Potable Water Treatment Plant

Sheikh Zayed City
Egypt

The joint venture “Lurgi Bamag / The Arab Contractors“ was responsible for the turnkey construction and one year of operation and maintenance for the Sheikh Zayed City drinking water treatment plant which has a capacity of 600,000 m³/d (potable water plus irrigation water).

Sheikh Zayed City is one of the new suburbs of Cairo situated approx. 50 km in the northwest of the crowded Egyptian capital. It gives home for about 3 million people and provides area for future industries and agriculture.

The water from the treatment plant is used to supply the inhabitants of the city with fresh potable water according to the latest standards and provide water necessary for the irrigation of the green areas inside the city and the green belt around it.

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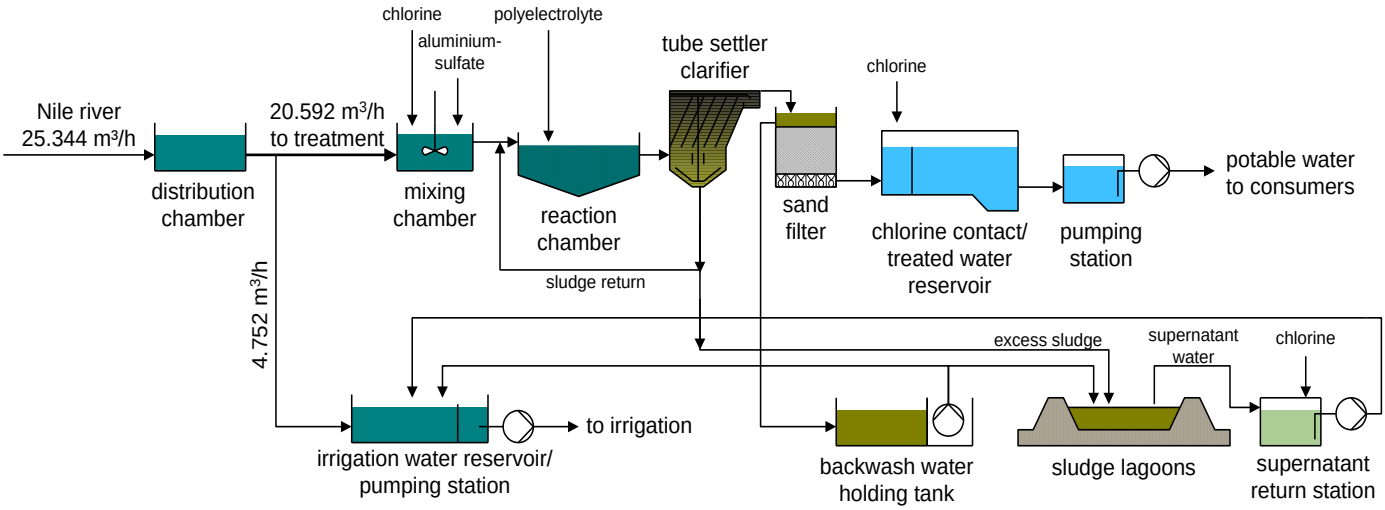

1. Objective

Treatment of potable water

- Design data

Source	River Nile
Throughput	600,000 m³/d
Turbidity	approx. 20 NTU
Total Coliforms	approx. 10^4 Colonies /100 ml
Total Algae Count	approx. 22,000

- Treated Water quality

Turbidity	0.4 NTU
Total Coliforms	Nil

2. Plant concept

- Process steps

  Pre-chlorination, rapid mixing, floccula-tion, sedimentation, filtration through rapid gravity filters, final chlorination, backwash water and sludge treatment

- Brief description

  Nile water from a sweet water canal is supplied to the treatment plant by others. Via the main distribution cham-ber the water is distributed evenly to the three flocculation / sedimentation trains and to the irrigation water reservoir.

  Each of the three flocculation / sedimentation trains consists of one flash mixer and four vortex reaction chambers/tube settler clarifiers. In the flash mix chamber water is dosed with Chlorine for preliminary sterilisation and Aluminium Sulphate for flocculation.

  The chemicals are dissolved in the incoming water by special Rapimix agitators. Water is directed towards the vortex reaction chambers by adjustable overflow weirs.

  The water enters the vortex reaction chambers tangentially near the top water level and leaves them via a pipeline in the centre of the sloped bottom, providing a rotating flow pattern without any mechanical mixer.

  At the entrance of the vortex reaction chamber, flocculation aid can be added to the water if needed.

  Water from each reaction chamber is directed to the inlet baffles at the narrow end of a tube settler clarifier. The water passes this rectangular tank in a longitudinal direction from down to up. The whole surface of the tank is covered with sloped hexagonal tubes. While passing these tubes the flocs are settling on their surface and sliding downwards counter-currently to the flow of water. Suspended matter settles as sludge on the bottom of the tank and is removed continuously by submersible pumps suspending from a scraper travelling back and forth. Sludge discharged from the tube settler clarifiers is passed to sludge return pumping stations (one per train) from where a certain portion is recycled to the outlet of the flash mix chamber. The surplus material is collected in a sludge pumping station and discharged to sludge lagoons.

  Clarified water leaving the tube settler clarifiers is collected and redistributed to the 30 rapid gravity filters. The water passes the mono-bed filters of the rising level type from the top to the bottom. Filtered water is collected in a wash water reservoir.

  Filters are backwashed counter-currently using both air and water. Backwash media is distributed evenly by M-block filter bottoms. Filtered water leaving the wash water reservoir is dosed with chlorine for final sterilization and passed to two under-ground reservoirs. From the reservoirs the potable water is flowing into a sump from where it is pumped to the consumers by the treated water pumps.

  Used backwash water is collected in two backwash water holding tanks. After having rested some time the supernatant is recycled to the irrigation water reservoir while the underflow is pumped to the sludge lagoons. Supernatant from the sludge lagoons is chlorinated for a reasonable time and then recycled to the irrigation water reservoir.

3. Characteristic plant data

- Pre-treatment

  3 Trains, each comprising

1 flash mixing chamber	115 m³
4 reaction chambers	Ø 15.5 m
4 tube settler clarifiers	16 x 33 m²
1 sludge return pumping station	90 m³/h

- Filtration

  30 Rapid Gravity Sand Filters

Filter area	95 m² each

- Chemical Dosing

  1 Chlorine Dosing Station
  1 Alum. Sulphate Dosing Station
  1 Floc Aid Dosing Station

- Treated Water Storage

  2 Reservoirs, 75,000 m³ each

- Treated Water Pumping Station

  14 Pumps 3,240 m³/h each

- Irrigation Water Reservoir

  1 Reservoir 75,000 m³

- Irrigation Water Pumping Station

  6 Pumps 3,420 m³/h each

4. Operating experience

During one year of operation it could be demonstrated that the treated water quality has been met under any operational conditions. The quality given to the consumers was normally much better than the guaranteed figures (Turbidity ≤ 0.1 NTU).