Feature Comparison

HIGH Q 103S

www.high-q.com

Other Lab Stills

On balance, High-Q reagent-grade water is better

PURITY

The High-Q 103S Still produces water with over 10 MΩ-cm resistivity, extraordinarily low concentrations of organics, and essentially undetectable levels of particulates, including microorganisms.[1]

Stills that lack essential design elements cannot prevent the entrainment of boiler water or remove volatile contaminants effectively, even when placed in series. Their product water resistivity will be well below 1 MΩ-cm.[1]

AUTOMATION

Truly fully automatic – self-cleaning and self-sanitizing, with sophisticated electronic controls. Produces optimal product water during unattended operation.

Stills lacking adequate controls are certain to produce a lower quality of product water during unattended operation than during manual operation.

BOILER STAGE

Designed to minimize splashing and deviations from equilibrium. Boiler level – controlled with electronic, feed-back controls (no adjustments necessary and no waste of pre-treated water). Boiler draining – controls automatically drain and rinse the boiler at periodic intervals (routine cleaning is not necessary).

Boiling surfaces – typically small, which results in excessive splashing and mist formation (some boilers splash boiler water directly into subsequent stages). Boiler level – typically, boiler level is controlled by overflow (tricky to adjust, wastes pre-treated water, and increases the concentration of volatile contaminants in the product water). Boiler draining – manual.

HEATERS

High-Q heaters use tungsten/inert gas/quartz cores that have an anticipated life of >20 years. High-efficiency, heat shields reduce radiant loss to a minimum and can be inexpensively replaced.

Metal or quartz jacketed Nichrome cores have relatively short life expectancies and no salvage value. Metal heaters do not hold up in deionized water and quartz-jacketed Nichrome heaters radiate excessive heat.

TRANSITION STAGE

A highly efficient dual action (hydrophillic/hydrophobic) transition stage – blocks mist and surface entrainment and corrects for deviations from equilibrium.

Ineffective transition stage designs permit entrainment of boiler water into the condensers.

CONDENSER STAGE

A compound condenser (hot-finger heat exchange and counter-current column) removes volatiles effectively.

Simple water jacket or coil heat condensers cannot remove volatile impurities effectively.

CONTROLS

The controls use fail-safe design principles and provide all necessary functionality to produce high-purity product water during unattended operation.

Incomplete functionality results in loss of product water purity during unattended operation.

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[1] Because a non-linear relationship exists between resistivity and the concentration of ions, the difference between 1 and 10 MΩ-cm is very significant; however, the difference between 10 and 18 MΩ-cm usually amounts to only a trace of CO_2.

Feature Comparison

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Type-I Cartridge Systems

On balance, High-Q reagent-grade water is better

PURITY

High-Q Stills remove all classes of impurities, without adding new ones.

Type-I systems do not remove many classes of contaminants efficiently[1], some can be concentrated[2], and new ones are added[3].

COST OF OPERATION

High-Q Stills produce consistently pure water over many years without expendables or significant maintenance (automatic self-cleaning and self-sanitizing is standard).

The components of Type-I systems are expected to exhaust and fail on a regular basis, usually without warning (see *Performance Monitoring* below). And the cost of expendables is likely to exceed the capital cost of a system in just a few years. Type-I systems should be broken down and sanitized frequently.

CONVENIENCE

High-Q Stills serve as convenient docking stations for portable High-Q 103C containers, which are designed to maintain the purity of High-Q water and take up very little room at workstations.

It is impractical to keep Type-I systems operating in standby mode or to locate one at every workstation, so users typically store water in containers at their workstations. High-Q 103C containers should be used, since the quality of water stored in unspecialized containers will decline quickly.

PERFORMANCE MONITORING

Resistivity is a sensitive, relatively inexpensive means of monitoring the performance of High-Q Stills, because distillation is not an ion-selective process and virtually every class of water contaminant is represented by ubiquitous, well-ionized substances. A resistivity meter with acceptable accuracy costs about $500.

Measuring resistivity at 18 MΩ-cm requires an extremely accurate, carefully calibrated meter, likely to cost well over $1000. Such meters are not standard on Type-I systems. In any case, Millipore says measuring only resistivity is not enough. Resistivity detects soluble ionized contaminants, leaving the Achilles' heel of Type-I systems (organics and microorganisms) exposed. If a Type-I system is fed with deionized water (the likely case), all of the cartridges can be replaced with empty dummies without any indication of trouble – unless the system is equipped with a total organic carbon (TOC) meter. But TOC analyzers, capable of making accurate measurements in the ppb range, cost over $10,000.

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[1] Many water contaminants are not efficiently removed by carbon sorption, ion exchange (including EDI), or ultra filtration..

[2] Activated carbon and ion exchange beds function chromatographically and will elute concentrated pulses of contaminants under a variety of conditions.

[3] Activated carbon and ion exchange beds are inherently unstable and contribute contaminants to the water steam. And microorganisms flourish in these beds and on other surfaces of cartridge systems.