Halcyan Water Conditioner:

Redefining hard water treatment for engineers

Technical Overview

What Halcyan is

HALCYAN is a physical water conditioner: a solid-state, in-line unit that changes how hard-water minerals behave so that limescale does not form and bond in the normal way, while leaving the water's chemical composition unchanged. It is not a water softener. Softening removes the calcium and magnesium; conditioning changes their behaviour and keeps them in the water.

The technology has been in continuous service since the early 1980s, with units installed in Australia, Canada and the UK still operating. Halcyan Ltd, based in Bristol, has supplied the UK market since 2015. The unit has no power supply, no moving parts, no salt, no chemicals, no consumables and no maintenance. Its core is a non-sacrificial alloy that does not deplete and releases nothing into the water, housed in a 316 stainless steel body.

This document sets out how the unit works, what independent testing has established, how it compares with other approaches to hard water, and what it does and does not do. It is written for homeowners, self-builders, specifiers, consulting engineers and facilities managers, and every factual statement in it is referenced to a named source.

At a glance	
Technology	Physical (alloy-core) water conditioner
What changes	How hardness minerals crystallise
What stays the same	Hardness, mineral content, pH, taste, drinkability
Power, salt, chemicals	None
Moving or sacrificial parts	None
Maintenance	None
Treats	Hot and cold water, whole property, mains or borehole supply
Persistence of treatment	Approximately 21 days after contact with the core
Certification	WRAS approved, no. 2312081
Warranty	30 years domestic; 10 years commercial and industrial
Performance guarantee	12 months, domestic units
Service history	In use since the early 1980s; UK supply since 2015

The hard water problem

Hard water is water carrying dissolved calcium and magnesium, picked up as rainwater passes through chalk and limestone. Around 60% of the UK is supplied with hard or very hard water including much of the north-east, midlands, east and south, including London. UK guidance treats water above 200 mg/l (as calcium carbonate) as hard and above 300 mg/l as very hard.

The minerals themselves are harmless and beneficial: the World Health Organization sets no health-based limit on hardness, and calcium and magnesium in drinking water contribute to dietary intake. The problem is what happens when hard water is heated or evaporates. Calcium carbonate comes out of solution and crystallises as **calcite**, which bonds hard to any surface it touches: heating elements, heat exchangers, pipework, taps, shower screens and worktops.

What limescale costs

Energy. Limescale is an insulator. Measured thermal conductivity of limescale is around 1.3 to 2.0 W/m·K, against roughly 400 W/m·K for copper: it conducts heat around 300 times worse than the copper it coats. Even a thin layer makes a boiler, immersion heater or calorifier burn more fuel to heat the same water. This is why the Building Regulations address it directly: the Domestic Building Services Compliance Guide (2013 edition), which supports Approved Document L1A and L1B (Part L, Conservation of fuel and power), requires that where mains water hardness exceeds 200 ppm, provision is made to treat the feed water to water heaters and the hot water circuit of combination boilers to reduce the rate of accumulation of limescale. The Non-Domestic Building Services Compliance Guide carries the same requirement for commercial buildings, and the Drinking Water Inspectorate notes that scaling of heating elements makes appliances less efficient.

Equipment. A scaled heating element runs hotter than its design temperature because the heat cannot escape into the water, and burns out early. Replacing the element does not fix the problem; the new one scales at the same rate. The same mechanism shortens the life of combi boilers, immersion heaters, cylinders, dishwashers, washing machines, kettles, shower heads and mixer cartridges.

Finishes. Hard water leaves a white film on stone, glass and brassware. The deposit itself is cosmetic and removable. The acidic descalers used to remove it are not: they etch natural stone, attack the resin in engineered quartz, degrade PVD and lacquered brassware finishes, and in several manufacturers' care instructions void the finish warranty. Prevent the deposit and the descaler is no longer needed.

Cleaning, chemicals and safety. Scale on shower heads, taps and sanitaryware drives the use of acid-based cleaning products. These are hazardous substances: they carry irritant or corrosive hazard warnings, and in a workplace fall under the Control of Substances Hazardous to Health Regulations 2002 (COSHH). Removing the scale removes the reason to stock and use them, which is a H&S benefit as well as a cost saving. In commercial settings scale also interferes with water hygiene regimes, providing a foothold for biofilm and reducing the effectiveness of thermal and chemical disinfection.

A note on struvite. In washrooms, hard water meets a second scale chemistry. Urine contains ammonium and phosphate; where it meets the magnesium in hard water, magnesium ammonium phosphate, known as struvite, crystallises in urinal traps, waste pipes and drains. Struvite is exceptionally hard, builds rapidly and is the usual cause of blocked urinals and the odour that goes with them. It is a separate mineral from calcium carbonate limescale and the two are often found together in the same system.

How Halcyan works

Calcium carbonate can crystallise in more than one form. **Calcite** is the hard, tightly bonded form that builds up on heating elements and pipework. **Aragonite** forms as fine, needle-like microcrystals that stay suspended in the water and travel with the flow. Halcyan alters which of the two the water produces: it drives the minerals to crystallise as aragonite in the water, not as calcite on the surfaces.

Inside the unit

Water passes through a 316 stainless steel housing containing a solid cast alloy core. The core is a patented alloy of twelve metals, six drawn from each end of the anode–cathode (galvanic) range; its precise composition is commercially confidential. It is cast as a series of fins and gateways that force the water into a highly turbulent flow path, bringing the dissolved minerals into repeated contact with the alloy surface. Nothing is added to the water and nothing is removed from it. The core is not a sacrificial anode: it does not dissolve, deplete or need replacing, and independent laboratory analysis of treated water finds no trace of its metals (see The evidence).

What happens to the minerals

As water passes through the core, calcium carbonate begins to nucleate as aragonite microcrystals in the body of the water rather than as calcite on the nearest surface. Those suspended crystals then act as seeds: new material deposits onto them, in the flow, instead of onto heat exchangers, elements and pipe walls. The water leaves the unit with exactly the same mineral content it arrived with, but carrying its hardness in a form that does not readily bond to surfaces.

Where treated water evaporates, on a tap, a shower screen or a worktop, it leaves a loose, powdery residue that wipes off, rather than a hard, bonded deposit that has to be dissolved with acid.

The same difference works on scale that is already there. The published literature describes calcite scale as thick and tenacious and hard to remove even mechanically, and aragonite deposits as soft, non-adherent and easily carried off by the flow of water. Once a Halcyan unit is fitted, existing calcite deposits stop being reinforced by new calcite, the crystals that do form are the soft kind and are flushed through, and the old scale gradually loosens and erodes under normal flow. How long that takes depends on how much scale there is, how hard it is and how much water moves through the system; it is a process measured in weeks and months, not days.

The effect on the minerals persists for approximately 21 days after contact with the core. In a domestic or commercial system water is used and replaced well within that period, so stored water in cylinders, tanks and calorifiers remains in its treated state throughout its useful life.

What the research says about the mechanism

Independent work has confirmed the two observable facts that matter: treated water forms less scale, and the scale-forming minerals crystallise preferentially as aragonite rather than calcite, with the water's chemistry unchanged. The University of Lincoln's 2020–21 study found that the

engineered turbulence through the core is central to the effect, and that performance depends on maintaining the flow conditions the unit is sized for. The same principle, bulk precipitation of non-adherent crystals in preference to surface scale, is described in British Water's 2004 consumer guidance on physical conditioners and in the peer-reviewed literature on physical water treatment.

	Untreated hard water	Halcyan-treated water
Calcium and magnesium content	Unchanged	Unchanged
Hardness reading (ppm / mg/l)	Unchanged	Unchanged
Dominant crystal form on heating	Calcite	Aragonite
Where the crystals form	On surfaces	In the water
Deposit left on evaporation	Hard, bonded scale	Loose residue, wipes off
Chemicals or salt added	None	None

The evidence

Halcyan's performance has been tested independently in the UK, and the physical-conditioning category it belongs to is recognised and tested under national standards in Germany and the United States. The work below is listed in the order a specifier is likely to want it: our own device first, then the category science that explains it.

University of Lincoln, 2020–21: independent laboratory study of the Halcyan unit

Halcyan commissioned JBL Science at the University of Lincoln to test the unit's efficacy. The study was conducted by Dr N. Riess and Dr P. Eaton and reported in July 2021 (ref. JBL_00722). Water from six UK supplies of differing hardness was passed through a Halcyan unit under controlled flow and pressure, and treated and untreated water were compared.

The findings:

- **Reduced scale in every water tested.** Scale formation was measured using the IAPMO IGC 335-2018 rapid scaling test for scale-prevention devices. Halcyan-treated water produced less limescale than untreated water from every one of the six sources. The authors conclude that the device is "demonstrably and reproducibly efficacious".
- **Water chemistry unchanged.** Ion chromatography and ICP-OES analysis found treated and untreated water "virtually identical" across all measured ions and elements. No metals from the core were detected in the water. Halcyan adds nothing and removes nothing.
- **Aragonite confirmed.** Scanning electron microscopy with EDX found aragonite present in treated water at working pressure, correlating with the reduction in scale: direct confirmation that the minerals crystallise as described above.

- **A lasting effect.** Particle-size analysis after 30 days showed untreated water had changed markedly while treated water had changed little, consistent with the treatment persisting for weeks rather than hours.
- **A possible cumulative effect.** Water that had already passed through a Halcyan unit before testing showed the greatest reduction of all six sources, suggesting repeat treatment, as in a recirculating system, may improve results.

The alloy core

The core is a patented alloy of twelve metals, six selected from each end of the anode–cathode (galvanic) range. Its composition is commercially confidential, as it is for every maker in this market; what distinguishes Halcyan is that the core is solid and non-sacrificial, and that independent analysis of the treated water found no trace of its metals.

Earlier laboratory and field evidence

- **Field test, 1986.** The original patent specification for the technology records a controlled installation trial. A conditioner was fitted on the cold-water inlet of a commercial hot-water calorifier, with all secondary return water also passing through it, at an average flow of 50 litres a minute on a 25 mm main. After several months the build-up of hard and soft scale in the calorifier was negligible; the only cleaning needed was hosing the heat-exchange surfaces down with water, after which they were substantially scale-free; flow through the calorifier was undiminished and inlet and outlet temperatures were constant throughout. Three identical calorifiers running at the same installation over the same period without a conditioner each had to have considerable hard scale removed, putting each out of service for several days.
- **Public-housing field trial, Western Australia, 1986–88.** A state public housing authority responsible for many thousands of homes, all on instantaneous gas water heaters, was replacing those heaters every 18 to 24 months because of limescale. In December 1986 it fitted a conditioner to a heater in one of its rental houses in a known hard-water area and ran it for sixteen months. In April 1988 the heater was returned to the state water utility's product-testing laboratory, which flow-tested it through the heater and through the heat-exchanger coil, and cut the coil open to inspect the tubes. Flow rates compared favourably with the manufacturer's figures for a new heater. The inspection found no evidence of scale build-up; a very thin surface film was noted, with no effect on flow, and the tubes were recorded as "in excellent condition". After sixteen months, a heater that would normally have been at the end of its life was performing as new. The housing authority's covering letter described the unit as "very successful in a known hard water area". Reports held on file.
- **Crystal structure and surface measurements, 2004.** Scanning electron microscopy of treated water (CAD Instruments, France) showed markedly smaller crystals consistent with aragonite. Separate measurements (Core Laboratories, Calgary; EnviroTest Laboratories) recorded lower surface tension in treated water, persisting for more than three weeks after a single pass.

Surface tension: a measurable, lasting change

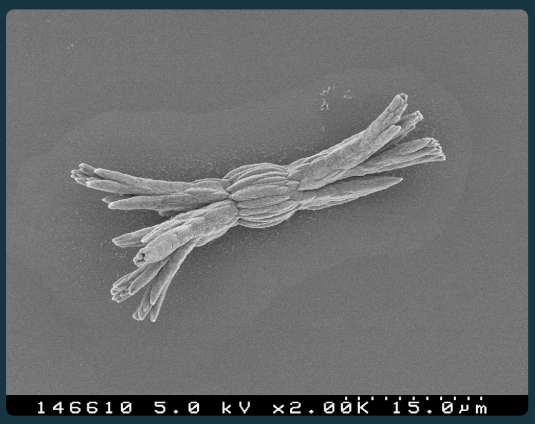
Surface tension is one of the few properties of conditioned water that a standard laboratory can measure directly. Samples of untreated water and water that had made a single pass through the conditioner were taken on 27 April 2004 and sent to Core Laboratories in Calgary. The treated sample measured 9.5 dynes/cm lower than the untreated water eight days later, a reduction of the same order as heating the untreated water to 80°C. By day 28 the two samples had moved back towards each other, which is consistent with the approximately 21-day persistence stated throughout this document.

Test date (days after treatment)	Untreated, room temperature	Untreated, 80°C	Treated, room temperature	Treated, 80°C
5 May 2004 (day 8)	79.0 dynes/cm	–	69.5 dynes/cm	–
25 May 2004 (day 28)	79.1 dynes/cm	69.2 dynes/cm	77.4 dynes/cm	67.5 dynes/cm

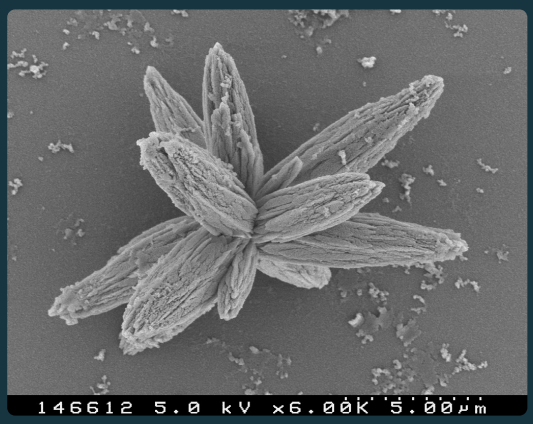
A separate measurement series (EnviroTest Laboratories) recorded the same direction of change, with the treated water still below the untreated value after three weeks.

Under the microscope: what the crystals look like

The two scanning electron micrographs below were taken from the same source water, before and after a single pass through the conditioner (CAD Instruments, France, 2004). Note the scale bars: the untreated crystal is imaged at ×2,000 with a 15 µm bar; the treated crystal at ×6,000 with a 5 µm bar, because it is roughly a third of the size.



Untreated water. A large, bundled calcium carbonate crystal of the kind that grows on surfaces and bonds as scale (×2,000; scale bar 15 µm).



Halcyan-treated water. A much smaller crystal with the radiating, needle-like habit characteristic of aragonite, surrounded by fine particulate; the form that stays in suspension rather than bonding to a surface (×6,000; scale bar 5 µm).

The category science

Halcyan is a physical water conditioner. The category has its own performance standards and a peer-reviewed literature:

- **DVGW (Germany)** certifies limescale-protection devices under its W 510 scheme, tested to W 512, and states in its own consumer guidance that such devices do not soften water and leave its chemical composition unchanged.
- **IAPMO/ANSI Z601-2018 (USA)** is the national standard for scale-reduction devices, modelled on DVGW W 512.
- **WateReuse Research Foundation / Arizona State University (2014)** evaluated alternatives to ion-exchange softeners under a W 512-based protocol and found physical conditioning technologies reduced scale formation substantially, with the scale that did form being soft and removable by brushing rather than hard calcite.
- **Lin et al., npj Clean Water (2020)** report that physical treatment favours precipitation in the bulk solution rather than on surfaces, without changing the water's chemical composition or hardness.
- **Coey & Cass (2000)** and **Alabi et al. (2015)** document the shift from calcite to aragonite and describe aragonite as forming soft, non-adherent scale.
- **British Water Fact Sheet 3 (October 2004)** describes physical conditioners causing hardness minerals to precipitate as suspended, needle-shaped aragonite-type crystals rather than onto heated surfaces, with chemical content unaltered, and advises buying from a maker that offers a performance guarantee.

Track record

The technology has been in continuous commercial and domestic use for more than forty years, across three continents and across supply types from municipal mains to artesian bores. The cases below are the ones with documentation Halcyan can produce.



A domestic Halcyan unit. The technology has run on municipal, borehole and surface-water supplies since the early 1980s.

Installation	Setting	What was recorded
Edson Hot Water Systems for Coles supermarkets, Australia, 2002	Commercial hot water, recirculating ring main	Heating elements had been failing from scale every three to six weeks. After the unit was fitted in the ring main, no further premature element failures. Sacrificial anodes inspected and found not under attack: the failures had been scale, not corrosion. The client then specified the technology on all new hot water installations in hard water areas.
Public housing authority, Western Australia, 1986–88	Public housing, domestic water heaters	A state public Housing Authority was replacing instantaneous gas heaters every 18–24 months because of scale. A test heater with Halcyan was run for sixteen months in a known hard-water area, then flow-tested and cut open by the state water utility's laboratory: flow rates compared favourably with a new heater; no evidence of scale build-up; tubes "in excellent condition".
Clayton Hotels, UK, 2017–18	Hotel group, two London properties	Two H2o56 units at Chiswick (July 2017) and two H2o220 units at Crown (February 2018), installed overnight by the hotel's services contractor, replacing salt softeners.
Original patent field trial	Hot water calorifier	Conditioner on the cold inlet and secondary return of a commercial calorifier, 50 l/min on a 25 mm main. After several months: negligible hard or soft scale, surfaces cleaned by hosing with water, flow and temperatures unchanged. Three identical untreated calorifiers at the same site each needed considerable hard scale removed and were out of service for several days.
UK domestic installations, 2015 to date	Homes across the UK hard water belt	120+ independent reviews on Trustpilot, all of them about this one product.

Units installed in the early 1980s remain in service. No Halcyan unit has ever been returned under warranty for physical failure.

The product



The Halcyan range: threaded domestic and commercial units and flanged industrial units, all 316 stainless steel.

Every Halcyan unit is the same technology at a different scale: a 316 stainless steel housing, a cast alloy core, and threaded or flanged headers to suit the system. The range runs from a single-outlet domestic unit to flanged units for industrial mains, and the unit is specified by flow rate, not by pipe size.

Attribute	Detail
Body	316 stainless steel
Core	Solid cast alloy, non-sacrificial, no moving parts
Connections	½" BSPP thread on the smallest domestic units; ¾" to 2" BSPT thread on larger domestic and commercial units; Table E flanges on industrial units; other headers to order
Maximum working pressure	10 bar
Maximum working temperature	80°C
Minimum operating pressure	1 bar
Orientation	Any; no specified inlet or outlet, no flow direction
Power or earthing	None required

Attribute	Detail
Supply type	Mains or borehole; hot or cold water systems
Consumables and maintenance	None
Treatment persistence	Approximately 21 days
Certification	WRAS approved, no. 2312081: potable water, no separate drinking tap needed
Warranty	30 years on domestic units; 10 years on commercial and industrial units
Performance guarantee	12 months on domestic units

Range and sizing

The table that follows gives the design flow rate of each model and the flow range within which it performs as intended. Performance improves with flow: the more vigorously water moves through the core, the better the result, so the smallest unit that will not restrict essential flow is the right one and oversizing reduces performance. Above the maximum flow for a given model the pressure drop across the unit rises, which is why sizing checks peak demand as well as average flow. Every model is designed to hold a low pressure drop across its working range, so the sizing rule is the right size, not the biggest size: a smaller unit that still passes the required flow works harder, drives more turbulence around the core, and costs less. Where pressure is critical, choose a model whose typical flow sits at or below its design flow. Flow and pressure-drop curves for each model are available on request.

Certification: what WRAS approval does and does not mean

WRAS approval confirms that the Halcyan unit complies with the Water Supply (Water Fittings) Regulations: that its materials and construction are safe for connection to the public supply and do not contaminate drinking water. It is a safety and materials approval, and we say so plainly, because it is sometimes presented in this market as evidence of performance. It is not. Performance evidence is the independent testing set out in The evidence section above.

Warranty and guarantee

Domestic units carry a 30-year manufacturer's warranty; commercial and industrial units carry 10 years. Domestic customers also receive a 12-month performance guarantee, the full terms are published on halcyanwater.com. Units installed in the early 1980s remain in service today, and no Halcyan unit has ever been returned under warranty for physical failure; the 30-year warranty reflects that history.

Model	Application	Connection	Design flow (l/min)	Minimum flow (l/min)	Maximum flow (l/min)
H2o5	Single outlet	½″ BSPP	5	0.5	7
H2o9 (15 mm)	Domestic, whole house	½″ BSPP	9	6	16
H2o9 (22 mm)	Domestic, whole house	¾″ BSPP	9	6	16
H2o18	Larger domestic	¾″ BSPT	18	10	26
H2o34	Commercial	¾″ BSPT	34	24	45
H2o56	Commercial	1″ BSPT	56	41	78
H2o70	Commercial	2″ BSPT	70	65	96
H2o100	Commercial	2″ BSPT	100	76	158
H2o220	Commercial	2″ BSPT	220	120	350
H2o335	Industrial, made to order	2½″ Table E flange	335	281	450
H2o500	Industrial, made to order	3″ Table E flange	500	335	800
H2o900	Industrial, made to order	4″ Table E flange	900	801	1,400
H2o1600	Industrial, made to order	5″ Table E flange	1,600	1,401	2,500
H2o2840	Industrial, made to order	6″ Table E flange	2,840	2,501	3,500
H2o4000	Industrial, made to order	8″ Table E flange	4,000	3,501	4,900
H2o5400	Industrial, made to order	10″ Table E flange	5,400	3,780	8,000
H2o7000	Industrial, made to order	12″ Table E flange	7,000	4,900	9,100

A compact H2o2 unit for the smallest applications is in development. An H2oPool350P, with a PVC housing for swimming-pool circulation, is available for pool and leisure installations (16 bar, 40°C). Industrial units are manufactured to order and can be supplied with alternative header and flange specifications.

Conditioning, softening and the alternatives

There are four broad ways to deal with hard water. They solve different parts of the problem, and the honest comparison is on mechanism, not on marketing.

Ion-exchange (salt) softeners remove calcium and magnesium by swapping them for sodium. They produce soft water, which prevents scale. The costs are considerable and continuing. The resin must be regenerated with salt, so the softener needs a salt supply for life and flushes brine to the drain every cycle, wasting water that has already been treated and paid for. It needs an electrical supply, a drain connection and a bypass, and because softening adds sodium to the water, the Water Regulations guidance and the softener industry's own code of practice recommend that the kitchen cold tap is fed unsoftened, direct from the main, which means a separate drinking tap and the extra plumbing to serve it (Building Regulations Approved Document G permits softened wholesome water for baths, basins and showers; drinking-water points must remain wholesome). It occupies a cupboard or utility space, it has moving parts, needs servicing, and the water it delivers has been stripped of healthy minerals.

Physical conditioners (Halcyan) leave the minerals in the water and change how they crystallise. Scale is prevented and reduced, and existing deposits are no longer fed; the water stays wholesome at every tap; nothing is consumed, nothing is discharged, no space is taken beyond a short length of pipe, and no extra plumbing is needed. They do not change the hardness reading.

Magnetic and electronic devices clamp to the outside of the pipe and apply a magnetic or electromagnetic field. Some are tested. Electronic units work only while powered. The treatment effect is generally reported to be short-lived once the water leaves proximity to the unit.

Sacrificial-anode devices condition the water by dissolving a zinc anode into it. The anode depletes and the unit is replaced on a cycle. Zinc ions are added to the supply.

An independent research-grade definition draws the line Halcyan sits on: water is *softened* when calcium and magnesium are removed, and *conditioned* when the potential to form scale is reduced while calcium and magnesium remain (WateReuse Research Foundation, 2014).

	Salt softener	Halcyan conditioner	Magnetic / electronic	Sacrificial anode
Minerals removed from water	Yes	No	No	No
Anything added to water	Sodium	Nothing	Nothing	Zinc ions
Scale prevention	Yes	Yes	Varies by device	Yes, while anode lasts
Drinkable at every tap	Separate hard-water tap needed	Yes	Yes	Yes
Power supply	Yes	None	Electronic: yes	None
Consumables	Salt	None	None	Replacement unit
Discharge to drain	Brine on regeneration	None	None	None
Moving parts	Yes	None	None	None
Maintenance	Salt top-up, servicing	None	None	Periodic replacement
Treatment persistence	Permanent (minerals gone)	Approx. 21 days	Typically hours	While anode is active

Questions to ask any conditioner supplier

Alloy conditioners look alike on paper. The alloy is what does the work, and the useful questions are the ones a maker can only answer with evidence:

1. How long does the treatment last after the water leaves the unit, and where is the test that shows it?
2. Is the core sacrificial? If so, what does it release into the water and when is it replaced?
3. Has the treated water been independently analysed to show what the core does or does not put into it?
4. Has the unit itself, not just the technology category, been independently tested, and by whom?
5. What is guaranteed beyond the warranty on the metalwork? Is there a performance guarantee?
6. Is the unit sized to the property's flow, or sold by pipe diameter off a shelf?

Halcyan's answers are in this document.

What Halcyan does, and what it does not do

We would rather you knew the limits before you bought than discovered them afterwards. Everything in the left-hand column is supported by the evidence in this document; everything in the right-hand column is a claim we do not make.

Halcyan does	Halcyan does not
Prevent and reduce limescale forming on heating elements, heat exchangers, pipework and fittings	Soften water: hardness, measured in ppm or mg/l, is unchanged
Keep calcium and magnesium in the water, and keep it wholesome at every tap	Remove minerals, chlorine or anything else from the water
Leave the water's chemistry, pH and taste unchanged, confirmed by independent analysis	Add salt, sodium, zinc or any other substance
Treat hot and cold systems throughout a property from one unit near the stoptap	Change a conventional hardness test result: that is the point, the minerals are still there
Change the residue left on evaporation from bonded scale to a loose film that wipes off	Clean deposits already sitting on a tap, screen or worktop: those are a cleaning job
Loosen and gradually clear existing scale inside a system, because old calcite is no longer reinforced and the new crystals are soft and carried away by the flow	Remove existing scale to a timetable: how long it takes depends on the scale, the system and the flow
Keep working for approximately 21 days after contact, with no power and no consumables	Treat water that bypasses the unit, or sits for longer than three weeks without being replaced
Protect stone, glass and brassware finishes by removing the need for acidic descalers	Prevent acid etching from cleaning products or food and drink

On health, skin and hair. Halcyan makes no health claims. It is not a medical device and we do not state that it improves any skin or hair condition. Many customers tell us in their own words that they notice a difference; those are their experiences, published as reviews, and results vary.

On energy and bills. Limescale is an insulator, and preventing it keeps heating elements and heat exchangers working as designed. We do not publish a percentage or pound saving for a Halcyan installation, because we only publish figures we hold measured evidence for.

On results varying. Results will vary depending on the water system, water flow and water type in each household. Water chemistry, flow and pressure all affect performance, which is why every unit is sized to the property and why we ask about your home before recommending one.

Installation and specification

A domestic Halcyan is fitted in line on the incoming cold main, as close to the stoptap as practical and before any branches, so that every hot and cold outlet in the property is protected from one unit. Installation is a straightforward plumbing job that typically takes under an hour: isolate, cut out a short length of pipe, fit the unit with WRAS-approved compression connectors, restore the supply and check for leaks. In a new build or renovation it is specified at first fix; retrofitting is simple wherever the main is accessible.

Installation rules

- Fit a WRAS-approved single check valve (or equivalent backflow prevention to fluid category 2) at or before the connection to the unit (WRAS IRN R150).
- Keep the unit accessible for inspection (WRAS IRN R120).
- Allow a straight length of pipe between a pump and the Halcyan so that the flow can settle. The hydraulic engineering minimum is 20 to 30 times the pipe diameter; because the Halcyan itself creates turbulence, use 30 × D.
- 15 mm main: 300 mm to 450 mm of straight pipe between the pump outlet and the Halcyan.
- 22 mm main: 440 mm to 660 mm.
- 28 mm main: 560 mm to 840 mm.
- 30 mm main: 600 mm to 900 mm.
- If the run between the stop tap and the pump is too short for those lengths, use a vertical loop or coil. Fluid dynamics does not care about gravity: a straight vertical or coiled section settles turbulence and velocity profile exactly as a horizontal one does.
- Any orientation; either direction of flow; no earthing; no power.
- Compression or pressfit fittings; pushfit is not recommended.
- Indoors, outdoors or underground, protected from frost and corrosive atmospheres in the same way as the surrounding pipework.
- Results for evaporative systems are less consistent.

Commercial and industrial specification

Commercial units follow the same rules at larger scale. What the specifier needs is the average flow rate at the point of installation and the peak demand including any buffering from tanks and cylinders; from those two figures Halcyan recommends the model, or combination of units in parallel, that delivers full treatment without restricting supply. Pipe diameter is not the sizing criterion. For larger flows, Halcyan now supplies flanged or concentric-reducer manifold assemblies, so that two or more units can be run in parallel on one main as a single engineered fitting rather than site-built pipework.

Where cold water storage tanks are used, fitting the unit on the supply to the tank with delayed-action ball valves gives the most controlled flow through the core and is the preferred location. Recirculating secondary hot water systems benefit from repeat passes through the unit. Typical

commercial applications: calorifiers and DHW cylinders, plate heat exchangers, boilers, commercial dishwashers and laundry, showers and washrooms in hotels, leisure and care settings, process water in food, drink and manufacturing, and agricultural and borehole supplies.

Halcyan provides a specification sheet, O&M manual, flow and pressure-drop data and CAD drawings for every model, and will review a system design before a unit is specified.

Operation

No maintenance is required. The only operating requirement is that flow through the unit stays within the range it was sized for; sustained low flow reduces performance. In high-TDS supplies a small amount of loose sediment may collect at low points in a system and is removed by routine flushing. Surfaces where water evaporates (taps, screens, shower trays) should be wiped as part of normal cleaning: the loose residue comes off with water and a cloth, with no acid needed.

Frequently asked questions

Do water conditioners really work? The category is real and tested: Germany and the United States both have national performance standards for scale-reduction devices (DVGW W 512; IAPMO/ANSI Z601), and the peer-reviewed literature documents the calcite-to-aragonite shift. Whether a particular unit works is a question for that unit's evidence. Halcyan's unit was independently tested at the University of Lincoln and reduced limescale formation in every water tested.

Is Halcyan independently tested? Yes. JBL Science at the University of Lincoln tested the unit in 2020–21 against water from six UK supplies and found it reduced limescale formation in every one, confirmed aragonite formation in the treated water, and found the water's chemical composition unchanged with no trace of the core's metals. The report is commercially confidential.

Will Halcyan soften my water? No. A softener removes calcium and magnesium; Halcyan leaves your mineral content and hardness reading exactly as they were. What changes is the way scale forms. If you need water with the minerals removed, you need an ion-exchange softener.

Does Halcyan remove chlorine? No. We do not claim it, because it does not do it.

Will a hardness test show it working? No, and it should not: the minerals are still in the water. What shows it working is the absence of hard scale on elements, the loose residue on surfaces instead of bonded deposits, and over time the condition of appliances that previously scaled.

How long does the effect last? Approximately 21 days after the water passes through the core, so water in your cylinder, tank or pipework stays treated. The Lincoln study observed treated water remaining stable at 30 days where untreated water had changed.

How long does the unit last? Units installed in the early 1980s are still in service. The core is not sacrificial and does not wear out. Domestic units carry a 30-year warranty.

What is the alloy? A patented alloy of twelve metals, six from each end of the anode–cathode (galvanic) range. Its composition is commercially confidential. It is solid and non-sacrificial, and independent analysis of treated water found no trace of its metals: it puts nothing into your water.

Does it need power, salt or maintenance? None of the three. It has no moving parts and nothing to replace.

Can I drink the water? Yes, at every tap. The unit is WRAS approved and the water's composition is unchanged. No separate drinking tap is needed.

Will it remove the scale already in my system? Yes, gradually. Calcite scale is tenacious; aragonite deposits are soft and non-adherent and are carried off by flowing water. Once treated water is passing through, old scale stops being reinforced, the crystals that form are the soft kind, and existing deposits loosen and dissolve back into the water over time under normal flow. How long that takes depends on how much scale there is, how hard it is and how much water passes through the system, and we do not promise a timescale. Deposits already sitting on taps, screens and worktops are a cleaning job.

Where does the limescale go? It stays in the water and leaves with it. The calcium and magnesium are not removed; they pass through the system as fine suspended aragonite crystals instead of bonding to surfaces as calcite, and go down the drain with the water that carried them. Where water evaporates on a surface, what is left behind is a loose film that wipes off. In systems with very high dissolved solids a little loose sediment can settle at low points and is cleared by routine flushing.

How much limescale does it stop? How effective is it? In independent laboratory testing at the University of Lincoln, Halcyan-treated water formed less limescale than untreated water from every one of six UK supplies tested, and the mechanism was confirmed by direct analysis. How much less varies with the water, the flow and the system, which is why we do not advertise a single percentage: a figure from one water would not be your figure. What we can say is that the effect was present in every water tested, that it is stronger when the unit is working hard within its sized flow range, and that forty years of installations and 120+ independent reviews describe the result in practice. If it is not doing the job in your home, the 12-month performance guarantee applies.

What is the difference between this and a salt softener? A softener removes the calcium and magnesium; Halcyan leaves them in and changes how they behave. That one difference drives everything else: a softener needs salt, power, a drain, a separate drinking tap and servicing, and delivers water with the minerals stripped out; Halcyan needs none of those and delivers the same wholesome water at every tap. If you want a hardness test to read zero, you need a softener. If you want to stop scale without consumables, plumbing or maintenance, you want a conditioner. The full comparison is in the section *Conditioning, softening and the alternatives*.

How often does it need to be replaced? It does not. The core is solid and non-sacrificial: nothing dissolves, depletes or wears. Units installed in the early 1980s are still in service, no unit has ever been returned under warranty for physical failure, and domestic units carry a 30-year warranty.

How do the different conditioners compare? The four approaches on the market work by different mechanisms and that is the fair basis for comparison: magnetic and electronic devices apply a field from outside the pipe, with effects that are generally reported to be short-lived; sacrificial-anode devices dissolve zinc into the water and are replaced when the anode is spent; alloy-core conditioners like Halcyan use a solid core that puts nothing into the water. Within the alloy category, the alloys and the evidence differ from maker to maker, and most makers publish neither. The comparison table and the six questions in *Conditioning, softening and the alternatives* are written so that you can put the same questions to any supplier and compare the answers.

Will it help my skin or hair? We make no health claims and Halcyan is not a medical device. Some customers describe a difference in their own reviews; results vary.

Will it save me money on energy? Limescale is an insulator and preventing it keeps heating elements working as designed, which is why UK building guidance requires scale treatment above 200 ppm. We do not publish a percentage or pound figure, because we only publish figures we hold measured evidence for.

Does it work on borehole or private supplies? Yes. The unit treats the hardness levels typically found in both mains and borehole water.

Does it work on hot water? Yes. Fitted on the incoming cold main, it treats the water before it reaches the cylinder or boiler, so hot and cold systems are protected from one unit. Maximum working temperature is 80°C.

Does it affect pressure or flow? Not when correctly sized. Pressure drop on domestic units at design flow is negligible. The unit is sized to your flow rate, not your pipe size, and we ask about your home before recommending one.

What is the guarantee? A 12-month performance guarantee on domestic units: if it is not doing the job in your home, we work with you to put it right, and if it cannot be put right, a refund is among the remedies. It is a performance guarantee rather than a no-questions-asked money-back scheme; the first step is always to find out why. The 30-year manufacturer's warranty then runs on the unit.

What should I clean my bathroom with once Halcyan is fitted? Warm water, a mild pH-neutral cleaner and a soft cloth. The residue treated water leaves on evaporation is loose and wipes off, which is exactly what stone, quartz and special-finish brassware manufacturers ask for in their care instructions.

References

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Category standards and guidance

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