## INTRODUCTION

Gwangju, which is located in the southwest of South Korea, is the sixth biggest city with the population of nearly 1.5 million. It has been known as a city of culture and has recently planned and developed its new housing project providing a new living environment meeting the city expansion as well as economic and social needs.

The Project proposed for nomination of the Award is a design and construction of a sewage treatment plant for processing sewage generated from the existing industrial complex and the new housing districts including Jinwol, Hyocheon-1and Hyocheon-2 located in the southern of Gwangju city. It was also designed and constructed to provide a multi-purpose space that can meet the residents' various needs in terms of environment, culture, education and sports activities.

### PROJECT OVERVIEW

The sewage plant is placed within the natural green space but has been designed to reduce the impact on natural habitats. The plant includes state-of-the art technologies to meet severe effluent standard and reusing of the treated effluent leading to the minimization of the impact on the neighboring water environment. The plant also provides the space for rest and recreation to contribute to improve the way of life of the residents and training program for raising environmental awareness of residents.

We, Cheil, had been involved in the project as the lead consultant for basic and detailed design of the sewage plant between September, 2009 and June, 2010. The plant has been in operation since the completion of its construction in the May 2013.

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| ▪ Location | : New Housing District, Hyocheon 2, Gwangju City |
| ▪ Purpose | : Sewage Treatment and Supply of Multi Purpose Park for the Residents |
| ▪ Sewage Plant | |
| - Capacity | : 20,000m$^3$/d |
| - Service Area | : Hyocheon 1-2 District, Jinwol District and Songam Industrial Complex |
| - Service Population | : 45,000 people |
| - Design & Construction | : 09.25.2009 ~ 05.24.2013 |

## INNOVATION, QUALITY AND TECHNICAL EXCELLENCE

Various requirements for the sewage plant from residents in terms of socio-economic and environmental needs gave rise to the introduction of new and innovative technologies to the sewage plant. The two main goals of this project is to provide the residents with a high-tech sewage plant and resident-friendly spaces.

In order to realize the goals, the sewage plants were designed to be placed on the first and third basement layer, while management buildings and amenities for residents such as multi-sport and cultural space were planned on the ground floor. In addition, it was designed to provide residents with educational services and experience in sewage plant through facilities on the ground and underground layers.

### Cutting Edge Technologies for High Quality Effluent and Odor Control

The sewage plants built on the underground layer is composed of a biological process to purify wastewater, venting and order control facilities, maintenance system, automated operation and control system which is linked to the other existing sewage plant.

The applied main wastewater treatment process is a modified submerged Membrane Bio-reactor equipped with Poly Tetra Fluoro Ethylene (PTFE) membrane of 0.25 micrometer pores, which is accompanied by Ozonation and Ion-Exchange process to polish the bio-reactor effluent. The high-tech treatment process has produced a clean effluent since its operation fully complying with the following severe regional effluent standard:

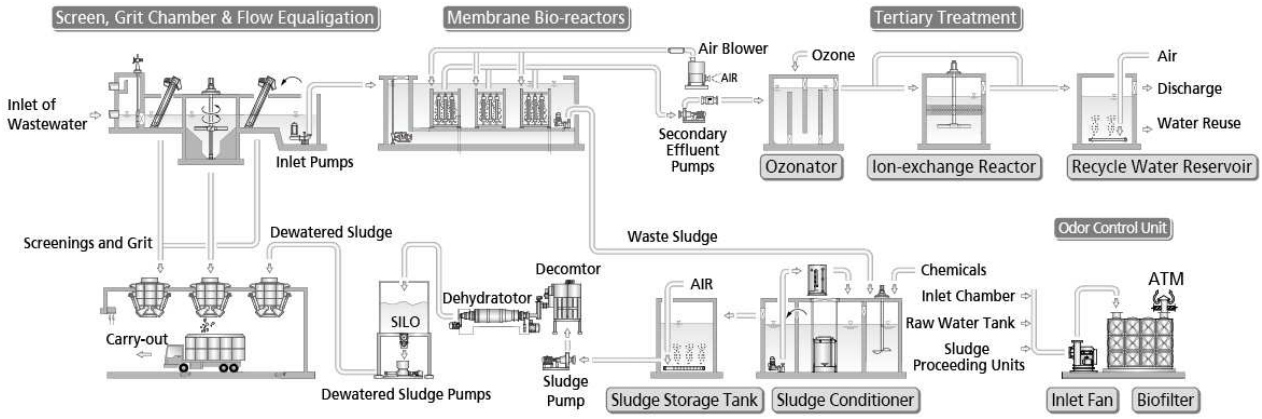
BOD, less than 3 ppm; Suspended Solid, less than 6 ppm; Total Nitrogen, less than 9.5 ppm; Total Phosphorous, less than 0.3 ppm; and Chromatility, less than 10.

An automatic process control system, which links the operational control to the effluent quality detector, was applied to the plant in order to secure stable and high quality effluent against the fluctuating influent load.

The plant also provide facilities enabling to reuse all the stable and highly purified effluent for any needs including the plant utility water and water use in the housing area.

The odor control process is composed of a state-of-the art technology units for ceiling, collection, biofiltration for high odor control, biofiltration combined with UV-catalytic oxidation for low odor control. Ventilation system was developed to protect the underground machineries and for minimization of the effect of the odorous gas on the ground air.

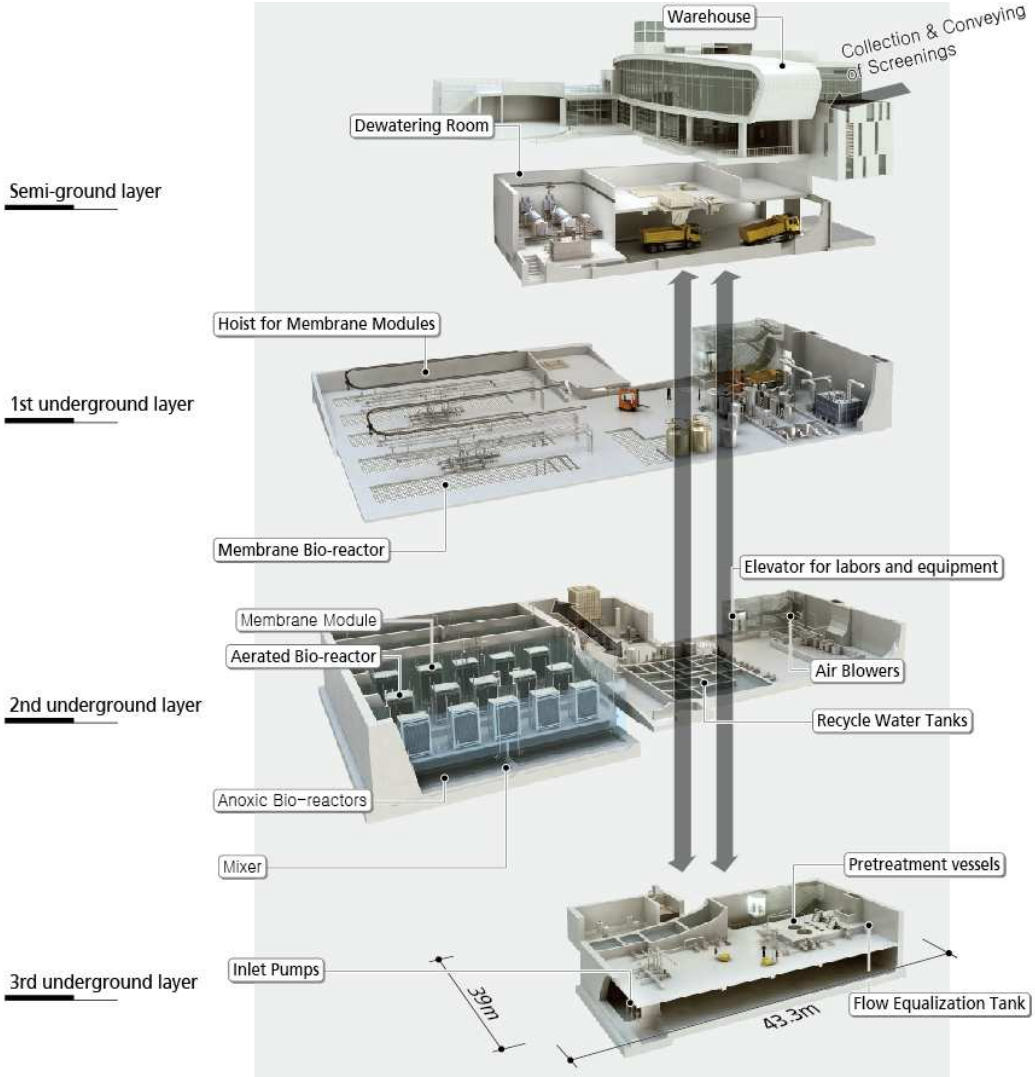
### Process Flow Diagram



## Vertical Allocation of Facilities

All units and facilities for sewage treatment were designed to be accommodated in the underground three stories in order to prevent the emission of any mal-odorous gases. The first underground story accommodates all the process control system.

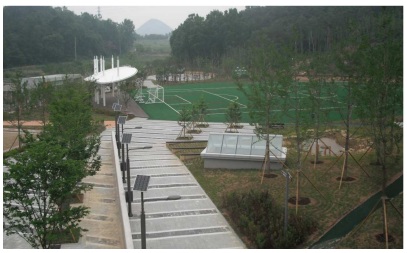
All civil works including bioreactors on the second and third underground stories were constructed with enough space for future sewerage demand of the city by adding mechanical and electrical works only.




## Environment-friendly and Multi-purpose Space Open to Residents

Facilities on ground layer of the plant were designed and constructed to minimize the impact on the natural habitat and to match well with the surrounding environment.

- Provision of multi-purpose space reflecting regional characteristics of Gwangju city
- Landscaping matching well with surrounding nature
- Educational services for environment protection and experience with sewage plant operation


## PRINCIPLE OF TRANSPARENCY AND INTEGRITY

This sewage plant was planned to be resident and environment-friendly infrastructure reflecting the public opinions by incorporating their requirements into the project from the planning and design stage.

The project team collected data and opinions from residents as well as specialists such as socialists and environmentalists.

The public requirements were:

- To meet the regional effluent standard;
- To keep the sewage plant free from odor;
- All sewage processing units to be hidden under ground;
- To provide amenities to residents;
- To be environment-friendly plant matching well with surrounding nature;

The plant was designed and constructed to fulfill all the above requirements and is being operated with full satisfaction of the residents.

The plant is open to public. People can access to the facilities and operation data at any time. All the operation data and results are shared by the Central Control Tower of Gangju City Government and relevant organization under central government.

## SUSTAINABILITY AND RESPECT FOR THE ENVIRONMENT

The sustainability and respect for the environment is a key factor of the project.

The design team reflected comprehensively the regional characteristics and environmental condition of the project area and opinions of the client and residents into design, and endeavored to create a environment friendly and sustainable plant by reviewing various alternatives.

▪ Minimization of environmental impact by:

- meeting the reinforced effluent standard by adopting the cutting edge treatment process and recycling of the treated effluent resulting in the minimized impact on the neighboring water body.
- minimized foot print required for the plant by applying multi-layered process allocation and compact process.
- minimizing the impact on the natural habitat through the civil works meeting requirement for

the future capacity demand.

- acquisition of stable effluent by automatic effluent control system linked to the operation mode.
- introduction of the high-tech odor control process to prevent odorous gases from being released into the air.

▪ Production of Renewable Energy and reduction of carbon emission.

- Power generation by solar panel and its application to the plant lightening.
- Utilization of renewable energy by the introduction of the sewage source heat pumps.

## SERVICES PROVIDED BY CHEIL ENGINEERING CO., LTD.

Cheil Engineering Co., Ltd., has provided the basic and detailed design services as the Lead Consultant of the design team under the turn-key Contractor for design services of the Project. We, Cheil carried out the following services, but not limited to:

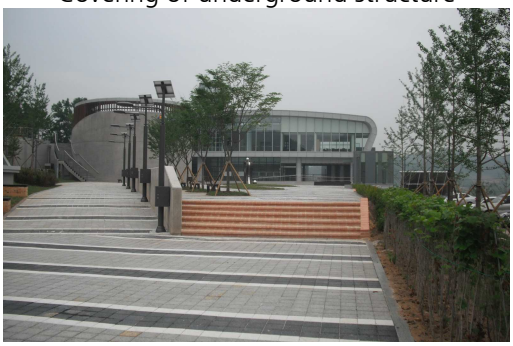
- Survey of the existing sewerage system
- Inflow and infiltration analysis
- Review of design criteria
- Field Survey (soil, water flow, etc.)
- Determination of process facilities
- Design for drainage facility improvement
- Design of sewer lines
- Design of vertical alignment and cross section
- Design of affiliated facilities (manhole, water tray, etc.)
- Detailed design drawings
- Estimation of quantities and costs
- Preparation of specification and construction schedule.

### View of Construction Site

Underground structure concrete works

Covering of underground structure

Maintenance building



Completion (05.24.2013)