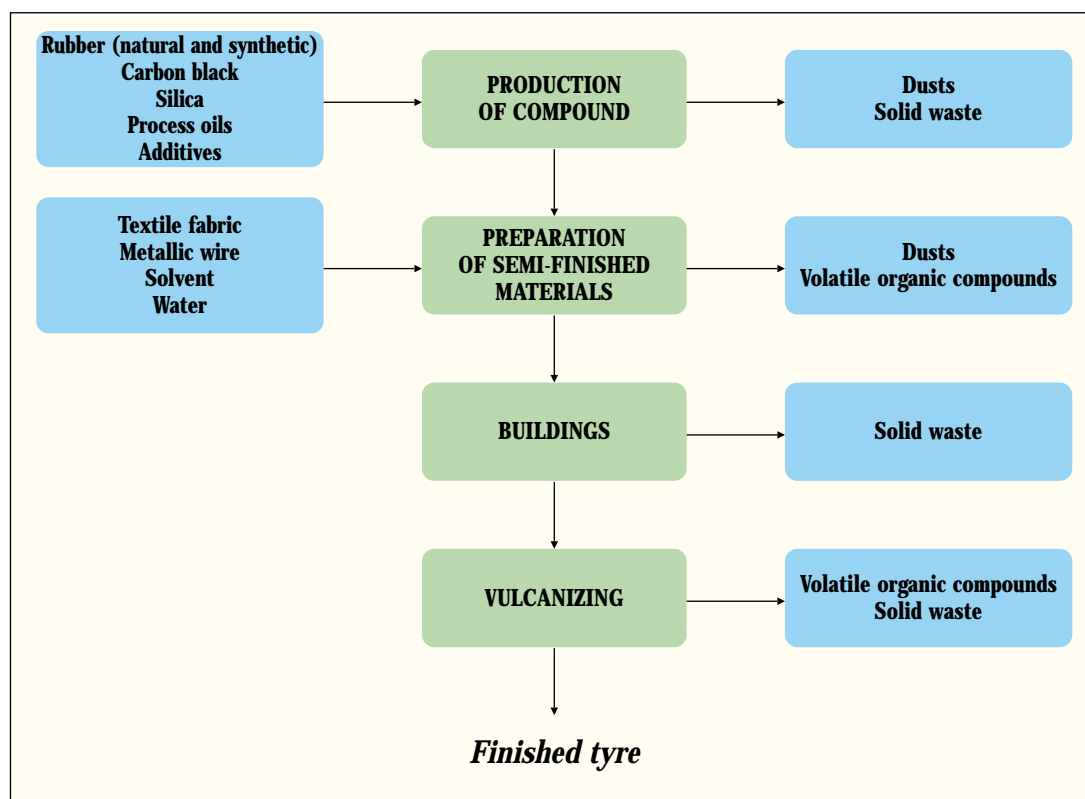
PRODUCTION AND FIGURES

Tyres

The range of Pirelli products includes car tyres (standard, high performance and sports), and tyres for offroad use, goods vehicles, buses and motorbikes.

The main process phases and the main inputs and outputs are shown in the table below.

Main process stages and main inputs and outputs in tyre production



Energy consumption by Tyre Production Units (2000)

QUANTITATIVE DATA

More than 95% of **water consumption** is for cooling and the production of steam. The rest is used for general and sanitary purposes. The differences in consumption of water per unit tonne of product in the different geographical areas results partly from the different production mixes used, and in part from differences in the level of water recycling within the various units.

As there is no process water, the degree of pollution is negligible. All waste water is in any case subjected to controls to ensure it meets legal requirements.

The processes used for the new range of tyre products have reduced **consumption of solvents** by over 80%, by completely eliminating the painting and building phases. In South America, where the market for conventional, non-radial, tyres is strong as well as for tyres for agricultural uses, consumption of solvents is higher.

Tyre Sector

Sector activities

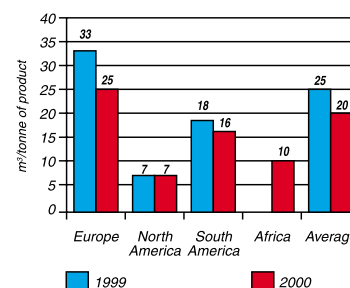
Production and Quantitative Data

The high figure for **hazardous waste** in North America (2 Operating Units) is due to the presence of the sole Pirelli factory which produces curing chambers in-house. This production requires the disposal of large quantities of hydraulic oil. In South America, an increase in hazardous waste in 2000 was due to improvement projects during the development of an environmental management system. The lower figure for non-hazardous waste is linked to the high level of recycling in the area.

Water consumption by Tyre Production Units¹⁴

	1999		2000	
	(m ³)	(m ³ /tonne of product)	(m ³)	(m ³ /tonne of product)
Europe	9,613,045	33	7,788,316	25
North America	185,842	7	185,919	7
South America	3,932,050	18	4,098,007	16
Africa	ND	ND	283,940	10
Total/Average	13,730,937	25	12,356,182	20

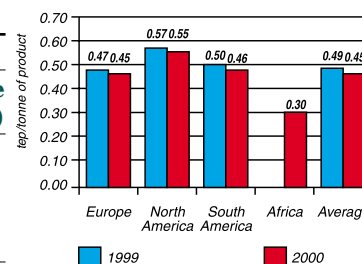
¹⁴1999: excluding Egypt (1 Operating Unit) - a new acquisition.



Energy consumption by Tyre Production Units¹⁵

	1999		2000	
	(tep)	(tep/tonne of product)	(tep)	(tep/tonne of product)
Europe	137,486	0.47	139,814	0.45
North America	15,378	0.57	15,290	0.55
South America	111,885	0.50	117,360	0.46
Africa	ND	ND	8,527	0.30
Total/Average	264,749	0.49	280,991	0.45

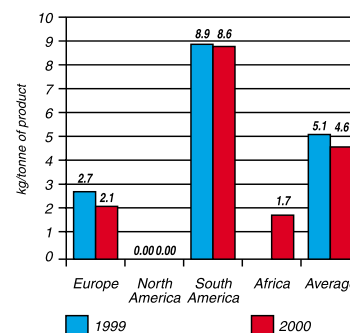
¹⁵1999: excluding Egypt (1 Operating Unit) - a new acquisition.



Consumption of solvents by Tyre Production Units¹⁶

	1999		2000	
	(t)	(kg/tonne of product)	(t)	(kg/tonne of product)
Europe	785.2	2.7	666.8	2.1
North America	0.4	0.0	0.3	0.0
South America	1,996.7	8.9	2,163.4	8.6
Africa	ND	ND	48.9	1.7
Total/Average	2,782.3	5.1	2,879.4	4.6

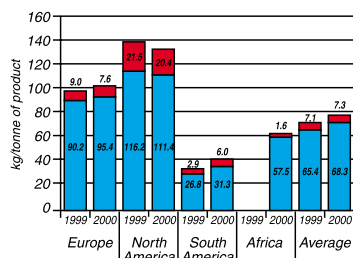
¹⁶1999: excluding Egypt (1 Operating Unit) - a new acquisition.



Tyre Sector

Sector activities

Production and Quantitative Data



■ Non-hazardous waste ■ Hazardous waste

Waste produced by Tyre Production Units¹⁷ (classified according to the categories of the European Union)

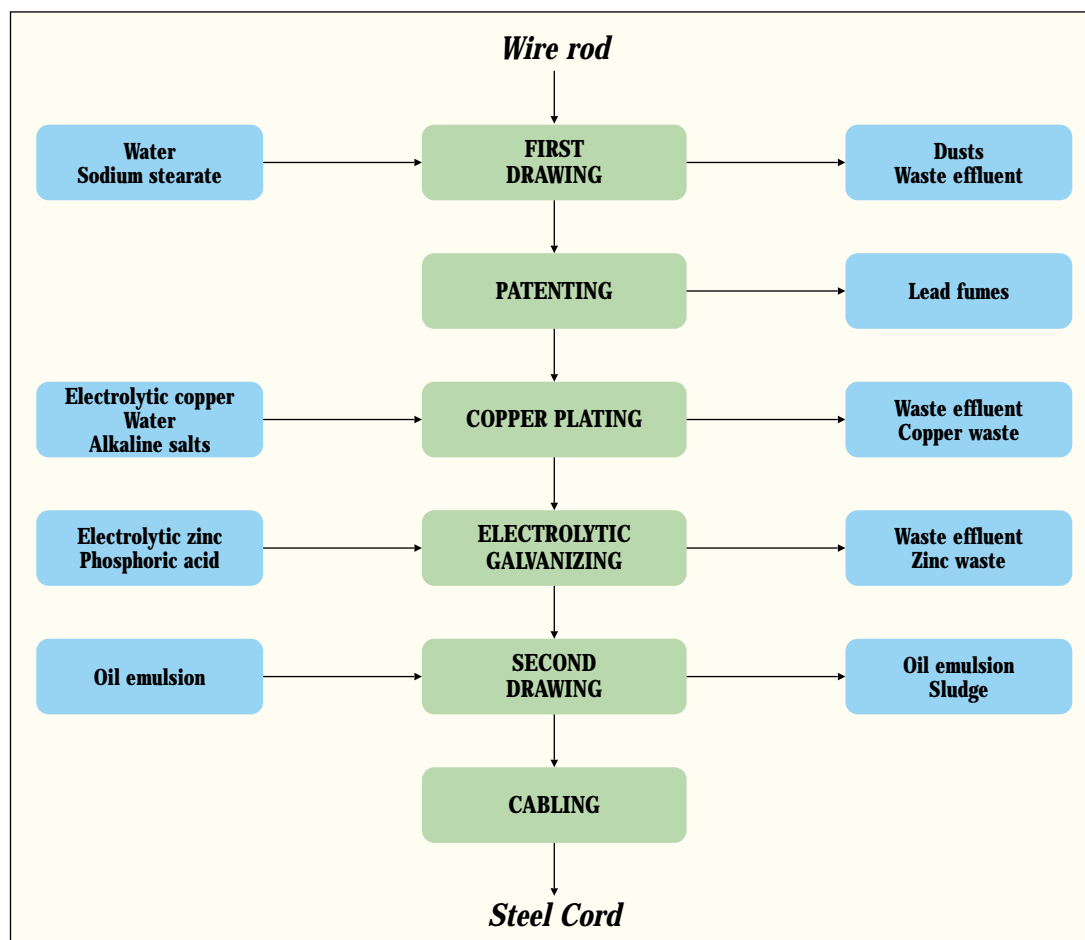
	1999				2000			
	Hazardous waste		Non-hazardous waste		Hazardous waste		Non-hazardous waste	
	(t)	(kg/tonne of product)	(t)	(kg/tonne of product)	(t)	(kg/tonne of product)	(t)	(kg/tonne of product)
Europe	2,639	9.0	26,525	90.2	2,399	7.6	29,928	95.4
North America	584	21.5	3,154	116.2	565	20.4	3,087	111.4
South America	639	2.9	6,017	26.8	1,520	6.0	7,912	31.3
Africa	ND	ND	ND	ND	43	1.6	1,609	57.5
Total/Average	3,862	7.1	35,696	65.4	4,527	7.3	42,536	68.3

¹⁷ 1999: excluding Egypt (1 Operating Unit) - a new acquisition.

Steel cord

Steel cord, a semi-finished product used in metallic fabrics and beads, is produced by 4 Operating Units in Italy, Turkey, Germany and Brazil. Although this production represents only 4 % of the Tyre Sector's revenues, it is included in the Report because of the environmental importance of its production process.

Main process stages and main inputs and outputs for the production of steel cord



Tyre Sector

Sector activities

Production and Quantitative Data

TREATING PROCESS WATER

Process water is one of the most significant elements for the environment of the steel cord production process. It is a by-product mainly of the water used for washing the metal wire and from the galvanic baths for wire surface treatment.

The potential impact on the water table derives primarily from inorganic pollutants, especially heavy metals (copper, iron, zinc and lead).

To limit the environmental impact, plants have been modified to recycle washing water, and all the Units have been equipped with wastewater treatment systems. At the Operating Unit at *Figline Valdarno* (Italy) a study of the impact on the environment of wastewater on a river system (the Arno) has been carried out in collaboration with the University of Milan. The study has demonstrated that the impact is, in practice, negligible.

Again, at *Figline Valdarno*, a process has been developed for reusing the sludge produced by the water treatment plant in the production of materials for the building trade.

QUANTITATIVE DATA

Steel cord production technology involves substantial **consumption of process water** from the galvanic baths. For **waste water**, to give an indicative value of the concentrations of the main pollutants, figures from the Unit at *Figline Valdarno* (Italy) have been used.

The production technology also gives rise to higher **energy consumption** (especially of electricity) compared to other Pirelli SpA production technologies.

Water consumption by steel cord production Units

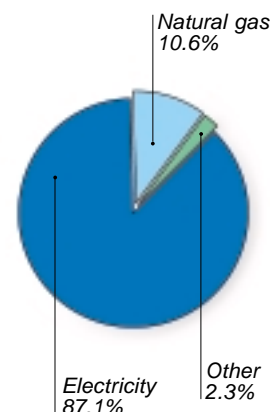
1999		2000	
(m ³)	(m ³ /tonne of product)	(m ³)	(m ³ /tonne of product)
1,412,884	12.4	1,419,919	11.6

Average values for the main pollutants in Figline Valdarno (Italy) in 2000

	Average values (mg/l)	Legal limits (mg/l)
COD	1	160
Copper	0.05	0.10
Zinc	0.13	0.50
Lead	0.12	0.20
Boron	1.6	2

Energy consumption of steel cord production Units

1999		2000	
(tep)	(tep/tonne of product)	(tep)	(tep/tonne of product)
61,716	0.54	64,098	0.52



Energy sources used by steel cord production Units (2000)

Waste produced by steel cord production Units (classified according to the categories of the European Union)

1999				2000			
Hazardous waste		Non-hazardous waste		Hazardous waste		Non-hazardous waste	
(t)	(kg/tonne of product)	(t)	(kg/tonne of product)	(t)	(kg/tonne of product)	(t)	(kg/tonne of product)
10,618	93.0	861	7.5	11,432	93.4	943	7.7

GLOSSARY

Aromatic compounds	A type of hydrocarbon (see below) with a characteristic pleasant smell, from which the name derives, containing at least one benzene ring in their molecule. They are found in crude oil and are formed during certain refining processes to produce, for example, components of petrol.
Carbon dioxide (CO₂)	Carbon dioxide is a colourless, odourless and tasteless gas, heavier than air, a by-product of the complete oxidation of carbon in processes of combustion, respiration and decomposition of organic material. Light rays pass through CO ₂ but it absorbs infrared radiation emitted from the Earth's surface, causing the so-called greenhouse effect. The Kyoto Conference in December 1997 led to the drawing up of the Kyoto Protocol, encouraging groups of countries to commit to reducing greenhouse gases.
Carbon monoxide (CO)	Carbon monoxide is a product of the incomplete combustion of carbon based fuels. It is highly toxic and attacks the brain and respiratory system.
Dissipation losses or losses due to the Joule effect	Losses in electricity transmission due to the heating of the metal conductor being used.
Environmental due diligence	Systematic verification of the environmental conditions of a site to establish existing environmental situation of a site or potential developments.
Environmental management system	Includes the organizational structure, responsibilities, procedures, measures, and resources available to a company regarding the environment and increasing relative efficiency in its respect. The documentation which describes the whole environmental management system and the means to achieving the stated objectives comprises the environmental policy, the environmental management manual and the environmental management program.
Environmental performance	The evaluation of environmental performance as a management tool which permits an organization to measure and check the impact of its activities and/or products on various elements of the environment. The evaluation of environmental performance normally uses reference environmental indicators.
Hydrocarbons	A large class of chemical compounds formed from carbon and hydrogen. Many of them are the main components of crude oil and natural gas as well as various natural substances (resins, rubber etc.).
ISO 14001	Standard published in 1996 by ISO (International Organization for Standards): "Environmental Management System – Specification with guidance for use". This is an international standard which

Glossary

defines the organizational and managerial requirements to implement an effective system of environmental management and its certification by an external certifier.

ISO 14040

Standard published in 1997 by ISO: "Environmental management – Life cycle assessment – Principles and framework". An international standard which sets the general principles and methodological requirements for carrying out an LCA of products or services.

Life Cycle Assessment (LCA)

A life cycle analysis. This is the methodology which makes it possible to evaluate the overall environmental impact of a product, taking account of its entire life cycle, from the activities necessary to extract and process the raw materials, to the manufacturing process, transportation, distribution, use, recycling, reuse and eventual disposal.

PE (polyethylene)

PE is a synthetic polymer material, which is built up by the repeated addition of the monomer ethylene

PVC (polyvinylchloride)

PVC is a synthetic polymer material, which is built up by the repeated addition of the monomer vinyl chloride (VCM). PVC has the same structure as PE except for the presence of a chlorine atom, replacing one hydrogen atom.

Rolling resistance

Component of the resistance to motion of a vehicle attributable to a tyre's rolling.

tep

Tonne equivalent petroleum. The conventional unit of energy, equivalent to about 10 million kcal, used to enable comparisons on the basis of calorific value between different energy sources.

Total suspended particulates (PST) - (Dusts)

Total suspended particulates are extremely small particles of matter which remain, even for long periods, suspended in the air before being deposited on the ground. Their composition is very varied (for example unburnt diesel fuel, partially oxidized long chain hydrocarbons, heavy metals from combustion plant, volcanic ash etc.).

Volatile Organic compounds (VOC)

Volatile organic compounds are organic substances of natural or synthetic origin found in the air as vapour or in gaseous form when a certain vapour pressure is reached. Sources of volatile organic compounds are vegetable resins (pine smell), LPG (liquefied petroleum gas) which escapes from its cylinder, un-combusted gas in engine exhausts, petrol fumes which escape from tanks, and organic solvents. As well as sometimes being dangerous (for example formaldehyde, benzene etc.) they contribute to the forming of photochemical smog through a complex process which involves nitrogen oxides, leading to the creation of organic peroxides and ozone amongst other things.



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