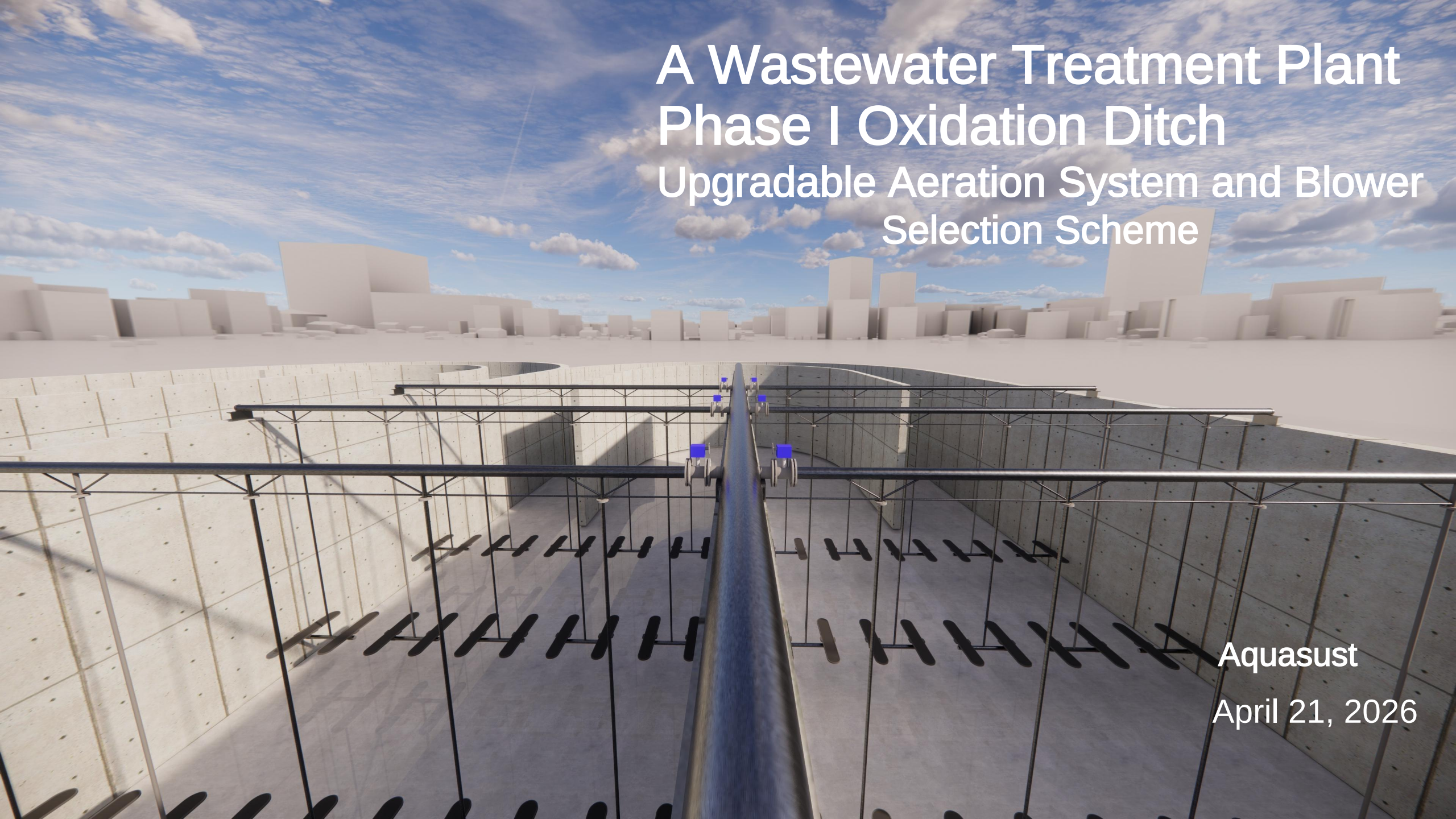

A Wastewater Treatment Plant Phase I Oxidation Ditch

Upgradable Aeration System and Blower Selection Scheme

Aquasust

April 21, 2026

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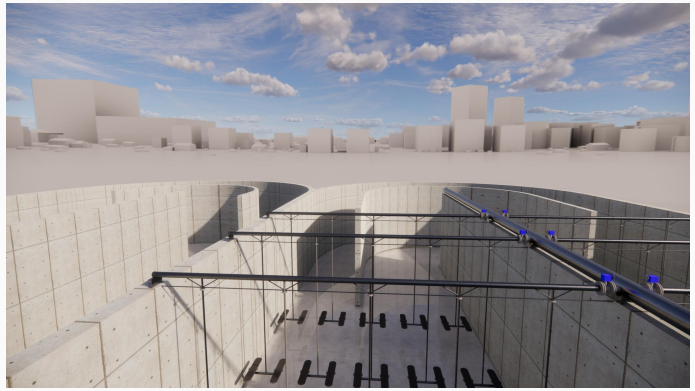
01Project Overview and Challenges

Project Background



Project Name: Phase I Project of a Wastewater Treatment Plant

Core Process: OxidationDitchProcess

Designed Treatment Capacity:20,000m³/d

System Configuration:

Includes2 independent oxidation ditch units, with a designed treatment capacity of 10,000 m³/d for each unit, enabling flexible operation and mutual backup.

Core Challenge: Extreme Low-Temperature Environment

Located in a severe cold climate zone, with long and extremely cold winters.

⚠ Key climate data:

- Extreme minimum temperature can reach -49°C
- Annual average temperature is only 3.6– 3.9°C

Dual Impact on the Treatment System

- Equipment side:Traditional plastic components are highly prone to cracking under extreme cold, directly leading to the risk of syste m shutdown.
- Process side:Low temperatures increase water viscosity by more than 30%+, significantly reducing oxygen transfer efficiency and resulting in a substantial increase in energy consumption.

01Project Overview and Challenges

Design Principles and Core Objectives

High Reliability and Weather Resistance

The equipment must operate stably under the extre-me low temperature of -49°C,with excellent freeze re-sistance and impact resistance to ensure long-term fault-free operation under harsh conditions.

High Efficiency and Energy Saving

The aeration system must have extremely high oxygen transfer efficiency to effectively cope with the challenges caused by increased water viscosity under low temperatures, thereby minimizing blower energy consumption at the source.

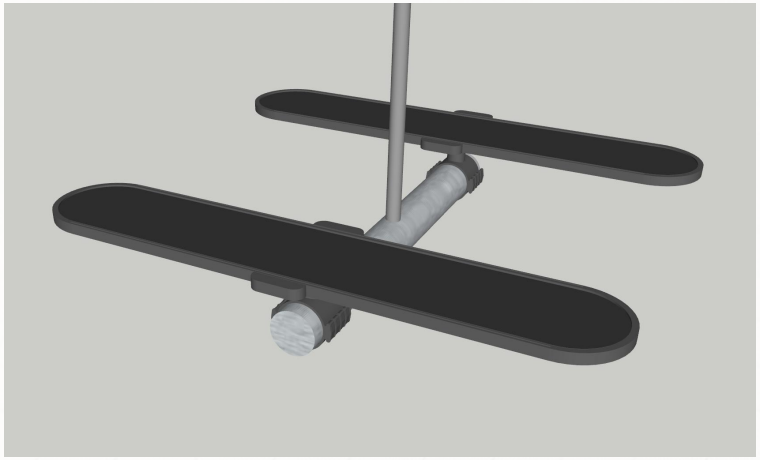
Low Operation and Maintenance Cost

The overall system design should facilitate on-site installation, routine inspection, and maintenance. In particular, the disassembly and replacement of the core component diffuser should be fast and convenient to reduce labor costs.

Cost Effectiveness

Not limited to initial investment, comprehensive consideration should be given to long-term operating energy costs, maintenance expenses, and total lifecycle cost, selecting the most cost-effective solution while meeting performance requirements.

02 Aeration System Selection Proposal



Option 1: Retrievable Panel Diffuser

Technical Principle

A modular panel design is adopted, with a large number of microporous diffuser membranes integrated on each panel. It is connected to the air supply header through a quick connection device to form an aeration unit that can be lifted as a whole, facilitating installation and later maintenance.

Diffuser Panel

Core component using low-temperature-resistant EPDM membrane material, which can still maintain excellent flexibility and durability under low-temperature conditions.

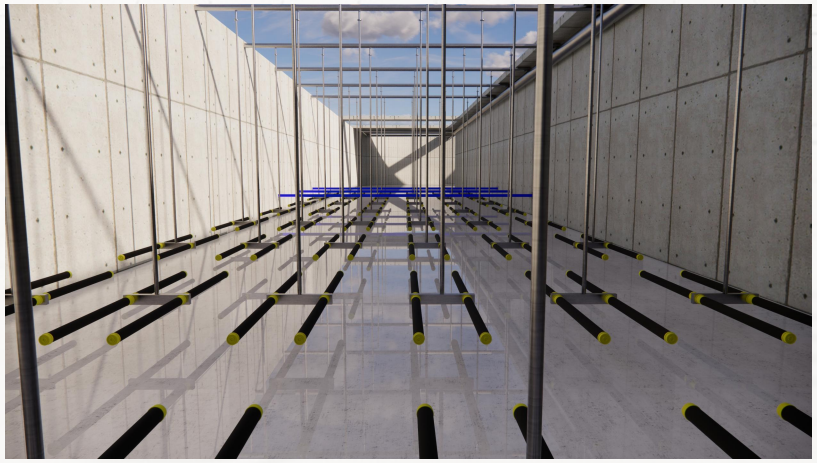
Quick Connection Device

Special connectors combined with fastening pins enable quick plug-in and removal between the aeration unit and the air supply pipeline, significantly reducing installation time.

Protective Ring

A high-strength integrated protective structure is built around the edge of the diffuser panel to prevent accidental damage to the membrane during installation or lifting.

02 Aeration System Selection Proposal



Option 2: Retrievable Tubular Diffuser

Technical Principle

Tubular diffuser membranes are connected to the aeration pipe by threads or clamps, forming continuous aeration strips to evenly disperse air into the water and meet the oxygen demand of microorganisms.

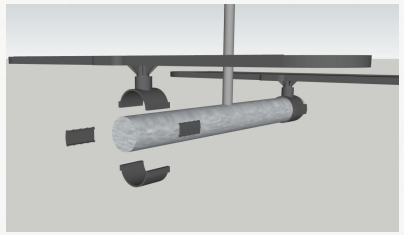
Core Structural Features

- Diffuser membrane tube: the main body is a tubular membrane supported by an internal support tube for structural strength
- Connection method: mainly threaded sealing or stainless-steel clamp connection for quick assembly and disassembly
- Protective structure: the membrane is directly exposed to water without dedicated mechanical protection design

02 Aeration System Selection Proposal

Core Advantage Comparison:Low-Temperature Adaptability

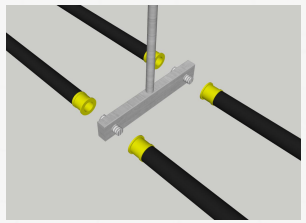
Retrievable Panel Diffuser



◇ Connection structure

Adopts a **quick connection device**, enabling rapid assembly and disassembly without complex tools, greatly simplifying on-site operation.

Retrievable Tubular Diffuser



◇ Connection structure

Mainly adopts traditional threaded or clamp connection methods. Frequent disassembly and maintenance involve relatively cumbersome steps, and there is a certain risk of component hardening in low-temperature environments.

Core Advantages in Low-Temperature Scenarios

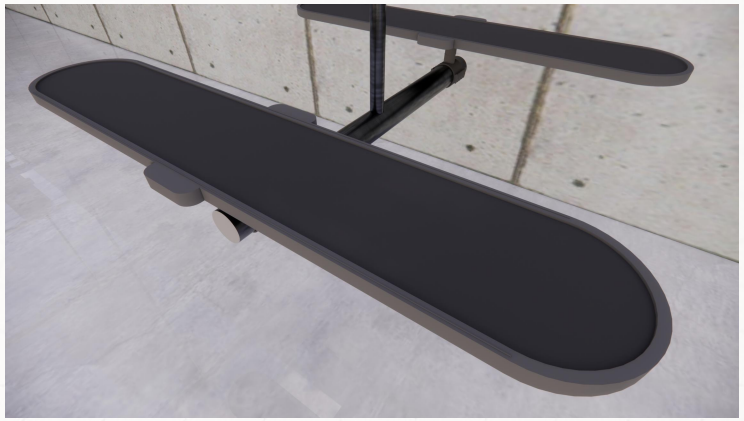
1.80% Improvement in Disassembly and Assembly Efficiency

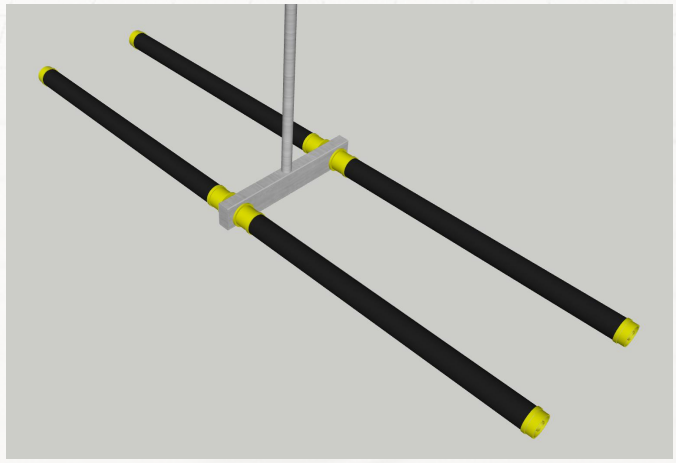
A single operator only needs 5 minutes to complete one set of module operations, greatly reducing outdoor maintenance workload in cold weather.

2.Extreme Low-Temperature Resistance (-49°C)

The connection parts use high-strength reinforced PP material and weather-resistant EPDM sealing gaskets, ensuring no cracking or leakage under extreme low temperatures.

02 Aeration System Selection Proposal





Retrievable Panel Diffuser

The membrane edge is equipped with an integrated protective ring, with no exposed parts. During installation, removal, and daily operation, it effectively avoids risks of physical friction and collision.

Retrievable Tubular Diffuser

The membrane is directly exposed to the water without any additional protective structure. During long-term water flow impact and maintenance, it is easily damaged by scratching and physical collision.

Core Advantage: Lower Damage Rate and Longer Service Life

1.**Low physical damage rate of membrane**:The integrated protective ring design significantly reduces membrane damage risk and unplanned maintenance costs.

2.**Double service life:**The average membrane replacement cycle can reach 5–8 years, far better than the 3–4 years of traditional tubular diffusers.

02 Aeration System Selection Proposal

Core Advantage Comparison: Aeration Efficiency and Energy Consumption

Retrievable Panel Diffuser

A **Oxygen utilization rate:** ⩾ 40%

B **Mass transfer efficiency performance:**

Generated bubbles are uniform and fine, effectively increasing gas-liquid contact area with high mass transfer efficiency.

Retrievable Tubular Diffuser

A **Oxygen utilization rate:** ≈ 35%

B **Mass transfer efficiency performance:**

Bubbles tend to merge into large bubbles during aeration, rise quickly, and have short gas-liquid contact time, resulting in relatively low overall mass transfer efficiency.

Core Advantages of Panel Type

☑Efficiently addresses low-temperature mass transfer challenges

Minimal performance degradation under low-temperature conditions.Guarantees treatment performance

☑Significant results

Aeration demand reduced by about 20%. Directly reduces blower energy consumption by up to 35%

☑Better mixing effect

More uniform fine bubbles create stronger hydraulic mixing

02 Aeration System Selection Proposal

Conclusion of Aeration System Selection

Conclusion:The retrievable panel diffuser, with its comprehensive advantages, is the optimal choice for coping with Beitun’ s extreme low-temperature climate.

It can effectively solve winter operation and maintenance difficulties, reduce equipment freeze damage risks, ensure stable wastewater treatment performance, and significantly save energy and maintenance costs during long-term operation, balancing technical reliability and economic practicality.

Adapted for Low-Temperature Environments

Designed specifically for cold climates, it maintains excellent aeration performance and stable operation even at low temperatures

Long-Lasting Membrane Protection

Special materials and structural design significantly reduce wear caused by freezing and sediment impact, extending service life

Leading Aeration Efficiency

Fine, uniform bubbles ensure high gas-liquid mass transfer efficiency, guaranteeing that dissolved oxygen requirements in biological treatment tanks are met even at low temperatures

Cost-Effective and Economical

The liftable design reduces labor costs for maintenance and repairs, while its high energy efficiency further lowers

03 Blower Selection Proposal

Aeration Volume Calculation and Configuration Parameters

Total designed treatment capacity (Q):

20,000 m^3/d (833.3 m^3/h)

Designed air-water ratio:

8 : 1

Engineering safety factor:

1.4

Total aeration demand (standard condition):

Calculation formula:833.3 $m^3/h \times 8 \times 1.4$

156 m^3/min

Panel Diffuser Configuration Plan

- **Single oxidation ditch configuration: 190 sets (380 panels)**
- Ventilation volume per panel: 12.3 m^3/h (within design range)

03 Blower Selection Proposal

Option 1 Aquasust Ultra Air Suspension Blower

Technical Principle

Uses an ultra-high-speed permanent magnet synchronous motor to directly drive the centrifugal impeller, with a speed exceeding 120,000 rpm, delivering strong and efficient performance.

Equipment Model

AS150-0.6

System Configuration

Configured with 2 units, each containing 3 independent heads

Operating Mode

Whole machine: 2 operating + 1 standby
Single machine: 2 heads operating

Total Installed Air Volume

222 m^3/min (sufficient margin)

03 Blower Selection Proposal

Core Performance Comparison Analysis

Whirlwind

*Maximum speed: 120,000 rpm

*DN value over 4.5 million

*Supports frequent start-stop cycles (verified 300,000+ times)

*Can withstand harsh conditions and 50 g impact

*Ultra-fast response: 0 120,000 rpm in only 4 s

*Operates at 85°C high temperature and -40°C low temperature

*Highest efficiency up to 94%

*Flow adjustment range: 20–120%

Frequency conversionadjustment, variable condition response < 1 s

*Surge margin increased by 200%

Maglev Blower

*Maximum speed: < 50,000 rpm

*DN value: < 2.5 million

*Capable of frequent start-stop cycles

*Operates in a stationary state, prone to damage from impact

*Operates at ambient temperature; prone to damage at high or low temperatures

*Slow response time: 0 to maximum speed > 1 min

*Cannot operate at high temperatures

*Maximum efficiency at low speeds: 90%

*Flow rate adjustment range: 45–105%

Conventional air-suspension blower

*Maximum speed: < 50,000 rpm

*DN value: < 2.5 million

*Not suitable for frequent start-stop cycles; start-stop lifespan < 20,000 cycles

*Operates in a stationary state, prone to damage from impact

*Operates at ambient temperature; prone to damage at high or low temperatures

*Slow response time: 0 to maximum speed > 1 min

Cannot operate at high temperatures

Maximum efficiency at low speeds: 90%

Flow rate adjustment range: 45–105%

03 Blower Selection Proposal

Blower Selection Conclusion

Conclusion: **Aquasust Ultra Air Suspension Blower (Whirlwind)** is the best choice.

Ultimate Energy Efficiency

Maximum 94% efficiency and ultra-wide flow adjustment range maximize electricity savings and significantly reduce long-term operating costs.

Excellent Environmental Adaptability

Specially designed for low-temperature environments, capable of stable operation at -40°C, perfectly matching Beitun’ s climate conditions.

Higher Reliability and Flexibility

The unique multi-head design enables “ standby head” instead of “ standby whole machine,” greatly saving initial equipment investment and floor space.

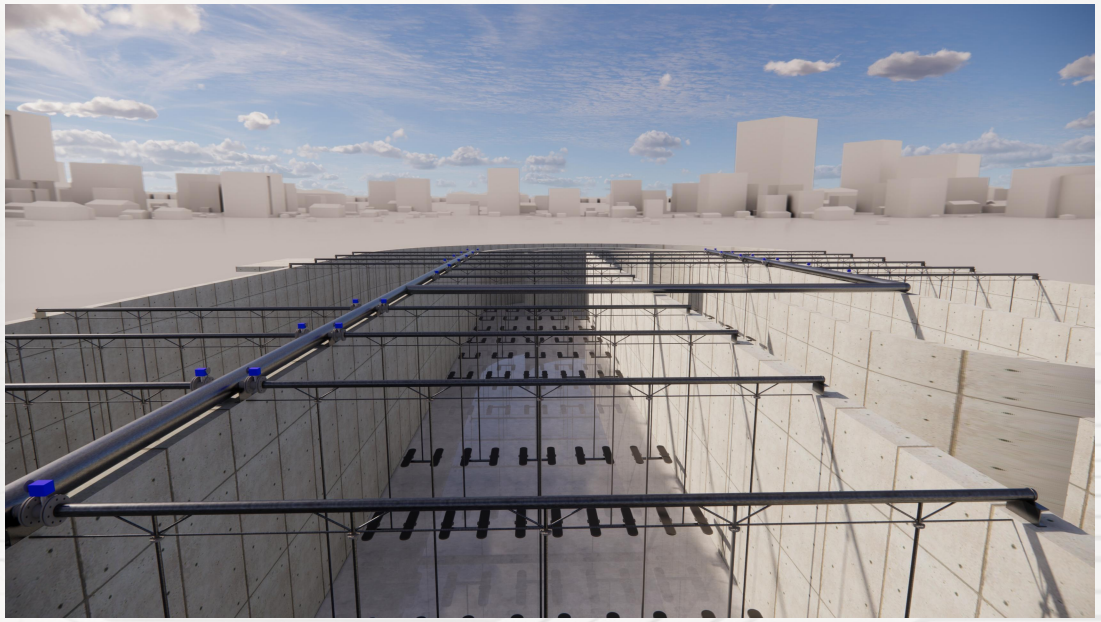
Final Recommended Solution

Recommended configuration:
2 units of
Aquasust AS150-0.6

04 System Integration Design

Air Pipeline System Design

- Main pipe: DN500 pipeline from blower room to oxidation ditch
- Branch pipe: DN250 independent pipeline to each oxidation ditch
- Header pipe: 38 DN100 headers evenly arranged along the oxidation ditch length
- Connection method: all pipelines use standard flange connections



Key Accessory Configuration

Manual Control Valve: Each DN100 lateral pipe is equipped with a dedicated valve, enabling precise fine-tuning of airflow for individual pipes and flexible adaptation to varying operating conditions.

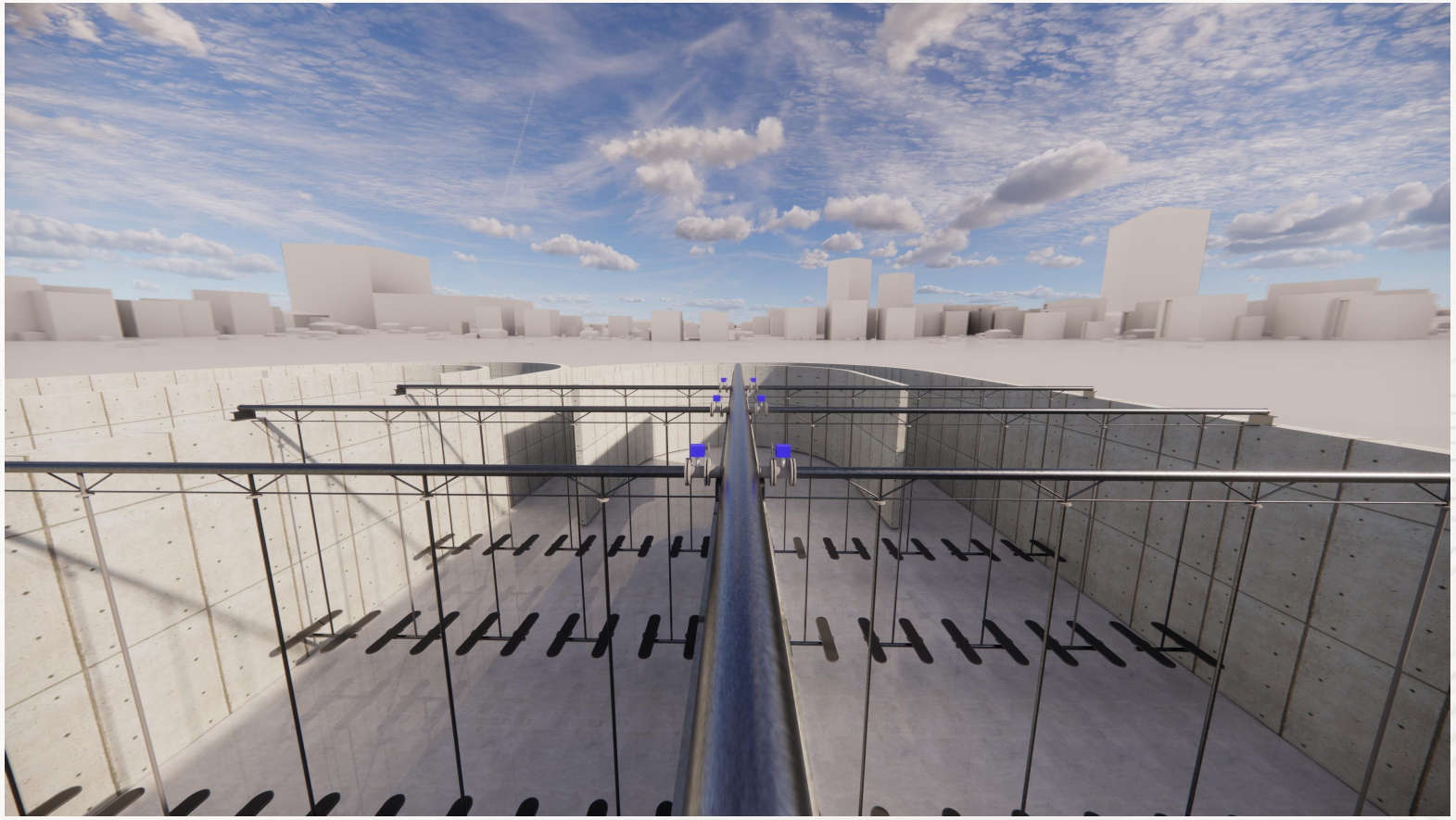
Quick-Release Connector: The diffuser and lateral pipe are connected via a clamp-type quick-release fitting, requiring no special tools and significantly simplifying maintenance and servicing procedures.

Summary of Design Highlights

The combination of a tiered piping design and precision control valves ensures both overall system gas supply efficiency and flexibility in local regulation, while flanged connections and quick-disconnect fittings strike a balance between engineering reliability and ease of operation and maintenance.

04 System Integration Design

System Layout Rendering



Blower Room & Piping System Integration: Clear layout design with well-organized piping routes, ensuring efficient and stable system operation.

05 Summary and Value Outlook

Core Value Summary

Technological Leadership

Uses industry-leading retrievable panel diffusers and ultra-high-speed centrifugal blowers.

Perfect Adaptation

Fully considers Beitun’ s extreme low-temperature environment.

Ultimate Energy Saving

Minimizes total lifecycle energy consumption.

Convenient Maintenance

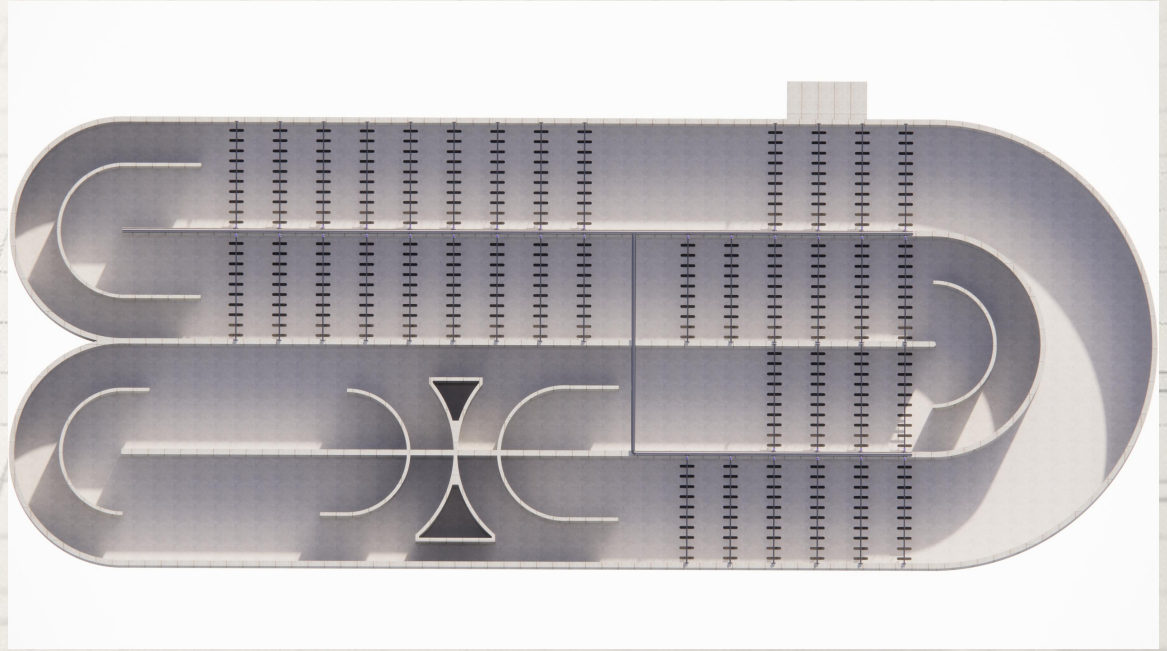
Quick disassembly design significantly reduces maintenance difficulty.

Economic Efficiency

Best cost performance considering both initial investment and long-term operating costs.

05 Summary and Value Outlook

Long-Term Benefit Outlook



Stable discharge compliance

Even in the harshest winter conditions, the system ensures consistent compliance with wastewater treatment standards, unaffected by extreme weather.

Reduced operating cost

Optimized system design and control logic are expected to yield significant annual savings in electricity costs and labor expenses for operation and maintenance.

Extended equipment service life

Scientific equipment selection and rational operating conditions effectively reduce equipment wear and tear, extending the service life of critical components.

Establish industry benchmark

This project establishes a model wastewater treatment facility that delivers high efficiency, stability, and energy savings even under extremely cold climatic conditions.


Thank you for listening
Looking forward to in-depth communication with you
and jointly exploring the value of technology