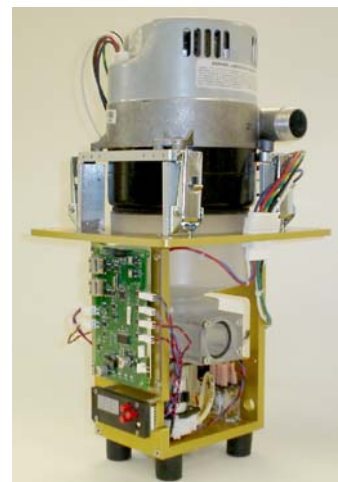


DryClone™ Prototype Performance Characteristics

This technical note discusses the performance characteristics of the DryClone™ samplers. Information provided is intended to be an indication of expected unit performance, based on testing done to date.

The Evogen DryClone™ is intended to be used to collect and concentrate biological and low vapor pressure particulate and liquid aerosols for subsequent detection and analysis. The DryClone™ is based on the principle of cyclonic particle separation. Particles suspended in the air enter the cyclone and are inertially separated from the airflow through cyclonic action and collected onto the dry walls of the cyclone. This process can be performed for long durations while the collected particulates are concentrated and retained within the system. At the end of a collection cycle, the unit performs an automated rinse procedure where fluid is injected into the incoming air-stream and caused to thoroughly wash the captured particulate from the walls of the cyclone. The eluted particulate is then extracted from the cyclone and may be transferred to a separate analysis system. Dry collection followed by liquid washdown enables the unit to operate with minimal consumable fluids over long periods of time. With the optional exhaust recirculation system, the unit is able to perform liquid extractions at temperatures down to -20°F, provided the fluid supply is maintained slightly above freezing.



Sampling Efficiencies and *Concentration Rates* are shown in the adjacent charts as a function of extraction volume, time, and particle size. *Concentration Rate* is expressed as the number of multiples of an ambient air volume collected into an equivalent volume of liquid sample per unit of time. For example, for a uniform and constant ambient air concentration of 2 particles per mL, a *concentration rate* of 150,000/minute indicates that the sample concentration will increase by 150,000 x 2 particles for each minute of sampling.

Table 1: Unit Characteristics

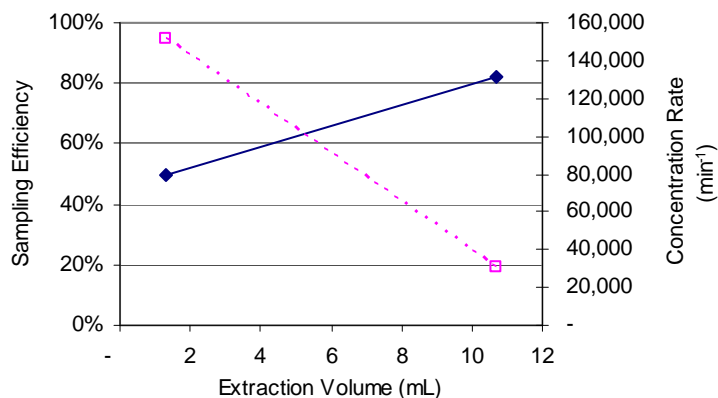
Parameter	Value	Units
Airflow	400	L/min
Max Power	800	W
Weight	15	Lbs
Dimensions	9x9x16.5	LxWxH"

To determine *sampling efficiency*, fluorescent polystyrene particles were disseminated from liquid solution and allowed to dry in a drying tube prior to being sampled by a reference sampler and the DryClone™ under test. This testing was performed at Evogen over the period of September 2005 – January 2006.

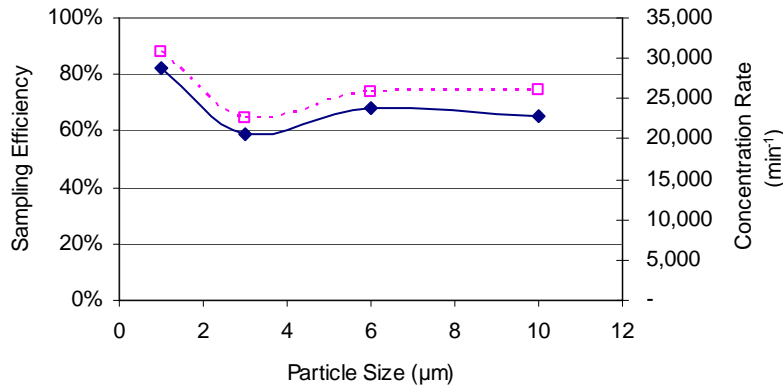
Efficiency is determined by dividing the total particles collected, determined from analysis of particles in the extracted DryClone™ sample, by the total particles challenged determined from analysis of reference filters. All sample concentrations were measured by analyzing the resultant fluorescence of the sample.

—◆— Sampling Efficiency - - - □ - - - Concentration Rate

**Collection Performance vs. Extract Volume
(at 1 μm particle size)**



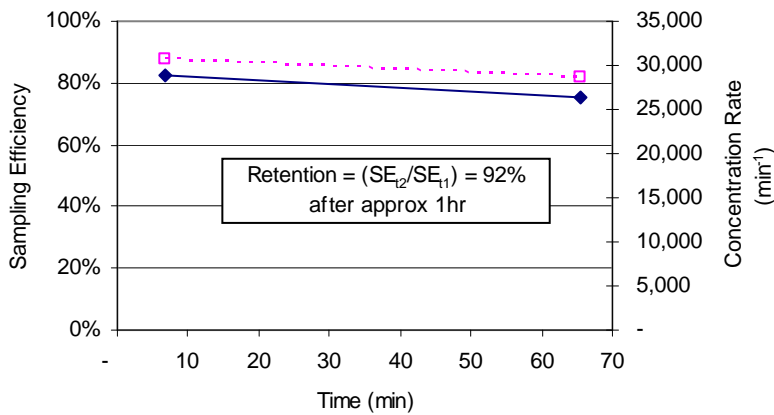
**Collection Performance vs. Particle Size
(at avg 10.3mL extract vol)**



As can be seen from the charts, the *Sampling Efficiency* (SE) can be adjusted based on the extraction volume, and averages 70% over the range of particles from 1 to 10 microns for an extraction volume of just over 10mL. The *Sampling Efficiency*, and therefore total particles

in the sample, increases with sample volume; however, the *Concentration Rate* (CR=Flow x Sampling Efficiency / Sample Volume), and therefore sample concentration decreases with sample volume. This provides added flexibility in the unit, allowing the end user to configure the collection performance to best suit the desired analysis method.

**Retention (at 1µm Particle Size)
(Apparent Sampling Efficiency with Time)**



Retention of the collected sample is very good, averaging 92% after one hour of operation. *Retention* is a measure of the ability of the sampler to retain the particles collected over time, and is identified as an apparent sampling efficiency reduction when sampling for a period of time after collection of an initial dose of material. The above *Retention* chart shows the measured *sampling efficiency* when measured immediately after a particulate dose (at T=6 min) and the

measured *sampling efficiency* when measured after sampling non-dosed air for 1 hour after completing a similar initial particulate dose (T=66 min).

The DryClone™ module may be interfaced directly to external control, sample preparation and analysis systems. For outdoor usage an omni-directional particle pre-preparation inlet with additional acoustic muffler, shown at the right, is also available. This inlet has been tested in wind speeds up to 14mph and shown to maintain in excess of 90% aspiration efficiency for particles in the size range of interest.



To discuss specific integration requirements, potential applications, and sales, please contact:

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