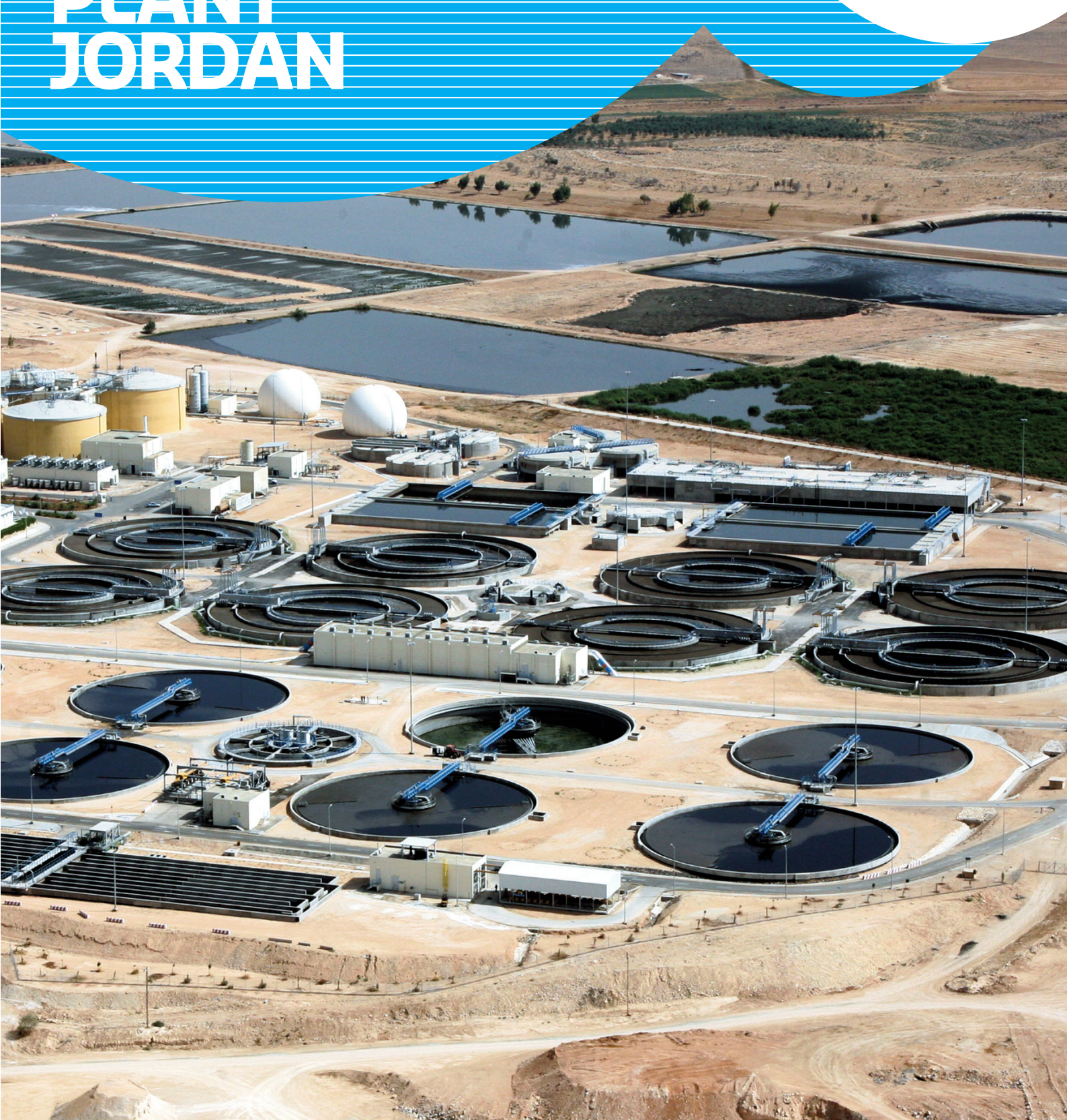
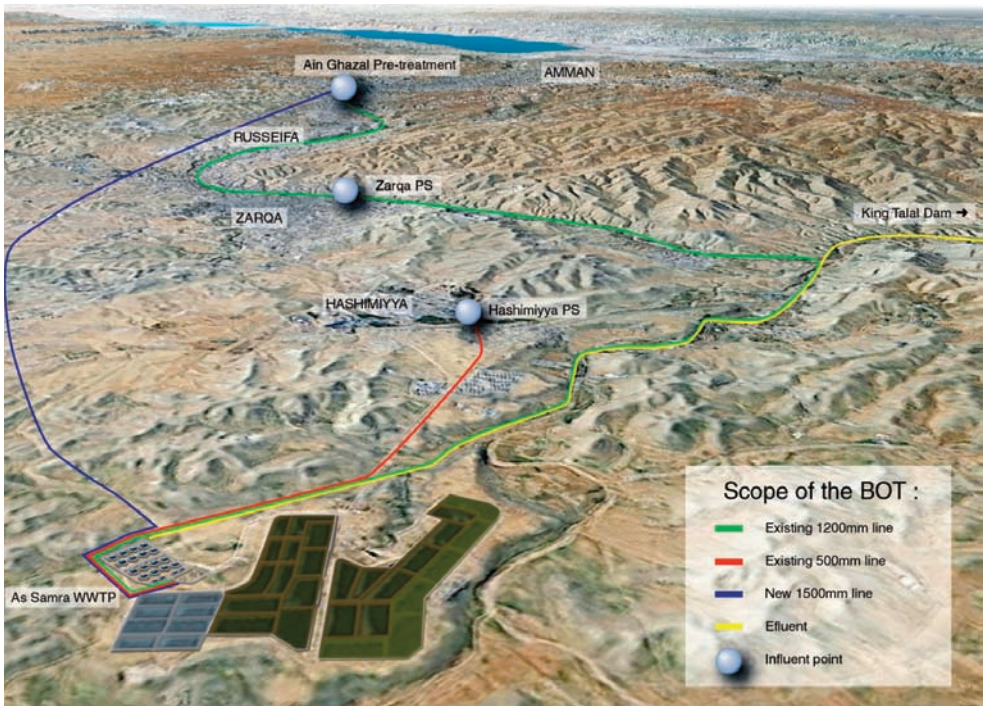
SAMRA WASTEWATER TREATMENT PLANT JORDAN



PROJECT OVERVIEW

THE WASTEWATER MANAGEMENT SYSTEM FOR THE GREATER AMMAN AREA INCLUDES THE COLLECTION, CONVEYANCE AND TREATMENT OF THE WASTEWATER GENERATED IN THE AMMAN RUSSEIFA–ZARQA BASIN, WHERE 60% OF THE POPULATION OF JORDAN LIVE.



Samra wastewater treatment plant project is:

- a public private partnership (ppp) for financing the construction and operation of a public infrastructure in Jordan based on a Build Operate Transfer approach over a period of 25 years.
- the first (BOT) project in Jordan.
- the first (BOT) project by USAID.
- a crucial element in its social, environmental and economical development.

The Swedish International Development Agency (SIDA) financed the technical assistance during the preparation phase, construction, commissioning and 18 months of the commercial operation period of the project.
The consulting company is SWECO.

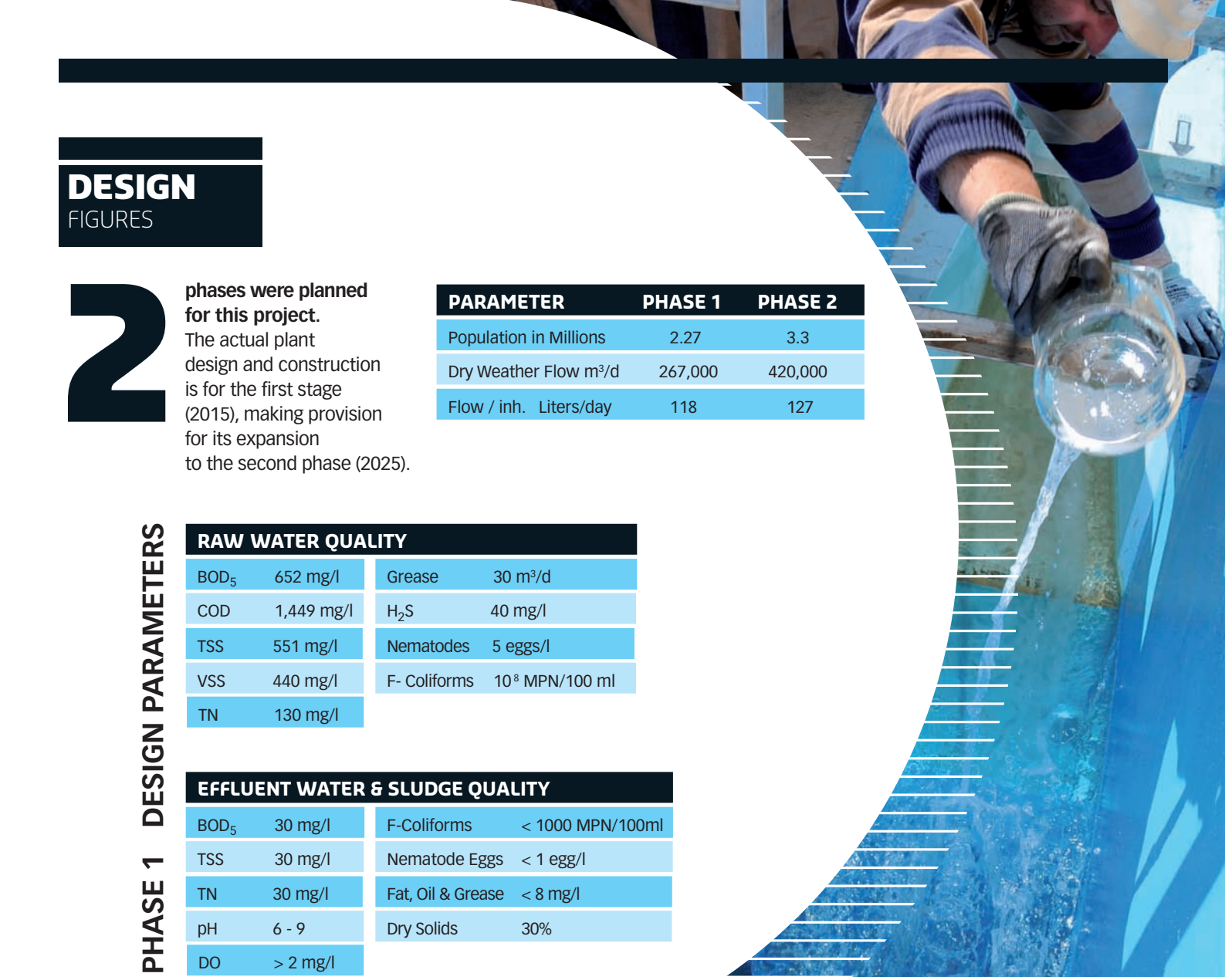
PROJECT FINANCING 169 MILLIONS USD

This is the Project budget financed by the following partners:

USAID	78
BANK CONSORTIUM	60
SAMRA PLANT CONSORTIUM (Suez Environnement, Infilco Degremont Inc. & The Morganti group)	17
GOVERNMENT OF JORDAN - MWI	14

PROJECT CHARACTERISTICS

- Provides a state of the art of wastewater treatment.
- Replaces an overloaded waste stabilization pond treatment system.
- Produces an effluent with a quality meeting the Jordanian Standards.
- Allows safe reuse of treated water for agriculture.
- Eliminates offensive odors in the surrounding area.
- Will develop the production of compost and fodder from the digested sludge.
- Use the biogas produced in the sludge digesters to generate thermal and electrical power.
- Use the hydraulic potential energy at the inlet and outlet of the plant to produce electricity.



DESIGN
FIGURES

2 **phases were planned for this project.** The actual plant design and construction is for the first stage (2015), making provision for its expansion to the second phase (2025).

PARAMETER	PHASE 1	PHASE 2
Population in Millions	2.27	3.3
Dry Weather Flow m^3/d	267,000	420,000
Flow / inh. Liters/day	118	127

PHASE 1 DESIGN PARAMETERS

RAW WATER QUALITY			
BOD_5	652 mg/l	Grease	30 m^3/d
COD	1,449 mg/l	H_2S	40 mg/l
TSS	551 mg/l	Nematodes	5 eggs/l
VSS	440 mg/l	F- Coliforms	10^8 MPN/100 ml
TN	130 mg/l		

EFFLUENT WATER & SLUDGE QUALITY			
BOD_5	30 mg/l	F-Coliforms	< 1000 MPN/100ml
TSS	30 mg/l	Nematode Eggs	< 1 egg/l
TN	30 mg/l	Fat, Oil & Grease	< 8 mg/l
pH	6 - 9	Dry Solids	30%
DO	> 2 mg/l		

PROCESS DESCRIPTION

RAW WATER FROM AIN GHAZAL PRETREATMENT FACILITY FLOWS THROUGH A Ø1,500 mm PIPE INTO TWO PELTON TURBINES IN THE INLET STRUCTURE WHERE ELECTRICAL POWER IS GENERATED.THE NET HEAD BETWEEN AIN GHAZAL AND SAMRA IS AROUND 78 m.

The outlet joins the incoming wastewater from Zarqa and Hashimiyya pumping stations and distributed into two grit and sulfide removal tanks each divided into two chambers:

• A Grit Removal tank (19.6m x 13.0 m) with a volume of 1,560 m^3 and an average hydraulic residence time (HRT) of 17 minutes. Air is introduced at the bottom of the grit chamber causing heavy particles to settle and is collected by a screw and discharged into the grit classifier. Air bubbles will cause oil, grease and scum to float on the surface. It is then collected in a scum pit and pumped to the digesters.

• A Sulfide Removal tank consisting of 2 aerated zones inseries each of capacity 2,500 m^3. Ferric Chloride is injected here as a catalyst for the sulfide removal.

The effluent from the sulfide removal tanks is distributed into four primary settling tanks each is 67 m long and 25 m wide. These tanks remove about 65% of the total suspended solids and 40% of the BOD_5.
The oil and grease are skimmed and collected in the scum chamber.

The settled water from the primary settling tanks is distributed into eight biological reactors each of a total volume of 26,200 m^3 consisting of three zones:

• Anoxic zone for exogenous denitrification (V= 6,875 m^3)

• Oxic zone where air is introduced continuously through air diffusers to remove BOD_5 and initiate nitrification (V= 10,825 m^3)

• Endogenous zone where air is introduced intermittently for complete nitrification (V= 8,500 m^3).

The effluent of the activated sludge process is distributed into eight secondary clarifiers each of Diameter 54 m.
Bio suspended solids are separated and the settled sludge thickened and returned to the anoxic zone of the aeration tanks.

The clarified effluent of the secondary settling tanks flows to two plug flow chlorine contact basins each of a volume of 3,500 m^3 where it will be in contact with chlorine for about 35 minutes for its final disinfection meeting the Jordanian Standards 893/1995.

SLUDGE TREATMENT

Primary sludge from the primary settling tanks is thickened in three covered circular thickeners each of diameter 23 m. Biological sludge from the aeration tanks is thickened in another three covered Dissolved Air Flotation units (DAF) of diameter 18 m.

The two are mixed together in a covered tank of 98 m^3 volume before it is pumped to four anaerobic digesters each of capacity 15,900 m^3.

The sludge is kept in the digesters for three weeks at 35ºC where it is mixed thoroughly by the Cannon®Mixers using the recycled compressed biogas.

Heating of the recycled sludge is done by hot water recovered from the cooling of the engines in a shell-Tube heat exchanger.

The digested Sludge flows to the digested sludge storage tank where it is pumped to 25 solar evaporation basins where it is dried to about 30% dry solids.

Lime will be used if necessary for sludge stabilization.

ODOR CONTROL

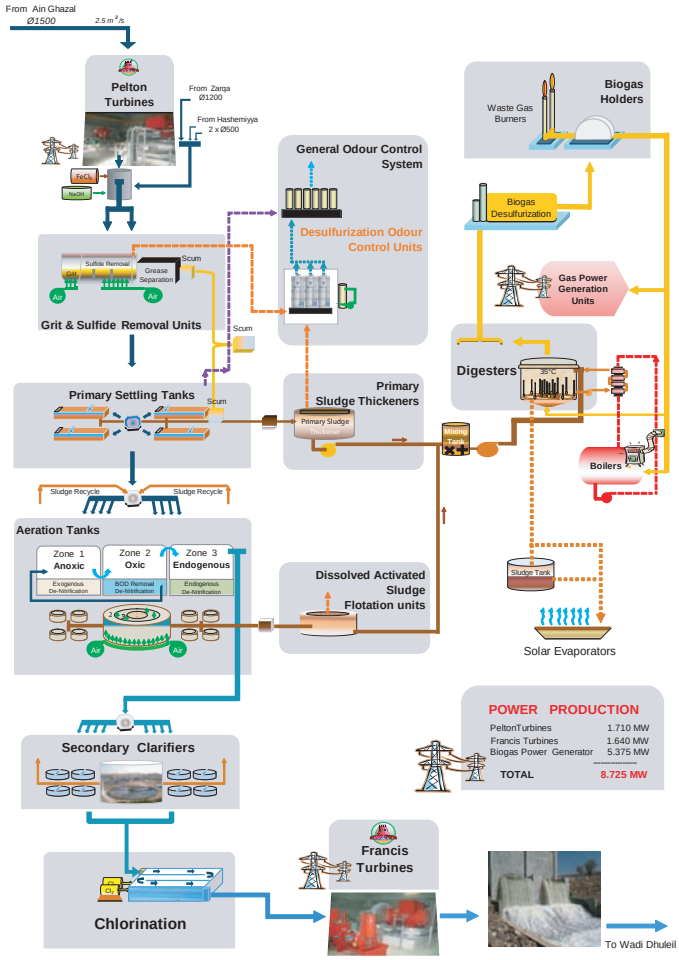
The plant is designed to ensure that no odor nuisance occurs at the site boundary. Odors are extracted in different places of the plant preventing the emission of unpleasant smells, providing satisfactory working conditions.

The process consists of treating polluted air in a scrubber system containing a special inert medium, the Biolite in which naturally present bacteria are fixed. Water is pulverized periodically on top of it absorbing the polluting gases.

The treated air in the lower part of the scrubber is collected and discharged to the atmosphere.

BIOGAS TREATMENT

The Biogas produced in the digesters is stored in two gas holders each of 5,000 m^3 capacity. It undergoes H_2S removal before being used in five Biogas engine generator sets for the production of electricity.



PROJECT KEY FIGURES

Total Concrete Poured	98,500 m^3
Concrete-reinforcing steel	12,500 Tons
Total Length of Electrical Cables	487 Km
Installed Electrical Power	14 MW
Stainless Steel Pipes	600 Tons
Carbon Steel Pipes	180 Tons
Underground GRP Pipes	15.4 Km
Other Pipes (Galvanized,PVC,HDPE)	14.2 Km
Peak Labor Force on site	1950
O&M Labor Force	150

DEGRÉMONT JORDAN
DAOUD KHOURY
57, BAONIAH STREET JEBEL WEIBDEH - AMMAN - JORDAN
MOBILE : 00 962 795 50 45 77
DAOUD.KHOURY@INFILCODEGREMONT.COM
DHKHOURY@GO.COM.JO

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