# Ultra-Oxygen™

## Optimising Water Quality

# MICRO & ULTRAFINE BUBBLE GENERATORS

(MB/UFB Generators)

## INFORMATION BROCHURE & USER MANUAL

Rev 13 | 9 July 2026

**Commercial control**

This manual contains technical, operating, installation and selection guidance only. Unit costs are intentionally excluded. Project costs, delivery, taxes, installation, monitoring, pumps, oxygen/ozone equipment (0-20L/min OxiBox and SteriBox), and commercial terms must be issued only through a formal Soldevco quotation.



| | |
|---|---|
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# Document control

| Field | Detail |
|---|---|
| **Document title** | Ultra-Oxygen™ Micro & Ultrafine Bubble Generators - Information Brochure & User Manual |
| **Revision** | Rev 13 clean draft - July 2026 |
| **Commercial status** | Technical document only. Unit costs and project commercial terms are excluded. |
| **Technical status** | Subject to site-specific hydraulic verification, water quality, installation details, commissioning data and operating conditions. |
| **Use control** | Suitable for client/partner technical introduction, pre-quotation discussions, installation planning, operator training and internal sales support. |

## Executive summary

The Ultra-Oxygen™ Micro and Ultrafine Bubble Generator is an award-winning hydrodynamic gas-liquid entrainment system used to improve oxygen transfer, mixing, water quality support and biological treatment conditions. It is used across wastewater treatment, aquaculture, aquaponics, hydroponics, irrigation water, open water bodies, industrial water and environmental restoration projects.

PATENT INFO:
Date of Acceptance: 2024 – 07 – 11
Class: B0 1F
Country: South Africa
Patent number: 2022/10967

This updated manual removes weak sales claims, removes unit costs, standardises terminology, adds the current generator technical range, and adds installation controls from the technical guide including straight-pipe placement, orientation, sensor vessels and commissioning checks.

**Ruthless rule for sales and engineering**
Never sell a generator as a magic object. Sell a measured treatment system: oxygen demand, water volume, treatment time, water quality target, hydraulics, monitoring and commissioning evidence.

## Static contents

# 1. Introduction and scope

Soldevco Pty Ltd is an award winning South African cleantech innovation company focused on restoring overloaded water systems, strengthening circular food-and-water economies, and advancing practical water infrastructure modernisation. Ultra-Oxygen™ is Soldevco's Micro and Ultrafine Bubble technology platform.

The UO2 MB/UFB Generator is used to introduce air, oxygen, ozone, carbon dioxide or selected liquids into water through controlled hydrodynamic entrainment, pressure differential, shear and cavitation-assisted mixing. The system is not a conventional diffuser and should not be treated as one.

## 1.1 Purpose of this manual

- Explain the technology in professional, defensible language.
- Summarise the current generator range without including unit costs.
- Set minimum design, installation, commissioning and monitoring rules.
- Protect Soldevco against uncontrolled claims, incorrect installations and poorly measured projects.
- Provide a practical pre-quotation data checklist for clients and sales partners.

## 1.2 What this manual is not

- It is not a quotation, offer or commercial schedule.
- It is not a final process design for any specific site.
- It is not a guarantee that every water body will achieve the same Dissolved Oxygen, Chemical Oxygen Demand or Biochemical Oxygen Demand improvement.
- It is not a substitute for hydraulic design, process engineering, water analysis, commissioning and monitoring.

## 1.3 Related Ultra-Oxygen product lines

This manual is scoped to the UO2 MB/UFB Generator range only. Soldevco/Ultra-Oxygen operates as an integrated cleantech provider, and the generator is often specified alongside other product lines depending on the site's needs. Each of the following has its own information brochure, user manual or scope document available on request:

- **UO2-Drylet biocatalyst range** (Aqua-Assist, Bio-React, Manure Magic) – biocatalyst-driven bioremediation for enhanced biological treatment.
- **UO2-Claire Quantum Disinfection™ range** (Clairify units) – electrochemical enhancement and disinfection systems.
- **SmartFarmer™ and AquaSmart™** – IoT-based water-quality and process monitoring platforms (controllers, sensors, panels and weather stations) for remote monitoring, data logging and process control.
- **OxiBox**– 0-20L /min Industrial oxygen concentrator (Proudly South African designed/manufactured/supported)
- **SteriBox**– 0-20L /min Industrial activated oxygen concentrator – O2+O3 (Proudly South African designed/manufactured/supported)
- **Soldevco Eco Water Systems** – modular, containerised water and wastewater treatment systems.
- **Pilot, site-assessment and advisory services** – trial units, water and site testing, and engineering advisory support used to confirm the right configuration before a full installation.
- **Smart Farmer Support** – Our monthly support services help farmers boost ROI and make the most of their technology.

# 2. Fine bubble terminology and technical positioning

Soldevco documents should follow ISO/TC 281 fine bubble terminology. Use "microbubble" and "ultrafine bubble" in formal documents. Do not use loose "nanobubble" wording unless quoting historic third-party source material.

| Term | Practical definition |
|---|---|
| **Bubble** | Gas in a medium enclosed by an interface. |
| **Fine bubble** | Bubble with a volume-equivalent diameter of less than 100 micrometres. |
| **Microbubble (MB)** | Fine bubble from 1 micrometre to less than 100 micrometres. |
| **Ultrafine bubble (UFB)** | Fine bubble smaller than 1 micrometre. |
| **DO** | Dissolved Oxygen: free molecular oxygen in water, normally reported as mg/L, ppm or % saturation. |
| **COD / BOD** | Chemical Oxygen Demand / Biochemical Oxygen Demand: indicators of organic pollutant load and biological oxygen demand. |
| **ORP** | Oxidation-Reduction Potential: a useful indicator for oxidative or reductive water chemistry, interpreted with pH and process context. |
| **Delta p / Δp** | Pressure differential across the generator. This is one of the most important operating variables. |

**Technical positioning**

The generator "**completes the bubble spectrum**" by creating micro and ultrafine bubble conditions that conventional coarse-bubble aeration cannot reproduce.

# 3. What the UO2 MB/UFB generator does

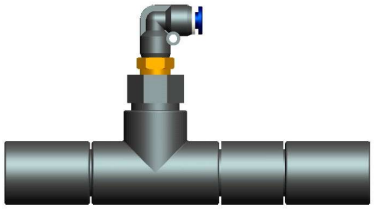
The generator converts hydraulic energy into gas-liquid entrainment, bubble formation, mixing and contact. Water enters the unit under pressure, a pressure differential is created, gas or liquid is drawn into the flow path, and the mixture is sheared into a micro and ultrafine bubble-rich discharge.

| Water flow | Pressure differential | Gas/liquid intake | Shear + cavitation | MB/UFB-rich discharge |
|---|---|---|---|---|

## 3.1 Operating mechanisms

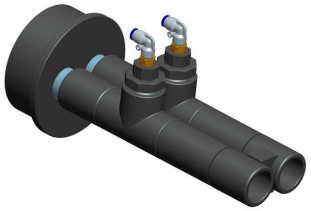
- **Gas-liquid entrainment:** The moving water stream creates suction that draws in air or any gas of your choice and/or selected liquid streams.
- **Micro and ultrafine bubble generation:** The unit produces fine bubble conditions that increase gas-water contact opportunity compared with coarse bubbles.
- **Mixing and distribution:** The discharge helps distribute oxygen/gas/liquid into the treated water body or process stream.
- **Cavitation support:** VIPER models can create cavitation effects under suitable conditions. Cavitation supports mixing and physical/chemical treatment mechanisms but does not itself increase DO.
- **Biological process support:** Higher and more stable DO can support aerobic microorganisms, roots and aquatic organisms where other process conditions are suitable.
- **Market differentiator:** What makes Ultra-Oxygen Micro and Ultrafine bubbles so special? Micro and Ultrafine bubbles are not just any bubbles; they have a **charged surface that can perform electrochemistry** and **oxidative reactions**. It represents an **advanced aeration technology** that effectively oxygenates the entire water column, **offering** water treatment engineers and farmers the **unprecedented potential to attain remarkable outcomes**.

## 3.2 Visual examples of current and legacy configurations

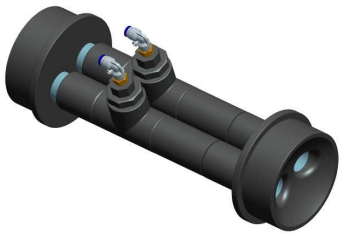


VIPER-20

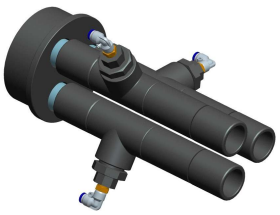
VIPER-30



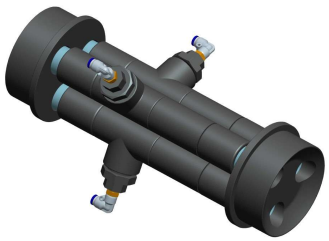
VIPER-70-OE



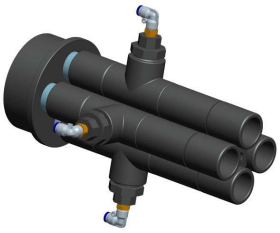
VIPER-70-IL



VIPER-X3-OE

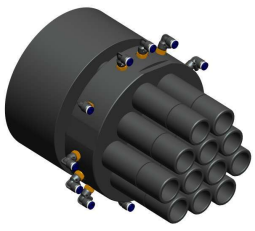


VIPER-X3-IL

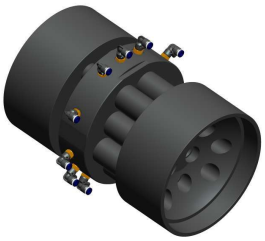


VIPER-100-OE

VIPER-100-IL



VIPER-200-OE



VIPER-200-IL

1N-VIPER-OE

1N-VIPER-IL

**Monitoring and control equipment examples**

Field monitoring


Smart control panel

# 4. Applications and expected outcomes

UO2 MB/UFB systems should be applied where improved gas transfer, oxygen availability, mixing, biological stability or oxidative support can create measurable value. The expected outcome must be defined before equipment is selected.

| Application | Expected value - project dependent |
|---|---|
| **Wastewater treatment** | Support DO stability, biological treatment, odour reduction, organic pollutant removal (COD/BOD), nitrification support and potential aeration energy reduction where process control allows. |
| **Aquaculture / aquaponics** | Improve DO availability for fish, nitrifying bacteria and root-zone stability; reduce stress risk during peak biological demand. |
| **Hydroponics / irrigation** | Improve oxygenated nutrient-water delivery, support root-zone health and nutrient dispersion where system design is correct. |
| **Open water bodies** | Support remediation strategies for low DO, odour, sludge interface issues and water-body recovery when combined with correct circulation and monitoring. |
| **Industrial processes** | Improve gas dissolution, mixing and process water treatment where chemical compatibility and hydraulic conditions are verified. |
| **Bioremediation** | Support UO2-Drylet or other biological programmes by maintaining oxygen and mixing conditions required by aerobic treatment biology. |

## 4.1 Claims control table

| Avoid saying | Say instead | Evidence needed |
|---|---|---|
| **Eliminates algae** | Can support algae-control strategies by improving oxygenation and water quality conditions. | DO, nutrients, chlorophyll, visibility, algae ID, photos. |
| **Removes COD/BOD everywhere** | Significant improvement in organic-pollutant removal (measured as COD/BOD) is achievable; results are site-dependent and supported by project evidence. | Flow, load, COD/BOD baseline and trend data, retention time. |
| **Disinfects water** | Can support disinfection or oxidation only when paired with the correct gas, dose, contact time and controls. | Microbiology, ORP, oxidant dose, pH, contact time. |
| **Always saves energy** | Up to 50% reduction in aeration energy consumption where site conditions and system design support this outcome. | kWh baseline, post-install kWh, DO stability, load normalisation. |
| **Always reduces sludge by 80%** | 30–80% reduction in sludge generation in biological treatment systems, depending on site conditions, operating regime and configuration. | Sludge production baseline, VSS/TSS trends, sludge age, wasting records. |
| **Always supersaturates or solves every oxygen problem** | Improved dissolved-oxygen performance and biological stability in suitable applications. | DO baseline and post-install logging, process stability records. |
| **Chemical-free compliance guaranteed** | Reduced chemical dependency and enhanced water-reuse capability where the full process design supports this. | Dosing records, chemical consumption baseline, effluent quality trend. |
| **Guaranteed carbon credits or verified offsets** | Approximately 965–970 tCO2e/year avoided at a suitable 2.5 ML/day wastewater facility, primarily through aeration savings; broader adoption remains a scenario, not a guarantee. | Facility flow and energy baseline, grid emission factor, aeration energy savings data. |

# 5. Generator range and technical selection guidance

The table below gives the current technical range for screening and design discussions. It excludes unit costs. Final selection must be confirmed by Soldevco based on project hydraulics, water quality and treatment objective.

## 5.1 Technical range - small and medium units

| Model | IN mm | OUT mm | Solid mm | Flow L/min | Flow m3/hr | Min Δp | Rec. Δp |
|---|---|---|---|---|---|---|---|
| VIPER-20 | 50-20 | 20-50 | 5.5 | 40-60 | 2.4-3.6 | 0.7 | 1.0 |
| VIPER-30 | 110/90/63-32 | 32-50 | 9 | 100-230 | 6-13.8 | 0.7 | 1.0 |
| VIPER-70-OE | 110 | 32-50 x 2 | 9 | 200-460 | 12-27.6 | 0.8 | 1.2 |
| VIPER-70-IL | 110 | 110 | 9 | 200-460 | 12-27.6 | 0.8 | 1.2 |
| VIPER-X3-OE | 110 | 32-50 x 3 | 9 | 300-690 | 18-41.4 | 1.0 | 1.2 |
| VIPER-X3-IL | 110 | 110 | 9 | 300-690 | 18-41.4 | 1.0 | 1.2 |

## 5.2 Technical range - high-flow and combined units

| Model | IN mm | OUT mm | Solid mm | Flow L/min | Flow m3/hr | Min Δp | Rec. Δp |
|---|---|---|---|---|---|---|---|
| VIPER-100-OE | 110 | 32-50 x 4 | 9 | 400-890 | 24-53.4 | 1.0 | 1.5 |
| VIPER-100-IL | 110 | 110 | 9 | 400-890 | 24-53.4 | 1.0 | 1.5 |
| VIPER-200-OE | 200 | 32-50 x 12 | 9 | 1200-2670 | 72-160.2 | 1.2 | 2.2 |
| VIPER-200-IL | 200 | 200 | 9 | 1200-2670 | 72-160.2 | 1.2 | 2.2 |
| 1N-VIPER-OE | 63-50 | Open Ended - 200 | 4 | 180-300 | 10.8-18 | 0.8 | 1.2 |
| 1N-VIPER-IL | 63-50 | 63-50 | 4 | 180-300 | 10.8-18 | 0.8 | 1.2 |

**Bubble spectrum operating note**

Gas intake is an operating control. Higher gas infusion tends to shift toward more visible microbubble-dominant operation. Lower gas infusion can favour ultrafine-bubble-dominant operation. Adjust using measured flow, pressure differential, vacuum, DO response and the project objective - not guesswork.

## 5.3 Configuration naming

| Label | Meaning |
|---|---|
| OE | Open-end / open discharge configuration, commonly suited to tanks, reservoirs, ponds, dams or direct return applications. |
| IL | Inline configuration, commonly suited to pipework installations and receiving chambers. |
| VIPER-X3 | Multi-VIPER configuration for higher flow duties. |
| VIPER-100 / VIPER-200 | Higher-capacity configurations for larger hydraulic duties. |
| 1N-VIPER | Combined configuration with 1N and VIPER functionality and multiple gas/liquid input opportunities. |

## 5.4 Physical dimensions and connections

The table below gives current weight, overall size and connection data for screening, transport and installation planning, sourced from the current Ultra-Oxygen product catalogue. It excludes unit costs. Hydraulic flow and pressure-differential design data remains governed by sections 5.1 and 5.2.

| Model | Weight | Overall size | Max pressure / connection |
|---|---|---|---|
| VIPER-30 | 0.38 kg | 32 mm dia x 255 mm | Max 6 bar - 32 mm inlet & outlet |
| VIPER-100-OE | 3.54 kg | 230 mm-125 mm dia x 320 mm | Max 6 bar - 50 mm inlet |
| VIPER-100-IL | 2.75 kg + 1.97 kg bolts/nuts | 230 mm-125 mm dia x 510 mm | 50 mm outlet |
| 1N-VIPER-OE | 8.8 kg (2.7 kg cover + 3.3 kg generator + 2.8 kg 200 dia fixed flange) | 340 mm-200 mm dia x 510 mm | Max 6 bar - 50 mm inlet |
| 1N-VIPER-IL | 10.33 kg (7.75 kg + 2.58 kg bolts/nuts) | 340 mm-200 mm dia x 510 mm | Max 6 bar - 50 mm outlet |

## 5.5 Multi-unit and combined configurations

Where a single generator's flow range does not match the site's required flow, or where redundancy or phased capacity is needed, multiple identical generators can be run in parallel from one pump and manifold. Common combinations include 2 x VIPER-30, 2 x VIPER-X3 (OE or IL) and 2 x VIPER-100 (OE or IL), among other combinations depending on site-specific requirements.

Combining units increases the achievable flow range and total gas intake capacity, but it does not change the pressure differential requirement of each individual generator. Every unit in the manifold must still receive its own minimum and recommended Δp (see sections 5.1 and 5.2). Manifold layout, pipe sizing, flow balancing and pump selection for a multi-unit arrangement must be confirmed by Soldevco for the specific site – this is not a standard catalogue configuration.

- Required site flow falls between two standard single-unit capacities.
- Redundancy or standby capacity is required for a critical process.
- A phased installation is planned, with capacity added in stages.
- Site layout favours two smaller manifolded units over one large unit.

**Data needed to confirm a multi-unit manifold**

Total site flow and available pressure differential; gas source and the intended split between units; available space and preferred manifold layout; and isolation/maintenance requirements for individual units without shutting down the whole system.

# 6. Design method and sizing logic

Correct selection starts with process need, not with a product photo. The generator must be matched to oxygen demand, water volume, treatment time, target quality, hydraulic performance and operating constraints.

| Design driver | Why it matters | Minimum data required |
|---|---|---|
| **Oxygen** | Air is not oxygen. Oxygen demand determines the real treatment duty. | DO target, COD/BOD, ammonia, biomass/fish/plant demand, organic load. |
| **Volume** | The required flow/turnover depends on how much water must be treated. | Daily flow, peak flow, stored volume, tank/dam size. |
| **Time** | Treatment time controls contact opportunity and number of turnovers. | Available operating hours, retention time, batch/continuous mode. |
| **Quality** | Discharge or reuse requirements define success. | Water analysis, compliance limits, odour/algae/solids problem. |
| **Hydraulics** | The unit needs the right flow and pressure differential. | Pump curve, pipe sizes, static head, filters, valves, gauges, Δp. |

## 6.1 Minimum design rules

- Verify flow and pressure differential at the generator, not only at the pump nameplate.
- Install upstream and downstream pressure gauges where practical.
- Protect the generator against solids larger than the safe passage size.
- Use strainers, screens or filters where water contains sludge, algae, sand, scale or debris.
- Select gas source and gas rate according to the objective: ambient air, oxygen, ozone and CO2 require different controls.
- For biological systems, design around the biology: DO helps, but pH, temperature, nutrients, toxicity, retention time and microbial health still control performance.

# 7. Installation requirements

The technical guide introduces critical installation controls that must be included in the user manual: straight-pipe distance, orientation, sensor vessels and start-up checks.

## 7.1 Straight-pipe placement from pump to generator

Best practice is to install the UO2 MB/UFB generator after a straight pipe section from the pump outlet. Use 10D to 15D as a practical minimum guidance, where D is the pipe diameter.

| Pipe diameter | Minimum straight distance | Maximum guidance distance |
|---|---|---|
| **20 mm** | 200 mm / 0.20 m | 300 mm / 0.30 m |
| **32 mm** | 320 mm / 0.32 m | 480 mm / 0.48 m |
| **50 - 63 mm** | 500 mm / 0.50 m | 750 mm / 0.75 m |
| **90 - 110 mm** | 900 mm / 0.9 m | 1100 mm / 1.1 m |

**Installation warning**

A generator installed directly after a turbulent pump outlet, elbow, valve or restriction can perform unpredictably. Use straight pipe, proper supports and measured Δp. Use 2 x 45deg bends to create 90deg bends, or use slow bends where possible.

## 7.2 Orientation and layout

- **General position:** Install horizontally.
- **Gas injection:** At upward angle to improve gas movement and reduce unwanted trapping.
- **Nutrient or liquid mixing:** Use horizontal or slightly downward orientation to reduce settling risk.

- **Support:** Secure the unit and pipework. Do not allow generator bodies, flanges or baseplates to carry cantilever loads.
- **Flow direction:** Confirm flow direction before energising the pump. Incorrect flow direction invalidates performance assumptions.

### 7.3 Typical system layout

1. Pump draws from the water source or process stream.
2. Straight pipe section is installed between pump and generator as far as practical.
3. UO2 MB/UFB generator is installed with correct orientation, supports and flow direction.
4. Gas or dosing line is connected through regulator, rotameter, non-return valve and isolation valve as required.
5. MB/UFB-rich water discharges to the water body, side-stream loop or pipeline.
6. Sensor vessels or representative sampling points are installed before and after the generator where validation is required.

### 7.4 Sensor vessel and IoT integration

For controlled projects, install separate monitoring points or sensor vessels before and after the generator. This creates baseline and post-treatment data instead of opinions.

| Monitoring point | Purpose |
|---|---|
| **Before UO2** | Measure baseline water quality: DO, temperature, pH, EC/TDS, ORP and project-specific parameters. |
| **After UO2** | Measure oxygenation, pH shift, nutrient dispersion, ORP response and system performance. |
| **IoT integration** | Connect compatible sensors to UO2-Aqua-Smart, UO2-Smart-Farmer or equivalent monitoring platforms for real-time data and alarms. |
| **Core sensors** | DO, temperature, pH, EC/TDS and ORP. |
| **Advanced sensors** | COD, ammonia, nitrate, turbidity, chlorophyll, blue-green algae, salinity, oil-in-water or TSS as required. |

## 8. Commissioning and start-up

Commissioning must prove the system is operating correctly. Switching on the pump is not commissioning.

1. Contact our technical support team and record project name, date, operator, model and installation location.
2. Confirm mechanical supports, pipework, valves, strainers, gas lines and electrical safety controls.
3. Record baseline water quality before starting: DO, temperature, pH, EC/TDS, ORP and project-specific lab parameters.
4. Start the pump with gas intake closed or at minimum safe setting.
5. Confirm flow direction, leaks, abnormal vibration and stable pump operation.
6. Record upstream pressure, downstream pressure and pressure differential across the generator.
7. Open gas or liquid intake gradually and record rotameter/vacuum response, and allow the system to stabilise.
9. Adjust gas setting only within the approved operating window and record every change. Record DO over time at consistent sampling points and issue a commissioning record with readings, photos, settings, risks and corrective actions to Soldevco.

### 8.1 Minimum commissioning record

| Record area | What must be captured |
|---|---|
| **Hydraulic data** | Pump model, kW, estimated/measured flow, inlet pressure, outlet pressure, Δp and gas/liquid intake rate. |
| **Water quality** | DO, temperature, pH, EC/TDS, ORP, turbidity and project-specific COD/BOD, ammonia, sulphide, algae or microbiology. |
| **Operating settings** | Valve positions, regulator settings, rotameter reading, oxygen/ozone/dosing settings. |
| **Visual evidence** | Photos of installation, gauges, flow direction, gas intake, return point, control panel and water condition. |
| **Risks/corrections** | Blocked strainer risk, insufficient Δp, undersized pump, excessive solids, poor sampling point, unsafe access or missing instrumentation. |

## 9. Monitoring, IoT and process control

The strongest proof of performance is data. Monitoring also protects Soldevco from false failure claims caused by process shocks, incorrect operation or missing baseline data.

| Parameter | Why it matters | Frequency | Notes |
|---|---|---|---|
| **DO + temp** | Primary oxygenation and process stability indicator. | Daily during start-up; then project-specific. | Use consistent sampling depth and location. |
| **pH** | Controls biology, gas transfer and chemistry. | Daily/weekly. | Investigate sudden shifts. |
| **EC/TDS** | Tracks salinity, nutrients and dissolved solids. | Weekly or as required. | Critical in fertigation and reuse. |
| **ORP** | Useful oxidation/reduction indicator. | During commissioning and treatment checks. | Interpret with pH and chemistry. |
| **COD/BOD** | Tracks organic pollutant load and treatment effect. | Baseline and scheduled lab testing. | Use accredited labs when needed. |
| **NH3/NO2/NO3** | Critical for nitrification, aquaculture and aquaponics. | Project-specific. | Low DO can inhibit nitrification. |
| **Visual/odour/sludge** | Practical operating indicators. | Every site visit. | Photograph consistently. |

### 9.1 Data integrity

- Use calibrated meters and record calibration dates.
- Measure at repeatable locations and depths.
- Separate field readings from laboratory results.
- Record weather, load shocks, chemical dosing, sludge movement, pump faults and operator changes.
- Do not claim success from a single reading unless the project objective was a single commissioning check.

# 10. Operation, maintenance and troubleshooting

## 10.1 Routine maintenance

| Interval | Action |
|---|---|
| **Every operating shift** | Check pump operation, abnormal noise, flow return, gas intake, pressure readings and visible leaks. |
| **Weekly** | Inspect strainers/screens, gas tubing, rotameters, valves, pressure gauges and return points. Clean as required. |
| **Monthly** | Check generator body, fittings, supports, non-return valves, pump performance and water-quality trend data. |
| **After dirty-water events** | Inspect after storms, sludge disturbance, algae crashes, high solids events or process upsets. |
| **Before long shutdown** | Flush with clean water where appropriate, isolate safely, protect from heat/UV/mechanical damage and record condition. |

## 10.2 Troubleshooting table

| Symptom | Likely causes | Checks | Corrective action |
|---|---|---|---|
| **Low/no gas intake** | Insufficient Δp, blocked gas line, flooded line, valve closed. | Gauge pressures, rotameter, non-return valve, tubing, flow direction. | Restore Δp, clean tubing, drain water, correct valves/orientation. |
| **Poor DO increase** | Demand too high, wrong gas setting, poor circulation, insufficient runtime. | COD/BOD/ammonia, DO profile, pump flow, gas rate, turnover. | Recalculate demand, adjust runtime/gas, improve circulation/capacity. |
| **Reduced flow** | Solids, algae, scale, sludge, biofilm or debris. | Strainer, pressure rise, flow drop, visual inspection. | Isolate, clean, flush, improve screening/maintenance. |
| **Vibration/noise** | Pump cavitation, air binding, pipe stress, restriction. | Suction, pipe supports, valves, pressures, leaks. | Correct suction, support pipework, adjust valves, inspect pump. |
| **Backflow to gas equipment** | Failed/missing non-return protection, wrong line routing. | Check valves, line height, water traps, shutdown sequence. | Install backflow protection and revise shutdown process. |
| **Client says failure** | No baseline, wrong expectation, load shock, missing data. | Data log, samples, hours, photos, operating changes. | Measure, compare, isolate variables and correct the real cause. |

# 11. Safety, limitations and warranty control

## 11.1 Safety requirements

- Only competent persons may install, operate or modify the system.
- Electrical equipment near water must comply with local electrical safety requirements and be protected from flooding and corrosion.
- Oxygen-enriched systems increase fire risk. Keep oil/grease away from oxygen fittings and follow oxygen supplier safety requirements.
- Ozone and other oxidants are hazardous and require ventilation, compatible materials, sensors and competent supervision.
- Pressurised pipework must be designed, supported and tested for operating conditions.
- Wastewater, dams and confined spaces introduce drowning, gas and biological hazards. Site safety procedures override this manual.

## 11.2 Technical limitations

- The generator cannot fix insufficient retention time, toxic shock, wrong pH, wrong nutrients, extreme solids loading or no biological capacity.
- Cavitation does not add DO by itself. DO improvement comes from gas transfer and oxygen availability.
- A DO reading at one location does not prove the entire water body is oxygenated.
- Dirty water can change performance due to solids, biofilm, algae, temperature and organic load.
- Serious claims require baseline data, trend data and/or laboratory verification.

## 11.3 Warranty control

| Control area | Requirement / limitation |
|---|---|
| **Registration** | Project and equipment use must be registered with Soldevco before warranty support can be assessed. |
| **Approved use** | Use must match the approved application, model, installation arrangement and operating range. |
| **As-built records** | As-built drawings, photos and commissioning records may be required before warranty acceptance. |

| | |
|---|---|
| **Exclusions** | Fair wear and tear, abuse, incorrect installation, blocked units, chemical incompatibility, over-pressure, unsupported pipe stress, unauthorised modification and poor maintenance are excluded. |
| **Appearance** | Minor visible assembly marks may occur on hand-assembled units and do not indicate functional failure. |

# 12. Pre-quotation information required

If the client cannot define the problem, water volume, water quality and target outcome, Soldevco should first propose a paid assessment or pilot, not a blind equipment package.

| Category | Information required | Why it matters |
|---|---|---|
| **Project basics** | Site, contact, water source, intended use, photos, drawings, access constraints. | Defines scope, layout and site risk. |
| **Water volume** | Daily flow, peak flow, stored volume, tank/dam dimensions, turnover target. | Drives capacity and runtime. |
| **Water quality** | DO, temp, pH, EC/TDS, ORP, COD/BOD, ammonia, solids, sulphide, algae or microbiology. | Defines treatment demand and risk. |
| **Existing system** | Pumps, pipe sizes, valves, filters, aerators, blowers, dosing and power. | Determines retrofit feasibility. |
| **Problem statement** | Odour, low DO, high COD/BOD, fish stress, algae, sludge, blocked filters, crop response or compliance failure. | Prevents wrong solution selection. |
| **Target outcome** | Required DO, discharge limits, reuse target, fish/crop objective and treatment timeline. | Defines success criteria. |
| **Decision process** | Procurement route, site owner, engineer, installer, dates and approvals. | Controls delivery and commercial risk. |

## 12.1 Typical site indicators by application type

The table below is a general reference to help clients and sales staff recognise common site conditions and gather the right data early. It is indicative only – it does not replace the full pre-quotation checklist above, and every site must still be assessed on its own facts.

| Site / application type | Typical indicators to look for | Data to gather |
|---|---|---|
| **Private/industrial WWTW** | High aeration energy cost, sludge disposal cost, effluent compliance risk. | Blower kWh, sludge wasting volume/cost, COD/BOD trend, discharge permit limits. |
| **Municipal WWTW** | Ageing aeration infrastructure, capacity constraints, energy budget pressure. | Plant flow and load data, existing aeration equipment type/age, energy tariff, compliance history. |
| **Agriculture / irrigation / CEA** | Root-zone oxygen deficiency, irrigation water quality concerns, yield or crop health issues. | Irrigation water source and volume, current DO levels, crop type, irrigation system layout. |
| **Aquaculture** | Stocking density limits, DO crashes, mortality or health events. | Pond/tank volume, DO and temperature logs, stocking density, species. |
| **Aquaponics** | Balancing fish and plant oxygen demand, system stability concerns. | System volume, fish and plant load, existing filtration/aeration setup. |
| **Estate / lake / dam** | Algae blooms, odour, poor water clarity, recreational or aesthetic concerns. | Water body volume and depth, nutrient levels, existing circulation/aeration, seasonal patterns. |
| **EcoPools / ecological pools** | Water clarity and biological balance challenges without chemical treatment. | Pool volume, filtration/circulation system, bather load, existing water quality data. |

# 13. Close-out and contact details

Oxygen is one of the most important control variables in water quality, biological treatment and aquatic life support. UO2 MB/UFB technology gives Soldevco and its partners a practical way to improve oxygen transfer, mixing and water-process stability, provided the system is applied with engineering discipline and measured evidence.

The strongest sales position is not hype. It is proof: baseline data, correct unit selection, proper installation, commissioning records and verified operating outcomes.



| | |
|---|---|
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# 14. Patent Information

The Ultra-Oxygen™ UO2 Micro and Ultrafine Bubble (M/UFB) Generator range, including its hydrodynamic gas-liquid entrenchment design, control methods and associated process technology, is protected intellectual property of Soldevco under

PATENT INFO:
Date of Acceptance: 2024 – 07 – 11
Class: B0 1F
Country: South Africa
Patent number: 2022/10967

No part of the unit's design, construction, internal geometry, control logic or process method may be copied, reverse-engineered, reproduced, or used as the basis for a competing or derivative product without Soldevco's prior written consent.

As a valued member of the Ultra-Oxygen™ family, every end-user of this equipment is automatically covered by Soldevco's standard terms and conditions and, where relevant, our Non-Disclosure Agreement – simple safeguards that let us keep investing in this technology for everyone who relies on it. All we ask in return is that you enjoy and operate your unit as intended, rather than opening it up, copying it, or helping anyone build a look-alike, and that if you ever come across another gas-liquid entrenchment unit out there that looks a little too familiar and might be encroaching on our patent, you give us a friendly heads-up at heindre@soldevco.co.za – you'd be helping protect the innovation that keeps Soldevco moving forward, for your benefit as much as ours.