

Understanding Freshwater Systems

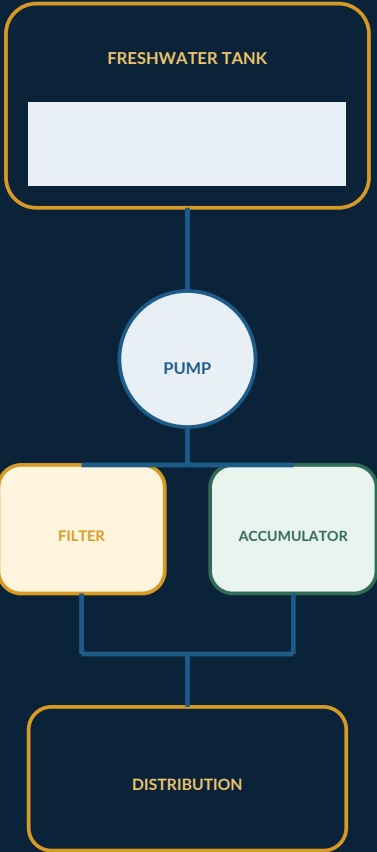
An owner's guide to clean storage,
reliable pressure and offshore reserves

Freshwater is both a domestic service
and an essential consumable.

Readiness depends on quality, quantity
and the ability to isolate failures.

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GUIDE OVERVIEW

What a freshwater system is designed to do

A yacht freshwater system receives or produces water, stores it without avoidable contamination, pressurises it and distributes it to drinking, washing, cooking and equipment users.

SCOPE

This guide covers tanks, fillers, vents, pressure pumps, accumulators, filtration, treatment, distribution, shore-water connections and the interface with watermakers. Hot-water production and watermakers are covered separately in more detail.

By the end of this guide, you should be able to:

- Trace water from its source to storage, treatment, pressure and outlets.
- Identify tanks, fillers, vents, pumps, accumulators, filters, valves and gauges.
- Recognise contamination, leakage, pump-cycling and level-indication problems.
- Understand cross-connection, shore-pressure and hot-water interface risks.
- Plan realistic freshwater reserves before extended or offshore cruising.

CORE PRINCIPLE

Freshwater readiness has three parts: the water must be suitable for its intended use, enough must remain for the voyage, and failures must be isolated before they empty or contaminate the reserve.

Safety

Do not drink water of uncertain quality. An unusual taste, smell, colour, contamination event or unexplained illness justifies stopping use for drinking and obtaining appropriate public-health or medical advice.

SYSTEM OVERVIEW

From source to outlet

Water quality and reliability depend on the complete chain. A clean tank cannot compensate for a contaminated fill hose, and a new pump cannot preserve a reserve while a hidden branch is leaking.



Water quality can be lost at any stage through contaminated filling, poor storage, unsuitable treatment or cross-connection.

The basic stages

- Source: Water enters from a trusted shore supply, carried water or the yacht's watermaker.
- Storage: Tanks hold the reserve and require suitable fills, vents, drains, inspection and level information.
- Treatment: Strainers, filters, disinfection or ultraviolet equipment may protect quality, depending on the installation.
- Pressure: Pumps and accumulators maintain useful flow to outlets and connected equipment.
- Distribution: Pipework, manifolds and isolation valves route cold and hot water throughout the yacht.
- Monitoring: Tank level, pump behaviour, pressure, consumption, leaks, taste, smell and service records reveal change.

OWNER INSIGHT	The most useful baseline is simple: know how much water the yacht normally uses each day, how long the pumps run, how often they cycle and whether the indicated tank level agrees with real consumption.
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Potable and domestic use

Some yachts supply every freshwater outlet from one potable system. Others have separate drinking-water treatment or non-potable branches. The crew should know which outlets are intended for drinking and whether any connection could allow lower-quality water to enter the potable system.

STORAGE

Tanks, fillers, vents and level monitoring

Freshwater tanks are part of the vessel structure or installed equipment. Their internal condition, materials, access and surrounding spaces affect both water quality and ownership risk.

FILL

Clean hose and known source

VENT

Screened, clear and away from contamination

TANK

Inspectable, clean and securely mounted

LEVEL

Gauge checked against real consumption

Tank cleanliness begins before the water enters the yacht.

Component	Purpose	Owner focus
Tank structure and lining	Stores water and separates it from the hull or surrounding space.	Material, corrosion, cracking, coating condition, baffles, supports and evidence of previous repair.
Inspection and cleaning access	Allows internal assessment, cleaning and repair where designed.	Accessibility, gasket condition, safe entry limitations and whether all compartments can be reached.
Filler and cap	Allows controlled filling without introducing dirt or seawater.	Clear labelling, cap seal, separate hose, deck runoff and protection from wrong-fluid filling.
Vent and overflow	Allows air to enter and leave as tank level changes.	Clear route, insect screen where appropriate, location away from waste/fuel contamination and no seawater ingestion.
Outlet and drain	Feeds the pump and allows sediment removal or tank isolation.	Valve condition, low-point contamination, branch isolation and protection from accidental emptying.
Level sender or sight indication	Estimates the available reserve.	Calibration, dead zones, fouling, wiring and comparison with actual filling and daily use.

LEVEL GAUGES ARE ESTIMATES

A sender can remain stuck or inaccurate while appearing believable. Consumption records, tank selection and known refill quantities provide valuable independent checks.

PRESSURE AND DISTRIBUTION

Pumps, accumulators, manifolds and isolation

The pressure system should deliver steady water without excessive noise, rapid cycling or uncontrolled leakage. Clear branch isolation can preserve most of the system after a local failure.



Finding or feature	What it indicates	Owner focus
Pressure pump	Creates flow and switches on or varies speed as demand changes.	Noise, current, leaks, mounting, pressure switch, dry-running protection and spare-pump arrangements.
Accumulator vessel	Stores a small volume under pressure and reduces pump cycling.	Pre-charge, diaphragm condition, waterlogging, corrosion and isolation before service.
Strainer or pump inlet filter	Protects the pump from tank debris.	Cleanliness, air leaks, correct element and whether restriction causes cavitation or poor flow.
Manifold and isolation valves	Separates cabins, heads, machinery and appliances.	Labels, access, exercise, leakage and ability to isolate a burst branch quickly.
Non-return and pressure-control devices	Control direction and limit pressure between sources or equipment.	Correct orientation, serviceability and protection against cross-flow or excessive shore pressure.
Hot-water interface	Adds heating, expansion and temperature-control equipment.	Relief discharge, expansion allowance, mixing control, leaks and scalding risk.

RAPID CYCLING IS A SYMPTOM

A pump that starts every few seconds may indicate a leak, failed accumulator, air entering the suction, pressure-switch fault or internal pump leakage. Repeated cycling shortens pump life and can conceal water loss.

WATER QUALITY

Preventing contamination and cross-connection

Water can become unsuitable through a contaminated source, dirty filling equipment, poor storage, stagnant branches, unsuitable materials or connection to a non-potable system.



No single filter can correct every possible contamination or poor system design.

Risk	How it can enter the system	Control thinking
Contaminated source	Unknown shore supply, dirty transfer container or watermaker product not meeting the intended standard.	Use trusted sources, verify watermaker operation and stop filling when quality is uncertain.
Dirty hose or filler	Hose stored on the dock, used for washdown or allowed to contact deck contamination.	Keep dedicated potable-water filling equipment clean, capped and separately stored.
Stagnation and biofilm	Long periods of limited use, warm tanks, dead legs or poorly circulated pipework.	Follow an appropriate flushing, cleaning and disinfection regime for the vessel.
Cross-connection	Shore water, washdown, black/grey water, engine cooling, chemical dosing or another non-potable service.	Use physical separation, suitable backflow prevention and clear labelling; investigate undocumented links.
Filter or UV neglect	Overdue cartridges, fouled housings, failed lamp, poor flow or bypass left open.	Maintain treatment equipment and understand what contaminants it can and cannot address.
Unsuitable materials	Non-potable hoses, degrading coatings, sealants or corrosion products.	Use components intended for potable-water service and investigate taste, odour or discolouration.

TREATMENT HAS LIMITS	A sediment filter improves clarity but does not prove microbiological safety. Carbon, ultraviolet and chemical treatment each have specific limitations and maintenance needs.
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SUPPLY INTERFACES

Shore water, watermakers and hot-water equipment

Convenient external or produced water can bypass parts of the normal tank-and-pump arrangement. The owner should know which protections and failure consequences change in each mode.

Interface	Potential benefit	Important limitation
Shore-pressure connection	Provides continuous water without running the yacht's pump or drawing from tanks.	A failed hose or internal branch can flood continuously; pressure regulation, backflow prevention and isolation are essential.
Tank filling from shore	Restores stored reserve while keeping the normal tank-and-pump arrangement.	Source quality, dedicated hose hygiene, overflow monitoring and correct tank selection remain critical.
Watermaker product water	Extends endurance and reduces dependence on shore supplies.	Production rate, power, seawater quality, membrane condition and product-water verification affect reliability.
Hot-water calorifier or heater	Provides domestic hot water using electrical or engine heat.	Expansion, relief, overheating, mixing and scald protection must remain effective.
Drinking-water treatment branch	Provides additional filtration or treatment at selected outlets.	A separate tap does not guarantee safety if cartridges, UV equipment or source water are not maintained.

Shore-water discipline

- Isolate the shore connection whenever the yacht is unattended or the supply is not required.
- Confirm the pressure regulator, hose and fittings are rated and in credible condition.
- Know whether the connection feeds the tanks or directly pressurises the distribution system.
- Check that shore pressure cannot force water backwards into tanks, watermaker lines or another source.
- Keep bilge and high-water alarms operational because a freshwater leak can still flood compartments.

RESERVE INDEPENDENCE	A watermaker is a production system, not a substitute for stored reserve. Keep enough protected water to manage a period of watermaker, generator, seawater-supply or electrical failure.
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CONSUMPTION AND ENDURANCE

Turning tank capacity into a realistic reserve

Headline tank capacity is not the same as usable endurance. Actual consumption, inaccessible volume, leaks, cleaning water and the reliability of production all affect the margin.

Factor	Why it changes endurance	Planning response
Daily crew use	Showers, cooking, drinking, cleaning and laundry vary widely between crews.	Measure real use during representative cruising rather than relying on an assumed figure.
Unusable tank volume	Tank shape, heel, trim, outlet location and sender error may leave water unavailable.	Treat nominal capacity as a maximum and preserve a margin.
Hidden leakage	A small branch leak or relief valve can consume a large reserve over time.	Monitor pump cycling, bilges and tank level when no outlets are in use.
Watermaker shortfall	Real production may fall with temperature, salinity, fouling, maintenance or limited electrical supply.	Plan using demonstrated output and allow for downtime.
Contamination event	Part or all of the tank capacity may become unavailable for drinking.	Keep a protected independent drinking-water reserve and a response plan.
Crew illness or heat	Water demand can rise unexpectedly while the consequences of shortage become more serious.	Include contingency and seek medical guidance when hydration or illness is a concern.



SIMPLE OPERATING METRIC	Record the tank level at the same time each day and note crew number, watermaker hours and unusual use. Trends reveal leaks, inaccurate gauges and rising consumption early.
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FAILURE AWARENESS

Common weaknesses and warning signs

Freshwater failures often begin with pump behaviour, changes in taste or smell, an unexplained tank-level fall, dampness or air appearing at outlets.

Symptom	Possible cause	Why it matters
Pump runs but no water appears	Empty tank, closed valve, blocked strainer, air leak, failed pump or lost prime.	Continued dry running may damage equipment and the crew may have no pressurised supply.
Pump cycles with all outlets closed	Leak, failed accumulator, pressure-switch fault, relief discharge or internal pump leakage.	Can empty the tank, flood a compartment or cause premature pump failure.
Flow pulses or pressure varies	Waterlogged accumulator, air, restriction, weak pump or several demands exceeding capacity.	Indicates reduced reserve performance and may affect connected appliances.
Tank level falls unexpectedly	Leak, wrong tank selected, inaccurate sender, overflow, siphoning or heavy unnoticed demand.	The yacht may lose its reserve before the crew recognises the problem.
Taste, odour, colour or cloudiness changes	Source contamination, stagnation, biofilm, tank/coating issue, unsuitable material or treatment fault.	Water may be unsuitable for drinking and the source must be investigated.
Tank deforms or fills slowly	Blocked vent, restricted fill, incorrect valve position or excessive fill pressure.	Can damage the tank, cause overflow or prevent reliable filling.
Water appears in bilge or lockers	Burst hose, leaking fitting, tank seam, hot-water relief or shore-pressure failure.	Can create flooding, electrical damage, mould and complete loss of freshwater.

DO NOT NORMALISE IT

A pump that always cycles at night, a tank gauge that is known to stick or water that sometimes smells different is evidence of a defect. Familiarity does not reduce the consequence.

Immediate response to contamination

Stop using the affected water for drinking and food preparation, protect any independent reserve, identify the likely source and obtain appropriate testing or professional guidance before returning the system to potable use.

OWNER CHECKS

Routine inspection and maintenance thinking

Owner checks should reveal changing condition, preserve hygiene and prove isolation without introducing contamination through careless servicing.

When	Useful checks
Before filling	Confirm the source, correct filler, clean dedicated hose, vent condition, selected tank and expected capacity.
Before departure	Check tank levels, pump behaviour, visible leaks, filter status, isolation valves, hot-water relief and reserve drinking water.
During operation	Monitor daily consumption, pump cycling, pressure, taste, smell, bilges and watermaker production where fitted.
After limited use or lay-up	Follow a suitable flushing, cleaning and disinfection procedure before relying on the system.
Routine service	Maintain pumps, accumulators, filters, UV equipment, valves, tank coatings, vents, hoses and hot-water safety devices.
After contamination or repair	Clean and disinfect as appropriate, remove dead water, replace contaminated media and verify quality before potable use.

Hygienic maintenance practice

- Wash hands and use clean tools, plugs, caps and containers when opening potable-water equipment.
- Do not place removed hoses or fittings on a dirty deck before reassembly.
- Use replacement hoses, sealants, filters and lubricants suitable for potable-water service.
- Label bypasses and restore the intended flow path after maintenance.
- Record cleaning, disinfection, filter changes, tests, repairs and any unusual result.

WORK TO REFER	Tank-entry work, structural tank repair, coating failure, persistent contamination, public-health testing, complex cross-connections and pressure or temperature safety faults should be handled by competent specialists.
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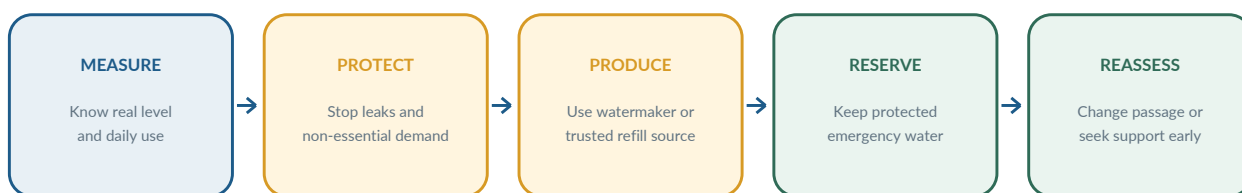
Useful spares and supplies

Useful support may include the correct pump or service kit, accumulator parts where appropriate, filters, food-grade hose, approved fittings, isolation plugs, UV lamp or watermaker consumables and protected emergency drinking water.

OFFSHORE READINESS

Failure response, buyer questions and readiness checklist

Freshwater loss is rarely an immediate navigation emergency, but it can quickly affect health, hygiene, cooking, machinery support and the crew's ability to continue the passage.



Questions worth resolving

- How many days of demonstrated consumption are stored without relying on production?
- Can each tank, pump and distribution branch be isolated independently?
- What happens if the pressure pump, watermaker or tank-level system fails?
- Is protected drinking water available independently of the main tanks?

Area	Questions for purchase or survey
Tanks and structure	Can tanks be inspected and cleaned, and is there corrosion, cracking, coating failure or inaccessible compartmentation?
Water quality history	Are cleaning, disinfection, testing, filter and contamination records available?
Pressure and distribution	Do pumps, accumulators, valves, branches and pressure controls work without leakage, rapid cycling or hidden cross-connections?
Supply and endurance	Do demonstrated tank capacity, actual consumption and watermaker output support the cruising plan?
Shore and hot-water risks	Are regulation, backflow prevention, relief, expansion and unattended isolation arrangements credible?

Quick readiness check

	Readiness statement
	The water path from each source through tanks, treatment, pumps and outlets is understood.
	Normal tank level, consumption, pressure and pump behaviour are known.
	There are no unresolved leaks, cycling, contamination concerns or inaccurate indications.
	A failed source or leaking branch can be isolated without losing every reserve.
	Stored capacity and demonstrated production support the intended passage.
	Protected emergency drinking water is available independently.
	More than one person knows the pump, valve and contamination response.

KEY TAKEAWAY

A dependable freshwater system combines protected water quality, realistic stored endurance, reliable pressure, clear isolation and a plan for continuing safely when production or distribution fails.

Guidance to consult

Use the manufacturers' instructions and applicable flag, coding, class, insurance, public-health and yard requirements for cleaning, disinfection and testing.

Understanding Yacht Systems

Practical guides for owners, buyers
and offshore cruising crews.

AMTG-010

Understanding Freshwater Systems

RELATED GUIDES

AMTG-011 Understanding Watermakers

AMTG-039 Understanding Hot-Water Systems

AMTG-012 Understanding Waste and Blackwater Systems

AMTG-026 Understanding Monitoring and Alarm Systems

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