

Hach helps one of the largest and most advanced reclamation facilities in the world fulfill stricter discharge contents while reducing costs

Changi, Singapore

Who is the client?

This wastewater plant in Changi comprises a 48km long deep tunnel sewer running from Kranji to Changi, a centralized plant at Changi, two 5 km long deep sea outfall pipes and 60km of link sewer. The facility is already one of the largest and most advanced facilities of its kind in the world. The plant occupies only 32 hectares, just one-third the equivalent footprint of a conventional plant.

The plant is designed to produce treated effluent of 10:10 (BOD:SS) quality. It treats used water generated by homes, local shops, and industries of Singapore. It has a capacity to treat 176 million gallons (800,000 cubic meters) of used water a day. The plant will undergo phased expansion until its capacity reaches 528 million gallons of water a day.



Figure 1: A wastewater plant in Changi, Singapore

This plant is built partially underground and stacked for maximum compactness and land use. It includes an influent pumping station (IPS), an effluent pumping station and a liquids processing and solids processing systems. It also uses water from the DTSS is pumped to the IPS before being transferred to head works for treatment.

What is the challenge?

Being the largest and most advanced reclamation facilities, we have to use advanced technology to monitor the water, to create the perfect output. The operator may be flying blind and may not discover problems until long after it develops, therefore operator might not know what have happened.

What is the process and Hach's solution to client?

Hach provide client with the all-round solution which covers the bioreactor process with Hach LDO sensors (testing for DO), Hach Nitratex sensors (testing of Nitrate) and Hach controller installed.

Following which, in the secondary sedimentation, Hach installed Hach LDO sensors (testing for DO), Hach 1720E Turbidimeter (testing for Turbidity) and Hach controller to cater for both testing of dissolved oxygen and turbidity. In the outfall stage, Hach has our renowned Hach astroTOC UV Analyzer (testing for TOC), Hach Amtax sc (testing for Ammonia) and Hach controller installed to test on TOC and Ammonia parameters.

Installing the Hach astroTOC UV Analyzer (testing for TOC), Hach Amtax sc (testing for Ammonia), Hach CA610 Fluoride Analyzer (testing for fluoride), Hach 1720E Turbidimeter (testing for Turbidity), Hach Sigma SD900 All Weather Refrigerated sampler auto sampler and Hach controller under the affluent process, Hach has got client all covered for water quality monitoring.

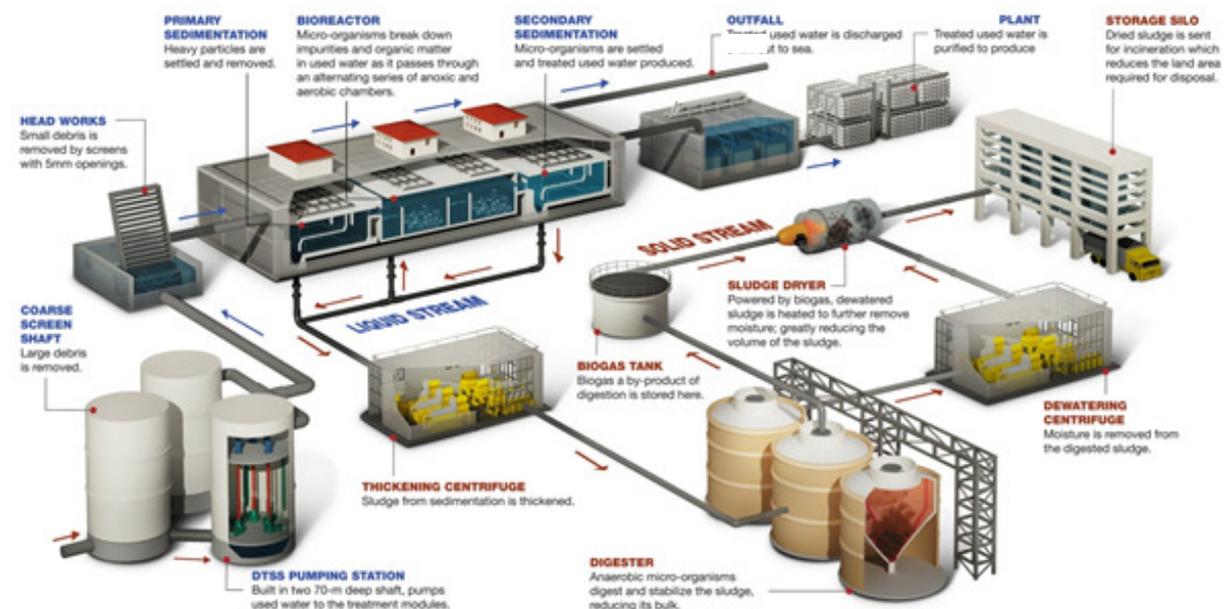


Figure 1: On-site wastewater process diagram

Influent Pumping Stations (IPS)—The 60m deep IPS receives wastewater from a newly constructed 48km, 6m- (max) diameter sewerage tunnel. The IPS is 50m deep, comprised of one 30m-diameter coarse screen shaft and two 50m-diameter pumping stations, each installed with 5 nos. of 400,000 CMD influent pumps.

Captured wastewater is treated by removing the solids and nutrients present in the used water. This plant is one of the largest and most advanced reclamation facilities in the world. The treated water is then returned to the environment or transferred to water factories for further processing.

It uses liquids and solids processes to treat the wastewater. The incoming used water is first fed into coarse screens for the removal of large debris. The water is then transferred to head works where smaller particles, grit, oil and grease are removed by using fine screens.



Figure 2: Influent pumping station (IPS) at the wastewater plant in Changi, Singapore.

Liquids Process—Phase I preliminary treatment includes fine screening, oil & grease removal and concentration, and a 2-stage degritting process. Primary and secondary sedimentation are achieved through stacked rectangular tanks fitting with chain and flight scraper mechanism. A 6-pass anoxic step feed bioreactor design is adopted as the secondary treatment process.

Solids Processing—Primary and waste-activated sludge is thickened through thickening centrifuges before being treated in anaerobic digesters. The biogas produced is used as a fuel to feed the sludge dryer. Digested sludge is dewatered through the dewatering centrifuges, and further volume and weight reduction is achieved through rotary drum dryers.

Heavy particles present in wastewater settle down at the bottom in the form of sludge while passing through double-deck sedimentation tanks. These solids are removed by moving scrappers. After the removal of heavier organic particles, the wastewater is fed into bioreactors where impurities and colloidal organic matter are broken down by using micro-organisms.

The resultant used water is sent to secondary sedimentation tanks for the activated sludge or heavy micro-organisms to settle down. These are recycled to the bioreactors and some are sent for solids processing. From the secondary sedimentation tanks, the treated used water is discharged through the 5km long outfall pipes.

Outfall—A twin 3m diameter outfall pipe is used to convey treated effluent to the sea. The outfall is about 5-km long and 35m below sea level.

How is the end result?

In summary, Hach offers total solution for client with the solution table for list of instrumentation as follows:

Products	Application Point
LDO sensors and controllers	Bioreactor
Nitratax sensors and controllers	Bioreactor
LDO sensors and controllers	Secondary Sedimentation
Turbidity: 1720E Turbidimeter and controllers	Secondary Sedimentation
TOC: astroTOC UV Analyzer	Outfall
Ammonia: Amtax sc with controllers	Outfall
TOC: astro TOC UV Analyzer	Affluent
Ammonia: Amtax sc with controllers	Affluent
Fluoride: CA610 Fluoride Analyzer	Affluent
Sigma SD900 All Weather Refrigerated Sampler Auto Sampler	Affluent
Turbidity: 1720E Turbidimeter and controllers	Affluent

Client's feedback: As the leading water quality expert, Hach provides client with the solutions to develop and provide world's best water analysis instrumentation and control system.

FOR TECHNICAL ASSISTANCE, PRICE INFORMATION AND ORDERING:

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In the interest of improving and updating its equipment, Hach Company reserves the right to alter specifications to equipment at any time.