

# Environmental Services



Befesa is an international company specialized in industrial waste management and water management and production. We manage more than 2.5 million tons of waste a year, of which 1.2 million tons are utilized to produce new materials by recycling, thereby eliminating emissions of more than two million tons of CO<sub>2</sub> per year. Our desalination capacity is one million cubic meters per day, sufficient to supply a population of 4.5 million.

**Leader in industrial waste and water management**

A large industrial furnace, likely used for recycling or waste treatment. The interior is a bright, glowing orange-red color, while the exterior is a grey, textured concrete. The furnace is viewed from a low angle, looking into the opening.

With waste ... we produce new materials  
through recycling, and we treat and desalinate  
water

[www.befesa.es](http://www.befesa.es)

## Summary 2007

In 2007, Befesa managed more than 2,600,000 tons of industrial wastes of which more than 1,270,000 tons were recycled, thereby preventing the emission of more than two million tons of CO<sub>2</sub>.

-Some 130,000 tons of aluminum-content wastes were recycled, resulting in production of 92,572 tons of aluminum alloys. The 230,000 tons of salt slag generated in the process were recycled in-full, with the company thus achieving "zero-discharge" aluminum waste recycling process.

-Some 496,562 tons of steel powder were recycled with the production of 187,090 tons of waelz oxide, and 118,765 tons of zinc were returned to the production process, thereby avoiding the need for mining of said mineral.

-We have treated 144,492 tons of stainless steel powder with the recovery of different metals such as nickel and chrome, avoiding the need for mining of said mineral.

In the water sector, the company's desalination capacity is one million cubic meters, sufficient to supply a population of more than 4.5 million. We executed wastewater treatment and reuse, potable water supply, and irrigation system installation works that contribute to a more sustainable globe.

## Evolution of the Year 2007

### General Balance of the Year

This has been a great year for Befesa, both due to the economic results achieved and the consolidation of all of our businesses, making us European leaders in the recycling of industrial waste, and in an international referent in generating and managing water.

Our aluminum waste recycling unit continues to lead not only nationally, but throughout Europe, managing 130,000 tons of different aluminum waste throughout the year. The work has been completed on the extension of our salt slag recycling plant in Valladolid, an activity in which we are the only company in Spain and the United Kingdom to offer



the service, and we will have the capacity to treat 230,000 tons. Our machinery and technology sales division has developed projects in different countries such as Bahrain, Iceland, Oman, Russia and Spain.

With Qualitas Equity Partners we have signed an agreement to integrate our aluminum waste recycling activities in a joint company. Befesa will put in the companies of the aluminum business unit, and Qualitas will contribute Aluminio Catalán (Alcasa). This operation will give a company with a turnover of more than 300 M€, the third largest company in the European aluminum recycling market, which will achieve the critical mass it needs to give its customers a comprehensive service throughout Europe, also to continue to develop our plan of sustained growth.

Our steel waste recycling and galvanization business recycled in 2007, an amount of 496,562 tons of residual common steel powder from electric arc and smelting process, avoiding the extraction of some 216,000 tons of mineral and returning around 118,765 tons of zinc to the productive cycle. Also, another 144,337 tons of steel powder from the stainless steel industry were valorized, recovering their content of materials of important economic value, such as nickel or chromium.

After signing the agreement at the end of last year for the purchase of 100 percent of the shares of the B.U.S Group AB, the largest European recycler of steelworks waste, our steel and galvanization business now has eight plants in Spain, France, Germany and Sweden. This year has seen the successful integration process of the companies, and the best possible use has been made of the structural, organizational and operational synergies of the said integration. For this operation to purchase the B.U.S Group AB, we received the Best of

European Business award from the CNN chain, IESE Business School and the firm Roland Berger Strategy Consultants, in the category of "Mergers and Takeovers – Medium-sized Companies".

In August 2007, a second furnace came into operation in the Befesa Valera plant in Gravelines, in the north of France. With the start-up of this furnace, its treatment capacity has expanded to 120,000 tons a year of stainless steel powder. If to this we add the other similar furnace in the Landskrona plant (Sweden), our total installed productive capacity is 185,000 tons a year, a sufficient volume to treat all the stainless steel powder generated in Europe. Furthermore, the modernization project of our factory in Asúa-Erandio, concluded successfully in September of last year, has materialized this year in an increase in steelworks powder treatment capacity.

During the year, the company treated 1,330,654 tons of hazardous and non-hazardous wastes a 3.7 percent increase on the previous year. Deba (Guipúzcoa) industrial waste transfer center was brought into operation in 2007. This completed our positioning on the peninsula that will allow us to improve the service provided for our customers in the Basque Region. Moreover, in December 2007, we closed the acquisition of Tratamiento y Concentración de Líquidos, S.L. (TRACEL), a company providing integral management services for liquid wastes (hazardous and non-hazardous), from different production process in Spain, at an 18,000 tons per year capacity treatment plant.

The activities of our industrial cleaning division are becoming more and more consolidated by participating in the main stopped of the petrochemicals sector in the country. Our collection, transport and elimination activity of materials with PCB has strengthened its position by increasing the tons managed with respect to last year by 20 percent. Furthermore, this year we have created the Soil Decontamination division, offering integral technical solutions to the problem of soil contamination.

Our current projects up and running in water generation and management provide sufficient water to supply 2.5 million people in regions such as the north of Algeria, India China and Spain. We have also contributed to social development in disfavored



regions such as Nicaragua, and soon Angola, with the construction of basic supply and hygiene infrastructures, to improve the conditions of hygiene-health and the availability of drinking water. In Spain, we are still contributing to the development of the rural environment by giving greater territorial balance with different actions in modernizing irrigation, which also suppose considerable savings in structurally scarce hydrous resources.

Our foreign activities in the water business have passed from a business of opportunities to a consolidated business in regions, based on the definition of markets and geographies of interest, consolidating our structure to be able to give continuity to contracting in the selected areas: Maghreb, Latin America, India, China and the United States. In the domestic market, in addition to our already consolidated presence in the National Irrigation Plan of the Ministry of Agriculture and the Water Plan of the Ministry of the Environment, the forthcoming launch of the National Plan of Water Quality must enable our significant growth thanks to this market, which requires strong technical specialization and the inclusion of new technologies.

In Latin America, we are consolidating our activity particularly in the treatment of waste management in Argentina, Chile, Peru and Mexico.

This year, we have developed several programs of corporate social responsibility, which imply an active contribution to the sustainability and social

and economic progress of the communities where we operate, through the application of innovative technological solutions that not only play in favor of the interest of the company itself and in achieving its strategic objectives, but also influence the improvement of the social, labor and environmental surroundings.

### **Our business and evolution of the business units**

Befesa provides solutions for managing industrial wastes and managing and generating water, while taking into account our social responsibility to contribute to creating a sustainable world, by developing activities of aluminum waste recycling, steel waste recycling and galvanization, environmental services to industry and the integral water cycle.

#### Recycling of aluminum waste

The most significant destination of aluminum waste recycling is to produce and sell alloys to the car industry and the construction sector. This activity contributes particularly to reducing CO<sub>2</sub> emissions in the primary aluminum sector. To carry out such activities, we have four plants, in Biscay, Valladolid, Barcelona and Poland.

The year 2007 was characterized by the stability of the prices of the raw materials close to their maximum values, as a result of growing demand in the world and the increase in energy costs. Aluminum was not oblivious to these conditions, and the year was characterized by stability of maximum business figures. In this context, we continued with our leadership in aluminum recycling, not only in Spain, but also in Europe.

We therefore continue to consolidate stable agreements in the medium and long term with customers and suppliers that guarantee us a stable framework of growth and profitability. On the other hand, we have continued with the restructuring program and investments aimed at guaranteeing a suitable cost structure, that is so necessary for achieving optimal profitability levels environmentally stable in the long term. All of the actions undertaken



this year were aimed at increasing the productivity of the different plants, reducing energy costs and improving the service to our customers.

Therefore, in Befesa Aluminio in 2007 we recycled nearly 130,000 tons of different aluminum waste and achieved a figure of 92,572 tons of production and 92,405 tons of sale of alloys, avoiding the direct emission of 1,250,000 equivalent tons of CO<sub>2</sub>, regarding to the primary aluminum production.

As important events, we must stress that in the past month of October, an agreement was reached with the Qualitas Investment Fund for the integration and merger of the respective aluminum recycling businesses (Befesa Aluminio and Aluminio Catalán), taking a decisive step in creating value and seeking leadership. Furthermore, this year saw the disinvestment and sale of the minority share held in the company Deydesa 2000, S.L.



### Salt slag recycling

We have a model for the comprehensive recycling of aluminum waste: on the one hand, we are developing technologies to improve waste management and treatment, and on the other, our current situation makes us the only operator in the world without solid waste in our productive process. We recycle aluminum without generating new waste in the recycling process, thus perfectly closing the cycle. Our salt slag recycling plants are an example of efficiency and sustainability.

A large part of the aluminum secondary industry uses salt melting liquids to separate and recover the metal aluminum from the slag and scrap used as a raw material. The waste resulting from this process collects the impurities from the original slag and scrap, mixed with the salt melting liquid. This waste is called salt slag and is characterized by a low content in aluminum metal and a high content in salts. Likewise, it is classified as hazardous due to its high reactivity with water, with the consequent production of toxic, potentially inflammable gases.

In Befesa, we collaborate with sustainability through two plants designed specifically to treat this waste. The plant in Valladolid (Spain) has a capacity of 150,000 tons/year, the investment having been culminated to increase its capacity by 15 percent, whereas the plant located in Whitchurch (United Kingdom), has a capacity of 80,000 tons/year. We also deal with smaller amounts of other wastes from the aluminum primary and secondary industry, such as aluminum slag, aggregates from grinding aluminum slag. In 2007, we treated a total of 230,000 tons of waste converted entirely into raw materials useful for industry (aluminum, melting liquid salts and aluminum oxide).

It must be stressed that in the last year, the saline slag recycling activity has avoided the extraction of 190,000 tons of non-renewable raw materials, at the same time avoiding the spillage of 230,000 tons of hazardous waste.

### Sale of machinery and technology

Our technology division gives technical support to the plants of the business unit and is also engaged in designing, building, assembling and starting up "turnkey" installations for the aluminum and zinc industries. This division has a long list of references from more than 100 installations in 40 countries. Its main products are the automated lines for producing aluminum ingots, casting wheels, truck loaders, rotating furnaces, slag coolers and the installations for slag treatment.

The main activities of this period were:

- Design and construction of two 22-kilogram ingot casting lines for the company Alba, in Bahrain. The first belt was brought into service this year, bringing in automatic pile handling and robotized labeling
- Design and manufacture of a third ingoting line for Nordural, in Iceland. This line, with a production of 27 tons an hour, includes the treatment of the refrigeration water and was delivered in September 2007. Complementary to this, the customer asked us to adapt all the innovations to the first of its belts, supplied in 1998.
- Design and manufacture of two ingoting lines with trailer-loader for Sohar, in Oman. These lines, with a productivity of up to 30 tons an hour, will be started up in 2008. Sohar, with Alcan as its technological partner, wishes to make this plant an example of quality, productivity and sustainability in the sector.
- Modernization of the profile grinding installation in our Valladolid plant. As a result of this project, productivity has been increased and the quality of the prepared material has been improved. The excellent scrap treatment levels are allowing us to access certain alloys, which had previously only been made with primary aluminum.

- Modification of the slag grinding installation in our Valladolid plant. The aim of this project, in addition to increasing productivity, is to minimize the losses of metal from the treated product. All gains in metal yield from the material have large associated energy savings. The separated non-metal does not have to be cast, nor does its corresponding melting liquid. Nor is any further treatment needed of the incremental salt slag. In this project, just as in the last, the powder suction has been improved and the filters have been replaced, and the working conditions have been improved and the emissions reduced.
- Design, manufacture and commissioning of a slag compacter for Podolsk, Moscow (Russia). Satisfied with our work, the customer has asked us to reform their slag grinder, in a project we have started and which will be completed in 2008.
- Design of an automatic ingot casting system. The possibility has been considered of installing it in our Erandio plant, but in any case the objective is to have a new product in the department. This kind of format, which we had not chosen up to now, is very common for the new casting.



### Steel Waste Recycling and Galvanization

Our steel waste recycling and galvanization business develops the treatment and recycling activities of common steel and stainless steel, as well as the recycling and treatment of waste from galvanization. These activities prevent the useless loss of tons of these metals, reducing the waste and contributing to reducing the extractions of zinc and other minerals from nature. Likewise, it includes an area of service activity and commercialization of manufactured products (permits and waste management), and logistics, which deal with giving services to the three areas of activity mentioned above.

It has six productive plants in Europe engaged in treating and revaluing the wastes generated in the manufacture of common and stainless steel: one in Spain, Befesa Zinc Aser, S.A. (Asúa-Erandio, Biscay); two in France, Recytech S.A. (Fouquierés-lez-Lens) and Befesa Valera S.A.S. (Gravelines); two in Germany, Befesa Zinc Duisburg GmbH. (Duisburg) and Befesa Zinc Freiberg GmbH. & Co. KG (Freiberg); and one in Sweden, Befesa ScanDust AB, (Landskrona). This division also includes another two factories located in the Biscay region: Befesa Zinc Sondika, S.A., which recycles zinc waste from the galvanic industry to achieve zinc oxide, and Befesa Zinc Amorebieta, S.A., which does the same with metal waste and zinc scrap for the manufacture of raw zinc ingot, electrolytic zinc and fine zinc ash.

Befesa, through Befesa Zinc Aser, is the only company in Spain that offers the integral collection and treatment of steelworks powder for revaluation, offering an optimal environmental solution for treating steelworks powder.

In the present period, our plants in the steel waste recycling section have treated a total of 640,899 tons of dry steelworks powder, from which 496,562 tons, come from the main European factories engaged in the manufacture of common and stainless steel, and a large number of casting works. The last 144,337 tons come from the main stainless steel factories of the continent. This tonnage increased by 552.6 percent over 2006, as a direct consequence, in the first place, of the contribution of the plants of the former Group B.U.S, brought into Befesa Zinc in late 2006, and, in a second term, as a result of the increased capacity achieved in Befesa Zinc Aser following the change in September of the same year, of the waelz furnace for another with a new design and larger size, with which it was possible in 2007 to process 48.5 percent more waste.

This treatment volume gave 187,090 dry tons of waelz oxide, of which 99,457 tons correspond to the purified product (D-L.W.O. ). This is an increase of 369 percent over the production level registered in the previous year for the two reasons given above. The stainless steel powder recycling plants also made 71,282 tons of metal alloys of high commercial value, having self-generated 57,745 MWh of electrical energy in the productive installation in Sweden.

This year, Befesa Zinc Sondika has recycled 10,508 tons of different zinc residues mainly from the galvanizing industry. This company has closed raw materials purchasing agreements with domestic and foreign suppliers, highlighting the 4,725 tons of zinc mattes acquired in the period, of which 30 percent have been supplied by Befesa Zinc Amorebieta and the rest by different galvanizers and intermediaries. The production of zinc oxide (ZnO) this time amounted to 10,239 tons, whereas sales reached 10,449 tons.

Befesa Zinc Amorebieta recycled 11,055 tons of zinc waste in the year. The total volume of manufactured products and sub-products amounted to 10,900 tons and sales rose to 11,200 tons. In this period,

the company made a large commercial offer aimed at diversifying the zinc ingot sales markets, having focused the product distribution on the galvanizing and brass markets.

In 2007, our steel waste recycling and galvanizing business unit invested in fixed assets with a value of over 28.7 M€. In order of importance, the most important actions carried out in the period includes the installation of a second furnace in the Befesa Valera plant for a total 18 M€; the construction of a new covered, enclosed warehouse in Befesa Zinc Freiberg, with a maximum capacity of around 25,000-30,000 tons, for use as a station for unloading railway carriages and lorries, and for storing coke and waste with high zinc content, with an overall investment that amounted to approximately 3.5 M€.

Also noteworthy in this chapter is the adaptation of machinery and steelworks powder covered store enclosure of Befesa Zinc Aser, along with the construction in the same plant of a lime silo of 200 m<sup>3</sup> and a new powder and steam uptake system on the slag extraction line.





In the same way, we must mention the introduction of different improvements in the sediment chamber in Befesa Zinc Duisburg, which tend, on the one hand, to modernize the current gas cooling system, and on the other to minimize the diffuse emissions of powder particles in this area.

By Resolution of 24th July 2007, of the Vice-Councilor for the Environment of the Basque Government, Integrated Environmental Authorization was granted to Befesa Zinc Aser for the development of the activity of treating and recovering waste with zinc and lead content in the municipal terminal in Erandio (Biscay).

### Industrial Waste Management

Our integral industrial waste management system is specialized in giving environmental services to industry, with the objective of recycling and revaluing, bringing in the latest technologies to design specific solutions for each customer and sector with respect to the environment. The activities we develop are waste management and industrial cleaning, desulfurating, plastics management, PCB management and soil decontamination.

#### Industrial wastes

This activity includes the management, transport, treatment and temporary storage of hazardous and non-hazardous industrial wastes for revaluation, recovery, reuse or final controlled deposit, and environmental assessment.

As waste managers, we offer different possibilities for carrying out suitable waste management. We have waste treatment installations to minimize or eliminate the pollutant load, such as the centers in Palos and Nerva, where in the year we stored more than 600,000 tons.

As transfer centers, distributed around the country, in order to serve small and large waste producers,



we have centers in Ajalvir (Madrid), Alovera (Guadalajara), La Puebla de Alfinden (Zaragoza), Paterna (Valencia), Deba (Guipúzcoa) and Lucena (Cordoba), where we handled more than 80,000 tons in the year.

In the field of non-hazardous industrial waste management, we have facilities in Torija (Guadalajara), Utrera (Seville), Gador (Almeria) and El Cerrato (Palencia); and classification and pre-treatment plants in Ajalvir (Madrid) and Alcalá de Guadaíra (Seville). In the past year we managed more than 400,000 tons.

As final facilities in the management of hazardous waste, we have the safety deposits in Cartagena (Murcia) and Nerva (Huelva), which handled more than 50,000 tons in 2007.

We must stress the opening in the year of the Deba Centre (Guipúzcoa), a new transfer centre with a capacity to manage 25,000-30,000 tons a year. This allows us to increase our geographical position with new facilities in order to give our customers greater service.

#### Cleaning

Our industrial cleaning division develops its activities in the area of industrial services through a broad offer that includes the suction and driving of solids, liquids and silts, high pressure cleaning work, the application of water a very high pressures for demolition operations, cutting and specialized cleaning, changes of catalyst beds, cleaning tanks and pipes, managing and treating wastes in the facilities of the customers themselves, and tank cleaning services in refineries and large oil facilities.

Our customers are large companies such as oil companies and multinationals of the chemical and electrical sector, and small companies, individuals and municipalities. The situation of the industrial cleaning market is characterized by the tendency towards outsourcing services not directly related to production, by a stricter legislative and regulatory environment and by a productive model that seeks to be more agile and flexible. We have therefore



continued with the development of a strategy designed to consolidate a business model capable of supplying specialized industrial services and adapting to market needs. The cleaning division is therefore purchasing the latest process and technologies available, and adapting them to the specific needs of the customers.

This market consolidation has led us to be present in the main stopped of the petrochemical sector in the country, with a dynamic organization to satisfy the needs of the large customers of the petrochemical, paper, cement, energy and steel sectors. We have also started an international development that allows us to capitalize on the experience gained in projects carried out in Spain. An evolution is expected towards a model in which specialization consolidates the position of the company in the large customer segment.

This year, we have developed "turnkey" projects in fields where we have great experience. Our growth has been based on offering specialized services, for which we have invested in equipment and processes of advanced technology. The growth has been especially strong in the areas of activity of mechanical cleaning, catalysers, mobile plant, chemical cleaning, special cutting and our international presence in automated tank cleaning.

### Plastics

Befesa Plásticos specializes in the manufacture of special low density polyethylene dross by recycling the film used in greenhouse coverings. The commercialized dross is used for obtaining different applications, particularly including the manufacture of films for construction (weatherproofing and protections), large sacks and rubbish bags, signaling mesh, pipes for irrigation, electrical and telecommunications conducts, injected materials such as pots, baskets and bottle sleeves and the achievement of modified asphalts. Our production capacity and the constant, even quality of our dross, make us the leading supplier both in Spain and in the European Union, exporting 80 percent of our total production.

As part of our active commitment in caring for and improving the environment, we have consolidated the agricultural plastic waste integral management service (Girpa). This service provides to the company, on the one hand, with the necessary raw material for its productive process, and on the other, it gives a very attractive, rigorous integral waste management service (guarantee of traceability, issue of waste management certificates, organization, amongst other things) for our customers.

In 2007, we recycled 12,500 tons of used film and water pipes, strengthening our position as the European leader in the sector of low density polyethylene recycling.

### PCB

In Befesa Gestión de PCB, we are specialized in giving effective solutions to the collection, transport and elimination of transformers, condensers and materials contaminated with PCB. With this activity, we recover all of the reusable materials and we eliminate polluted materials, with the most advanced technology.

In 2007, we strengthened our leading position in the national PCB market. We treated more than 3,600 tons of apparatuses and materials polluted with PCB, which is a 20 percent increase over 2006. We are therefore, the reference company in treating PCB in



the electrical sector. This year, we are continuing with the contracts for the management of this waste with Iberdrola, Endesa and HC Energía.

We also handled equipment from companies and institutions from a large variety of productive sectors of all the autonomous communities, such as Afesa, Global Steel Wire, Tubacex. We also reactivated the line of importing equipment polluted with PCB from Argentina, an activity carried out in co-operation with Befesa Argentina since the year 2000, and imports continue from Portugal.



### Land decontamination

This division offers integral technical solutions to the problem of land contamination, within the framework of "Royal Decree 9/2005, of 14th January, establishing the list of potentially polluting activities for the land and the criteria and standards for the declaration of contaminated lands". As an innovative company in this field of action, in early 2007 we created this division to develop all of our actions with respect to polluted lands, dedicated exclusively to the environmental engineering of the subsoil, which allows us to offer an integral and immediate service for the study and correction of the problems derived from land pollution, treatments on site, off site and all complemented by the treatment plants, the transfer and waste pre-treatment centers, and the safety deposits for hazardous and non-hazardous wastes (Nerva and Cartagena centers).

This year, numerous land research and diagnosis actions have been carried out, for prime customers from different sectors of industry (refinery and petrochemical, steelworks, real estate development and construction, energy, chemicals, amongst others), and different land decontamination actions such as bio remedying, in situ treatment, digging and management.

### Desulfuration

In Befesa Desulfuración in Barakaldo (Biscay), we are engaged in producing sulfuric acid and oleum (a compound rich in  $\text{SO}_3$ ) from waste sulfur recovered from the plants of the petrochemical sector. We have a plant that allows us to solve the environmental problems of the oil plants by applying the cleanest and safest process.

In 2007, we achieved a production of 301,800 tons of equivalent acid, with an associated generation of electrical energy of 77,100 MWh, which, after deducting self-consumption, supposed surplus sales of 49,700 MWh.

As regards the origin of the sulfur, the supply is maintained from Repsol Derivados of 77 percent, the rest coming from France. The sulfur supplied in liquid form remains at 23 percent of the total.

### Water

Our water business activities have to areas:

-We create hydraulic infrastructure that:

- Generate water: by desalinating sea water, by reusing urban waste waters, by modernizing irrigation to reduce its consumption.
- Protect our rivers and coasts: by purifying the urban and industrial waste waters.
- Avoid emissions: with the renewable energy of our hydraulic units.
- Contribute to social development: by making water drinkable and enhancing the rural and agricultural medium with the irrigation.

-We manage water in a sustainable manner:

- By providing supply and municipal cleaning.
- By promoting and operating all kinds of hydraulic infrastructures.
- With information and control systems that help to take decision on the integral water cycle.
- By maintaining and preserving the desalinating plants.

We are therefore specialized in desalination, water treatment, supply, cleaning, hydraulic and environmental actions, treatment of industrial waters for the private sector, covering the areas of process waters and services, waste waters, reuse and recycling and sewage sludge treatment. We cover the domestic and foreign market with a stable presence in the United States, Mexico, Nicaragua, Ecuador, China, India, Algeria and Morocco.

This year, we have still been one of the leaders in the domestic and foreign market of large desalination plants. In Algeria, this year we have achieved the financial closure of the Temclem-Honaine desalination plant, whereas the one in Skikda is under assembly work to start the pre-commissioning in February 2008. These actions make a joint investment of \$343 M, and during their 25 years in operation, they are expected to bring in income of over \$1,812 M in water sales. The Chennai desalination plant, the construction of which was started this year with an investment of € 91 M, will bring in income from water sales of close to € 827 M, also in its 25 years of operation.



Considering too the desalination plant in Bajo Almanzora (Almeria, Spain), also in full production, and the one in Qingdao (China), currently under financial closure, the projects we have up and running have the capacity to produce more than 500,000 m<sup>3</sup>/day, an amount that would be sufficient to provide drinking water to a population of over 2.5 million people.

The lines of our strategic plan, the selection of products to open new geographical markets abroad, and the focusing on the National Irrigations Plans and the Water Plan in Spain are giving their fruit with high, continuous growth, having increased our sales by more than 30 percent over the previous year. Abroad, we have practically doubled sales as the execution of the projects contracted in previous years has already been launched, supposing approximately 40 percent of the total for the business unit.

The recurrent incomes that will provide the operation and maintenance of the concessions (between 15 and 25 years) of large desalination plants, three in Spain, two currently in operation, and five abroad that will come in progressively after 2008, will contribute to assuring the stability of the sales figures in the coming years.



### Main actions 2007

#### Desalination

- Desalination plants in Algeria. The financial closure has been performed on the desalinating plant in Tlemcem-Honaine, and the execution of the Skikda plant is still underway, which will begin to operate in 2008. The contracts, under the form of integrated products, are developed through the Spanish consortium Geida, and include operation for 25 years, with a total production capacity of 300,000 m<sup>3</sup>/day.
- Desalination plant in Bajo Almanzora (Almeria). The work has started on this plant, adjudicated by the Ministry of the Environment through the state company Acuamed. The contract includes the construction for 73 M€, and its operation and maintenance for 15 years. The plant desalination process is inverse osmosis and it will have the best and most efficient energy recovery technology currently available, isobaric chambers. The planned capacity is 60,000 m<sup>3</sup> of water a day, equivalent to 20 cubic hectometers a year. These works give benefit to a total 15 municipalities, reaching 15 percent of the population of the province of Almeria and an area of more than 12,031 hectares of agricultural production.



- Sea water desalination plant in Minjur (India). After having achieved the financial closure under the DBOOT mode (Design, Build, Operate and Transfer) the work started on this plant, which is intended to supply Chennai, a city in the state of Tamil Nadu (India). The plant will have a capacity of 100,000 m<sup>3</sup>/day and is expected to start producing water to supply more than 500,000 inhabitants in the third quarter of 2008. The investment amounts to 91 M€, of which 77 percent will be financed without recourse by a syndicate of local banks. During its 25 years in operation, the plant is expected to bring in income of over 827 M€ with water sales.
- Operation of the desalination plants in Almeria and the New Canal in Cartagena. This year, we continued operating the two plants, desalinating more than 26.5 million m<sup>3</sup> intended, on the one hand, for supplying the city of Almeria, and on the other, for the hydraulic system of the Mancomunidad de Canales del Taibilla, which is responsible for supplying drinking water to the primary network (high), to 77 municipalities in Murcia, Alicante and Albacete. This volume of water is sufficient to cover the needs of more than 360,000 people.



reducing its initial transporting capacity of 10m<sup>3</sup>/s as water is derived to irrigate the 16,500 ha of the new irrigable area, benefit 11,834 users.

#### Irrigation

- Canal de Navarra irrigable area. The consortium formed by the Caja de Navarra and Befesa, amongst other companies, is continuing with this work. The contract includes both the construction and the operation of the infrastructures of the irrigable area of the Navarre canal in its first phase, that is, to the river Aragón, a tributary of the Ebro. The consortium that will do the work will forward the cost of 180 M€, and later the administration and the irrigators will pay a tax for its use for 30 years. This type of financing is given the name of "toll in the shadow". This first phase will cover an extension of 23,619 hectares of irrigation.
- Xerta –Sènia irrigation. Regs de Catalunya recently adjudicated the adaptation for the irrigation of the section of canal from Xerta – Sènia in Tarragona. The canal, built 26 years ago in a semi-circular section to supply water from the river Ebro to the Sagunto steelworks, and currently disused, will be rebuilt to have a telescopic rectangular section,

#### Hydraulic works and large conducts

- Jorf Lasfar (Morocco). The work on the driving unit was completed in late 2007 for the company Maroc Phosphore. It included the driving of sea water to supply the cooling and the rest of the services of the new phosphoric acid production lines and the factory complex in Jorf Lasfar, a town on the Moroccan Atlantic coast, some 150 km south of Casablanca. The work has a canal to transport 75,000 m<sup>3</sup>/h of sea water, connection between deposits, a driving station with three motor pump units of 7,500 m<sup>3</sup>/h each (which may be doubled), and the network of concrete conducts with metal sleeve to distribute 45,000 m<sup>3</sup>/h from the pumping station to the production lines.
- New safety reservoir and raising station on the ETAP in Torrealta (Murcia-Alicante). This is still being done for the Mancomunidad de Canales del Taibilla, an organization of the Ministry of

the Environment. Its purpose is to extend the installations that supply raw water to the ETAP (potable water treatment plant) in Torrealta, so that it has sufficient storage capacity to guarantee the supply of drinking water in the event of short stoppages of a maximum of between 126 and 171 hours in the canal from where the water is taken. Given the capacity of the ETAP, 9,000 m<sup>3</sup>/h, two new semi-underground reservoirs will be built with a joint useful capacity of 756,000 m<sup>3</sup>, and a raising station with a nominal flow of 9,500 m<sup>3</sup>/h.

- Font Santa pumping and driving station (Barcelona). Aigües Ter Llobregat (ATLL), adjudicated us with the construction of the Font Santa Pumping Station and a section of the conduct that will connect it to the Trinitat Distributing Unit, to connect the two networks that supply drinking water to the metropolitan area of Barcelona (Ter and Llobregat systems), thus guaranteeing supply indistinctly from any point of the network with water from either system. To do this, 2,000 liters of water will be raised each second at 57 meters water column. The project supposes an investment of more than 20 M€.
- Improvement of the supply to the city of Cáceres from Portaje reservoir. The General Water Board adjudicated this work to us with an investment of over 40.4 M€. The aim is to satisfy the supply needs of 150,000 additional inhabitants in Cáceres and another 13 municipalities in the province, by building 3 pumping stations within the framework of acceptable environmental impact, and more than 65 km of conducts designed to transport a maximum flow of 1,500 liters per second.

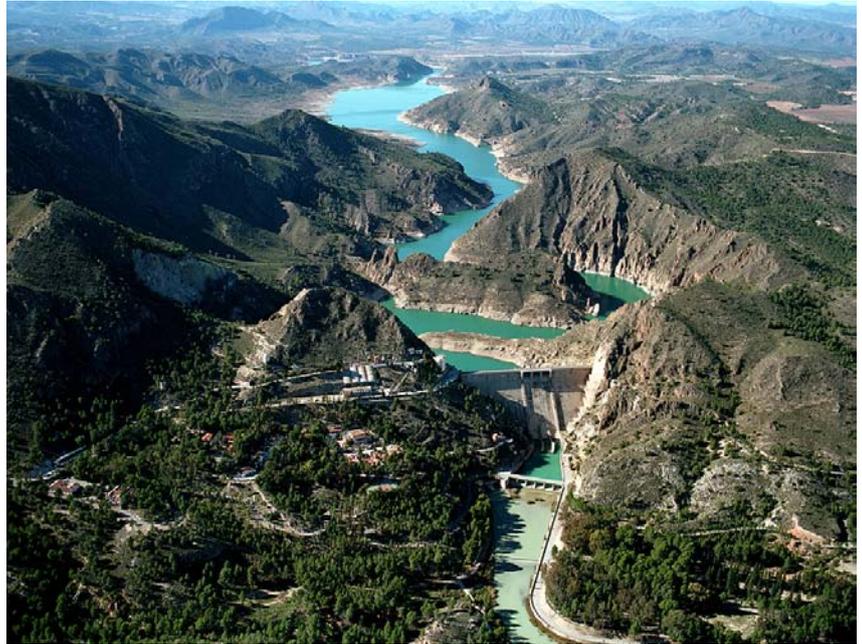


#### Supply and drinking water

- Extension of the "El Conquero" potable water treatment plant (ETAP) (Huelva). With these works, adjudicated by the state company Hidroguadiana, the plant will increase its capacity from the current 45,000 m<sup>3</sup>/day to some 90,000 m<sup>3</sup>/day, including, amongst other processes, a treatment consisting of ozonization and remineralization. This will respond to the increase in the population of the city of Huelva and the plant will be adapted to the quality parameters required by current legislation for water for human consumption.
- Supply to the Ojá-Tirón system (La Rioja). We are building the necessary infrastructures to resolve the supply problems in this area, which includes water uptake, the drinking water treatment plant, the network of conducts to distribute it with a length of more than 200 km, 145 km of new pipes, four pumping stations and all the complementary installations, to guarantee the operation of the system to supply a population that is expected to reach 76,000 inhabitants in 2025. This was adjudicated by the state company Aguas de la Cuenca del Ebro.



- Supply from the Cenajo Reservoir. Section III. ETAP (Murcia). Aguas de la Cuenca del Segura have adjudicated us the preparation of the project and performance of the work of the Cenajo ETAP (potable water treatment plant), of 6 m<sup>3</sup>/s, and a regulating tank of 12,000 m<sup>3</sup> for 33.8 M€. Both actions are framed in a much broader project, the object of which is the distribution to the municipalities of the Mancomunidad de Canales del Taibilla of 131 hm<sup>3</sup> of water for human supply, from the Tajo-Segura transfer.
- Systems of drinking water and sewers of the cities of San Juan del Sur and Boaco (Nicaragua). The two contracts, of great social content and financed by the Spanish government through FAD Funds, were adjudicated in 2007 by the Nicaraguan company, Empresa Nicaragüense de Acueductos y Alcantarillados Sanitarios (Enacal), for over 18 M€. The projects include the construction of both water uptakes, drinking water plants, drive lines and distribution systems, pumping stations, regulating deposits, collectors and waste water treatment plants. These actions will benefit some 66,000 inhabitants, improving the hygienic-health conditions of the population, guaranteeing the supply of drinking water in the dry season, and enhancing the tourist development of the area.
- Supply of waters from the river Cunene (Angola). Adjudicated by the National Water Directorate of the Ministry of Energy and Waters of the Head Office of the Republic of Angola, to resolve the problem of supply in the south of the province of Cunene. The work includes the water uptake system from the river, seven pumping stations, 100 km of conducts, two raised deposits and four on the surface, and this is the largest infrastructure project undertaken in the region. The investment of the adjudication of the works amounts to \$110 M.



#### Treatment and reuse

- EDAR Meco (Madrid). The work continues for the Canal de Isabel II, with a capacity to treat the waste for a population of 58,686 inhabitants, with activated mud treatments at half load with nitrogen and phosphorus biological elimination. The surplus muds will be treated by thickening, anaerobic digestion and mechanical dehydration with centrifuges. The project also contemplates the construction of a reinforced concrete interceptor that will take the waters to the treatment plant, and a section of the purified water outlet emission unit into the river Henares.



- Several treatment plants in Castilla – La Mancha. Aguas de Castilla-La Mancha adjudicated us two tenders of the project and work for a total amount of over 25 M€: on the one hand the EDAR (wastewater treatment plant) and collectors in Mocejón (Toledo), which, with a capacity to treat the waste of 100,000 inhabitants, will serve six municipalities; and on the other, thirteen treatment plants in the province of Albacete. Both actions will contribute to solving the problems of cleaning that are derived from the sharp growth in population and the absence of infrastructures in some centers.
- EDAR El Campello (Alicante). Adjudicated by the Public Entity of wastewater treatment of the Valencia Community, the EDAR will have a capacity of 4,000 m<sup>3</sup>/day in two lines that can be expended to three, it will treat the waste waters of the residential areas to the north of this tourist municipality on the Mediterranean coast. The treatment will be biological by reactor, with micro filtration membranes and later disinfection, so the waters could be reused for irrigation. The action also contemplates the collectors of the EDAR for taking in the wastewaters, and seven pumping stations.

#### Industrial water

- Lixivate plants for the Environmental Complex of Montalbán (Cordoba). The construction of this plant for the Cordoba Provincial Company of Waste and the Environment, where the waste is treated that is produced in 52 municipalities with more than 450,000 inhabitants, will have a capacity for treating 29,000 m<sup>3</sup>/year by MBR (Membrane Bio Reactor), ultra filtration and finally, an inverse osmosis phase that will allow the lixiviate to be reused in other activities such as washing vehicles and irrigation waters.
- Lixivate plant in "La Paloma" (Madrid). This is located in the bio methane installation of the same name, located in the Environmental Complex of Valdemingomez, the current disposal unit for the community of Madrid. It is designed to treat a flow of 110 m<sup>3</sup> a day by pre-treatment with filters of different gauges, biological treatment by aerobic process with anoxic area, an ultra filtration system, ending with an inverse osmosis process.
- Lixivate plant of the Waste Classification Plant in Zaragoza. With the same treatment process as the previous one, and with a capacity for a flow of 200 m<sup>3</sup> a day.
- Reformation of the waste water treatment plant in the Gijón factory of Arcelor –Mittal (Asturias). This action includes the installation of a new physical-chemical, treatment line that will allow the different flows of the steel production processes to be treated, specifically the flows of the blowing process (estimated volume of 30 m<sup>3</sup>/hour), the circuit purging process (estimated volume 40 m<sup>3</sup>/hour) and the slag damping process, producing 3 batches/day at 60 m<sup>3</sup>/batch.
- Abener – Abengoa Solar. (Sanlucar La Mayor, Seville). Design and construction for the PS-10 of the process water treatment plant (PTA) with inverse osmosis technology and electro deionization (EDI), to supply water to the cooling plants, mirror washing and to supply ultra pure water for the high pressure boiler. Design and construction of the effluent treatment plant (PTE) by physical-chemical treatment and sewage sludge dehydration system.
- Abengoa Bioenergy (Murcia). Reformation of the existing effluent treatment plant of the Ecocarburantes Españoles factory in Cartagena, consisting of making a primary treatment before the neutralization tank and increasing its biological treatment capacity.

In this time, Agua y Gestión continued to manage the Municipal Services in El Ejido (Elsur) Almeria, and the Servicios de Agua Baena de Córdoba in San José del Valle, Barbate y Vejer in Cadiz, of Herrera in Seville, of la Puebla de D. Fadrique y Ugíjar in Granada, and Zafra in Badajoz, giving a total of more than 200,000 inhabitants. Moreover, the dung water treatment activity continues with the operation in the treatment plant in Vilches (Jaen), this year having managed 64,200 m<sup>3</sup> of pig slurry.



## Latin America

We are present in the following countries: Argentina, Chile, Peru and Mexico, where we manage industrial waste and develop environmental engineering activities.

### Befesa Argentina

Our most significant works carried out in 2007, were the conditioning of waste with PCB for the companies Cican and Bridgestone Firestone and the certification of the destruction of the waste with PCB of the customers Coca Cola Femsa, Metrovías, Establecimiento Elaborador de Alimentos Sacaan, Hilados Nylon and Obras Sanitarias de Mar del Plata.

Furthermore, we have works currently under way and services, such as:

- Oil services  
Plant Operation Alfa Laval and US Filter Plant, La Plata refinery, Repsol YPF. We are working with two horizontal centrifuges installed in the effluent treatment plant (US Filter). These plants work 24/365.  
  
Slop Oil unit, Tank 265, La Plata Repsol YPF refinery. We continue to operate the plant set up by us for hydrocarbon recovery. In 40 months of operation, we have processed 88,220 m<sup>3</sup> of product, giving Repsol YPF 80 percent of water with HC, six percent of solids and 14 percent of livian HC in specification as sub products. This project involves 20 people and work is done 24/365.
- Transport, incineration, inertization and final disposal  
This service includes transport, incineration and final disposal in a security landfill of maintenance wastes, paint slops, cataphoresis silts, oils and empty containers. Our main customers are Daimler Chrysler, Ford, Peugeot – Citroën, Toyota Argentina and Volkswagen.
- Campana inertization plant and final disposal  
We have optimized the operative management by purchasing equipment to allow us to improve the compacting in the final waste disposal work in Celda de Campana.

- Pacheco Incineration Plant  
Following the policy of reducing operative risks, we increased the covered storage area by building a secondary storage warehouse for solvents, which allows any event or contingency to be isolated and controlled. Our laboratory in the plant is in a stage of expanding the services offered internally, to be able to begin to offer services in the industrial market in the future.
- Oil industry  
The services we give are transport, incineration and final disposal in a security landfill of maintenance wastes, coking carbon, insulations, spent catalysts and contaminated lands.
- Pharmaceutical laboratories  
The services we give are transport, incineration and final disposal in a security landfill of expired medicines, products off specification, raw material packaging, amongst other things.
- Chemical industry  
The services we give are transport, incineration and final disposal in a security landfill of maintenance wastes, mud's from effluent plants, raw materials off specification. Our main customers are Rohm & Haas and TFL.

### Befesa Chile

In July 2007, we started work on the construction of the centre for handling hazardous and non-hazardous industrial wastes (CMR) in Antofagasta II northern region of Chile, 1,500 km from the capital Santiago. The work is 30 percent advanced and includes the construction of a non-hazardous waste deposit, a hazardous waste deposit, a storage area for voluminous solid industrial wastes, a guard's hut and weighbridge, laboratory, hazmat building, hazardous waste store, non-hazardous waste store, administration building, lorry weighbridge, stabilization and solidification plant and solution handling plant. Operations are expected to start in March 2008.



### Befesa Perú

2007 was the fourth year in operation of the safety deposit of Befesa Perú, during which our activities were consolidated. The managed waste increased by 21 percent, exceeding 12,500 tons, and the portfolio of customers, which now lies at 256 companies. This all supposed sales increased by 28 percent.

Our activities have also been consolidated with regard to collecting and transporting hazardous wastes, as a way to approach the waste generating industries, in order to develop comprehensive services with greater added value. This has allowed us to attend new companies in the sectors of hydrocarbons (Petroperú), mining (Doe Run, Milpo and Southern Perú), chemicals (Merck, Basf and Farmex) and electricity (Luz del Sur – Pseg). The first activity is also being given in industrial waste recycling, having recycled 51 tons of cylinders.

Following the development plan of the infrastructure and the efficiency of our installations in the safety deposit, pressing and grinding equipment has been purchased; the safety of the operations has been increased by intensifying the signaling, improving the fire fighting equipment, implementing an air supply system in confined spaces, gas measuring equipment, improvement of the storage of inputs, materials and equipment. All of this aimed at the sustainability of our activities with the implementation in the deposit of a pilot treatment plant for the water generated, and which once treated can be used for irrigating green areas.



### Befesa México

Since 2001, in Befesa México we have been promoting the introduction of industrial waste management activities with the referent of promoting, building and operating a centre for treatment and final disposal of hazardous industrial wastes, and complementary activities including the correction of environmental liabilities and industrial cleaning.

In this year, we managed to complete the construction of the confinement vessel, which is being built by taking advantage of a natural pit, using the best techniques to guarantee the sealing required by current regulations. An access road has been built for heavy vehicles, and the systems for drainage and lixivate collection, which will be treated in the lixivate plant. The total filling volume is 450,000 m<sup>3</sup>.

In addition to the industrial and administrative installations, a road has also been built to connect the city of Zimapán with the plant for heavy vehicles, with a length of over 14 km, including the construction of two bridges with lengths of 64 and 18 meters.

## Research, Development and Innovation

### **R&D&I Strategy**

Our R&D&I strategy is aimed at creating value and developing new technologies to carry out our activities in a sustainable manner. In Befesa we have a strategic R&D&I plan with the following objectives:

- To be leaders and technologically competitive in the aluminum and galvanized steel waste recycling.
- To develop new technologies for industrial waste management.
- To be leaders in desalination technology and technologically competitive in the treatment and reuse of wastewaters.

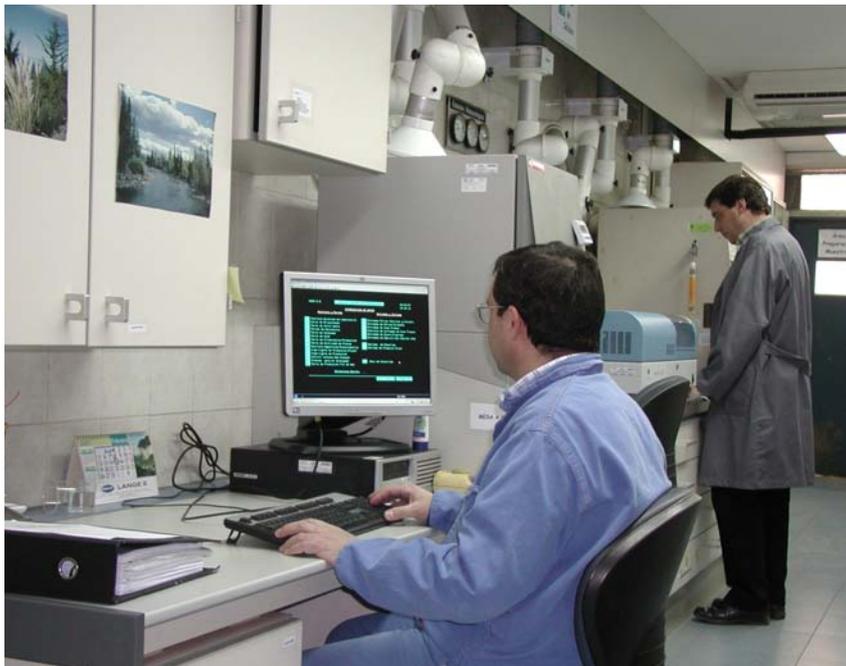
This strategy supposes a permanent commitment and is used as a vehicle for the continuous improvement and consolidation in technological leadership in waste treatment and generating and managing water.

In our aluminum recycling business, the R&D&I activities seek to improve our operating processes, the quality of our products, the development of new technologies and new business opportunities.

The projects developed by the steel recycling and galvanization business unit are focused on designing and building installations that allow us to improve our activity and research to achieve new materials from our products.

In the case of integral waste management, the new technologies must be adapted to the continuous evolution of environmental legislation, to prioritizing the management methods based on the hierarchy marked by reuse, recycling and revaluation as opposed to elimination treatments, and diversification towards new environmental markets, and increasing the number of treatable wastes.

With regard to our strategy for the sustainability of the integral water cycle, our plan is focused on optimizing the energy efficiency of the desalination and reuse of wastewaters, minimizing their costs and environmental treatment, and the optimization of the hydraulic infrastructures under considerations of



sustainability and the development of management systems for resources (natural and those generated and regenerated) bearing in mind droughts and the quality of the water, in addition to the floods.

Many of our projects are developed in collaboration with institutions and universities such as Euskoiker Foundation and the Bilbao Senior Technical School of Industrial Engineers, forming part of the activities carried out by the Aula Befesa in training and research; or with subsidies and/or co-operation with the Ministry of Industry, Trade and Tourism, the Regional Government of Andalusia's Department of Innovation, Science and Enterprise, CDTI, Inasmet, Valladolid University, the Program for Nurturing Technical Research (PROFIT), Andalusia Technological Corporation, Inatec Laboratory, Insesca and Alcan, amongst others.

## Research and Development

### Improvements in aluminum casting (Mecoal)

The objective of this project is the enhancement of the automatic casting or ingoting lines sold by the technology department. One of the most important aspects to be resolved was the elimination of the external cavities in the ingots. Several laboratory tests were performed for this, simulations of the solidification process with the Procast program, and a prototype was tested in the foundry. The systems for eliminating the cavities may be heating or cooling of the upper surface and shaking this surface, either with air or by mechanical means. The mechanical means were chosen in our processes, dealing with suitable refrigeration of the ingoting lines. This R&D project is of great interest for improving our technological offer, and concerns basic metallurgy unknown in the market that requires it, so it is open to patenting. In 2007, the ingot demolding system was patented that was developed last year in an earlier phase of this project.

### Pilot plant for the energy-chemical use of the waste gases from the process

Starting with the results achieved in the previous phase of the project concluded last year, this second stage is intended to study the continuous use of the current of gases from the Waelz plant for absorbing the CO<sub>2</sub> needed in the regeneration of the lixiviant bleach, used in the waelz oxide washing process. As a final objective, the continuous production is pursued of a final product (D-L.W.O.®), of a quality similar to the present, through the self-consumption of the bicarbonate-carbonate achieved from the waste gases, with the consequent minimization of the CO<sub>2</sub> emissions into the atmosphere.

### Obtaining of new products from purified waelz oxide (D-L.W.O.®)

On the basis of experimental tests and trials performed some years ago, to achieve zinc oxide (ZnO) of great purity (99.99%) from double lixivated waelz oxide (D-L.W.O.®), using a bleach containing ammoniac and ammonia carbonate as a lixiviant agent, the lines of research have been expanded with other acid and basic lixiviations, in order to achieve new products of greater added value, such as the



mentioned zinc and/or zinc metal oxide the current finished product (D-L.W.O.®), as raw material in the new process.

### Project to design and build an installation for zinc oxide pelletization

This year, Befesa Sondika concluded this project, intended to achieve an 80 percent reduction in the scattered emissions of solid particles generated in the fabrication of zinc oxide, during the operations involving the transfer of the product from the silos to the sacks, big-bags or tank trucks. By mixing the end product with liquid agglomerates in a pelletization plate under controlled conditions, the diffuse emissions of material into the atmosphere is minimized, and, after the opportune drying process, a more compact, easier-to-handle pelletized zinc oxide is achieved, improving the output of the process and giving the product greater added value. In 2007, the project was completed with the optimization of the drying phases, in order to keep the final properties of the product stable, and the company is now awaiting industrial approval of the product from its main customer, which is expected for early 2008.

#### Production of fiber glass reinforced thermoplastic composites

The goal is an industrial installation for the production of fiber glass reinforced polypropylene with a fiber glass content of between 20 and 40 percent, to achieve final production of between 7,000 and 8,000 tons to be sold, mainly, to the automobile and electro-domestic industries. The product will be obtained by mixing polypropylene and additives, together with the fiber glass, in variable percentages, in function of the needs or requirements of potential customers. The research work is aimed at achieving an end product from recycled materials, of the same technical characteristics as the composites manufactured with virgin materials. Therefore, the study has focused on identifying and designing a production process suitable for mixing and treating the product to be manufactured. The process incorporates recycled materials, the competitive advantage being the lower purchase price of the materials to be utilized as against that of the virgin products currently used in the manufacturing of these composites.

#### Production of new materials and alternative fuels

With the aim of revaluating and recycling waste, Befesa continues the search for new materials for use in the construction area utilizing inorganic industrial wastes, thereby reducing the consumption of non-renewable raw materials. To this end, together with the University of Seville, the efficiency of the metal encapsulating mechanisms in crystalline networks is being evaluated. At the same time, through the use of organic industrial wastes, alternative fuels that enable the reduction of consumption of fossil fuels and minimization of CO<sub>2</sub> emissions are being pursued. In this way, industrial waste is recycled efficiently and safely, by propitiating the use of waste-derived fuels as a vehicle towards sustainability.

#### Correction of contaminated lands from harmless wastes and other sub-products

The enforcement of a new regulating framework considering the management of contaminated lands, propitiates the development of techniques that prioritize the treatment of the land in the place itself, as opposed to techniques that imply massive land movement. In this sense, it is intended to confirm correction techniques with the contamination of metals and hydrocarbons, based on fixing the

contaminants through the use of harmless industrial wastes based on plaster and other sub-products, such as modified clays or organic clays. Correct management of land and its natural resources is a priority in the development of the environmental services.

#### Use of glycerin

Glycerin is a sub-product in biodiesel manufacture that is caused in a proportion of 10 percent in relation to it. The recent rise of this biofuel in Europe in general, and in Spain in particular, is causing saturation in a market which up to now was as stable as the glycerin market. Given the volumes of glycerin expected in coming years, it is very possible that this should be managed as waste. In fact, a large part of the glycerin is currently being eliminated in cement furnaces. We are therefore developing alternatives for the correct environmental management of glycerin, by focusing our effort on material revaluation in the search for new substances and in energy revaluation.

#### High efficiency desalination pilot plant

The aim is to reduce the energy consumption of the desalination to values below 2.5 kWh/m<sup>3</sup> of water produced. The inverse osmosis membranes and the energy recovery systems have been studied for this, and also improvements in the process that allow energy consumption to be minimized. The project is subsidized by the Regional Government of Andalusia's Department of Innovation, Science and Enterprise and the Ministry of the Environment.

#### Study of the brine dilution phenomenon



The purpose is to develop a system for diluting the brine from the desalinating plants, to guarantee the minimization of any possible environmental impact. We are therefore developing a simulation tool confirmed with experimental data achieved from a physical scale model. The project is subsidized by the Regional Government of Andalusia's Department of Innovation, Science and Enterprise; the Andalusia Technological Corporation and the Ministry of the Environment.

#### Elimination of the EDAR (waste water treatment plant) silts by supercritical oxidation

This project is intended to demonstrate the technical and economic feasibility of the supercritical oxidation technology in eliminating the EDAR (wastewater treatment plant) silts, for which a pilot plant has been designed and is being built, and which is expected to start up in early 2008. The Regional Government of Andalusia's Department of Innovation, Science and Enterprise; the Andalusia Technological Corporation and the Ministry of the Environment are subsidizing the project.



#### Development of Renewable Energies for Desalination (DeReDes)

The object of the project is to perform a systemic study of the possible combinations of desalination technologies and the possible sources of renewable energies. The technical and economic feasibility of the different combinations is being analyzed, bearing in mind the possible scenarios for locating these kinds of plants. Finally, three concepts of desalinating plants with renewable energies will be designed. The Project is subsidized by the Ministry of Industry, Trade and Tourism; the Program for the Development of Technical Research (PROFIT) and the Ministry of the Environment.

#### Advanced treatment of wastewater for reuse (TRASOS)

The aim of this project is to develop the optimal technologies to allow the regeneration of water, in line with the type of wastewater to be treated and the quality required in line with the final expected reuse. Physical-chemical technologies, membrane technologies, biological processes and electrolytic technologies are being developed and laboratory pilot plants are used for this.

## **Innovation**

### Treatment of SPL

The project pursues an application for the carbonic part of the electrolysis cells (SPLs) used in the production of primary aluminum. It is an environmental service for plants that require recycling of this material. The work carried out this year is as follows:

- In Wales: the problem-free industrial scale crushing of a truckload of material was carried out. This demonstrates the ease of this operation, which is necessary for future applications.
- In Spain: with the sample obtained from Alcoa, thermogravimetric and chemical analysis tests to apply the thermolysis that destroys the material's most hazardous substances have been carried out. The research work will center mainly on substances with fluorine content. The project has been developed in co-operation with Alcan.

### Pre-treatment of fuels for the hazardous waste vitrification by plasma plant

The project consists of building a plant for the heat treatment of hazardous waste by means of a plasma vitrification process. Its objective is to eliminate the waste and make use of the synthesis gas generated in the process to produce electrical energy. To expand the range of treatable wastes and to optimize the operating conditions of the process, a waste pre-treatment system is being developed. These wastes constitute the input fuel of the synthesis gas production process.

### Development of advanced pre-treatment systems for desalination

The aim of this project is to develop the raw sea water treatment systems that allow us to guarantee that the quality of the water entering in the inverse osmosis membranes is optimal, depending on the type of sea water and bearing in mind its possible seasonal variation. Physical-chemical and biological process technologies and membrane technologies are being developed. The project is subsidized by the Regional Government of Andalusia's Department of Innovation, Science and Enterprise and the Ministry of the Environment.

### Development of a control system for large desalinating plants

The purpose of this is to develop a system of integrated control, that allows the optimization of the operation of the desalinating plants by maximizing their availability, and which includes tools to help in the decision-taking process. The Regional Government of Andalusia's Department of Innovation, Science and Enterprise; the Andalusia Technological Corporation; the Ministry of Industry, Trade and Tourism and the Program for the Development of Technical Research (PROFIT), are subsidizing this project.