NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE | Nanyang Environment and Water Research Institute

Characterisation Study of Wafer Fab Discharge for Future Water Reclamation Plant (WRP)

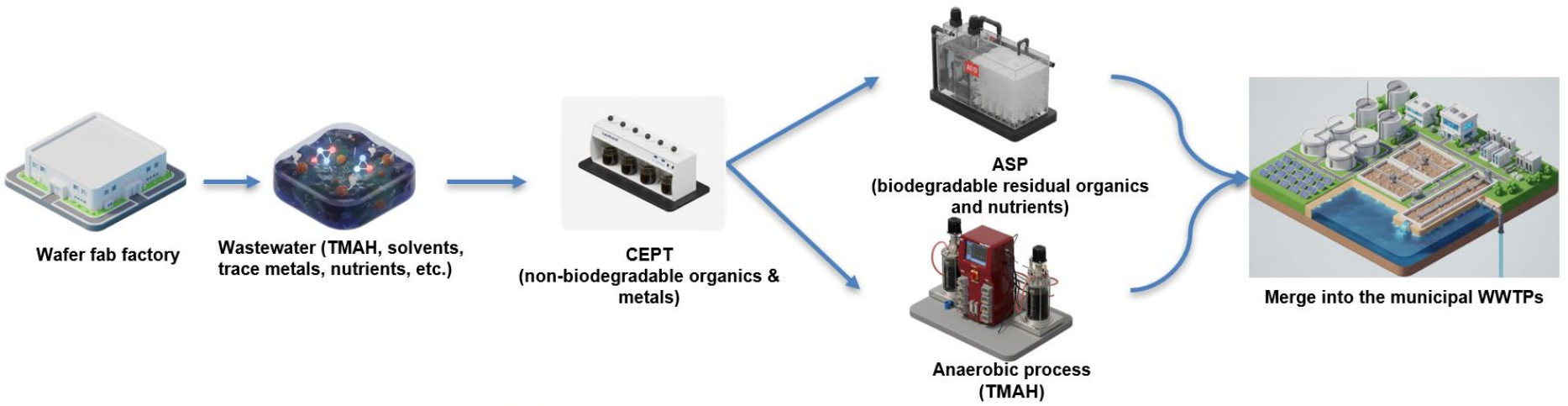
Abstract:

Wafer fabrication, an important process in semiconductor manufacturing, produces complex wastewater that contains chemicals such as strong organics, solvents, and trace metals. These substances are difficult to remove and can harm the bacteria used in municipal wastewater treatment plants. If this wastewater is sent directly to public treatment facilities, it can reduce treatment efficiency, and risk environmental safety.

To tackle this issue, the project will explore the treatment approach. On the one hand, a process called CEPT will be used to remove harmful materials by adding special chemicals (e.g., coagulant and polymer) that help solids and pollutants to settle. On the other hand, wafer fab discharge will be treated using the ASP and anaerobic process, which rely on bacteria to break down the remaining pollutants.

The project will also study the treatability of wafer fab discharge by quantifying the readily biodegradable COD (rbCOD) before and after CEPT as well as the inhibitory effects on the biological processes, such as activated sludge. Following which, the project will study how to best mix wafer fab discharge with municipal wastewater to make sure the treatment remains effective and stable, and minimise inhibitory effects.

This research will help Singapore better manage industrial wastewater, protect treatment plants, and support the sustainable growth of the high-tech industry. It also aims to guide safe discharge practices through close collaboration between industry and government.



Advanced Treatment of Wafer Fab Discharge

Developing a novel hybrid technology integrating Chemically Enhanced Primary Treatment (CEPT) with specialised biological process (ASP and Anaerobic) to treat complex wafer fab discharge containing toxic organics (e.g., TMAH). The purpose is to detoxify the waste stream before municipal discharge, protecting the integrity of downstream water reclamation. Key approaches include characterising recalcitrant compounds, optimising chemical pretreatment for toxicity reduction, and validating anaerobic/aerobic degradation efficiency.

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