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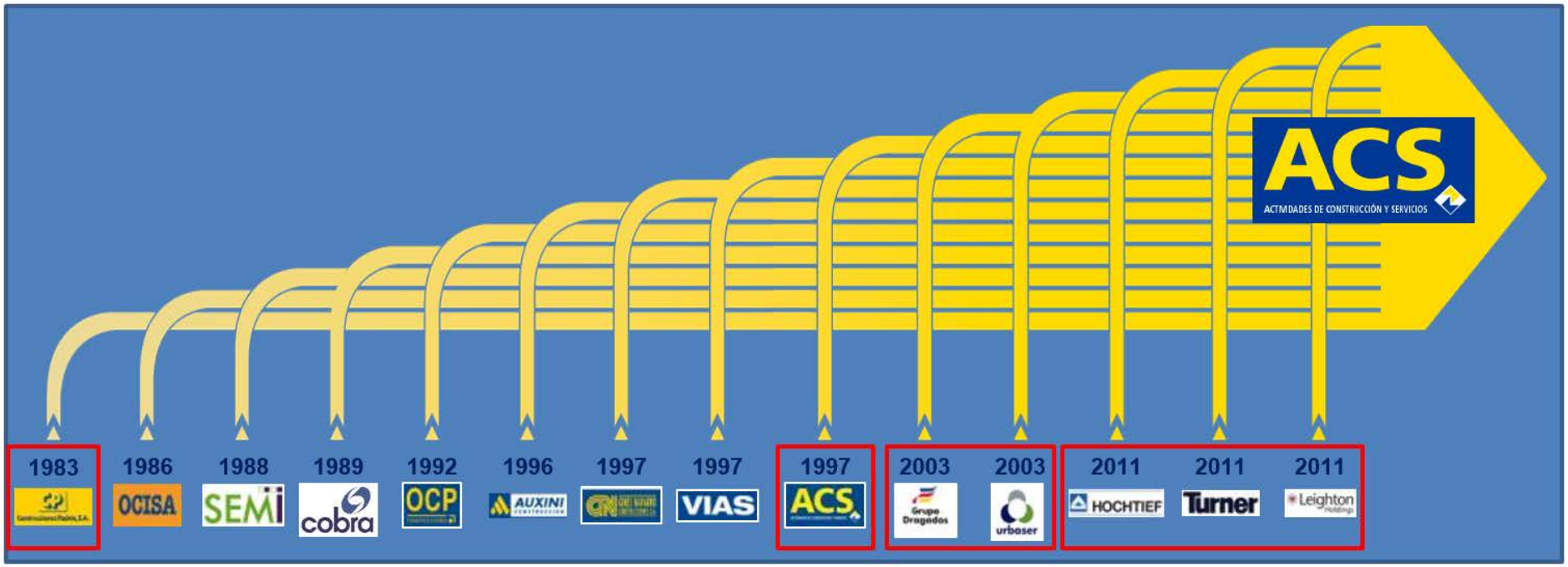
Comprehensive Solutions
for Water Treatments

Contents

The ACS Group

Evolution of an Extensive Group

ACS's history spans **30 years** of the integration of companies and businesses, allowing it to become the **world leader** in the development and operation **of infrastructure and energy assets**.



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The ACS Group
The leader in Infrastructures

ENR **THE TOP 250**

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PARIS HARMONY
Bouygues is completing construction of the 2,400-seat Philharmonie de Paris, designed by French architect Jean Nouvel. It features over 10,000 sq ft of photovoltaic panels and a rainwater recovery system.

International Contractors

It's a Competitive Wor

For large contractors, the amount of work is increas demands of their clients and the competition By Peter

ENR THE TOP 250 INTERNATIONAL CONTRACTORS

RANK 2014	RANK 2013	FIRM	2013 REVENUE $ MIL. INT'L	TOTAL
1	1	**GRUPO ACS,** Madrid, Spain†	44,053.8	51,029.3
2	2	**HOCHTIEF AG,** Essen, Germany†	34,845.0	37,012.8
3	3	**BECHTEL,** San Francisco, Calif., U.S.A.†	23,637.0	30,706.0
4	4	**VINCI,** Rueil-Malmaison, France†	20,292.6	54,107.0
5	5	**FLUOR CORP.,** Irving, Texas, U.S.A.†	16,784.3	22,144.1
6	6	**STRABAG SE,** Vienna, Austria†	15,392.0	18,023.0
7	7	**BOUYGUES,** Paris, France†	14,789.0	35,993.0
8	9	**SKANSKA AB,** Stockholm, Sweden†	14,141.1	18,446.5
9	10	**CHINA COMMUNICATIONS CONSTRUCTION GROUP LTD.,** Beijing, China†	13,162.5	54,181.7
10	11	**TECHNIP,** Paris, France†	12,243.0	12,399.0
11	8	**SAIPEM,** San Donato Milanese, Italy†	12,137.6	12,310.2
12	12	**CONSTRUTORA NORBERTO ODEBRECHT,** Sao Paulo, SP, Brazil†	9,877.1	15,145.8
13	15	**HYUNDAI ENGINEERING & CONSTRUCTION CO. LTD.,** Seoul, S. Korea	8,707.8	13,784.9
14	**	**FERROVIAL,** Madrid, Spain†	7,416.5	10,861.2
15	13	**SAMSUNG ENGINEERING CO. LTD.,** Seoul, S. Korea†	7,132.5	9,292.5

ACS
ACTIVIDADES DE CONSTRUCCIÓN Y SERVICIOS

MEMBER OF
Dow Jones Sustainability Indices
In Collaboration with RobecoSAM

Revenues 2014
€ 34.881 mn

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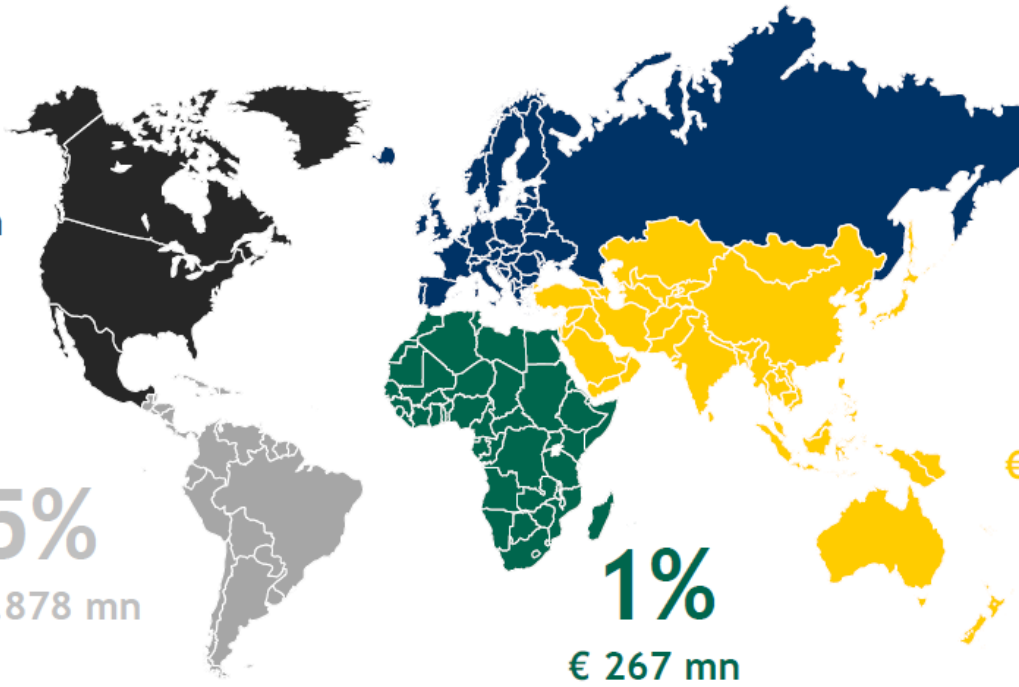
The ACS Group

Financial results (Dec, 2014)

ACS
ACTIVIDADES DE CONSTRUCCIÓN Y SERVICIOS



Revenues 2014 € 34.881 mn

Construction	Industrial Services	Environment
€ 25.820 mn	€ 6.750 mn	€ 2.338 mn

EBITDA € 2.466 mn

Net Debt € 3.722 mn

Employees 210.345

The ACS Group

Corporate Strategy

VISION:

- **An international point of reference** in the civil and industrial infrastructures **construction** and **development** industry.
- A group participating in the **development** of basic sectors for the **economy**.
- A company that is committed to the **economic and social progress** of the countries in which it operates.

MISSION:

- To strive for **global leadership,** optimizing the **profitability of resources** and promoting **sustainable growth.**

VALUES:

COMPETITIVE ADVANTAGES:

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The ACS Group
Industrial Services

ACS SERVICIOS COMUNICACIONES Y ENERGÍA

- The ACS **Industrial Services** Area develops both concession contracts and "turnkey" (EPC) construction contracts as well as industrial infrastructure maintenance activities.
- Its growth has been tied to the increasing demand for oil, gas, electricity and industrial installations in general.
- Strong presence in Latin America and the Middle East, with clear growth in the Asia-Pacific markets and developing countries.
- Turnover of **€6,750 M** in 2014, **with 63% in the foreign market**.

cobra GRUPO Dragados Industrial

- Power Networks
- Petroleum and Gas
- Water
- Traffic Control
- Railways
- Telecommunications
- Electromechanical Installations
- Industrial Plants
- Offshore
- Energy
- Auxiliary Services

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The Cobra Group

Main Highlights

cobra

- The **Cobra Group was created in 1943** and was acquired by the **ACS Group in 1989.**
- In **1978** Cobra group appeared on the international scene, in Saudi Arabia with the construction of OHV Line for an Oil Company. Immediately, new contracts in Libya, United Arab Emirates and Oman were awarded.
- Our matrix organization is formed by specialized Business Head Offices that support our services-activities of **engineering, construction, operation, installation and maintenance** of the industrial facilities and power infrastructures, and which allows us to undertake any project with total efficiency and capability anywhere in the world.
- Our strategy for the future is to achieve and maintain a clear **leadership position** in all the activities, through our **service quality**, our **market share** and our **high profitability**.

AENOR Gestión Ambiental GA-2006/0259

AENOR ER Empresa Registrada ER-0588/2002

CERTIFIED IQNet MANAGEMENT SYSTEM

OHSAS 18001

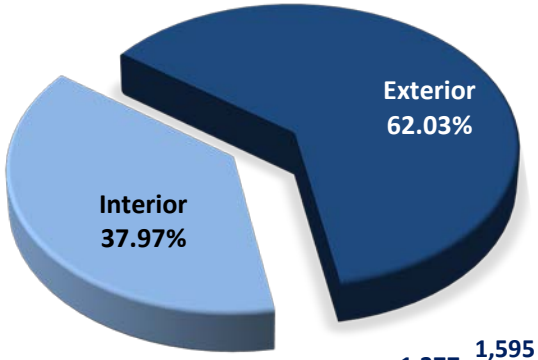


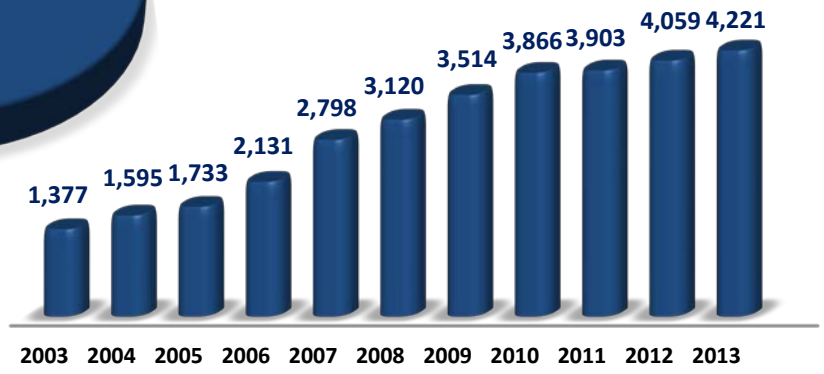


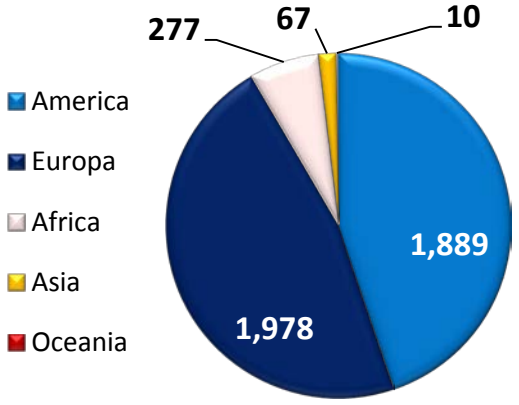
The Cobra Group

Annual turnover (Dec, 2014)

- The evolution of the **Cobra Group** is characterised by a **sustained growth**, based on the development of business in new countries and the **creation of local** specialised companies.
- The Group has been working for **over 30 years** in different countries and activities. Today the Cobra Group is **present on the five continents**, developing projects such as EPC, BOT, Concessions, etc.







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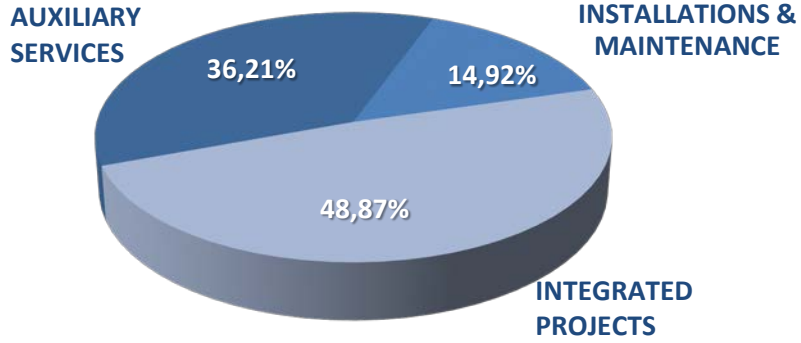
The Cobra Group
Business Areas



AUXILIARY SERVICES

- **Electricity:** Power Distribution, Power Transmission, Substations, Live-line Works, …
- **Railways:** Overhead Contact Lines, Catenary and Signaling Systems, Urban Transport, …
- **Communications:** Engineering, Piping and Wiring, Integral Services, Lines and Cables, Optic Fibre, …
- **Gas:** Distribution Networks, Regulating Stations, Integral urban gasification, …
- **Hydrocarbons:** Drilling and Mining, Collecting and Bucking Stations, Fuel Drying Plants, Oilfield development, O&M, …
- **Other Services:** Additional Activities, Sporting facilities, …

INSTALLATIONS & MAINTENANCE

- **Electrical Installations:** Industrial Insts., Control & Instrumentation, Building works, Public Sector, …
- **Mechanical Works:** Heavy Structure assembly, Industrial sector, EPC Contracts, O&M, …
- **Air Conditioning:** Management Systems, Automation, Hotels & Resorts Eqs, …
- **Maintenance:** Building & Industry sectors, Infrastructures, Other services, …
- **Engineering:** Telecommunications, environmental, power and all kinds of industrial Projects, …
- **Airports handling Oper.:** Fleet Management, Aircraft Maint., Operation Military Facilities., …

INTEGRATED PROJECTS

- Renewable energies (Wind and thermosolar farms , …) — eyra
- Industrial Installations
- Offshore — Dragados Industrial
- Liquefied Gas
- Power Plants
- Petrochemical Industry — cobra PLANTAS INDUSTRIALES
- Hydroelectric plants and dams
- Hydraulic infrastructure
- Industrial building — cobra INFRAESTRUCTURAS HIDRÁULICAS
- Desalination, Drinking & Waste Water treatment plants, pipelines, …
- Environment (evaluation of energy from waste) — tedagua

Work systems examples

Integrated Projects

	Wastewater treatment plant	Combined Cycle Plant	Solar Thermal Field
DEVELOPMENT	ProInversión	BizkaiaEnergia	ACS
MAIN CONTRACTOR	ACS	GE, ACS	SENER, cobra
EPC SUBCONTRACTOR			
Engineering	tedagua	(1) GE; cobra, SENER	SENER
Procurement			cobra
Construction			
Commissioning	(1) EMASESA, tedagua		
O&M SUBCONTRACTOR	tedagua	BizkaiaEnergia	ACS

(1) Selected consultants and subcontractors, equipment manufacturers, etc.

Our History

- **TEDAGUA** (Técnicas de Desalinización de Aguas, S.A.), was **established in 1983** on Gran Canaria, and has 30 years of experience in the field of **desalination** and **water treatment**.
- Since August 2001 it has formed part of the **Cobra Group** and it's the specializes company in water treatment (desalination of seawater and brackish water, drinking and wastewater treatment plants, regeneration plants, etc), and hydraulic works in general.
- TEDAGUA has supplied more than 100 desalination plants, representing a desalinated water production capacity of 900,000 m^3/day.
- TEDAGUA has built the largest wastewater treatment plant in South America: the Taboada WWPT in Lima (Peru). It provides service to an equivalent population of more than 4.1 million, with an average flow of 14 m3/s and peaks of 20 m3/s.

AENOR ER Empresa Registrada UNE-EN ISO 9001 ER-1478/2008

IQNet UNE-EN ISO 9001 UNE-EN ISO 14001 ES-1478/2008 ES-2008/0626

AENOR Gestión Ambiental UNE-EN ISO 14001 GA-2008/0626

SYSTEM CERTIFICATION OHSAS 18001 SGS ES-10/7781

Our Services

DEVELOPMENT

- Proprietary concessions financed through **project finance** or similar methods.
- Alliances with clients and public institutions, **putting up the capital** when necessary.

EPC CONTRACTOR

- Independently or with **strategic partners.**
- Possibility of consortiums **with client subsidiaries.**

SUBCONTRACTOR

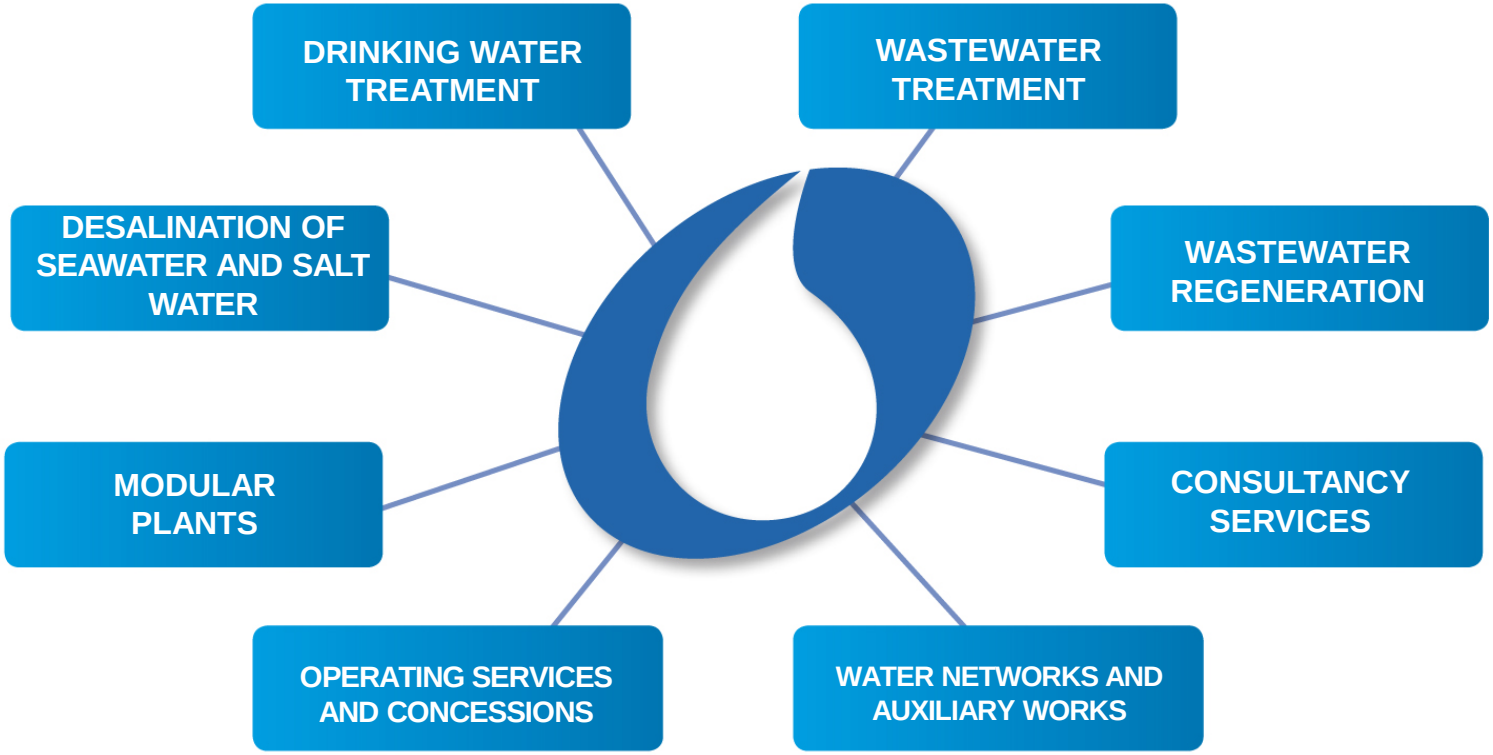
- Full **capacity** to **execute all disciplines** (civil, mechanical, electrical, etc.)
- Strategic alliances with the **main equipment manufacturers** and/or **leading engineering firms.**

OPERATION AND MAINTENANCE

- Specialists in the **operation and maintenance** of water treatment plants and auxiliary works.

Our

Activities



Our

References

1 SEAWATER AND SALT WATER DESALINATION PLANTS (SWRO/BWRO)

2 DRINKING WATER TREATMENT PLANTS (DWTP)

3 WASTEWATER TREATMENT PLANTS (WWTP)

4 WASTEWATER REGENERATION PLANTS

5 INDUSTRIAL PROCESS WATER TREATMENT PLANTS

6 WATER NETWORKS AND AUXILIARY WORKS

References

1. Seawater and brackish water Desalination Plants (SWRO/BWRO)

Beni Saf Desalination Plant
(W. Aïn Témouchent, Algeria)

- With a production of **200,000 m^3/day**, this is considered to be one of the largest seawater desalination plants in the world.
- It covers the water needs of a population of **750,000 people** living in the wilayas of Aïn Témouchent and Orán.
- The works and operating period is **25 years** and it will generate revenue of more than **400 million dollars** .
- This has proven to be one of the best employment and development opportunities for the area, with the creation of more than 700 jobs.

Awarded	May 2004
Client	SONATRACH
Location	Beni Saf, Algeria
Technology	Reverse Osmosis
Design flow	200.000 m^3/day
Final use	Drinking water
Investment	129.2 M€
Contract Type	DBOT 25 years
Current status	**In operation**

Escombreras Desalination plant
Murcia (Spain)

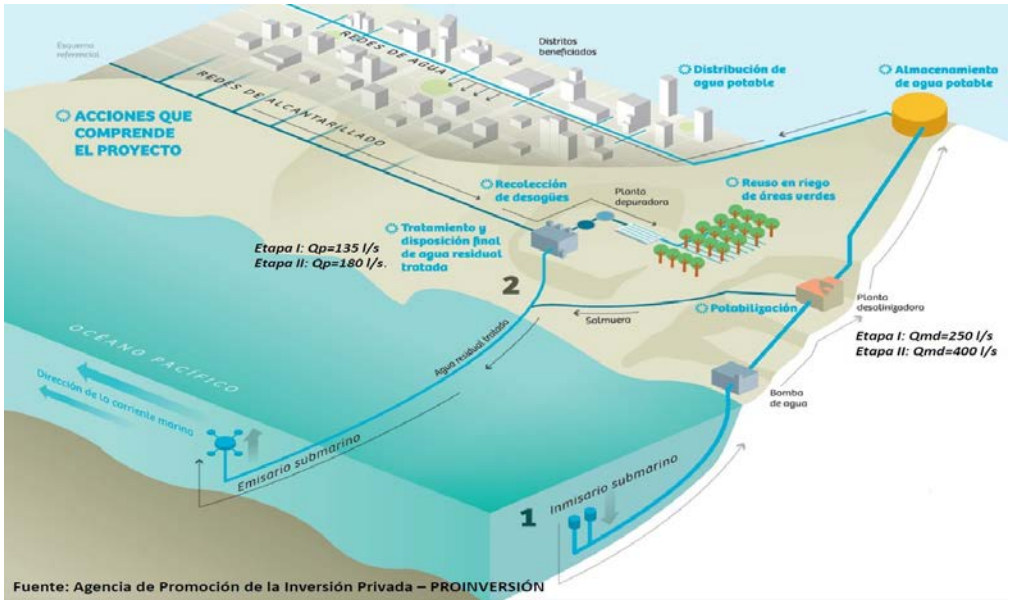
- This currently has a maximum production of **63,000 m³/day** of drinking water, which is easily increased to 72,000 m³/day. The works include 51.3 Km of distribution pipelines with diameters between 700 and 1,000 mm.
- Due to the large variations that may occur in raw water quality, this plant is equipped with the most demanding pre-treatment stage constructed to date, consisting of coagulation - flocculation, dissolved air flotation, activated carbon filtration, ring and ultrafiltration filters.
- Its water production is able to supply more than **300,000 inhabitants in 20 municipalities**, making it one of the most important water-supply infrastructures in the Murcia Region.

Awarded	June 2006
Client	Murcia Regional Water Authority
Location	Cartagena, Murcia
Technology	Reverse Osmosis
Design flow	63,000 m³/day (ext. to 72,000 m³/day)
Final use	Drinking water
Investment	€126 M (incl. additional works)
Contract Type	DBOT 25 years
Current status	**In operation**

Desalination plant of the **PROVISUR project** - Lima (Peru)

- This desalination plant is part of the Provisión de Servicios de Saneamiento para los Distritos del Sur (**PROVISUR**) project and it´ll turn into the first experience in desalination in Peru, taking seawater as a supply source.
- The project will benefit around **100,000 inhabitants** in the summer period and it will include the necessary infrastructures for improving and enhancing the current drinking water supply service and the sewage system (**230 km of pipelines**), along with a new wastewater treatment plant **(WWTP) of 16,000 m3/day** capacity and the refurbishment of two existing WWTP´s.

Awarded	December 2013
Client	SEDAPAL (Lima Water Supply & Sewerage Authority)
Location	Lima, Peru
Technology	Reverse osmosis
Design flow	Phase I: 21,600 m^3/day Phase II: 34,560 m^3/day
Final use	Drinking water
Investment	MM$ 100 (PROVISUR Project)
Contract Type	DBOT 25 years
Current status	**Under construction.**



Desalination plants of the **Águilas and Mazarrón Irrigators Community** Murcia (Spain)

- In the past, these were two **fundamental installations** for the agricultural development of the Murcia region, due to the scarcity of water suffered by both municipalities.
- They were developed in several phases, and the current production capacity is**30,000 m3/day (Águilas)** and **37,500 m3/day (Mazarrón)**.
- The Mazarrón desalination plant was the first in Spain to incorporate energy recovery in order to reduce power consumption.

Small
Modular Plants

Seawater desalination plant “FRED OLSEN”
Q = 2,000 m^3/day
San Sebastián de la Gomera (Canary Islands)

Seawater desalination plant “COSTA GUANCHE”
Q = 2,000 m^3/day
Gáldar (Canary Islands)

16 Mobile Units for Directorate for Military Works
Q= 45 to 130 m^3/day
Abu Dhabi (U.A.E.)

References

2. Drinking Water Treatment Plants (DWTP)

Water supply to Pontevedra and **Lérez DWTP** (Spain)

- Expansion of the **Lérez DWTP from 25,900 to 86,400 m^3/day.** The treatment process consists of the physical-chemical treatment, solids separation, filtration, and disinfection.
- **Additional works:** 10.3 km of new pipelines, upgrading of existing pipelines by “trenchless” methods, 4 new tanks with a total capacity of 25,000 m^3, 3 new pumps and the extension of another, and electrical service connections.
- **Population supplied:** 120,000 inhabitants.
- **Client:** ACUAES (Aguas de las Cuencas de España, S.A.)
- **Budget:** €18.6 M
- **Current status:** under construction.

Water supply to Monforte de Lemos and **Ribasaltas DWTP** – Lugo (Spain)

- New drinking water treatment plant with a capacity of **20,000m³/day**, and with civil works executed for a future extensión up to 26,000 l/s.
- The **DWTP** consists of two independent lines, with pre-filtration, ozone oxidation systems, pH adjustment, physical and chemical treatment, a lamellar decanting module, double-layer pressure filtration in sand and anthracite, and final disinfection with ultraviolet light and sodium hypochlorite.
- **Additional works:** New tank with capacity for 3,500 m³, pumping station of 300 l/s, discharge pipe Ø 500mm and 250m lengh and interconnection of several existing tanks.
- **Population supplied:** 30,000 inhabitants.
- **Client:** ACUAES (Aguas de las Cuencas de España, S.A.)
- **Budget:** €5.3 M
- **Current status:** under construction.

Extension of the **Jaen DWTP** – Peru

- This solved the drinking water problems of the **86,000 inhabitants** of the city of Jaén, located in the northern part of the country in the Cajamarca region.
- The works consisted of expanding the plant's capacity from 14,500 to **40,000 m^3/day.**
- It consists of the chemical building, mixture and diffuser, flocculators, lamellar settling tanks, fast declining-rate filters, chlorine contact chamber, and desilter.
- Awarded by the Regional Government of Cajamarca in February 2010, it represented a total investment (including additional works) of **€25 M**.

Drinking water plants in **Romania**

DWTP and distribution network in **Chiciu (Calarasi)**

CLIENT: Ecoaqua **INVESTMENT:** €4.3 M
DESCRIPTION: Underwater intake and floating pump station in the Danube River, DWTP of 35,700 m^3/day and 6.5 km distribution network.

Intake, DWTP and network works in **Urziceni (Calarasi)**

CLIENT: Ecoaqua **INVESTMENT:** €5.3M
DESCRIPTION: 30 collection wells and pipelines to the DWTP of 11,000 m^3/day, pump stations and 11 km of distribution networks.

DWTP and distribution networks in **Agnita and Dumbrăveni (Sibiu)**

CLIENT: APA Tarnavei Mari SA **INVESTMENT:** €7.1 M
DESCRIPTION: Agnita: New DWTP with a capacity of 6,500 m^3/day and 36 km of pipelines. **Dumbrăveni:** Renovation of 8 collection wells, pipelines and DWTP for 2,900 m3/day

DWTP's Improvements in **Catamarasti and Bucecea (Botosani)**

CLIENT: SC Nova Apa Serv S.A. **INVESTMENT:** 3.4 M€
DESCRIPTION: Works to improve treatment to reduce turbidity to the level of 200 NTU set out in the European directive in both plants.

References

3. Wastewater Treatment Plants (WWTP)

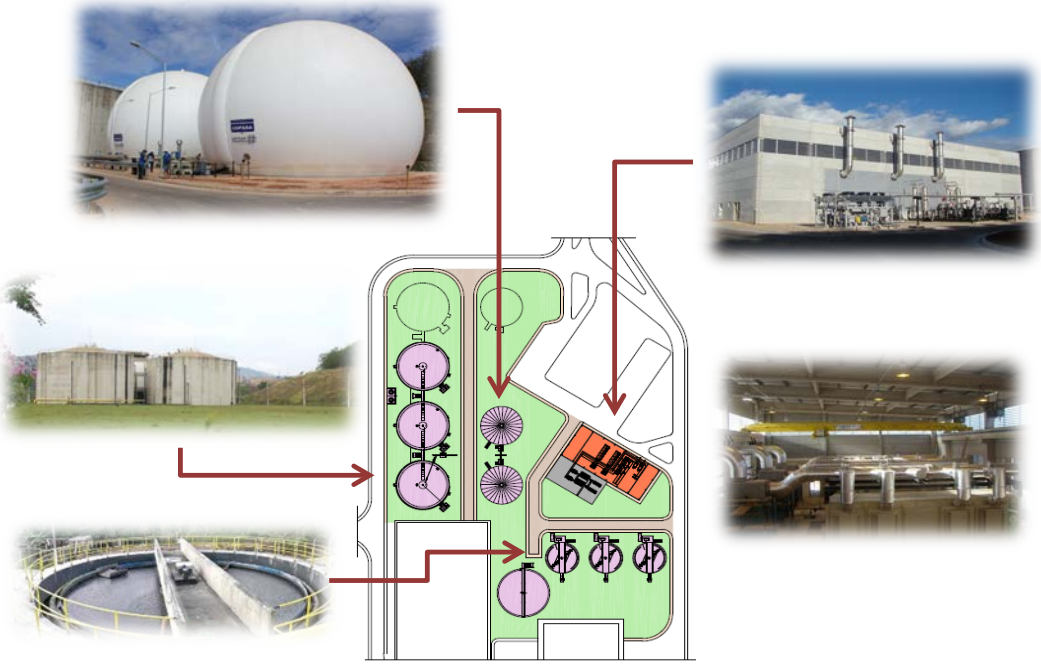
Taboada WWTP

Lima - Peru

- This is a concession contract (DBOT) from the Peruvian state agency **ProInversión**, managed by SEDAPAL, with a total budget of 660 M€, **133 M€** of which correspond to construction.
- With **an average flow of 14 m^3/s** and a maximum flow of 20.3 m^3/s, it has become the largest wastewater treatment plant constructed to date in South America.
- It will provide service to a population of more than **4.1 million inhabitants**, which represents 56% of the population of Lima and Callao and 72% of the wastewater from the two cities.
- The plant will initially consist of raw water pumping, pre-treatment with roughing grates, 6 mm screening, degreasing – desilting, and fine screening at 1 mm, considering expansion to include tertiary treatment of effluents.
- The treated water is discharged through an HDPE underwater outfall with a diameter of 3,000 mm almost 4 km from the coast.

Waste Sludge to Energy Plant in the **Dr Hélio Seixo de Brito WWTP**, Goiânia (Brazil)

- **Client:** SANEAGO (Saneamento de Goiás S.A.)
- The **Dr Hélio Seixo de Brito WWTP** cleans the waste water from a 840,000 inhabitants population, with an average flow capacity of 2.3 m3/s. Thank to this project, electrical power will be produced from the biogas generated in the WWTP digesters.
- The **facility** will be made up of:
  - 3 sludge thickeners of 16 m diameter.
  - 3 digesters of 9,327 m^3, each one.
  - A digested sludge tank of 5,400 m^3.
  - 2 gasometers of 4,100 m^3.
  - 2 biogas pre-treatment units with a capacity of 600 Nm^3/h.
  - 10 microturbines of 200 Kw, each one.
  - A 1,000 m^2 building to store the microturbines and control systems.
- **Budget:** 33 million Euros
- **Current status:** Under construction.



Expansion of the **Bizerte WWTP** – Tunisia

- This is a “turnkey” construction contract (EPC) for the **ONAS** (Office National de l´Assainissement).
- The plant increased its treatment capacity from 5,000 m^3/day using basic impoundment treatment, **at 26,500 m^3/day** based on extended aeration by activated sludge.
- It gives service a population of **200,000 inhabitants.**

Renovation and extension of the **Nabeul WWTP** - Tunisia

- L'Office National de l'Assainissement (**ONAS)** in May 2013 awarded Tedagua the new wastewater treatment plant **SE4 in the city of Nabeul**, which will have a treatment capacity of **17,000 m3/day** and will serve a population of **173,000 inhabitants**.
- The process planned by TEDAGUA consists of a degreasing and elimination of sand, primary decanting, nitrification-denitrification with elimination of phosphorous and biological treatment by activated sludge.
- The line of sludge consists of mechanical dehydration of the sludge, anaerobic stabilisation by digestion and cogeneration by evaluation of the biogas. The treatment of odours is carried out through photo-ionisation.
- The tertiary treatment of the treated water will be carried out by continuous filtration and UV radiation treatment.
- **Budget:** 16.3 million Euros.
- **Current status:** Under construction.

Concessions for the **WWTPs in Zones 09, 07A and P2** of Aragón - Spain

These are 20-year concessions that are part of the **Special Sewer and Treatment Plan of Aragón** developed by **the Aragon Water Institute**, which will achieve the treatment of **100%** of the wastewater in the region.

ZONE 09

Awarded in January 2006.

The works include the construction of **11 WWTPs with capacities of between 480 and 2,500 m³/day** for a population of **32,000 inhabitants**, in addition to 32.2 km of sewer pipe with diameters ranging from 250 to 630 mm.

Budget: €62 M

In operation.

ZONE 07A

Awarded in March 2007.

They include the construction of **9 WWTPs of between 480 and 1,750 m³/day** for a population **36,600 inhabitants**, as well as 4.4 km of sewer pipes with diameters of between 500 and 1,200 mm.

Budget: €85 M.

In operation.

ZONE P2

Awarded in August 2010.

The works include the construction of **56 WWTPs of between 20 and 3,500 m³/day** for a population of **45,440 inhabitants** in **58 towns** in the province of **Huesca** and their respective sewer pipes.

Budget: €98.2 M.

Under construction / In operation

Gandario pipelines and WWTP (A Coruña, Spain)

- **Client:** Aguas de Galicia.
- The **biological treatment** consists of a suspended biomass process through activated sludge with prolonged ventilation, with nitrifcation-denitrification. Deodorising through active carbon filters.
- **Average flow rate of 2,250 m^3/s** with peaks of 2,700 m^3/s for a population of 6,000 inhabitants.
- The contract includes **4.3 km of pipelines**, pumping stations and underwater discharge pipe.
- **Budget:** 3.8 million Euros.
- **Current status:** Under construction.

Sewerage for the districts of **Badajoz** (Spain)

- **Client:** ACUAES (Aguas de las Cuencas de España, S.A.)
- Includes the construction of **four new WWTPs** with a flow rate of 2,400 m3/day for 15,500 inhabitants, in the towns of Alvarado, Alcazaba, Novelda and Sagrajas, as well as two new pumps, storm tanks and 5.8 km of pipes of diameter between 800 and 1,000 mm.
- **Budget:** 8.2 million Euros
- **Current status:** Under construction.

References

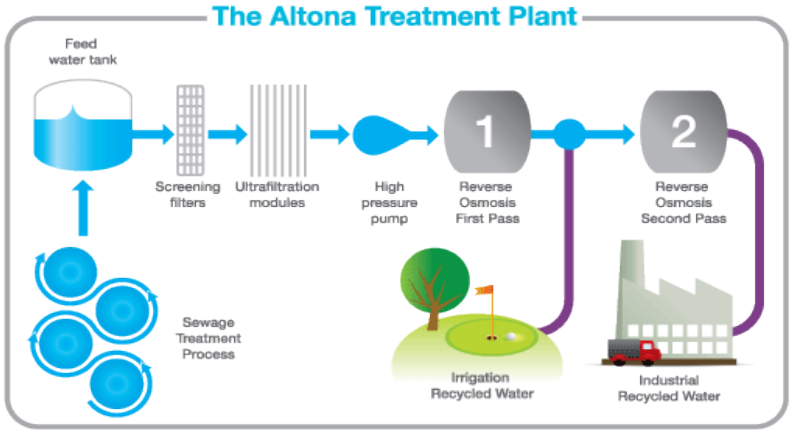
4. Wastewater Reuse Plants

Recycled Drilling Water Plant for the **Puerto Gaitán Oilfield** (Colombia)

- Awarded in August 2012 by **Pacific Rubiales Energy Corp.**
- The contract, valued at approximately **$100 million** (approx €78 million) consists of the design, construction and operation for a period of 10 years of a plant to treat underground water brought to the surface as part of oil drilling operations.
- The Plant will produce **500,000 barrels/day (79.500 m3/day)** of recycled water, which will be utilized for local agricultural and forest irrigation.
- The treatment process consists of a pre-treatment phase using various filtration systems before the application of reverse osmosis membrane treatment, with a very high recovery rate (90 per cent), and a sludge separation process.
- The CEO of Pacific Rubiales, Ronald Pantin said, *"This is a very interesting win-win project for Pacific Rubiales. It provides an innovative, sustainable and low cost approach to the management of water produced at the Rubiales oil fields. The project also represents the establishment of a new green industry that benefits the local region."*

Altona Wastewater Reuse Plant (Victoria, Australia)

- Awarded in August 2009 by **City West Water**, the body responsible for controlling the whole water cycle for a population of 856,000 people living in the central district of Melbourne. It entailed the entry of the ACS Group into the Australian water market through the design, construction and operation of the plant for a five-year term by **TEDRA Australia Pty. Ltd.**, TEDAGUA'S subsidiary in the country.
- The Altona Wastewater Reuse Plant process which consists of a double-pass ultrafiltration and reverse osmosis system, was described as "*revolutionary in terms of technology and production*" by **City West Water**.
- With a budget of **23 million AU$ (€18M)** for construction and operation over five years, the plant has a production capacity of **9,000 m3/day**, with 5,900 of this volume being used by neighbouring industries and 3,100 for watering the golf courses in Sanctuary Lakes and Kooringal.



West Werribee Wastewater Reuse Plant (Victoria, Australia)

- Once again, **City West Water**, the body responsible for water management in Melbourne, put its trust in **TEDRA**, TEDAGUA's subsidiary in Australia, for the construction of the new **West Werribee** Regeneration Plant in the Western Wastewater Treatment Plant and its auxiliary installations (tanks, pumps and regenerated water pipelines).
- These are two independent contracts for a price of 18.9 mill AU$ for the plant and 22.7 mill AU$ for the auxiliary installations (totalling approximately €33.7 M).
- During the first phase, the plant will have three pressurised and hollow fibre ultrafiltration membrane lines (2+1) and two reverse osmosis lines, with a total regenerated water production capacity of **6,000 m3/day**. During the second phase, which is scheduled for the second year of operation, the production capacity will be increased to **9,000 m3/day**, ending in a further increase of up to **15,000 m3/day** at the end of the five-year term.

Mar Menor Wastewater Reuse Plant (Murcia, Spain)

- The system improves the quality of the water from the main treatment plant, making it possible to recover 2.5 cubic hectometers of water for irrigation in the Mar Menor area, in the province of Murcia.

Awarded	July 2005
Client	"Arco Sur" Irrigators Community
Location	Cabo de Palos, (Murcia)
Treatment	Ultrafiltration and Reverse Osmosis
Design flow	7,000 m^3/day
Investment	€3.1 M (equipment)
Contract Type	EPC + O&M
Current status	**In operation**

Water reuse and desalination systems in **Tenerife Island** (Spain)

- **Client:** BALTEN (Balsas de Tenerife)
- **Budget:** 1,653,000 €/year.
- This **6 year contract** includes all the necessary activities to operate and maintain the whole waste water reuse and desalination system in Tenerife Island (Canary Islands). It provides service for a **900,000 inhabitant** population in an extension of more than 2,000 km2.
- The system is made up of the following facilities:
  - **Tertiary Treatments** of Santa Cruz de Tenerife WWTP. Capacity=32,000 m^3/day.
  - **Desalination Plants:**
    - Valle de San Lorenzo Capacity=12,000 m^3/day.
    - Adeje-Arona. Capacity=8,000 m^3/day.
    - Isla Baja. Capacity=4.000 m^3/day.
  - **Pumping Stations:**
    - Santa Cruz WWTP. Capacity=2.160 m^3/h.; h=220m.
    - Isla Baja –Montaña de Taco. Capacity=864 m^3/h.; h=107m.
  - **Storage Tanks:**
    - Santa Cruz de Tenerife. V=15,000 m^3
    - El Tablero. V=15,000 m^3

References

5. Water Treatment Plants for Industrial Process

Treatment Plants for the **Oil Industry**

Desalination plant in the **Puerto Gaitán oilfield** (Colombia)

- Client: Pacific Rubiales Energy Corp.
- With a production of **79,500 m3/day** (500,000 barrels per day), the water obtained from oil extraction is treated using a **reverse osmosis** process with a high recovery rate (90%), and is then reused for irrigating farmlands and forests.

Treatment of effluents in **La Pampilla refinery** (Peru)

- Client: Repsol YPF Peru
- This enables the treatment of oily effluents generated when producing oil derivatives. It consists of constructing a new treatment unit for **3,312 m3/day**, including biological reactors, secondary decanters and sterilization of the effluent. The sludge line includes digestion, thickening and drying by centrifugation.

Slurry Treatment Plants
in Peñarroya de Tastavins and Valderrobres (Teruel, Spain)

- Developed as part of the European program **LIFE ES-WAMAR**, led by the public enterprise **SODEMASA** of the Department of the Environment of the Government of Aragon. These are contracts for **construction followed by operation for a period of 5 years**.
- These plants are identical in terms of treatment capacity and the technology used. The unit capacity is **120,000 m^3/year** (329 m^3/day), with an average contaminant load of **37,500 mgO_2/l**.
- The process consists of a physical separation with **biological treatment** that allows liquid effluents to be used as irrigation water for crops and solid wastes as fertilizer. The **anaerobic digesters** accumulate the biogas generated during the fermentation. The **cogeneration** of electricity and heat with the biogas produced generates **526 kW of electrical power** and **559 kW of thermal power** every day.
- The daily production of compost is estimated at **25 Tn.**

Thermal Solar Fields
Treatment Plants

- The thermal solar fields for which the TEDAGUA technology has been selected will generate a total power of 410 MW. They use both parabolic cylinder technologies (**Extresol, Vallesol and Casablanca** in Spain) and central receiver tower technologies in Crescent Dunes Energy, located in **Tonopah** (Nevada, USA).
- Water installations in thermal solar fields collect and treat raw water to supply process water to the cooling towers (pretreated water), demineralized water for the vapour cycle and drinking water for consumption by the solar field staff.
- Diverse processes are used, depending on the raw water quality. In its installations, TEDAGUA has used lamellar decanting, filtration by sand, ultrafiltration, electrodeionization, reverse osmosis, ionic-exchange resins, etc.
- The treatment flows vary, reaching 1,728 m^3/day for demineralized water and 21,120 m^3/day for service water in the Extresol solar field.

Combined Cycle (CC) Power Plants

CC Mittelsbüren (Germany)

- With a production capacity of 445.6 MW, this plant is currently being constructed for Gemeinschaftskraftwerk Bremen (GKB) in the city of Bremen.
- The water treatment plant takes the water from the river Wesser to supply a service water flow of 13,440 m^3/day, with lamellar decanting and two-layer silex-anthracite filtration.
- The 480 m^3/day of demineralized water is obtained by means of a double-pass ultrafiltration reverse osmosis system with previous cartridge and mixed bed filtration.

CC Great Island (Ireland)

- Located in the town of Wexford, it will have a production capacity of 460 MW.
- The demineralized water treatment plant will supply 400 m3/day using silex-anthracite and active carbon filtration, anion-cation and mixed bed resins.

References

6. Water Pipelines and Auxiliary Works

Pipelines and auxiliary works
in Escombreras Desalination Plant (Spain)

- As part of the contract for designing and constructing the desalination plan for the production of drinking water in Escombreras, Tedagua carried out the additional work necessary for the water distribution:
  - **Collection works** with open intake: structure for the collection chamber, pumping station and FRP piping of **1,577m ∅ 1,400mm**.
  - **Cast iron piping** of **5,128m ∅ 1,000mm** of drinking water to the regulating tank.
  - **Regulating tank** made of reinforced concrete “in situ” with a capacity of **25,000 m^3** and two independent chambers and a chlorine dispensing system.
  - **Raised distribution network** formed by **18.5 km ∅ 700mm and 32.9 km ∅ 1,000mm** in concrete with sheet metal casing and cast iron.
  - **HDPE underwater outfall** for tipping brine with a length of **908m ∅ 710mm**.

Water supply and sewage
in cities of Lima and Cajamarca - Peru

- The priority of these projects is to improve the drinking water supply and sewer services for a total population of more than 210,000 inhabitants, reducing the amount of unbilled water.
- This included the installation of a network of more than 400 km of pipe, with 26,400 household service connections for drinking water and 24,000 sewer connections.
- The Jaén project also includes the intake works in the Jaén River, four new tanks with a capacity of 6,050 m^3, the expansion of the existing WWTP to 40,000 m^3/day and the expansion of the anaerobic impoundments of the WWTP.

	SAN JUAN DE LURIGANCHO	INDEPENDENCIA Y COMAS	JAÉN
CLIENT	SEDAPAL	SEDAPAL	Reg. Government of Cajamarca
DRINKING WATER SUPPLY WORKS			
– **Pipeline** (Pn 5 atm)	91.0 km Φ50-200 mm	54.2 km Φ50-250 mm	86.7 km Φ110-450mm
– **Service connections** (Φ12 mm)	9,237 units	4,447 units	12,720 units
SEWER WORKS			
– **Conduits**	60.6 km Φ150-350 mm	40.9 km Φ150-350 mm	80.4 km Φ150-750 mm
– **Service connections** (Φ150 mm)	8,316 units	4,169 units	11,402 units
CITY	47,200 inhab.	21,300 inhab.	143,000 inhab.
BUDGET	€18.5 M	€10.9 M	€27.4 M

Improvement of **drinking water pipelines** in the Mirpur 10 area (Dhaka, Bangladesh)

- **Client:** DWASA (Dhaka Water Supply & Sewerage Authority)
- The work will improve the drinking water supply to almost **1,000,000 inhabitants** of district 10 in the area of Mirpur, in the north of Dhaka.
- It consists of the desing and construction of a total of **625 km of PEHD pipes** of diameters ranging from 75 to 450 mm, as well as the renovation of **53 collection wells** which supply the capital.
- The majority of these pipelines will be installed through **"no-dig" systems**, with directional drilling and "bursting".
- **Budget:** US$ 24.2 million
- **Current status:** Under construction.





Submarine pipelines

Taboada WWTP submarine pipeline (Lima, Peru)

- **3,900 m of trenched PEAD piping with 3,000 mm diameter** (425 ground and 3,475 m water with 250 diffusers), to drain water treated in the WWTP pre-treatment.
- Work included in the Taboada wastewater treatment plant contract.

Submarine pipelines in the **Beni Saf** Desalination Plant (W. Aïn Témouchent, Algeria)

- WWTP harnessing discharge pipe **1,550 m long and 2,400 mm in diameter** (1,200 m underwater and 350 m underground).
- WWTP brine discharge pipe **1,400 m long and 1,800 mm in diameter** (475 m underwater and 925 m underground).
- Works included in the Beni Saf desalination plant contract.

Pump Stations
at El Attar and Choutrana (Tunisia)

El Attar Pump Station

- The project involves elevating the wastewater of El Attar to the wastewater treatment plant of the same name situated at a geometric height of 98 metres. The works consisted of installing a first pump with a flow rate of **2.166 l/sg (187.142 m3/day)**, which raised the wastewater the first 47 metres, and then a second pump with the same flow rate to raise the water to the necessary 98 metres. Each pump station is divided in two parts, consisting of 4+1 pumps of 270 l/sg with a total head of 51 and 54 metres respectively.
- Civil works for the project were executed keeping in mind a planned future expansion to 3,250 l/sg (280.800 m3/day). Two additional pumps were installed in each pump station.
- In each pump station, discharge conduits have a total length of 8 km from the pump station to the WWTP. They consist of two parallel pipes (one per pump station) of **1,200 mm diameter GRP PN10**

Choutrana Pump Station

- With a capacity of **1,300 l/sg (112.320 m3/day)**, this pump station is composed of 10 pumps (2x(4+1)). Each pump has a flow rate of 162 l/sg and 38 m.c.a. height gauge.
- The water is driven through two parallel conduits **HDPE PN10 DN 800**, a distance of 9376 meters.

Contact **Addresses**

OFFICES IN SPAIN

HEADQUARTERS

Cardenal Marcelo Spínola, 10
28016 – Madrid
Tel: +34 91 456 95 00
central@tedagua.com

CANARY ISLANDS

C/ El Procesador, 19
Polígono Industrial de Jinámar
35220 - Telde - Las Palmas
Tel: +34 928 71 04 75

ARAGON AND LA RIOJA

Paraíso, 3
50410 - Cuarte de Huerva,
Zaragoza
Tel: +34 976 50 40 23

BASQUE C. - NAVARRE

Larrondo Goiko Kalea, 2
Pabellón 3-4
48180 Loiu - Vizcaya
Tel: +34 94 453 26 29

LEVANTE - MURCIA

Paraje Los Parales, s/n
30350 - Valle de Escombreras,
Cartagena - Murcia
Tel: +34 696 527177

Avda. Alquería de Mina, 2
Pol. Ind. La Mina
46200 - Paiporta - Valencia
Tel: +34 96 3523836

CATALONIA

Carretera del Mig, 37
esquina C/ Sant Ferrán
Polígono Almeda Park
08940 - Cornellá de Llobregat,
Barcelona
Tel: +34 93 206 39 50

BALEARIC ISLANDS

Gremi Fusters, 19 A
Polígono Ind. Son Castelló
07009 - Palma de Mallorca
Tel: +34 971 27 76 50

NORTHWEST

Avda. de Madrid, 45
Polígono Ind. Los Pinos, N.6
47008 - Valladolid
Tel: +34 983 214391

ANDALUSIA

Torneo Parque Empresarial
Arquitectura, 5 Planta 9
Módulo 4-6
41015 - Sevilla
Tel: +34 95 467 24 76

OFFICES OUTSIDE SPAIN

EASTERN EUROPE

Str. Gheorghe Titeica, 142, 3º
Sector 2, CP 020304
Bucuresti - Romania
Tel: +40 212 273 805

NORTH AFRICA

67, Rue Alain Savary
2eme "Tranche SOPIVEL"
Bloc B - 4eme etage 1082
Tunise – Tunisie Tel: +216
71 841 796

SUDAMÉRICA

Avda. Argentina, 2415
Lima - Perú
Tel: +511 336 83 83

Alameda Rio Negro, 1030, S.1301
Barueri – **São Paulo (Brasil)**
Tel.: +55 1141 934 106

Av. Los Militares 5885, Piso 10
Las Condes, **Santiago de Chile**
Tlf.: +56 (9) 99177446

CENTRAL AMERICA

2ª Avenida 13-35, zona 17
Complejo Ofibodegas
Los Almendros, Bodegas 3
01017 **Ciudad de Guatemala, Guatemala**
Tel: +502 2389 66 00

CL Corregimiento Bethania
Barrio La Gloria
74 Oeste y Av.17c Norte, Casa L21
Ciudad de Panamá - Panamá
Tel: +507 3939445 / 446

NORTH AMERICA

Williams Tower
2800 Post Oak Blvd.
Suite 5858, 58th Floor
TX 77056 **Houston – U.S.A.**
Tel: +1 (713) 400 3577

José Luis Lagrange, 103, 8º
Colonia Los Morales
11510 **México D.F. – México**
Tel: +5255 3640 3140

ASIA-PACIFIC

293 Queen Street,
Altona Meadows
(3028 VIC, Australia)
Tel: +961 382 566 900

B-324, New Friends Colony
New Delhi (India) – 110 065
Tel: +91 11 2633 27 45

Khalifa Street, Blue Tower,
6th floor (P.O. Box 7705)
Abu Dhabi - U.A.E.
Tel: +971 2 627 23 22

tedagua

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