

Wastewater is conveyed from the cities through 40 km of buried network. The flow reaches the plant through a 2 m diameter pipe laid at 18 m below ground level.

In order to prevent any damage or inefficiency of the process, large objects, if any, are removed in the inlet chamber. Wastewater is then flowing through coarse screens extracting all objects with a size > 50 mm.

WATER STREAM

Inlet Pumping Station 1

The Inlet Pumping Station 1 consists of submersibles pumps, pumping the water from 18 m deep to 5 m high allowing circulation by gravity of the water throughout the plant.

Preliminary treatment 2

The wastewater is conveyed through Fine Screens removing all objects with a size > 6 mm and then to the "Grit and Grease Removal Tanks" 2, where the velocity is controlled to allow the settlement of sand, grit, stones and broken glass. Bottom scrapers collect the settled matter while surface skimmers gather the oil and grease floating on the surface.

Primary treatment: primary settling 3

The wastewater flows then through Primary Settlers 3, where a large part of suspended solids is removed. This treatment step uses a Veolia Water's patent, Multiflo™, which consists in creating a low counter current flow along inclined lamellas to optimize the process of settlement and create self cleaning. Mechanically driven scrapers continually release the collected

sludge towards a hopper in the base of the tank where it is pumped to the Sludge Treatment Building 9.

Secondary treatment

Secondary treatment consists in removing the major part of BOD₅ and ammonia from the wastewater. It is composed of two main steps: activated sludge process 4 and clarification 6.

Activated sludge process 4

The objective is to remove all dissolved organic matters and nitrogen (pollutant). This process uses specific bacteria working in sequential aerobic & anoxic conditions to « eat » carbon & nitrogen. Air is produced by turbo-blowers and is injected in fine bubbles at the bottom of the activated sludge tank.

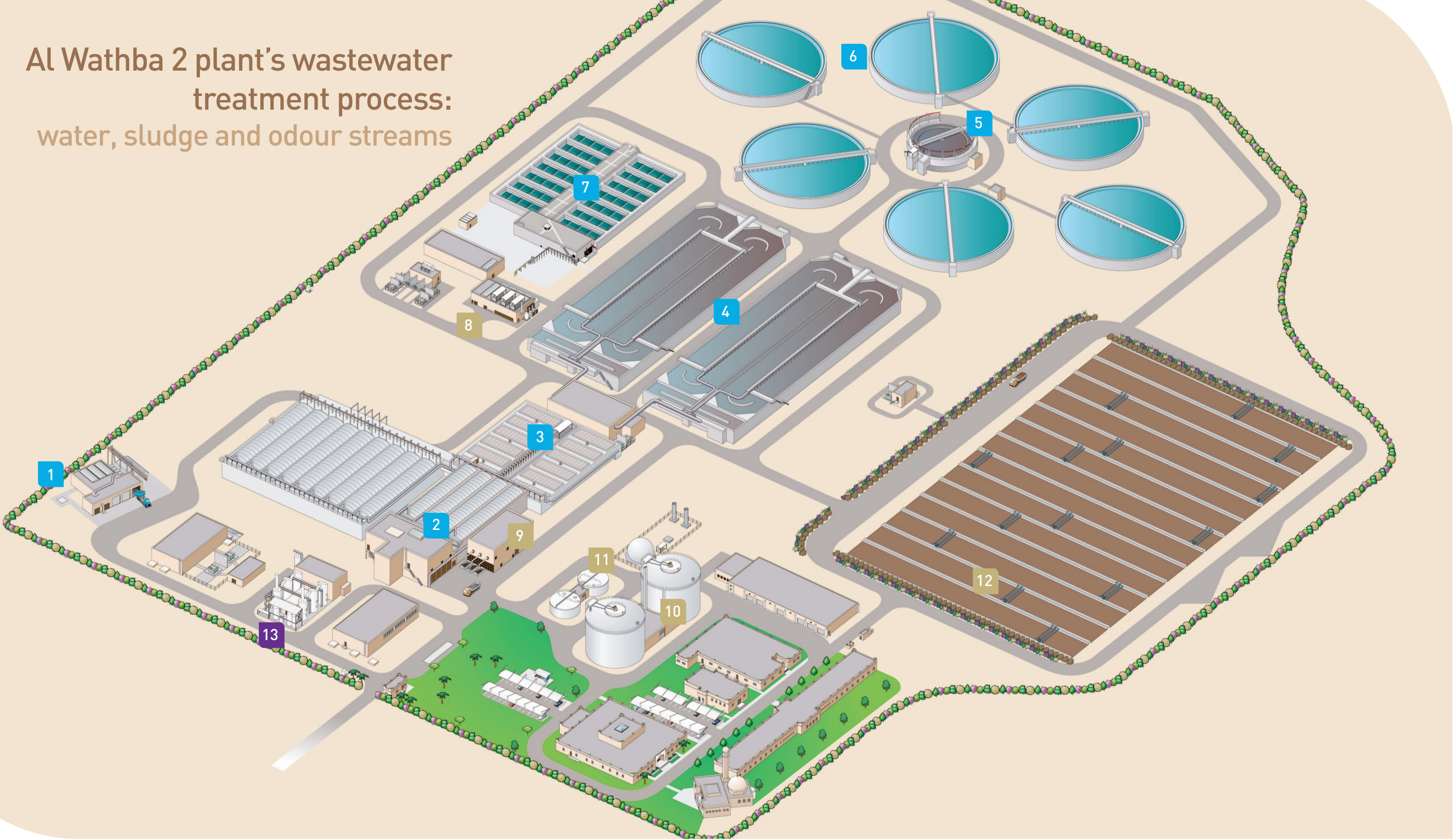
Then the flow is conveyed to the Deaerator/Splitter Tank 5 where the water is degasified (air bubbles removal) and diverted to the Clarifiers.



Clarification 6

During the clarification process, the low water flow allows the settlement of biological sludge, which is collected at the bottom of the clarifier and recirculated upstream of Activated Sludge Tanks to keep the concentration of bacteria constant.

Al Wathba 2 plant's wastewater treatment process: water, sludge and odour streams



Tertiary treatment 7 : filtration and disinfection

For the wastewater to be re-used for irrigation, a third treatment stage is required to reach the regulatory standards. It is composed of two steps: filtration and disinfection 7. Filtration consists in removing residual suspended solids (size > 10µm) through a Dual Media Filter (pumice stone and sand).

The disinfection is done through the injection of bleach in the filtered water. The bleach is produced on site by Electro-Chlorination Units 8 from a mix of salt and water.

The compliant treated water, which is called recycled water at this stage, is pumped to the Final Effluent Reservoir, where it is stored, before being sent to the Abu Dhabi and Al Ain cities for irrigation purposes.



Main Water parameters (after treatment)

Parameters	Contractual Value (mg/l)	Value achieved (mg/l)
BOD ₅	10	1.6
Suspended Solids	10	5
Ammonia Nitrogen	2	≤ 0.5

SLUDGE STREAM

The sludge line handles primary sludge from the Primary Settlers, scum from the Deaerator/Splitter and the Clarifiers and excess biological sludge from the Clarifiers.

Thickening 9

Primary sludge (coming from the Primary Settlers) and excess biological sludge (coming from the clarifiers) undergo a thickening process.

It consists in reducing the quantity of water contained in the sludge by adding polymers to create flocculated particles and applying rotating strength in the drum thickeners.

Sludge is afterwards pumped to the Digesters 10.

Anaerobic digestion 10



This step aims at stabilizing the sludge and consists in the destruction of volatile organic matter by anaerobic bacteria in the absence of oxygen. The process is a mesophilic digestion in which sludge is fermented in tanks at a temperature of +/- 36°C and mechanically homogenized during at least 15 days to ensure proper reduction of volatile matter. This process generates biogas with a high proportion of methane which is partly used to heat the tank during the cooler season.

The sludge from the Primary Digesters gravitates to the Secondary Digesters 11, which serve as buffer tanks before dewatering, optimize volatile matter removal and act as sludge degassing.

Dewatering 9

Digested sludge passes then through centrifuges in order to achieve a dryness of 24%. Polymer is injected to the sludge upstream of the centrifuges to create flocculated particles and improve drainage.

Drying 12

The dewatered sludge is transported by trucks to the open sludge Solar Drying Beds 12, which are equipped with mechanical devices that move forward and backward in order to aerate the sludge and expedite the drying process.

The drying phase takes approximately 30 days depending on the weather conditions. The dry solids content at the end of the process is minimum 85%.

ODOUR STREAM 13

Nitrogenous and sulphurous compounds cause odorous nuisance and have to be treated. The hydrogen sulfide gas (H₂S) is the main odorous gas to be treated in the plants.

The fouled air is collected from each structure where H₂S is present (1, 2, 3, 4 and 9) and conveyed through ventilation pipes to the Odour Treatment Building 13.

The treatment of odours consists in two (for Al Hamah) or three (for Al Wathba 2) scrubbers in series. The fouled air flows from the bottom to the top of each scrubber where it undergoes a chemical treatment. In the first scrubber, an acid solution is sprayed on the air flowing up, removing all nitrogenous compounds. In the second and third (for Wathba only) scrubbers, an alkaline solution (mix of soda and bleach) is sprayed on the air, removing all sulphurous compounds.





Al Wathba 2 Plant

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Conception and réalisation: Avie des Mote - Illustrations: Comitus/Jean-Luc Guérin - July 2012

Al Wathba 2 and Al Hamah Wastewater Treatment Plants



Treatment Capacity

• Volume :
Wathba 2: 300,000 m³/day
Al Hamah: 130,000 m³/day

• Population Equivalent :
Wathba 2 (Abu Dhabi): 1 million
Al Hamah (Al Ain): 650,000

Solution

Abu Dhabi Sewerage Services Company (ADSSC) is the governmental organisation in charge of collecting and treating the wastewater from residential and commercial customers in the Emirate of Abu Dhabi. ADSSC is also in charge of the safe distribution and disposal of recycled water and biosolids.

Following the objective to cope with the aforementioned challenges, ADSSC has assigned a Special Purpose Company (SPC) to design, finance, build, own and operate (BOOT) during 25 years two new wastewater treatment plants in Abu Dhabi and Al Ain. ADWEA (Abu Dhabi Water and Electricity Authority), the major shareholder of this SPC awarded the remaining 40% of shareholding to two internationally recognized companies, Veolia Water and Besix, providing a world class service and state-of-the-art technologies for the benefit of the Abu Dhabi's environment.

Through this partnership, the SPC treats a total of 430,000 m³/day of wastewater (300,000 in

Al Wathba 2 Plant, Abu Dhabi and 130,000 in Al Hamah Plant, Al Ain) into two valuable resources: recycled water and biosolids. The output of the plants has, indeed, all the required characteristics to be reused to irrigate farms, forest, public areas, etc. This project helps the Emirate to save the production of millions of m³ of desalinated potable water each year.

Committed to protecting the environment at all times, the construction and operation teams have constantly been monitoring their impact through the implementation of environmental management systems. The reduction of carbon footprint has been integrated from the design stage and allows today great optimisation of electricity consumption. Options to furthermore reduce the carbon footprint are currently being studied such as the re-use of biogas produced at the plant, and the conversion of biosolids into soil conditioner for farmlands and forest, which could reduce the overall carbon footprint of the plants by around 30%.



Challenge

The United Arab Emirates is a country made of seven emirates, of which the Emirate of Abu Dhabi covers 90% of the territory. The two main cities of this Emirate are Abu Dhabi, the capital of UAE and Al Ain. Located on the shore of the Arabian Gulf, the UAE is suffering from freshwater scarcity (22 m³/inhabitant/year compared to around 3,203 m³/inhabitant/year in France¹ for example). The important demographic growth combined with a rapid urbanisation require the UAE to address two major challenges: treat the growing amount of wastewater produced and provide always more water resources to its population, industry and agriculture.

In the framework of its development plan "Abu Dhabi Economic Vision 2030", the Emirate has also made the environmental issue one of its top priorities. And wastewater treatment is a key issue in the sustainable development of the cities of Abu Dhabi and Al Ain.

¹ Source: FAO - Aquastat - Data 2008-2012

