



Ricao Waste Water Treatment Plant in Cangas de Onís, Asturias

1/3



Location	Cangas de Onís - Asturias
Owner	Asturias Principality Government Regional Environmental Ministry
Period	48 months
Capacity	13,700 m³/day
Population	54,000 eq-inhabitantsq
Budget	8,788,672 €

The Ricao Wastewater Treatment Plant is located in the municipality of Cangas de Onís, between the right bank of the River Sella and the N- 634 road, exactly 1.5 kilometres from the town of Arriondas and 8 km from Cangas de Onís. The name Ricao is taken from the fishing preserve in which it is situated.

The water treatment plant has the capacity to treat an average flow rate of 570 m³/h and a maximum capacity of 1,720 m³/h in pre-treatment. The maximum flow rate admitted in biological treatment is 860 m³/h. The design parameters are the following:

	Influent	Effluent
BOD ₅	165 mg/l	<12 mg/l
SS	227 mg/l	<15 mg/l
TNK	23 mg/l	<5 mg/l
Pt	6 mg/l	
NH ₄		<2 mg/l
NO ₃		<8 mg/l

Water Line

Waste water reaches the pumping station via a 900 mm diameter sewer from the left bank of the River Sella. The gross-solids tank has an 80 mm grille for passage, through which water passes to the pumping pit where there are 3 submerged pumps with a 575 m³/h unit flow rate, capable of driving the volume to the plant via a 700 mm diameter, 1380 metre long pipe. The volume to be pumped is controlled by means of a frequency changer. The solids are collected through a 250 l bivalve scoop operated from a 2.500 Kg. bridge crane

A safety spillway has been provided at the headwork to the Waste Water Treatment plant that makes it possible to create a bypass for the entire volume by activating some motorised gates at the entrance. The bypass to the Plant runs through a 1.200 mm. diameter reinforced concrete pipe. This pipe also picks up excess flow that cannot be biologically treated from the grit channel outlet. From the influent area the water passes to two fine solid screening channels, isolated by means of motorised gates. Each channel, 900 mm wide and 1,050 mm high, has an automatic screen for fine solids with a 3 mm space between the strips.

Screened waste is collected by a screw conveyor/compactor which empties it in a container for its subsequent removal.



Ricao Waste Water Treatment Plant in Cangas de Onís, Asturias

2/3



Once screened, the waters passing through two grit and grease removal chambers, 14 m long and 4 m wide. The type of grit channel/degreaser used is aerated, using medium-bubble diffusers. The sand thereby drops and the grease is separated. Air is supplied to the diffusers through blowers. The sand area is separated from the grease by a GRP filter screen.

For biologic treatment flow rate control, there is a 400 mm. diameter electromagnetic flow rate meter. The excess flow that cannot be biologically treated is conveyed to the general bypass line.

The biological treatment adopted is the patented A2O process marketed in Spain by **DRACE Medioambiente**, in the form of prolonged aeration with nitrification, de-nitrification and biological removal of phosphorous. The A2O process is a variation on conventional treatment of activated sludge, which includes an anaerobic zone at the entrance to the biological reactor to receive influent waste water and re-circulated sludge, causing fermentation reactions and phosphate release.

Under these conditions of anaerobiosis, a proliferation occurs in the type of predominant heterotrophic organisms (PAO bacteria) able to store fermentation products by releasing phosphates to the environment. These fermentation products stored will be used later as a substrate for growth. An anoxic tank has been provided at the head in order to reduce the nitrates supplied to the anaerobic tank as much as possible.

The anoxic zone is where the internal recirculation needed to carry out the de-nitrification process is added. Two recirculation pumps have been provided for this from anaerobic tanks at the side of the central anoxic zone, with a unit flow rate of 712 m³/h, and which involves a recirculation capacity of 250% with respect to the average influent flow rate. The aerobic treatment process commences in this anoxic zone, as a result of the oxygen supplied in the form of NO₂ and NO₃ from recirculation of part of the mixed liquor in the oxic zone, where the nitrification takes place. The oxic zone, where the air supply system is situated, is also the place where removal of carbonaceous material is

completed, where nitrification takes place and where phosphorous is reduced.

The final reactor configuration involves a central line with a succession of anoxic I (286 m³), anaerobic (2 x 882 m³) and anoxic II (2 x 4,023 m³) zones and two 5,442 m³ carousel type, aerobic lines at the side. Total biological reactor volume is 16,076 m³.

All the central zones are equipped with submerged stirrers in order to obtain as even a mix as possible. Some flow rate accelerators (two units per tank) have been provided in the two aerobic tanks at the side, as well as an aeration system using turbines (two 75 kW. units per tank) in order to cover any anticipated oxygen needs. The necessary instruments have also been provided for continuous measurement of the oxygen content of each basin.

The biologically treated effluent is conveyed through a 500 mm diameter pipe to a supply tank which feeds two 28 metre diameter circular settling tanks, with a water height of 3.5 m at the straight part. Clarified water is led to a treated water tank where the general bypass pipe also comes out, and from where it is released to the river via a 900 mm diameter pipe.

Sludge Line

Sludge extracted from the secondary clarifying tank is conveyed to a recirculation pumping pit from where it is once again driven to the reactor by means of three submergible pumps with a unit flow rate of 290 m³/h, allowing recirculation of as much as 150 % of the average flow rate with the help of the reserve pump. Excess sludge is driven by two 35 m³/h pumps to the gravity thickener.

Biological sludge thickening to nearly 3% is carried out in a centrally operated gravity thickener, 11 metres in diameter and 3.8 m high at the straight part. The thickened sludge is driven to the centrifuges by means of three volumetric pumps with a maximum capacity of 10 m³/h.



Ricao Waste Water Treatment Plant in Cangas de Onís, Asturias

3/3



Dewatering takes place through two centrifuges with the capacity to treat units of up to 12 m³/h of sludge between 2 and 3 % dryness, equipped with differential speed system between the screw and the drum.

Final dehydrated sludge dryness will reach levels of close to 20%. A screw conveyer collects the sludge and empties it into a volumetric pump which drives it to a 40 m³ capacity storage hopper. There is also a continuous poly-electrolyte preparation system from where the diluted reagent is measured out into the pipe where sludge enters the centrifuges.

There is also a 10,700 Nm³/h chemical deodorization installation with washing towers for gases and stored reagent deposits. This installation is able to replace all air in the pre-treatment and drying building in 7.5 minutes.

Control

The plant is controlled from the control building, which has a laboratory to carry a series of tests needed to establish plant operating parameters. A PLC manages and controls the working of all waste water plant items, as well as the main pumping station. A flow chart installed in the control room allows rapid display of the working condition of all devices.

Special Characteristics

This plant is a typical urban waste water plant with biological treatment of activated sludge and biological removal of nutrients, required due to the demands made on maximum Nitrogen and Phosphorous parameters when the effluent comes out.

The plant treats waste dumped in the basins of the Rivers Sella and Piloña, the main pumping station (Castañón Pumping Station) in particular collecting waste from the Infiesto-Sevares-Arriondas sewer, as well as the Cangas de Onís-Arriondas sewer, with a total network of more than 30 kilometres of sewers converging at the wastewater plant.

The main pump drives water to the Treatment Plant through a 700 mm diameter, 1,380 m. long pipe, compensating a geometric height of 8.2 metres.

The plant is intended and designed to considerably improve the quality of the Sella River, an important river due to its fishing tradition and the world famous International Descent of the Sella.

Supplementary Works

Construction Work was completed with two supplementary projects that helped to improve both the functionality and the final aesthetic appearance of the work.

- Supplementary Project no. 1 was based on construction of an approach road to the plant from the N-634.
- Supplementary Project no. 2 ranged from several improvements at the Water Treatment Plant and various items of equipment to the construction of a building to the main pump and conditioning of the effluent line and release into the river.