

## **PURE H2O RODI-UF**

SUPERIOR STEAM QUALITY FOR AUTOCLAVES  
ELIMINATES CROSS CONTAMINATION

**high purity water for advanced decontamination in dentistry**

# #1 CHOICE FOR AUTOCLAVES

The use of tap water (or water from poorly maintained point of use RO water treatment systems) in autoclaves can lead to cross contamination of surgical tools and patients.

At the forefront of technological advances, our world class systems are the only equipment outperforming industry standards. For spotless surgical tools your Autoclave requires the highest quality water. The patented RODI-UF system from PureH2O delivers perfection.

High purity water for superior steam quality in autoclaves eliminates the possibility of cross contamination of surgical tool and patient, by preventing scaling, stabilising lipopolysaccharides (LPs) in endotoxin complexes and ensuring 100% microbiological protection, eliminating pyrogens, pathogens and endotoxins.

Ours is the only RO system, worldwide, with EPA certification and are fully MHRA compliant, meaning they are the only equipment suitable for use on non microbiological safe water.

Established for over 35 years, the RODI-UF purification process is the choice of leading health professionals throughout the world. Exclusively available from The Pure H2O Company.

*Roger Wittshire*

Managing Director  
The Pure H2O Company

## UNIQUE PROPERTIES OF THE PURE H2O RODI-UF SYSTEM

- IQ EMP (Intelligent Memory Panel)
- Advanced flushing technology
- Micro Switch Activation Mechanism (MSAM)

# WHY RODI-UF?

## Removal capacity

Reverse Osmosis is by itself an excellent method for removal of impurities. It has the capacity to remove up to 70% of nitrates, 96% of lead, 98% of heavy metals, 98% of chemicals, 100% disease causing micro-organisms, pathogens and viruses if controlled by an intelligent system.

Our unique process couples RO to DI with intelligent controls, achieving 99.99% purity across the spectrum of impurities, both naturally occurring and man-made.

UF screens (0.02-0.0008 microns) are an essential part of the treatment process and the only proven method of eliminating pathogenic or pyrogen contamination from water.

## Lower service costs

The patented RODI process is the only system that incorporates a unique auto-flushing mechanism to remove the build up of plaque from the membrane.

This feature helps our membranes to last up to ten times the lifespan of other RO systems. This could mean a saving of over £1000 on membrane replacement over a period of ten years. Ask about our service commitment and free extended warranty.

## Consistent 99.99% purity

The patented RODI process is the only system benefitting from integral micro switches for total isolation from mains water when the storage tank is full.

It's essential that the RO membrane is separated from mains water pressure when the tank is full. Without this function impurities bleed through to the 'pure' storage.

The unique management system used with RODI ensures purity is kept to the highest level possible.

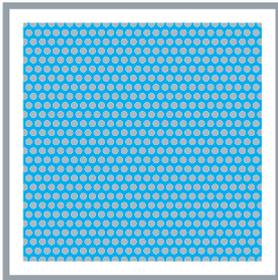
## Water efficiency

We are the only company to have achieved high levels of water efficiency in our domestic systems. Our RO process achieves 2:1 production ratio whilst RODI achieves 3:1.

Other RO systems use basic mechanical valves resulting in lower levels of water efficiency.

Our RODI equipment is unique, utilising high quality micro switches and an intelligent management system that minimises water usage and maximises purity.

# THE PATENTED RODI PROCESS



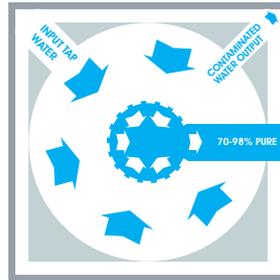
MEMBRANE

## Stage One: Granular Activated Carbon (GAC)

The Carb12 pre-filter removes chlorine and other organic impurities and serves to protect Stage Two, the Reverse Osmosis membrane, from damage.

GAC is an excellent media for the absorption of chemicals found in raw tap water but has little or no affect on dissolved solids, micro-organisms, heavy metals, pathogens and viruses.

Jug filters and filter taps use small quantities of GAC as the primary process to improve the taste of tap water. GAC is an effective filtration media rather than a purification process.

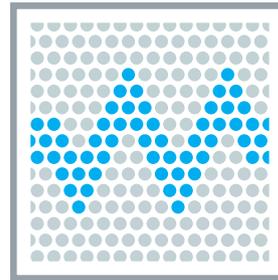


MEMBRANE

## Stage Two: Reverse Osmosis (RO)

With the chlorine removed, the raw tap water passes into the Reverse Osmosis module. Our own patented thin film composite (TFC) membrane is the only RO with US Environmental Protection Agency (EPA) certification meaning this is the only RO system certified suitable for the removal of micro-organisms from water. At 0.0001 microns it's capable of removing 100% of disease causing micro-organisms and up to 98% of inorganics and 70% of nitrates.

Our patented flushing mechanism removes scale and biofilm extending membrane life to up to ten years.



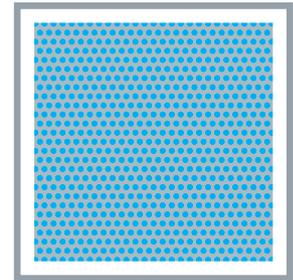
MEMBRANE

## Stage Three: De-ionisation (DI)

Another unique and essential feature of our patented system is the de-ionisation module. The impurities that breach RO can only be removed by DI. This stage is an ion exchange process removing heavy metals, nitrates<sup>1</sup>, gases, volatile organic chemicals<sup>2</sup> and oestrogens, replacing them with hydroxide (OH) or hydrogen (H), better known to us as H<sub>2</sub>O. The result is Pure H<sub>2</sub>O, the purest water available.

<sup>1</sup> Nitrates have a habit of mimicking oestrogen and starving the red blood cells of oxygen. They should be removed from drinking water.

<sup>2</sup> Nitrates and volatile organic chemicals hide the hydrogen bond of the water molecule that makes them invisible, thus, passing through RO but not DI stages.



## Stage Four: Aquashield Ultra Filtration (UF)

Unique to the RODI process is the Aquashield UF polishing membrane that physically prevents migration of microorganisms through to essential sterilisation processes. UF is a low pressure membrane that has different properties and advantages over Reverse Osmosis (RO). Whereas RO (with intelligent management system) will remove ionic load (up to 99.99%) from a water source, it is not suitable for removal of microorganisms because they can change shape (much like an octopus) and squeeze through the microscopic pores of the membrane.

The unique Aquashield UF stage in our process eliminates 100% of water-borne, disease causing, microorganisms.

## PREVENTING CROSS CONTAMINATION

The use of tap water (or water from poorly maintained point of use water treatment systems) in autoclaves can lead to cross contamination of surgical tools and patients. In particular, pathogens from blood transferred onto tools during a check-up or surgery, or pyrogens (1) from body fluids will find a food source in the scale and detritus baked onto tools during the decontamination process.

Any surface that comes into contact with bacteria has potential for pyrogen contamination. Endotoxins tend to stick to glassware and are difficult to wash away with soap and water. Autoclaving can sterilize the surface of glassware, however, endotoxins that cling to sides tend to be too heat-resistant to be removed practices for sterilization and depyrogenation of materials, equipment and products that must be free from microbial and pyrogenic contamination.

### TAP WATER STANDARDS IN THE UK

Standards for drinking water microbial quality rely on faecal indicator bacteria (E. coli, Total Coliforms, Enterococci) in drinking water and assume that, if faecal indicator bacteria are not present, the water is considered microbiologically safe. This has been increasingly challenged over the years. Several authors have shown that outbreaks of waterborne disease have occurred despite the absence of faecal indicators in source water and/or treated water (2).

Furthermore, many publications report the limited correlation between the presence and concentration of faecal indicators and the presence and concentration of waterborne pathogens. They demonstrate in particular that faecal indicator bacteria are poor surrogates for protozoa and viral pathogens (3). Therefore, safety from testing a small volume of treated water is not satisfactory.

Tap water standards in the UK are certainly some of the best in the world, but there is a wide variance in quality from the North to the South, the North being predominantly soft water with conductivity of 20—50ppmTDS whilst the South is predominantly hard with conductivity anywhere from 250-500ppmTDS. In the past 5 years, at least 7 Water Utilities have failed to meet the maximum permissible levels for metaldehyde (slug poison). Without the equipment to remove this pesticide, many drinking supplies are failing to meet EU regulations.

### GETTING DECONTAMINATION RIGHT

All staff involved with decontamination in dental care services are required to be familiar with and practice as Health Care Technical Memorandum 01-05-Decontamination in Primary Care Dental practices. Implicit in this are cross-references to other standards and specifications. US Pharmacopeia (USP) limit for endotoxin content in Water For Injection (WFI) is 0.25 EU,<sub>1</sub> (BS EN 13060).

Steam quality used in dental contamination impacts two crucial areas 1) prevention of scaling and 2) stabilising lipopolysaccharides (LPs) part of the endotoxin complex if the divalent cations Ca<sup>++</sup> and Mg<sup>++</sup> are not controlled.

The use of distilled water, typically supplied by BP, has long been the preferred source of water for autoclaves. Today however, the use of small-scale Point of Use Reverse Osmosis purification systems is becoming a preferred and more convenient method for an on-tap supply of purified water. With BP, the client understood that the company employed Quality Control measures to guarantee water quality.

Because of a cheap influx of Reverse Osmosis systems from Asia, quality control has been lost and water produced from such equipment will be sub-standard in comparison.

It is possible therefore that diminishing quality control over the water quality feeding autoclaves could lead to cross contamination from surgical tools (failing the decontamination/sterilisation process) to patient.

### NOT ALL RO IS CREATED EQUAL

A well-engineered Reverse Osmosis system is designed on the principal that the membrane requires substantial differential pressure if it is to be able to reject the ionic load from the feed water. This necessitates a management system to control 'deact' and 'react' pressures in such a way that maximum differential is achieved across the membrane. A flushing mechanism (4) will also prolong membrane life and quality well into the tenth year of the system's lifespan. Systems without these features will fail relatively quickly with blocked membranes and microbiological creep across the membrane.

The flood of cheap Asian systems made the equipment very affordable - but at what price? These cheap RO systems use a very simple mechanical valve to deactivate the unit once its reservoir is full but they fail to see the pressure leading to a state where the system is perpetually active (with water permanently running to drain) with minimal differential pressure on the membrane.

A further problem is with the cheap drain valves used; early blocking leads to membrane fouling and as a result the 'permeate' (purified water) degrades quickly and over time will become worse than the tap water feeding it.

As ions and microbes build up in the high pressure side of the membrane with nowhere to go the level of dissolved solids in solution increases proportionately to the volume of water passing through the membrane so that even with a +90% rejection rate the permeate may have a greater level of dissolved solids than tap water itself.

## WORLD CLASS RODI SYSTEMS

TFC (5) Reverse Osmosis systems pre-treated with GAC are certainly the best individual process for Deionization of water but given the level of purity required for sterilization, it is necessary to post treat RO with an IX (ion-exchange) bed. This should be a nuclear grade bed of mixed cation and anion resin, the properties of which exchange any remaining ions for hydroxide and hydrogen.

### REMOVAL OF IONIC LOAD FROM WATER

However, Reverse Osmosis is not a proven method for the removal of micro-organisms and since it is necessary to eliminate pathogenic or pyrogen contamination from water, the only proven method is UF screens (0.02-0.0008 microns) which are therefore an essential part of the treatment process given the need to remove pathogen and pyrogen from feed water.

Washer disinfectors used in dental decontamination provide cleaning processes validated within EN that include water quality specifications. Typically in addition to water quality different cycles require different temperatures e.g. flush <45°C and thermal disinfection >80°C.

### WORLD CLASS RODI SYSTEMS

These differing but crucial demands are catered for in The PureH2O Company's stock system of pre-treatment, reverse osmosis, ion exchange and final filtration, producing water typically 15-16MΩ resistivity filtered  $\leq \mu$  for particulate and endotoxin control. These therefore eliminate gross contamination in flush comprising blood, tissue, bone fragments, fluids and solid debris through to high purity steam in autoclaves ensuring that safety of the instruments are not compromised by the decontamination process.

The PureH2O Company specialise in Reverse Osmosis systems that are controlled with intelligent management systems, reducing the amount of water consumed in production of permeate to a minimum whilst achieving 99.99% purity and elimination of micro-organisms through the patented DIUF (6) stage. Their range of systems benefit from a patented auto-flush mechanism, preserving the life of the membrane for up to 10 years. Micro-switches control the deactivation and reactivation of the system whilst stainless solenoid valves are part of the deact/react process eliminating any ingress of feed water when the system has shut down.

### ADVANTAGES OF ULTRAFILTRATION

- No chemicals added to the water
- Reduces turbidity and removes pathogens in a single treatment step
- Absolute barrier to bacteria, virus and parasites
- No deactivated pathogens remain in treated water
- Regardless of feed water fluctuation, no change in treated water quality

The term ultrafiltration (UF) describes a membrane with a pore size <20nm (0.02  $\mu$ ). This is smaller than viruses and much smaller than bacteria. Membranes of this type have demonstrated full virus rejection when challenged by MS2 phages.

Unlike Reverse Osmosis (RO) UF does not affect mineral content of the water greatly, only rejecting suspended solids, not dissolved solids.

#### References:

- (1) Pyrogens are bacterial cell wall fragments and can be detected by using a test for lipopolysaccharides (an enzyme found in pyrogens).
- (2) Barreletal.2000
- (3). Petrilli et al. 1974; Berg & Metcalfe 1978; Melnick & Gerba 1982; Paymentetal.1985; Roseetal.1986; Barreletal.2000; Griffin et al. 2001; Nwachuku et al. 2002
- (4.) Flushing mechanism on consumer units is a patented process by Aquathin Corporation (The PureH2O Company)
- (5) Thin Film Composite membrane first introduced by The PureH2O Company in 1991 to European markets
- (6) Cummings et al. 2005 development of UF processes for disaster relief

# RODI-UF SYSTEMS



**Product**  
**PURE H2O**  
**RODI-UF**

**Process**  
RODI-UF

**Production**  
5ltr/hr

**Description**

Most water efficient, technologically advanced system in the World delivering 16-18Meg water suitable for autoclaves and surgical use from one compact RODI process.

SubSink  
RODI-UF system  
with intelligent  
management  
processor



**PURE H2O**  
**RODI-UF 600+**

RODI-UF

60tr/hr

Most water efficient, technologically advanced system in the World delivering 16-18Meg water suitable for autoclaves and surgical use from one compact RODI process.

Semi  
commercial  
RODI-UF system  
with intelligent  
management  
processor



**PURE H2O**  
**RODI-UF 1200+**

RODI-UF

120ltr/hr

Most water efficient, technologically advanced system in the World delivering 16-18Meg water suitable for autoclaves and surgical use from one compact RODI process.

Semi  
commercial  
RODI-UF system  
with intelligent  
management  
processor

# PURE H2O: RODI - UF

## RODI-UF purification data

### Removal rates

99.99% micro-organisms  
 99.99% organics  
 99.99% heavy metals  
 99.99% lead  
 99.99% nitrates

### Patented autoflush

For prolonged membrane life ten years longer than standard RO systems.

### Patented micro switch deactivation

The only RO system that accurately deactivates and reactivates in line with optimum tank pressure resulting in higher levels of purity and consistent production rates.

### Patented coupling of DI to RO

DI effectively removes nitrates, VOCs, gases and other impurities that RO cannot effectively remove.

### Patented anti-bleed mechanism

Effectively minimises impurities breaching the RO stage.

### The only reverse osmosis system of its type

designed and built by World leading RO engineers spanning 50 years global experience.

The auto flush sequence removes plaque build-up from the membrane, preserving production capacity, maximising rejection, minimising water usage, maximising recovery rate whilst increasing membrane longevity by 10 years beyond cheaper RO processes available on the market. Service costs are cheaper than other systems because membranes are covered under warranty so that clients never pay for replacements.



# PURE H2O: RODI - UF 600+ & 1200+

## RODI-UF 600+ & 1200+ purification data

### Removal rates

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99.99% heavy metals  
99.99% lead  
99.99% nitrates

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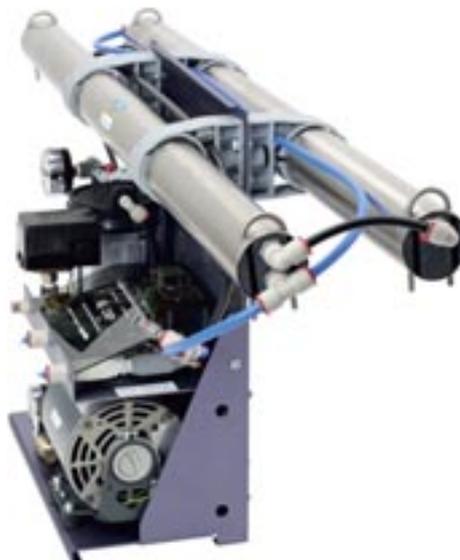
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# WHY PURE H2O RODI-UF

## EXCELLENCE

Commended as a supplier of excellence by Royal Institute of British Architecture (RIBA) member Michaelis Boyd for work on their prestigious Oxford Gardens project and selected for publication in the RIBA London Architectural Review. The Pure H2O Company was given the highest rating (HHHH ) of all bottled, tap and filtered waters surveyed by the Daily Mail (10/06/03)

## QUALITY

TDS: PureH2O membranes are the only RO membrane to deliver 98% rejection. Filmtec, the largest manufacturer of membranes has only managed 97% with TFC membranes. Nitrates: RO will only remove 70% nitrates from UK tap water, The addition of our DI process will be required to meet this specification. RODI is a patented process, it has a superior rejection rate of ionic impurities achieving 96% rejection of lead and up to 98% for all ionic load.

MHRA compliance: Our systems are the only system worldwide with EPA certification. This means that PureH2O RO is the only equipment to be suitable for use on non microbiological safe water. Whilst tap water in the UK contains chlorine as a biocide it still, regularly fails to meet microbiological standards including e-coli tests. Our systems are therefore best positioned to protect the client from these eventualities and can always be relied upon to surpass standards for all forms of sterilisers.

## EXPERIENCE

As the pioneer of RO system design in the UK and with 26 years developing RO & RODI equipment within an ISO9001:2008 environment, we are well placed to prescribe the best equipment to suit your requirements. We hold over 60 patents that ensure our equipment remains at the forefront of technological advances and provides our customers with unique equipment that out perform industry standards.

## TECHNICAL SUPERIORITY

All our engineers and technicians go through theoretical and practical training throughout their careers to achieve a higher level of professionalism and understanding for how RO equipment works.

RO equipment requires routine maintenance each year to ensure that the system is functioning efficiently. This includes ensuring that the rejection rate is not undermined through pressure switches being reset to the correct parameters, pumps checked, tanks drained, sanitised and re-pressurised to the correct setting.

The result is highly efficient RO equipment producing high purity water well beyond the first three years.

**The Pure H2O Company is the leading supplier of water treatment systems to dental surgeries in the UK.**

**Unique properties of the Pure H2O RODI-UF system**

- **IQ EMP (Intelligent Memory Panel)**
- **Advanced flushing technology**
- **Micro Switch Activation Mechanism (MSAM)**

the  
**pureh2o™**  
company

**World leading water purification**  
**35 years pure excellence**  
**An ISO 9001:2008 certified company**

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