

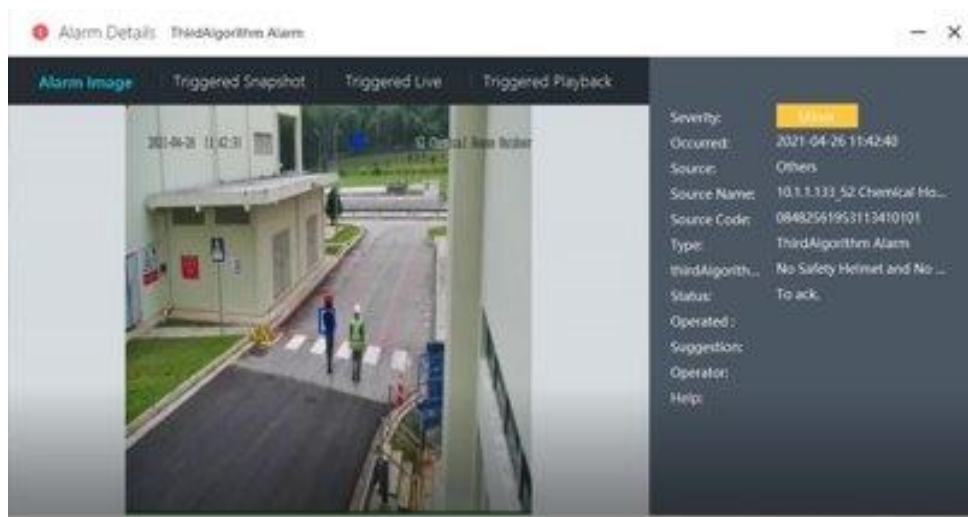
Annex D – Reconstruction of Choa Chu Kang Waterworks

[Choa Chu Kang Waterworks](#) (CCKWW) is an 80 million gallon per day (mgd) water treatment plant that treats raw water from the Western Catchment Reservoirs (comprising Kranji, Pandan, Tengeh, Poyan, Sarimbun and Murai Reservoirs) into potable water. It currently hosts the world's largest ceramic membrane system.

Construction works are set to start in 2022 and complete in 2026. Upon completion, CCKWW will be a state-of-the-art water treatment plant in Singapore with the latest water treatment technologies and smart capabilities. Some of the key smart features to be incorporated include:

- The existing Supervisory Control and Data Acquisition (SCADA) system will be enhanced with advanced process control features, such as data analytics, machine learning and online sensors that can identify inaccuracies or deviations in sensor readings (e.g. high pH value), to help optimise the plant's performance.
- Autonomous systems will be installed to reduce manpower needed for labour-intensive tasks, such as chemical preparation for water treatment processes.
- Online sensors will be used to monitor and predict the condition and performance of key equipment (e.g. pumpsets) in real-time.
- CCTVs with video analytics capabilities connected to a central Video Management System will be incorporated for supervision, work safety and plant security. If any abnormalities are observed on screen, a notification alert will be automatically sent to operators.

Fig 1. CCTVs with video analytics capabilities can send out automatic alerts if any abnormalities are observed (e.g. plant personnel is not wearing proper Personal Protection Equipment)



- Plant personnel will be equipped with SMART wearables that have health monitoring, fall detection and location tracking capabilities.
- Plant personnel can also make use of SMART headsets for real-time remote supervision of maintenance work within the plant.

Fig 2. Hands-free smart headsets for maintenance workers allows for remote supervision by operators in real-time



- Structural and process simulation models i.e. digital twins will also be developed for CCKWW. The structural model, a 3D digital twin of the plant can be used to simulate plant walkthroughs, examine equipment data and train new operators. To complement this, the process simulation model can be used to mirror the operation and performance of various water treatment processes within CCKWW using near real-time data feeds. It can also be used for predicting future trends and performance of the plant or processes, so that pre-emptive measures can be taken if there are any faults or abnormalities expected.

Fig 3. 3D Structural Digital Twin allows operators to simulate plant walkthroughs easily



Fig 4. CCKWW engineer using the Process Digital Twin model to simulate performance of the plant's water treatment processes

