



OIL & GAS

OIL, GAS & PETROCHEMICAL UV SYSTEMS
EXPERTS IN WATER TREATMENT





ABOUT US

THE WORLD LEADER FOR OIL, GAS & PETROCHEMICAL UV SOLUTIONS

Established in 1981, atg Evoqua have become the world market leader in the design and manufacturer of UV disinfection systems and integrated water treatment packages for the oil and gas industry. As a specialist supplier to the oil and gas and petrochemical sectors, atg Evoqua are recognised worldwide for innovative engineering solutions, high quality manufacturing and for unrivalled collaborative research and development, including involvement many joint industry projects (JIP) with leading oil and gas major operators.

Operating from a modern UK based manufacturing facility, atg Evoqua serves the global oil, gas and petrochemical sectors directly from our head quarters in Lancashire, North West England (UK) with a team of experienced Project Managers and Process, Mechanical, Electrical and Chemical engineering disciplines.

With over 35 years of expertise in water treatment and equipment designed especially for offshore and hazardous area environments, atg Evoqua have delivered hundreds of UV plants worldwide, including many of the worlds' largest offshore potable drinking water plants treating over 160 m3/hr and seawater injection plants (EOR) treating over 4,600 m3/hr each and every day.

As a global business, atg Evoqua have an established and experienced global distributor, service and after sales network who work closely with operators, EPC contractors and oil field service companies to provide innovative and cost effective solutions and award winning after sales support, that includes offshore installation, commissioning and service visits.



MANUFACTURED IN THE UK SINCE 1981

Over 35 Years Oil & Gas Experience

- Independent UK based manufacturer
- Dedicated oil & gas division
- Global onshore & offshore oil & gas experience
- Over 120 oil & gas projects successfully delivered
- ISO 9001-2015 certified
- Approved ATEX manufacturer
- Cenelec approved (ATEX equipment) engineers
- Extensive Oil & Gas R&D program
- Offshore certified engineers & service technicians

Oil & Gas & Petrochemical Solutions

- Offshore specification designs
- ATEX UV systems (zone 1 & zone 2 hazardous areas)
- Skid packages & containerised packaged plants
- Pump, filter, UV & chemical dosing solutions
- Winterization & tropicalisation designs
- Unmanned platform & subsea solutions
- Specialist testing, certification & documentation
- NORSOK, GOST, DNV & DOSH solutions
- NiPH, WHO & NSF-55 compliant solutions





HOW DOES UV WORK?

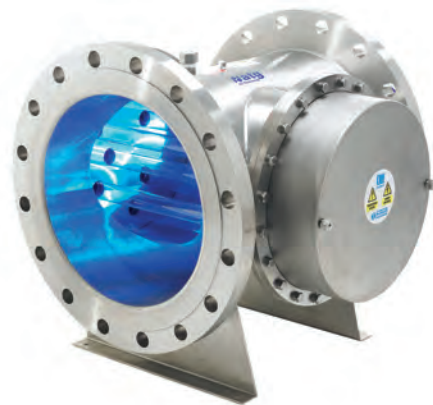
CHEMICAL FREE, UV DISINFECTION

Ultraviolet radiation in the UV-C band has a wavelength of 254nm which is very close to the absorbance wavelength of the amino acid bases which form the “rungs” of the DNA double helix in all microorganisms. UV-C radiation fuses adjacent amino acid groups making it impossible for the molecule to replicate and permanently damages the thymine strand of the DNA helix, rendering the microorganism harmless and unable to replicate.

Microorganisms that are exposed to the correct dose of UV-C radiation then effectively ‘die’ at their next natural, reproductive cycle. As microorganisms cannot reproduce, genetic mutation is significantly less likely to occur, meaning no known microorganism has developed any immunity to UV-C light, including 17 known chlorine resistant microorganisms e.g. Cryptosporidium & Mycobacterium Intracellular.

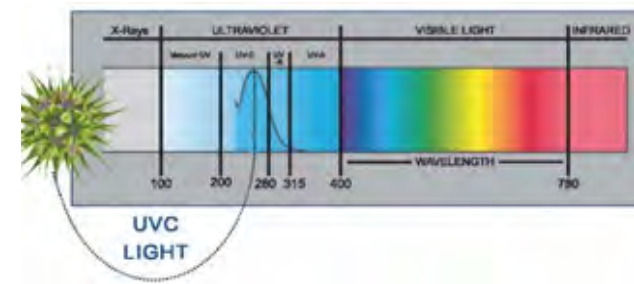
The UV dose (fluence rate) is typically is expressed in mJ/cm² and is calculated from ‘intensity (total UV lamp power) x contact time (flow rate). Other parameters such as target microorganism species, inlet microorganism levels, UV Transmittance (UVT%) and Total Suspended Solids (TSS) are also taken into account when sizing a UV disinfection system.

Whilst all known microorganisms are susceptible to UV light, different microorganisms have different UV dose response rates. Species such as SRB’s have proved to be very sensitive to UV-C with standard industry doses of 40 mJ/cm² providing a >4 log (99.99%) reduction in a single pass (0.5 seconds exposure). Other species such as Adenovirus or more complex organisms e.g. Mussel larvae have a higher dose response rate and require an increased UV dose (e.g. 120 mJ/cm²) to achieve a 4.0 log reduction (99.99%).



Holistic Approach

As a chemical free, physical process, UV disinfection provides a range of operational advantages and process benefits to the oil and gas industry. As regulations such as OSPAR, HOCNF and the EU Priority Substances Directive introduce more stringent operational and environmental parameters, the holistic link between chemical use in up-stream processes and its impact on down-stream applications and Environmental Impact Factors (EIF) is becoming more understood.

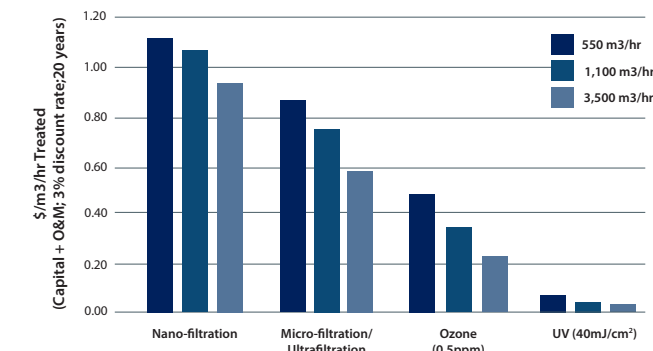


Operators looking to take a holistic approach have started to invest in alternative water treatment methods that reduce / eliminate the need to add additional chemicals into the process. As UV disinfection does not introduce any residual compounds into the water, challenges regarding residual toxic compounds e.g. PAH’s, Phenols and BTEX’s in returning produced water, or the formation of disinfection by-products e.g. Halogenated Hydrocarbons can be reduced or in some cases eliminated – driving down operational costs whilst improving environmental performance and lowering the EIF at discharge.

In addition, no residual compounds in the water also can alleviate issues regarding additive performance. For example, the most commonly used biocide, glutaraldehyde is not compatible with the most commonly used oxygen scavenger, Sodium bisulphate. By switching to the physical process of UV treatment as the primary disinfection technique, operators can avoid negative chemical / additive interactions.

Operational Costs

As the oil and gas sector drives to improve efficiency, many operators are basing their investment decisions regarding the selection of water treatment equipment on whole-life costing models. This takes into account the capital cost of equipment (CAPEX), and the predicted operational life costs (OPEX) for up to 20 years.



UV disinfection is a cost-effective solution compared to alternative technologies on the market. An annualised cost analysis (graph above) illustrates how UV disinfection is the most cost-effective advanced treatment technology available when compared to alternatives such as nano-filtration, micro-filtration/ ultra-filtration and Ozone.

UV DISINFECTION
USED AS PART OF AN HOLISTIC
APPROACH, CAN ASSIST
OPERATORS TO REDUCE THEIR
ENVIRONMENTAL IMPACT
FACTOR (EIF)

Oil & Gas Applications

UV Disinfection plants are typically skid mounted or containerised and when compared to alternative disinfection technology’s such as electro-chlorination are typically 50% smaller in footprint and weight. UV Chambers use modern ‘in-line’ designs that see UV reactors installed direct into the pipe (similar to a valve or flow meter) making the technology suitable for retrofits into pipe galleries.

Developments in power supply technology and UV lamp design have significantly increased both UV system capacity (typically treating 1 m3/hr to over 6,000 m3/hr) and operational life, with certain UV designs being able to operate continuously for over 2 years before requiring any maintenance, making UV Systems suited to future developments such as unmanned platforms and subsea installations.

Applications Include: -

- Drinking Water
- Well Injection (Seawater & Produced Water)
- Hydraulic Fracturing (Shale Gas & Oil)
- Blow Out Preventor (B.O.P.) Hydraulic Fluids
- Pipeline Hydrotesting (Seawater)
- Membrane Protection (RO, UF & Nano)
- Cooling Water & Heat Exchangers



UV SYSTEM DESIGN

OFFSHORE / OIL & GAS SPECIFICATION UV SYSTEMS

UV treatment is widely used throughout the oil and gas sector, however the design, engineering, quality and documentation requirements are far beyond that of standard UV equipment used in typical industrial applications. As specialist suppliers to the onshore and offshore oil, gas and petrochemical sectors, atg Evoqua have over 35 years' experience in supplying UV systems and integrated water treatment packages that meet the high specifications and engineering requirements of oil, gas and petrochemical operators worldwide.

All UV Systems are manufactured to the highest standards and feature key upgrades such as material of construction, certification, advanced weld procedures, pressure vessel design and upgraded electrical designs to ensure the equipment is fit for purpose for installation in some of the worlds' most demanding environments.

From high temperature desert locations (+55 Deg C) to the freezing outdoor decks of Norwegian North Sea platforms (-40 Deg C), atg Evoqua have the experience and engineering knowledge required to design and manufacture UV Systems and associated package designs to suit any specification or location, including: -

- Offshore Platforms, FPSO, Drilling Rigs & Support Vessels
- Onshore Oil & Gas and Shale Well Pads
- Petrochemical & Refineries
- Unmanned Platforms & Subsea Environments
- High vibration environments (DNV)
- Desert Locations (+55 Deg C Ambient)
- Freezing Locations (-45 Deg C Ambient)
- Tropical Locations (+98 % Humidity)



DESIGNED FOR OIL & GAS INSTALLATIONS

Standard Oil & Gas Designs

- 316L SS Local control panels
- LSZH cables (Low Smoke Zero Halogen)
- 316L SS cable glands
- Robust, vibration proof panel designs
- UV chamber ASME B31.3 calculations & nozzle loads
- RF Flange Upgrades for all nozzles
- PMI, NDT, X-Ray & 3.1 material certifications
- 316L SS instrumentation
- Full Project Documentation & Certifications

Optional Design Upgrades

- NiPH certified (FHI Water Report 126)
- US EPA UVDGM validated
- NSF-55 certified (class 1 & 2)
- NORSOK, GOST, DOSH compliant designs
- ASME, PD5500 & EN13445 pressure vessels
- ATEX / IE CEX hazardous area - Zones 1 & 2
- Exotic materials, specialist ITP & material certifications
- Tropicalisation / winterization
- 230V / 400V / 440V / 480V / 690V designs



ATEX & IEC EX

UV SYSTEMS FOR EXPLOSIVE HAZARDOUS AREAS

atg Evoqua are one of only a few UV system equipment manufacturers in the world to specialise in the design and manufacture of ATEX (99/92/EC) and IEC EX certified UV disinfection systems and water treatment packages for operation in hazardous area Zones 1 and 2 for the global oil, gas and petrochemical sectors.

From drilling decks and accommodation platforms, to upstream refineries, many oil, gas and petrochemical installations now require equipment to be installed in hazardous areas and ATEX classified zones. Explosive atmospheres can be caused by any number of flammable gases, mists, vapours and combustible dusts. When a sufficient quantity of hazardous material is mixed with air, all that is needed to cause an explosion is a source of ignition such as a spark or even a high surface temperature.

Locations classified in to hazardous zones are required by law to be protected from sources of ignition. Whilst there are many UV systems available on the market, there are very few that can meet the strict requirements of the ATEX (99/92/EC) & IEC EX directives for installation into explosive atmospheres and classified hazardous zones.

atg Evoqua are the worlds' leading supplier of ATEX Zone 1 & 2 / IIA & IIB / T3 certified UV disinfection systems. In addition, atg Evoqua's UK manufacturing facility is certified as an approved ATEX equipment manufacturing site under the Explosive Atmospheres Directive 2014/34/EU-Annex IV. Clients for ATEX approved UV systems include: Equinor (Statoil), Shell, Transocean, Petronas, Conoco Phillips, GDF Suez, ADMA, Maersk and Total.



ATEX & IE CEX DESIGNS

ATEX UV System & Package Designs

- Ex d & Ex e UV chamber designs
- Ex d Local control panels (<10.0 kW)
- Ex p Local control panels (>10.0 kW)
- Ex de Junction boxes & cable glands
- Ex ia & Ex d instrumentation
- Ex d Automatic wiper systems
- Ex d valves & actuators
- Ex d pumps
- ATEX Zone 1 & Zone 2, SIL rated safety circuits





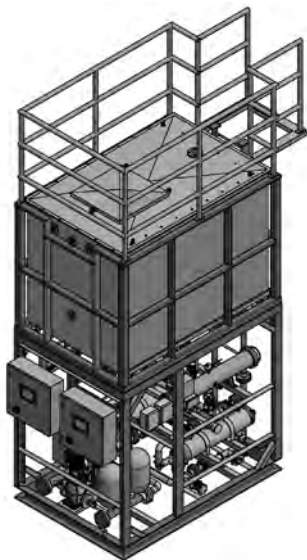
INTEGRATED WATER TREATMENT PACKAGES

atg Evoqua are the worlds’ leading supplier of UV disinfection skid packages and containerised water treatment plants for the offshore oil and gas industry. Operating from our dedicated UK based facility in Lancashire, atg Evoqua have over 35 years’ experience in the design, manufacture, fabrication and assembly of both standardised ‘off-the-shelf’ package designs and custom built, bespoke projects designed and engineered to meet strict project requirements and operator engineering specifications such as NORSOK and GOST.

atg Evoqua package experience includes skid designs manufactured to meet client engineering specifications, footprint requirements and tie in points of individual projects and also, containerised UV plant designs, with all equipment installed into mobile 10ft, 20,ft, 30ft or 40ft DNV certified containers.

All ancillary items such as valves, actuators, manifolds, pipe work, junction boxes, distribution boards and electrical installation materials are included. In addition to UV disinfection systems, atg Evoqua specialise in providing integrated technology solutions onto one, turn-key package that includes all necessary equipment to treat the process, such as-

- Valves & actuators (isolation & flow control)
- Pumps
- Filters (Y-Type, basket & cartridge)
- Chemical dosing equipment
- Buffering capacity / storage tanks
- Project specific instrumentation
- RIO cabinets and supervisory control panels



OUR WORLD LEADING
INHOUSE OIL & GAS TEAM
BASED IN THE U.K. HAVE OVER
30 YEARS EXPERIENCE IN OIL
& GAS DESIGN & PROJECT
DELIVERY



PACKAGE DESIGN FOR OIL & GAS INSTALLATIONS

Skid Packages Features

- Purpose built 316L SS skid frames
- Ultra compact, low weight designs
- Duty / standby & duty / assist / standby designs
- Single point lift
- Turn-key operation, easy to install
- 30 year design life
- Designed for installation in an offshore environment
- Safe area & ATEX Zones 1 & 2 hazardous area designs
- Standard ‘off-the-shelf’ & bespoke designs available

Design Options

- Euro code 3 skid designs & stress analysis
- ASME B31.3 pipe stress analysis+ nozzle loads
- ASME, PD5500 & EN13445 pressure vessel design
- Seismic, wind, snow, transport, lift & drop loads
- Safe area / ATEX / IE CEX hazardous area installations
- Exotic materials and bespoke designs
- Outdoor installations (winterization / tropicalization)
- NORSOK / DOSH / GOST compliant designs
- Range of ITP & NDE options

Standard Equipment

- Pumps
- Filters
- Chemical dosing units
- Buffering Capacity / Storage Tanks
- Pipe work, Manifolds & Tubing
- Valves & Actuators
- Flow Meters & Additional Instruments
- Winterization (heat tracing & insulation)
- Lifting Equipment



DRINKING WATER

UV DISINFECTION FOR CREW WATER SUPPLIES

UV treatment is now the disinfection technology of choice for offshore potable drinking water systems and provides a simple, ultra compact and easy to maintain solution that protects against all known bacteria and harmful micro-organisms, including the 17 known chlorine resistant drinking water micro-organisms such as Cryptosporidium and Giardia.

atg Evoqua have a large range of both amalgam low pressure and polychromatic medium pressure UV systems that are designed specifically for potable drinking water disinfection and surpass the WHO guidelines for potable drinking water quality. Selected UV models are fully certified to meet the requirements of US EPA UVDGM (2006), NSF-55 (Class 1 and Class 2 Systems) and the Norwegian NIPH (FHI Water Report 120 & 126) requirements.

UV disinfection is a physical process that does not involve the use of chemicals and does not create any disinfection by-products. In some locations / regions, UV is used as the only disinfection barrier, providing the full inactivation of bacteria, protozoa and viruses. In other locations, UV is used as part of a multi-barrier approach, either installing the UV as a final treatment stage to protect against chlorine resistant pathogens or utilising it as the primary disinfection stage, followed by the residual chlorine at low levels (0.2ppm - 0.5ppm) to protect the sterilise drinking water as it travels through the distribution / pipe network.

No microorganism has developed immunity to UV disinfection, with a standard UV dose of 40 mJ/cm2 achieving a 4 log reduction (99.99%) of microorganisms in a single pass (0.5 seconds exposure).



BENEFITS OF UV DISINFECTION

Process Advantages

- Independent 3rd party validated performance
- Effective against all known microorganisms
- Proven barrier against Cryptosporidium
- Typical >4 Log reduction (99.99%) in a single pass
- UV cannot be overdosed
- No disinfection by-products or chemical residuals
- Effective for both RO permeate and bunkered water
- Automatic dose pacing adjusts power to match variable flow rates & water quality

Operational Benefits

- Solution from 0.1 m3/hr to 2,000 m3/hr
- Duty / standby operation
- Low maintenance technology
- Simple to operate, turn-key designs
- 10,000 hour continuous operation
- Easy to install / retrofit into existing pipe galleries
- 30 year design life
- Safe area & ATEX Zone 1 & 2 solutions
- Local / Remote / SAS / DCS / ICSS Operation





SEAWATER (WELL INJECTION)

CHEMICAL FREE, UV DISINFECTION FOR ENHANCED OIL RECOVERY (EOR)

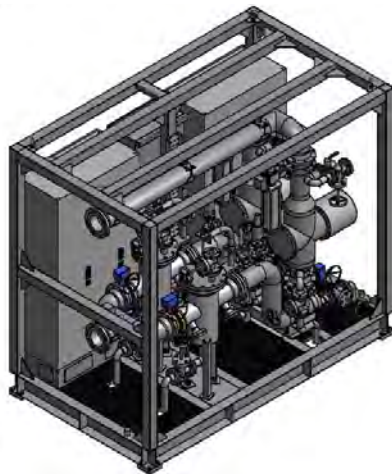
Inadequate disinfection and treatment of micro-organisms such as SRB's (Sulphate Reducing Bacteria) and Slime Forming Bacteria in seawater used for well injection (enhanced oil recovery) has been proven to lead to a range of negative consequences, including: -

- Microbiological Induced Corrosion (MIC)
- Well souring (H_2S)
- Reservoir plugging ($H_2S + Fe = FeS$)
- Formation of bio-films & Extracellular Polymeric Substances
- Damage of equipment & components (e.g. Pumps)

With increasingly strict regulations on chemical use (OSPAR, HOCNF, PSD) there has been an increasing effort by operators to reduce or eliminate chemicals and biocides from the process and research new, environmentally friendly treatment solutions.

Working with Conocophillips in a Joint Industry Project (JIP), atg Evoqua carried out the original research (1993) into using UV treatment for seawater disinfection and SRB reduction. The high effectiveness of UV against SRB's has led to UV being widely used offshore and onshore for well injection, with the largest plants operating in the Norwegian North Sea since 1999: Conocophillips Eldfisk Platform (4,365 m3/hr) and Ekofisk Platform (4,620 m3/hr).

By using UV disinfection for seawater treatment, operators can reduce the required volumes of biocides from the process typically by 90% to 100%. Alternatively, operators can use UV disinfection as an additional treatment step in conjunction with biocides or other chemicals such as chlorine to ensure maximum disinfection performance, significantly improving reservoir life.



BENEFITS OF UV DISINFECTION

Process Advantages

- Chemical free, environmentally friendly solution
- Reduces the use of HOCNF classified chemicals
- Leaves no residual chemicals or toxic compounds
- Creates no disinfection by-products
- Provides >4 Log Reduction (99.99%) of SRB's
- Protects against MIC (Microbial Induced Corrosion)
- Protects against bio-films & EPS layers
- Protects against well souring & well plugging (H_2S)
- No microorganism immunity to UV disinfection

Operational Benefits

- Eliminates the need to ship / store biocides offshore
- Improves Health & Safety (reduced chemical handling)
- Improved environmental profile (reduced EIF)
- Low maintenance technology
- Suitable for unmanned platforms
- Proven, cost saving technology
- Simple to operate, turn-key design
- Easy to install, modular design
- Flow rates from 10 m3/hr to 6,000 m3/hr per chamber





PRODUCED WATER

CHEMICAL FREE DISINFECTION & SRB REDUCTION

Produced water re-injection (PWRI) is increasingly being used by operators to gain value from returning injection waters and avoid the need for environmental discharge or disposal wells. With total global volumes of re-injected produced water set to increase to over 340-bn barrels annually by 2020, operators are looking for advanced treatment solutions that can increase the quality of re-injected produced water, whilst reducing operation costs and simplifying operations.

Traditionally, large volumes of biocide such as Glutaraldehyde have been used to control bacterial growth before reinjection, however the rising costs of chemicals, handling, and offshore storage concerns plus an appetite by operators to reduce the number of chemicals added to the process has seen operators turn to UV treatment as an alternative solution.

Through extensive R&D with major oil and gas operators, atg Evoqua have developed and field tested a range of UV solutions specially designed to treat produced water and provide a minimum 99.99% reduction of microorganisms such as SRB's, acid producing bacteria and biofilm forming microorganisms, that if left untreated, pose a range of negative consequences including:-

- Microbiological Induced Corrosion (MIC)
- Well souring (H₂S)
- Reservoir plugging / equipment blinding (H₂S + Fe = FeS)
- Formation of bio-films & Extracellular Polymeric Substances

By using UV disinfection, operators can significantly reduce the required volumes of biocides from the process or alternatively use UV as a final polish solution to improve produced water quality.



BENEFITS OF UV DISINFECTION

Process Advantages

- Chemical free, environmentally friendly solution
- Reduces the use of HOCNF classified chemicals
- Leaves no residual chemicals or toxic compounds
- Creates no disinfection by-products
- Provides >4 Log Reduction (99.99%) kill of SRB's
- Protects against MIC (Microbial Induced Corrosion)
- Protects against bio-films & EPS layers
- Protects against well souring (H₂S)
- No microorganism immunity to UV disinfection

Operational Benefits

- Eliminates the need to ship / store biocides offshore
- Improves Health & Safety (reduced chemical handling)
- Improved environmental profile
- Low maintenance technology
- Suitable for unmanned platforms
- Proven, cost saving technology
- Simple to operate, turn-key design
- Easy to install, modular design
- Flow rates from 10 m3/hr to 2,000 m3/hr per chamber





HYDRAULIC FRACTURING

ON SITE, CHEMICAL FREE DISINFECTION FOR WELL INJECTION WATER

The process of Hydraulic Fracturing requires large volumes of clean, sterile water to be injected into the shale formation to release the gas trapped between the rocks. Typically, 20% to 70% of the injected water, together with formation water and other contaminants returns from the well in the form of flowback or produced water.

Large scale removal of this water poses significant problems for operators due to the high number of truck movements required to remove the flowback to an off-site facility and then deliver replacement fresh water in its place. In addition the high costs associated with off-site wastewater treatment and disposal are also of significant concern, with typical disposal costs ranging from £11.00 to £19.00 per m3 (in the UK).

As regulations, planning authorities and politics continue to drive sensitivity over the use of chemicals, truck movements and fresh water use, investment in on-site water treatment solutions that see flowback water recycled and reused for use on additional fracture stages have become a major priority for shale gas operators.

The use of UV disinfection as the primary sterilisation technique has allowed operators to eliminate the need for chemicals / biocides such as Glutaraldehyde and THPS from the process and have provided both the US and UK shale gas / shale oil industries with a highly effective 'chemical-free' treatment solution that targets a range of micro-organisms including SRB's (Sulphate Reducing Bacteria), Acid Producing Bacteria and Slime Forming Bacteria.



BASED ON A WELL USING
30,000 M3 OF WATER,
GENERATING 40% FLOWBACK,
ON-SITE TREATMENT AND
FLOWBACK WATER REUSE
COULD ELIMINATE UP TO
1,556 ROAD TANKER TRIPS.



MOBILE WATER TREATMENT
PLANTS ALLOW OPERATORS
TO SOURCE WATER FROM
LOCAL RIVERS, CANALS,
COAST LINES & EFFLUENT
TREATMENT PLANTS

BENEFITS OF UV DISINFECTION

Process Advantages

- Highly effective, field proven technology
- Identified as a Best Available Technique (BAT)
- 100% chemical free (safe, drinking water technology)
- Provides >4 Log Reduction (99.99%) kill of SRB's
- Leaves no residual chemicals or toxic compounds
- Creates no disinfection by-products
- Protects against MIC (Microbial Induced Corrosion)
- Protects against bio-films & EPS layers
- Prevents well souring (H_2S)
- Prevents well plugging ($H_2S + Fe = FeS$)

Operational Benefits

- Eliminates the need for biocides by 90% - 100%
- Significantly reduces truck movements
- Reduces / eliminates fresh water use
- Reduces CO_2 Carbon footprint
- Allows for local water extraction e.g. River / canal
- Improves environmental profile of operations
- Reduces operational costs
- Mobile design with small footprint (20ft container)
- On site, turn-key solution





PIPELINE HYDROTESTING

CHEMICAL FREE DISINFECTION & SRB REDUCTION OF PIPELINE FLOODING WATER

The water used for pipeline flooding and hydro-testing has for some time been known as a potential source of microbial contamination, containing natural concentrations of SRB's (Sulphate Reducing Bacteria), Acid Producing Bacteria and Planktonic Slime Forming Bacteria, that if left untreated, pose a range of negative consequences including:-

- Microbiological Induced Corrosion (MIC)
- Production of hazardous hydrogen sulphide gas (H₂S)
- Formation of bio-films & Extracellular Polymeric Substances
- Damage of equipment & components (e.g. Pumps)

Traditionally, chemical biocides such as Glutaraldehyde and THPS have been used to prevent bacterial growth, however strict limitations on discharges to the environment of wastewater

following completion, together with the high cost of chemical biocides have seen operators look for alternative solution. UV disinfection of fresh water, brackish water and seawater provides a highly effective, low cost alternative to chemical biocides for eliminating all known microorganisms, including SRB's. As a chemical-free technology, UV treatment has been successfully used in the field by leading operators on some of the worlds' largest and most prestigious pipeline commissioning projects including the Nord Stream 1 & 2 (Baltic Sea) and Castor (Caspian Sea) pipelines.

When used with 50 micron pre-filtration, operators deploying UV packages have been able to fully eliminate the use of biocides from the process, significantly improving the environmental profile of the project and lowering operational costs.



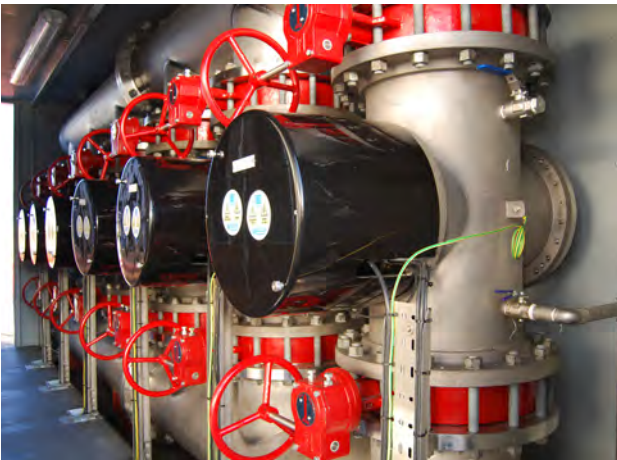
BENEFITS OF UV DISINFECTION

Process Advantages

- Highly effective, field proven technology
- Used on major pipeline projects worldwide
- Identified as a Best Available Technique (BAT)
- 100% chemical free (safe, drinking water technology)
- Leaves no residual chemicals or toxic compounds
- Creates no disinfection by-products
- Provides >4 Log Reduction (99.99%) kill of SRB's
- Protects against MIC (Microbial Induced Corrosion)
- Protects against bio-films & EPS layers

Operational Benefits

- Eliminates the need for biocides
- Allows for free discharge of water into environment
- Simple to operate, turn-key design
- Improves environmental profile of operations
- Reduces operational costs (chemical cost saving)
- DNV certified, containerised designs (10ft & 20ft)
- Skid package solutions
- Solutions from 10 m3/hr to 6,000 m3/hr per system
- Treats seawater, brackish water & freshwater





B.O.P. PROTECTION

UV DISINFECTION FOR B.O.P. HYDRAULIC CONTROL FLUIDS

Blowout Preventor (B.O.P.) units used during drilling operations are critical safety devices that rely on high quality, sterile and particle free hydraulic fluid for reliable operation. As a leader in water treatment for the oil and gas industry, atg Evoqua developed the world's first UV treatment solution to effectively maintain and protect B.O.P. operation fluids.

Blow out preventors are used to stop the uncontrolled flow of liquids and gases during operations. Typically, BOP's are controlled and operated by hydraulic fluids comprised of: potable grade fresh water, glycol based antifreeze & soluble lubricants with corrosion inhibitors. If left untreated, the levels of bacteria present in the BOP controls fluid can quickly begin to rise. This growth is quickly accelerated by the sugars present in the glycol mixture.

Bacterial growth is now a hot topic with operators, as even small amounts of biological activity can cause significant damage including; microbial induced corrosion (MIC) on the fluid lines, corrosion of the BOP and control unit components and seals and control system blockages caused by the formation of particles and solids in the fluid. These can lead to critical BOP failure and irreparable damage of the blow out Preventor itself.

Working with subsea BOP control specialists, atg Evoqua developed a unique treatment solution that combines specially designed UV disinfection reactors, pumps, instrumentation and filtration technology. The atg Evoqua solution has been field tested and proven to keep BOP hydraulic operation fluid in perfect condition.



BENEFITS OF UV DISINFECTION

Process Advantages

- Field proven process design
- Continuous, recirculation disinfection technology
- Effective against all known microorganisms
- Keeps B.O.P. fluid in perfect, sterilise condition
- UV cannot be overdosed
- No disinfection by-products or chemical residuals
- Chemical free, environmentally friendly solution
- Installs directly to B.O.P. Mix Tank (recirculating line)
- Monitors fluid integrity (pH & conductivity)

Operational Benefits

- Turn-key, skid design solution available
- No complex monitoring or measurements required
- Designed to recirculate B.O.P. mix tank
- Low maintenance technology
- 100% duty / 100% standby design
- 12,000 hour continuous operation
- Easy to install / retrofit into existing pipe galleries
- 20 year design life
- Safe area & ATEX Zone 1 & 2 solutions



MEMBRANE PROTECTION

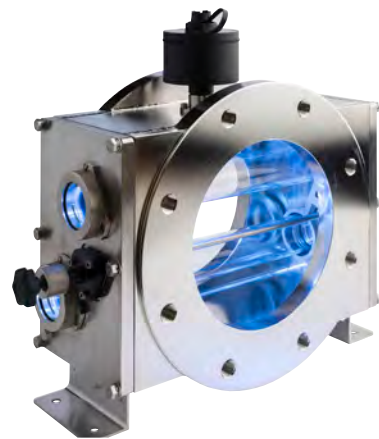
MEMBRANE & DOWN STREAM EQUIPMENT PROTECTION

Membrane and filtration technology such as Reverse Osmosis, Ultra Filtration and Nano Filtration are widely used in the oil and gas sectors to remove organics, solid particles and sulphates from process water such as seawater, used for well injection and enhanced oil recovery (EOR) applications in order to protect the reservoir. However, microorganisms such as Sulphate Reducing Bacteria, Vibrio Fischeri and Pseudoalteromonas Lipolytica that are naturally present in the environment and feed water can significantly decrease the life of membranes, filters and other equipment through microbiological damage, including: -

- Bio-film / EPS layer growth
- Microbial Induced Corrosion (MIC)
- Plugging / blinding (biological organic particles)
- Plugging / blinding ($H_2S + Fe = FeS$)

Traditionally, disinfection with chlorine, followed by de-chlorination with sodium bisulfate or carbon filtration has been used to protect membranes, however due to unpredictable chlorine breakthrough, scaling issues and rising chemical costs, UV disinfection has been adopted as an effective alternative technology.

Installed before the RO membranes or UF plant, UV disinfection is proven to increase membrane life by protecting equipment from biological degradation. Unlike chlorine, UV disinfection effects the DNA of the microorganism and does not effect cell membrane integrity that if ruptured, can release polysaccharide's (sticky glue like substance) that can quickly damage and blind membranes. As a chemical free technology, no residual chemical breakthrough can occur, further protecting downstream equipment.



BENEFITS OF UV TREATMENT

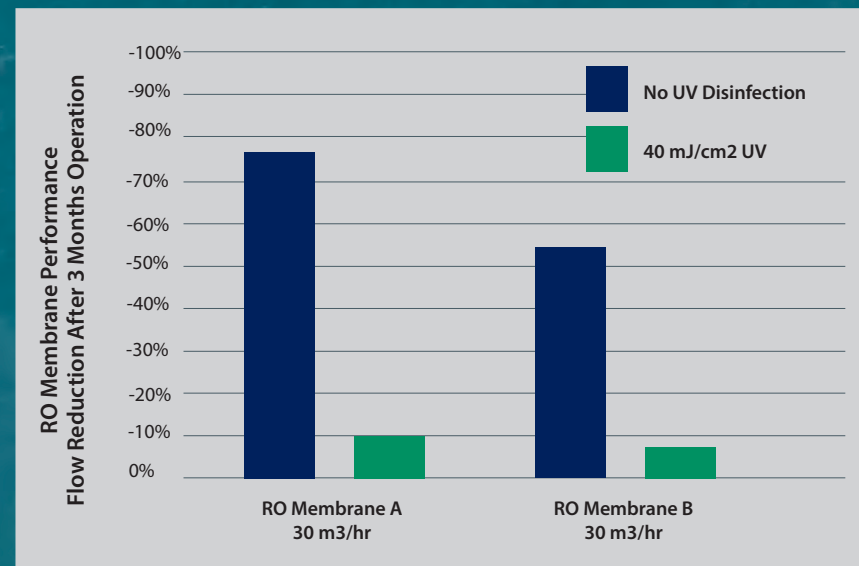
Process Advantages

- Chemical-free disinfection technology
- Significantly increases membrane & filter media life
- Eliminates risk of attack from residual chlorine
- Does not produce damaging, sticky, polysaccharides
- High disinfection efficiency >4 log reduction
- UV cannot be overdosed
- Leaves no residual chemicals or toxic compounds
- Creates no disinfection by-products
- Effective against all known microorganisms, including 17 chlorine resistant strains

Operational Benefits

- Eliminates the need to de-chlorinate feed water
- Improves health & safety (reduced chemical handling)
- Improved environmental profile
- Low maintenance technology
- Suitable for unmanned platforms
- Suitable for subsea installations
- Proven, cost saving technology
- Simple to operate, turn-key design
- Easy to install, modular design
- Flow rates from 10 m3/hr to 6,000 m3/hr per system

UV DISINFECTION IS PROVEN
TO INCREASE MEMBRANE LIFE
BY PROTECTING EQUIPMENT
FROM BIOLOGICAL
DEGRADATION





COOLING WATER

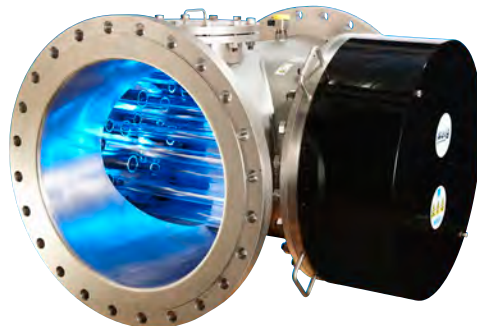
MICROBIAL INDUCED CORROSION & BIO-FILM PROTECTION

Water sources such as seawater, fresh water and brackish water used for cooling loops and heat exchangers carry a major risk of microbial contamination. Operating at increased temperatures that provide the optimum environment for biological growth, operators are required to treat and disinfect source water to protect their systems and piping networks from Legionella, bio-films, EPS layers, Microbial Induced Corrosion (MIC) caused by acid producing bacteria such as SRB's and mussel growth.

Traditionally, chemical dosing with biocides, chlorine dosing or electro chlorination have been used to protect the process, however strict limitations on discharges to the environment of wastewater, together with the high cost of transporting, storing and dosing chemicals has seen operators look for alternative, environmentally friendly water treatment solutions.

UV disinfection of fresh water, brackish water and seawater provides a highly effective, low cost alternative to chemical biocides for eliminating all known microorganisms, including Legionella pneumophila (Legionnaires disease) acid producing bacteria such as Sulphate Reducing Bacteria (SRB's), bio-film forming bacteria, including chlorine resistant strains such as Mycobacterium Avium and Mycobacterium Intracellular and mussel larvae.

When high doses of UV light at 254 nm is used as the primary disinfection technique for controlling bacterial growth, operators have been able to reduce the need for biocides and chemical use by 90% to 100%, significantly improving the environmental profile (reducing EIF) of installations, simplifying operations and significantly, lowering the operational costs of the plant.



BENEFITS OF UV DISINFECTION

Process Advantages

- Chemical free, environmentally friendly solution
- Reduces the use of regulated / classified chemicals
- Leaves no residual chemicals or toxic compounds
- Creates no disinfection by-products
- No microorganism immunity to UV disinfection
- Provides >4 Log Reduction (99.99%) kill of SRB's
- Protects against MIC (Microbial Induced Corrosion)
- Protects against bio-films & EPS layers forming
- Eliminates mussel larvae

Operational Benefits

- Eliminates the need to ship / store biocides
- Improves health & safety (reduced chemical handling)
- Improved environmental profile
- Low maintenance technology
- Suitable for unmanned / remote locations
- Proven, cost saving technology
- Simple to operate, turn-key design
- Easy to install, modular design
- Flow rates from 10 m3/hr to 20,000 m3/hr per system





AFTER SALES

35 YEARS EXPERIENCE IN ONSHORE & OFFSHORE OIL & GAS

atg Evoqua believe that the relationship between the customer and supplier does not end once a UV system or water treatment package is delivered, and are committed to providing an excellent after sales and support service for the life of the UV System / package.

Starting the life of your UV system with an approved atg Evoqua commission ensures your new investment has been correctly installed, calibrated and is working at the optimum performance from day one. As a continuation of our partnership, atg Evoqua offer a range of onshore & offshore service contracts from 1 to 20 years. Regular service and maintenance of your UV system not only provides you with peace of mind, but will significantly extend the life of your investment, optimise process performance and ensure reliability of the system.

All atg Evoqua systems and water treatment packages are fully supported in the field with a range of tailored service plans and consumable spares options, with all major spare parts such as UV lamps, quartz sleeves / thimbles and instrumentation kept in stock for next day dispatch from our UK headquarters and also at selected, strategically placed locations around the world including Norway, China and the U.S.A.

In addition to commissioning and spare parts, atg Evoqua offer a range of after sales services such as our dedicated UK based technical help desk, certified operator training courses, site acceptance tests, bacterial performance sampling and reporting and the option for 24 hour technical support and rapid site mobilisation for offshore certified (Offshore Survival & Fire fighting qualified) engineers & service technicians.



AFTER SALES SERVICES

After Sales Services

- Commissioning & installation assistance
- Annual service & maintenance visits
- System health checks & diagnostic visits
- Service level agreements (SLA)
- Site acceptance tests (SAT)
- Offshore certified engineers & service technicians
- Dedicated technical help desk (UK based)
- 24 hour technical phone assistance
- Global spares & after sales network

Certified Training

- On-site training (offshore & onshore)
- Training at atg Evoqua's head office training facility
- Mechanical maintenance
- Electrical maintenance
- SPECTRA control modules
- Installation, start-up & operation
- Fault Finding & system diagnostics
- Introduction to UV disinfection process
- Tailored training packages

Commissioning

- Mechanical installation inspection
- Electrical installation inspection
- Final electrical connection / terminations
- Calibration of UV system to site specific parameters
- Instrumentation calibration
- Testing of fault settings, alarms & procedures
- PLC / SAS / DCS integration testing
- Bacterial performance testing
- Sign off, acceptance and reporting



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