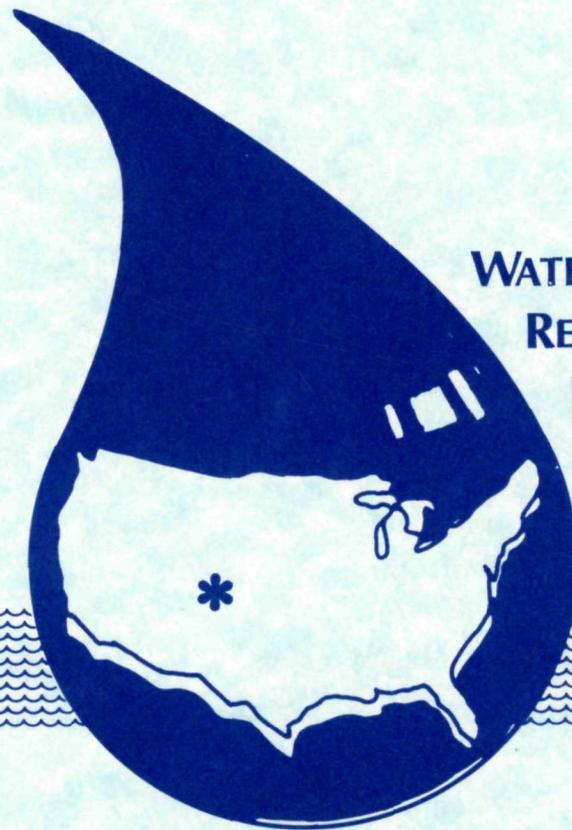


AUTOMATIC WATER SAMPLERS FOR FIELD USE



**WATER
RESOURCES
FIELD
SUPPORT
LABORATORY**

WRFSL REPORT No. 83-1



**WATER RESOURCES FIELD SUPPORT LABORATORY
NATIONAL PARK SERVICE
COLORADO STATE UNIVERSITY
FORT COLLINS, COLORADO 80523**

The Water Resources Report Series of the National Park Service, Water Resources Field Support Laboratory, Colorado State University, Fort Collins, Colorado, provides the means for distributing to National Park Service regional and field staff the results of studies and other scientific information useful for the management, preservation and protection of the water and related riparian resources of the National Park System.

The Water Resources Report Series is not a substitute for the open scientific and technical literature. The degree of editing depends on usage, as the Series is designed to be flexible in format and content. The Series encompasses the disciplines of hydrology, geology, biology, ecology and engineering and provides for the retention and dissemination of research information which:

1. Directly address water resources management problems in the parks;
2. Are primarily literature reviews or bibliographies pertaining to water resources problems;
3. Present compilations of basic scientific data; and
4. Discuss methodologies for collecting water quality and quantity information in the National Park System.

The reports may present the results of research conducted by the National Park Service, other agencies, universities, or independent research institutions.

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Fort Collins, Colorado 80523

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WRFSL Report No. 83-1

August 1983

Water Resources Field Support Laboratory
National Park Service
Colorado State University
Fort Collins, Colorado 80523

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Interior, National Park Service, Water Resources Field Support
Laboratory Report No. 83-1.

Qualification Statement

This paper is prepared for internal use by National Park Service (NPS) employees and for our cooperative use with the USDA-Forest Service. No attempt is made here to rate the quality of the brands of water samplers. We assume any prospective buyers will want to obtain brochures and make their own judgment. We made no attempt to look at non-U.S. brands beyond a few that were included in the U.S. listings that we used. We searched U.S. Environmental Protection Agency (EPA) lists, commercial equipment catalogs and American Association for the Advancement of Science (AAAS) scientific equipment lists and wrote letters for information. Our personal experience with field samplers also aided in describing the samplers.

Mention of brands, models or company names is for convenience of the reader and does not represent any endorsement by the NPS Water Resources Field Support Laboratory, NPS, or other organizations with whom we are cooperating, and likewise omission of any relevant model that happens to be unknown to the Lab does not represent criticism of the brand. Please inform us if you know of any other brand/model fitting our criteria (see page 1) that should be included as an addendum.

Cooperation of the companies in supplying information and photographs for our use is appreciated.

CONTACTS AT WATER RESOURCES FIELD SUPPORT LABORATORY (WRFSL)

The information in this paper was compiled and prepared by Sam Kunkle, Hydrologist, of WRFSL with assistance by Randy Nickerson, Colorado State University Student Research Assistant.

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ABSTRACT

The paper reviews the major features of eleven automatic water samplers that are (i) relatively portable, (ii) self-contained, i.e. battery and/or gas operated and (iii) designed for use in the field.

The eleven samplers are described by price (from \$390 to \$2900), weight (from 19 to 62 lb), size (about 2 to 4 cubic feet) and by features of their clocks, pumps, hoses and other parts. They are not rated as to quality.

A table describes main options to look for in buying a sampler, and each sampler is briefly described.

Names and addresses for 22 companies selling various types of samplers are given.

CONVERSIONS

1 pound (lb)	= 454 grams
1 inch (")	= 2.54 centimeters
1 foot (ft)	= 0.305 meter
all \$ prices	= \$ U.S.
1 gallon U.S. (gal)	= 3.785 liters
1 ounce U.S. (oz)	= 29.6 ml

degree Fahrenheit to Celsius conversion:

$$^{\circ}\text{C} = (^{\circ}\text{F} - 32)/1.8$$

AUTOMATIC WATER SAMPLERS
FOR FIELD USE

A Review of Automatic Water Samplers

This paper has been prepared from a review of several dozen specification sheets, brochures and booklets on automatic water samplers supplied by companies producing such equipment, primarily in North America. The paper describes samplers that should be useful for park resource management specialists, summarizing eleven samplers that are:

- (a) relatively portable (usually 20 - 45 lbs), with handle or backpack arrangement;
- (b) battery and/or compressed gas or air operated, i.e., self-contained;
- (c) intended for field use (as opposed to many models intended to be used in a shelter or inside the sewage treatment plant).

An automatic water sampler is essentially a pump controlled by a clock or other automatic trigger, so that water samples can be pumped from a stream into a bottle at some pre-determined time or event and later collected for analysis.

How Automatic Water Samplers Can Be Useful in Parks and Forests

Water samplers can be useful tools for monitoring water quality or for detecting pollution in streams in parks and wildlands. Samplers can tackle tedious jobs, such as around-the-clock monitoring or difficult tasks such as storm runoff sampling (where runoff can be used to trigger a sample). Samplers may be left out to work at remote sites. For

research work, automatic samplers can be used to gather the samples needed to understand how a stream's water quality is affected by stream flow, weather and other variables.

How the Samplers Differ

Many aspects must be considered in selecting an automatic sampler, not the least of which is the initial cost, ranging from about \$400 to over \$3000. The most basic samplers simply put water into a composite jug at some pre-set intervals, while the more elaborate samplers with micro-computers can change pumping rates in proportion to stream levels, be triggered by rising storm runoff or do other tricks. All features, of course, add to the cost as well as to the array of gadgets that could malfunction--also a consideration.

In Table 1 is a summary of the principal features to look for in a sampler. Remember that the options are trade-offs; no one sampler has all the features. We make no quality judgments on the brands and also assume that any prospective buyers will want to get brochures and specifications for themselves, ask companies for other details and get exact price quotations, which vary with the types of hoses, clocks, bottles or accessories included. We also are personally familiar with some brands, if you wish to telephone the Lab with questions. The table is followed by a page description for each of the eleven models. Many companies also are glad to provide demonstrations.

Table 2 may be used to compare major features of the eleven samplers.

TABLE 1

Principal considerations and trade-offs in selecting an automatic water sampler

How the Water is Handled

1. Is the water composited (put into one jug) or taken in discrete (individual-multiple) bottles? Some samplers also offer both options or exchangeable bottle racks. Individual bottles can always be composited (but the reverse is not true). Composite samplers are generally cheaper and simpler.
2. a. Can the bottles be iced? This is important for some bacteriological or biological sampling.
 b. What are the bottles made of? Most samplers feature polyethylene or plastic bottles. For certain sampling (e.g., pesticides) glass is recommended.

Principal Mechanical Features

3. Is weight or compactness a concern? Some of the more elaborate samplers will be nearly 50 lb empty and well over 60 lb full.
4. How flexible is the clock? The microcomputer types are almost infinitely flexible (and more costly); whereas, simple samplers may have few options or even require manual gear changes.
5. Is durability and weatherproofing a major feature? The brands range from watertight to only water repellent.
6. How long will a battery or battery-air charge run the sampler? This ranges from one day to several weeks.
7. Do you need high velocity pumping so as to sample turbid waters? There is a trade-off between slow pumps and fast pumps in terms of battery drain. Also, how well does a multiple-bottle sampler avoid cross contamination from bottle to bottle?
8. Is debris or hard freezing a special problem? Only a few models emphasize use below freezing. One sampler is claimed to operate to -20°F.
9. Will a high lift/long hose ever be needed? (e.g., sampling up a cliff, down a hole in a cave, etc.). One gas-driven model lifts to 400 feet. Some models lift only 10 feet.
10. Do you need "automatic triggering" or "proportional sampling"? (e.g., sampler is triggered to start when storm runoff starts and samples more during the higher flows).

One Last Point

11. What is the company's history and service reliability? In our survey five manufacturers of samplers of five years ago apparently were no longer selling samplers. Suggest asking company for previous buyers of their samplers, to ask about service.
-

TABLE 2

Some of the highlight points of the samplers and estimates for complete costs including tubing and accessories. See descriptions following for other details and metric conversions on page iv.

Brand	Various Models Approx Price Ranges	Empty Weight with Battery	Case Type	Composite (C) or Discrete (D) Type	Can be Iced	Lift (ft)
Brailsford	\$390 - 815	19-24 lb	hinged epoxy-wood box	C	No	12
Masterflex	\$1100 - 1150	27 lb	"suitcase" with sampler built in	C	No	25
BVS	\$1500 - 2000 ^{4/}	20 - 25 lb ^{1/} plus 15 for gas	aluminum-steel, weatherproof	C	No	400
Krofta	\$1655	30 lb ^{1/2/}	clamped lid, heavy wall plastic, weatherproof	C	No	25
N-CON	\$1250	26 lb	insulated, weatherproof NOREL structural foam	C	No	26
American Sigma	\$1500 - 2050	36 lb	ABS thermoplastic watertight	C/D	Yes	26
Isco	\$1100 - 2500	40 lb	clamped lid, sturdy plastic, watertight	C/D	Yes	26
Markland	\$1700 - 2900	48 - 62 lb ^{3/}	fiberglass, weatherproof	C/D	Yes	50 -60 or higher
Manning	\$1360 - 2345	40 lb	clamped lid, polyethylene, watertight	C/D	Yes	22
Sirco	\$2000 - 2450	45 lb ^{1/}	weatherproof, metal- enamel insulated	C/D	No	10
Quality Control	\$1490 - 2000	36 lb ^{2/}	fiberglass, upright case, controls watertight	C/D	Yes	20

^{1/}Our estimate only

^{3/}For discrete and composite models,
respectively.

^{2/}Separate weight of battery pack not added to this weight.

^{4/}Tubing adds significantly to price.

NAME: BRAILSFORD EFFLUENT SAMPLER(S), Brailsford and Co., Inc.,
Milton Road, Rye, NY 10580 (914) 967-1820.

COST: \$390 for most simple to \$815 for more elaborate model and
with accessories could be about \$1000.

DESCRIPTION: Modest price composite samplers at 19 to 24 lb (including
battery), the lightest samplers of the 11. Box shape, 19 x 12 x 9½"
laminated, epoxy-bonded formica/wood. Presumably somewhat weather
resistant but not watertight.

SAMPLE SIZES AND SAMPLING INTERVALS: Composites adjustable shots of up
to 20 ml into a 2 gal polyethylene jug. Also will take
continuous trickle sample -- one of only two samplers able to do so,
because of nature of their pump. Interval setting for the shots
varies from 1-¾ up to 13 min, meaning you can take from 4 hours up
to 11 days to fill one jug (depending on the model).

OTHER: Unique all-plastic, valveless pump draws only 0.20 watt, so
6 v model lantern battery can operate sampler continuously for over a
month or rechargeable type model for 1 week. Accessories for propor-
tional sampling and hydrologic event (storm) sampling. Lift 12 ft.



Figure 1. Brailsford effluent sampler.

NAME: MASTERFLEX COMPOSITE SAMPLER, Cole-Parmer Instrument Co., 7425 North Oak Park Avenue, Chicago, IL 60648, (312) 647-7600.

COST: About \$1150 complete depending on tubing used.

DESCRIPTION: A lightweight, compact, portable suitcase-like composite sampler, 15 x 24 x 9", weight about 27 lb with portable rechargeable battery.

SAMPLE SIZES AND SAMPLING INTERVALS: Aliquot or shot depends on time interval set and the length of lift, with shots composited into 2½ gal jug. One of only two samplers that take continuous trickle samples. The 30 min interval setting collects approximately 200 ml size sample. Three sample intervals are 15 min, 30 min, or "continuous trickle", up to 23 hours maximum program duration (every ½ hour for 23 hours collects approximately 200 ml samples).

OTHER: Rechargeable battery goes 24 operating hours. Peristaltic (roller on tubing) pump. Polyethylene jug. Also AC adapter available. Purges line to clear debris from previous sample. 25 ft lift.

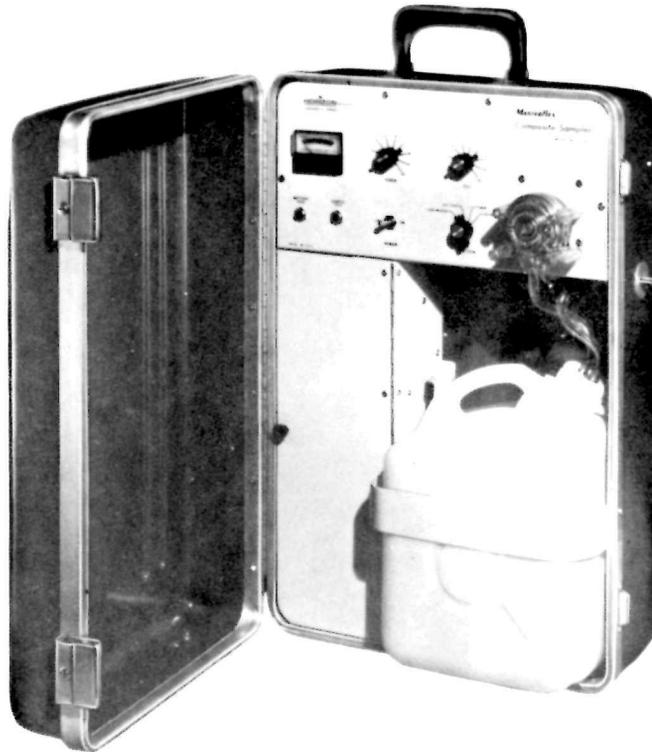


Figure 2. Masterflex composite sampler.

NAME: BVS AUTOMATIC SAMPLER(S) (gas pressure powered), BVS, Inc.,
Route 322 West and Poplar Road, Honey Brook, PA 19344, (215)
273-2841.

COST: \$1750 plus 25¢ to over \$4.00/ft for tubing, so probably about
\$2000 for typical sampler.

DESCRIPTION: Pressure-operated, composite sampler in weatherproof
aluminum square case, 14 x 14 x 21". Weight (we estimate) 20 - 25 lb
plus 15 lb of type R-12 gas propellant. Up to 400 ft hose.

SAMPLE SIZES AND SAMPLING INTERVALS: Composites the shots into a 2½ gal
jug at 2 sec up to 60 min intervals. Shot size also adjustable.

OTHER: Powerful gas driven pumping mechanism lifts samples up to
400 ft and takes up to 1/8" particles in the samples (because no pump
as such). Company can also make custom high lift samplers. Many
different types and lengths of tubes possible to use. Automatic
sampling probe flushing.

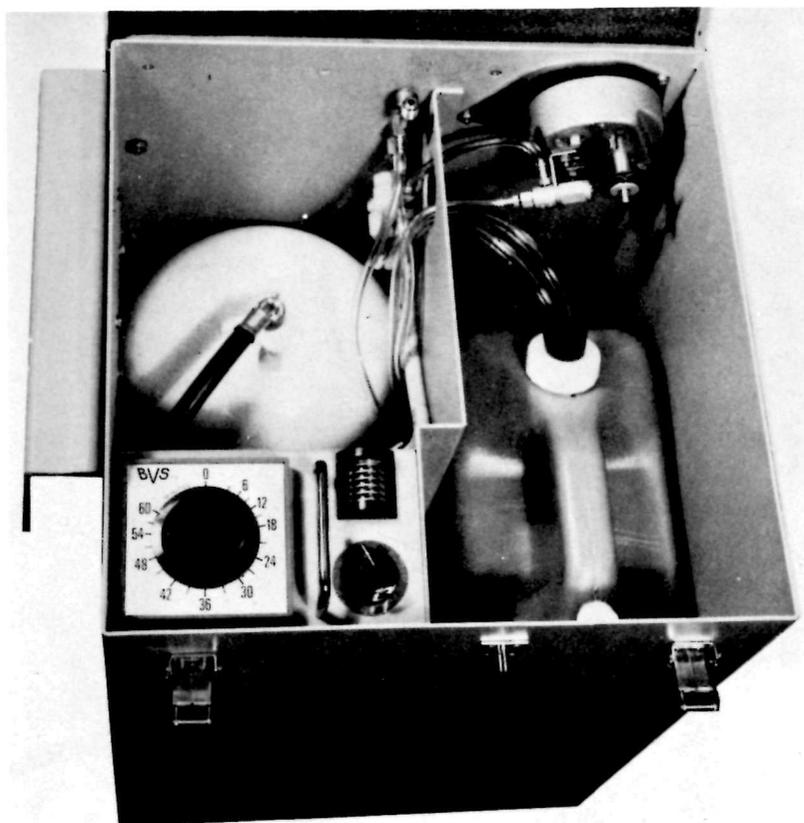


Figure 3. BVS automatic sampler.

NAME: KROFTA PORTABLE SAMPLER, Krofta Engineering Corp., 58 Yokun Avenue, Lenox, MA 01240, (413) 637-0740.

COST: \$1655 including complete package: battery charger, jug, etc.

DESCRIPTION: Portable suitcase-like case (heavy plastic) water repellent with clamping lid 14 x 8 x 14", 30 lb not including separate battery pack (of unknown weight). "Rugged construction" for "outdoor ...operation" claimed.

SAMPLE SIZES AND SAMPLING INTERVALS: Puts adjustable aliquots of up to 30 ml samples into 3½ gal composite jug made of heavy-wall plastic. By changing cams obtain either a 15 or 30 min sampling interval. Claim 12 v battery pack allows "weeks of operation".

OTHER: Lifts to 25 ft w/ self-priming positive displacement pump. Suction hose drains between samples to prevent freezing.

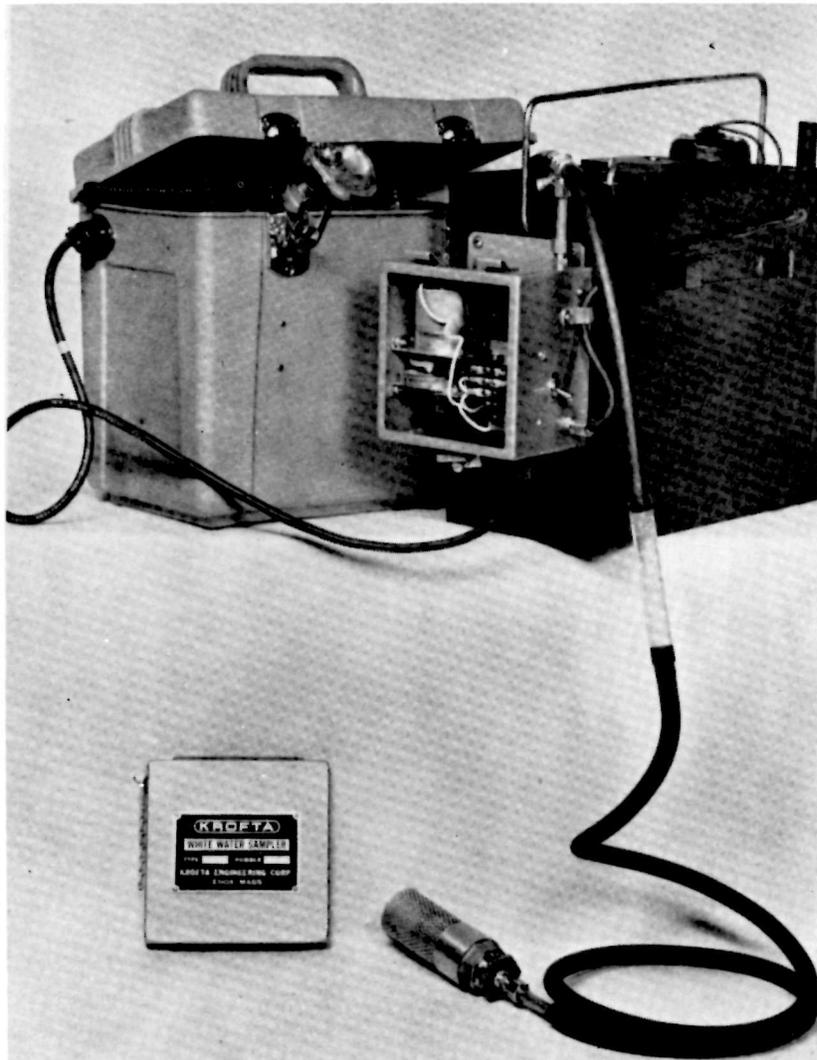


Figure 4. Krofta portable sampler.

NAME: N-CON ASM SAMPLER(S), N-CON Systems Company, Inc., Clean Waters Building, 308 Main Street, New Rochelle, NY 10801, (914) 235-1020.

COST: A composite sampler priced around \$1250 complete.

DESCRIPTION: A lightweight, compact, box-shape, composite sampler, 15x15x15", weight only 26 lb including self-contained rechargeable nicad battery.

SAMPLE SIZES AND SAMPLING INTERVALS: Composites volumes of 100 up to 750 ml into either a one or two gallon, glass or polypropylene wide-mouth jug. Interval settings for the shots are 1, 2, 4 or 8 samples per hour, meaning you can take from 3 up to 72 hours to fill container (depending on container size).

OTHER: Automatic Sampling Module (ASM) provides a "building block approach" with many expansion options available including a flowmeter, sequential sampling, iceable container for composite sampling and proportional sampling. Operates on either line or 12 V DC battery. Will purge before or after samples. 26 ft lift.

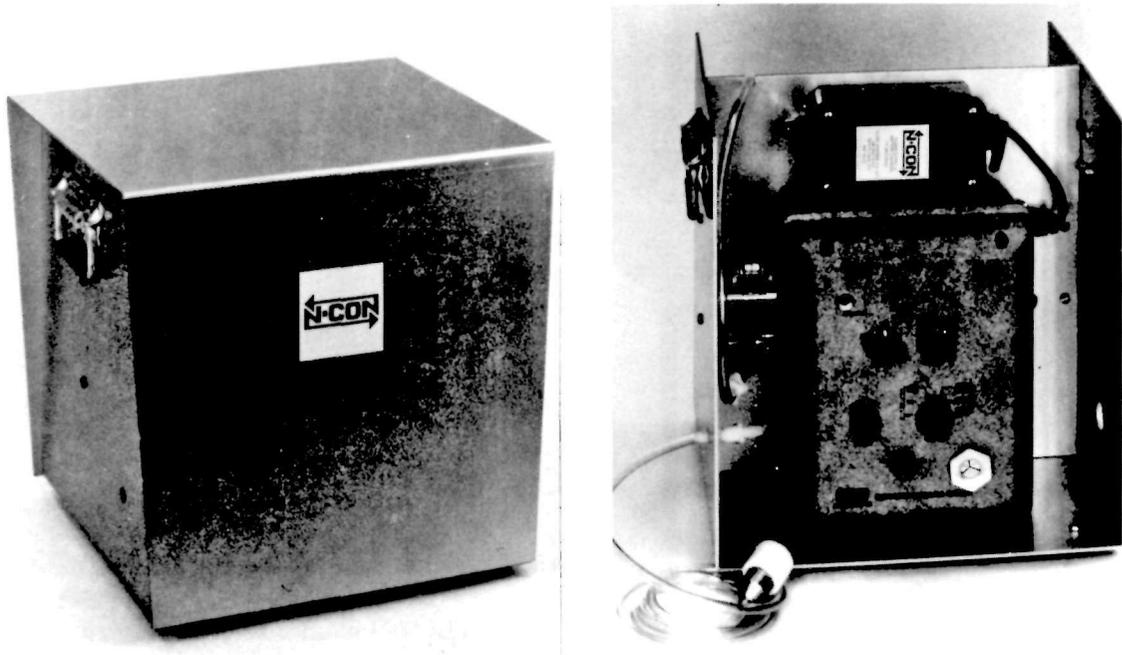


Figure 5. N-CON ASM sampler.

NAME: AMERICAN SIGMA PORTABLE SAMPLER(S), One Elizabeth Street,
P.O. Box 100, Middleport, NY 14105, (716) 735-3616.

COST: About \$1500 complete for #6200 composite and about \$2050
complete for #6201 discrete/composite.

DESCRIPTION: Either composite jug or discrete models. Clamped, sealed
door ABS sturdy box 20 x 14½ x 14", weight 36 lb w/ battery. Will
tolerate short immersion.

SAMPLE SIZES AND SAMPLING INTERVALS: Many options of adjustable
aliquots from 10 to 10,000 ml size (+/-5%) either put into composite
2½ gal jug (Model 6200) or individual 475 ml bottles (24) in Model
6201. Many options from 1 min up to 99 hr may be set for intervals on
digits of quartz crystal clock unit. Can delay sampling initiation by
99 hr.

OTHER: Can collect flow-proportion samples. Lines purged before/
after sample. Operates both 120 V AC and 12 V DC. Rechargeable
battery 5 day min operation. Can be iced. Peristaltic (roller on
tubing) pump. 26 ft lift. High velocity.



Figure 6. American Sigma portable sampler.

NAME: ISCO WASTEWATER SAMPLER(S), Isco, P.O. Box 82531, Lincoln, NE 68501, Sales (800) 228-4373, Service (800) 228-4374.

COST: Several models ranging from about \$1100 for most simple version up to about \$2500 for best one, but many possible accessories/options means the complete price can frequently be closer to \$3000.

DESCRIPTION: About 40 lb cylindrical shape, 25" tall, 19.5" diameter, sturdy plastic watertight case (will tolerate some submersion). Similar to the Manning sampler.

SAMPLE SIZES AND SAMPLING INTERVALS: Many options including either composite jug (2½ gal) or discrete 24 or 28 bottle versions w/ glass, polyethylene, polypropylene. Glass/teflon option for wetted parts. Aliquots adjustable from 10 to 1000 ml. Quartz crystal timer, 1 to 999 min settings at 1 min intervals. "Multiplex" system allows several aliquots to be pumped into a bottle.

OTHER: Rechargeable nicad battery can fill 150 bottles (or 40 gal) on a charge. Peristaltic type pump lifts 26 ft. Samples may be iced. Training courses offered at company.

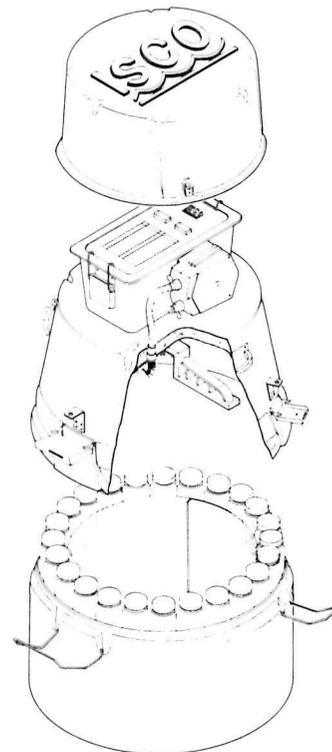


Figure 7. Isco wastewater sampler.

NAME: MARKLAND "DUCKBILL" SAMPLER(S), Markland Specialty Engineering, Ltd., Box 145, Etobicoke, Ontario, Canada M9C4U2, (416) 625-0930.

COST: Simple composite model about \$1700 and best automatic discrete (24 bottle) model about \$2900 (prices \$ U.S.).

DESCRIPTION: Composite model 1301 is fiberglass, dual cylinder shaped, 12 x 17 x 28", 62 lb and holds jug and scuba diver type compressed air cylinder. Discrete model 140N is "hat box" shaped, 18" diameter x 19" high, 48 lb complete, weatherproof, fiberglass case, battery with its own small air compressor. Air power provides high lift (50-60 ft) and freeze-prevention traits. Has been used down to minus 20°F.

SAMPLE SIZES AND SAMPLING INTERVALS: Composite sampler puts 75 ml shots into 2 gal jug. Discrete sampler shoots into 24 individual 500 ml polyethylene bottles from 75 ml/shot up to 500 ml/shot. Sample intervals adjustable, 5-60 min, or briefer intervals also possible in seconds. Multiple shots per bottle also possible from 1-6. Available float switch, signal remote start-up and event timers for storm sampling or other special needs. Delayed start-up also available.

OTHER: High velocity sampling. Claim "non-clogging, debris-proof" sampler head. Non-rechargeable battery on composite models lasts one year. On discrete model rechargeable battery will run approximately 3 of the 24 bottle loads and rechargeable batteries can be switched. 50 or 60 ft lift for the 2 models.

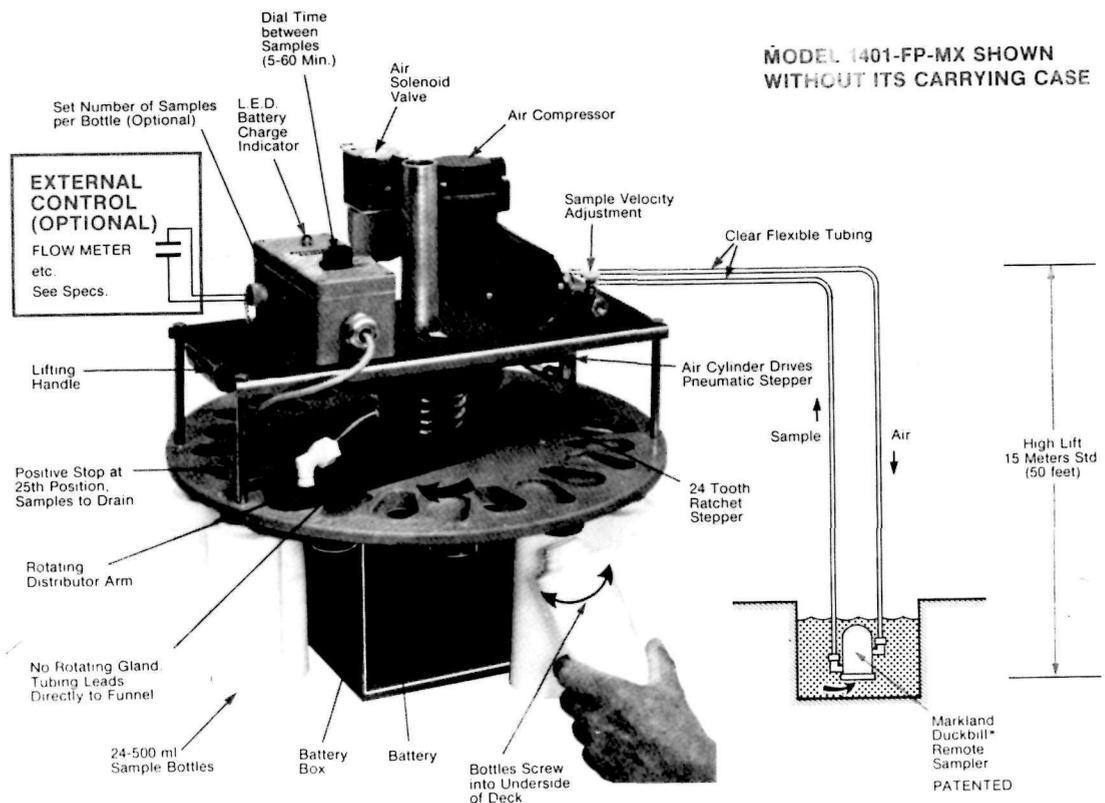


Figure 8. Markland "Duckbill" sampler.

NAME: MANNING PORTABLE SAMPLER(S), Manning Technologies, Inc., 100 Technology Circle, Scotts Valley, CA 95066, (408) 438-3900.

COST: Several models ranging from about \$1360 for most simple version up to about \$2345 for best one, with options possible bringing the price up to about \$3000.

DESCRIPTION: 40 lb, less battery, cylindrical shape models 29-32" tall and 19.8" diameter. Sturdy, clamping polyethylene constructed case. Weatherproof sections, watertight. Similar to ISCO samplers described on page 11.

SAMPLE SIZES AND SAMPLING INTERVALS: Many options in models including composite 3 gal or 4 gal jugs or 24 bottles w/ glass or polyethylene. Aliquots adjustable from 50 to 500 ml size (\pm 1-5%). Bottles available in 350 and 500 ml sizes. Special wide-mouth, fast cooling, wedge-shaped bottles unique. Watertight, sealed microprocessor controls 1 min to 99 hr 59 min at 1 min intervals, allows 2 to 10 samples each bottle, up to 12 different intervals within a sample schedule.

OTHER: Claim their new type pump (not peristaltic) more consistent and produces higher velocity than most peristaltic type pumps. Special models designed for suspended sediment work. Options for automatic hydrologic event (storm) sampling, proportional sampling or triggering by other signal. Samples may be iced. "Toxic option" models with Teflon/glass wetted parts. 22 ft lift. Operation at 32°F and up. Operates on either line or 12 V DC rechargeable battery.

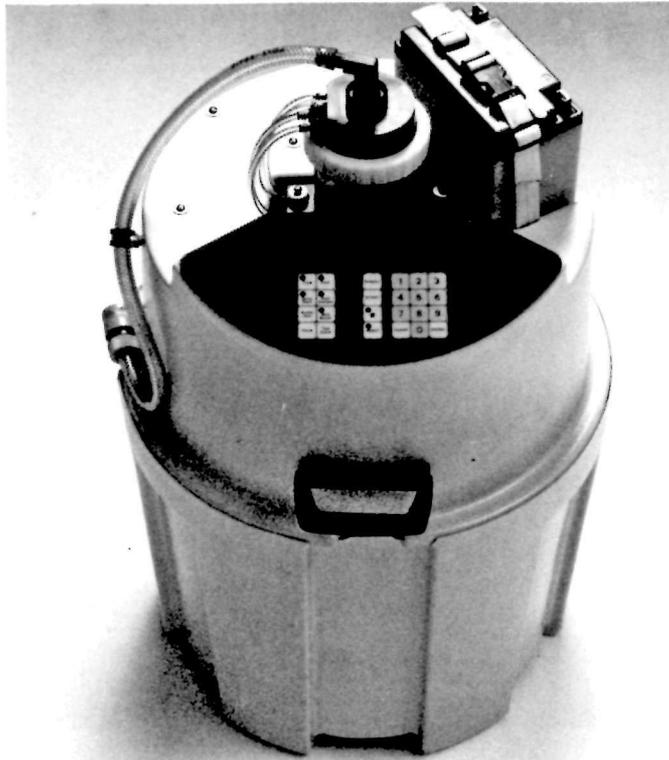


Figure 9. Manning portable sampler.

NAME: SIRCO (VACUUM/PRESSURE) PORTABLE SAMPLER, 8815 Selkirk Street, Vancouver, B.C., V6P4J7, Canada, (604) 261-9321.

COST: \$2000 composite to \$2450 discrete models (prices \$ U.S.)

DESCRIPTION: Upright, moisture-sealed, weatherproof, enamel-metal box, 18 x 10 x 10" of 22 lb but not including separate battery case with 12 V DC auto type battery (estimated at 20-25 lb). Battery case about 12 x 10 x 10". Total weight probably around 45 lb.

SAMPLE SIZES AND SAMPLING INTERVALS: Sample shot sizes adjustable from 25 to 500 ml put either into 1½ gal jug or into 24 individual bottles (materials not known). At least 15 possible intervals, from 3.75 min up to several hours duration.

OTHER: Metering chamber type pump arrangement. Handles suspended sediment up to 3/8" diameter. High velocity intake (50 ml/sec). 10 ft lift. Pre and post purge to clean lines and chamber. Also has proportional-to-flow type sampling arrangement. Rechargeable 12 V DC battery.

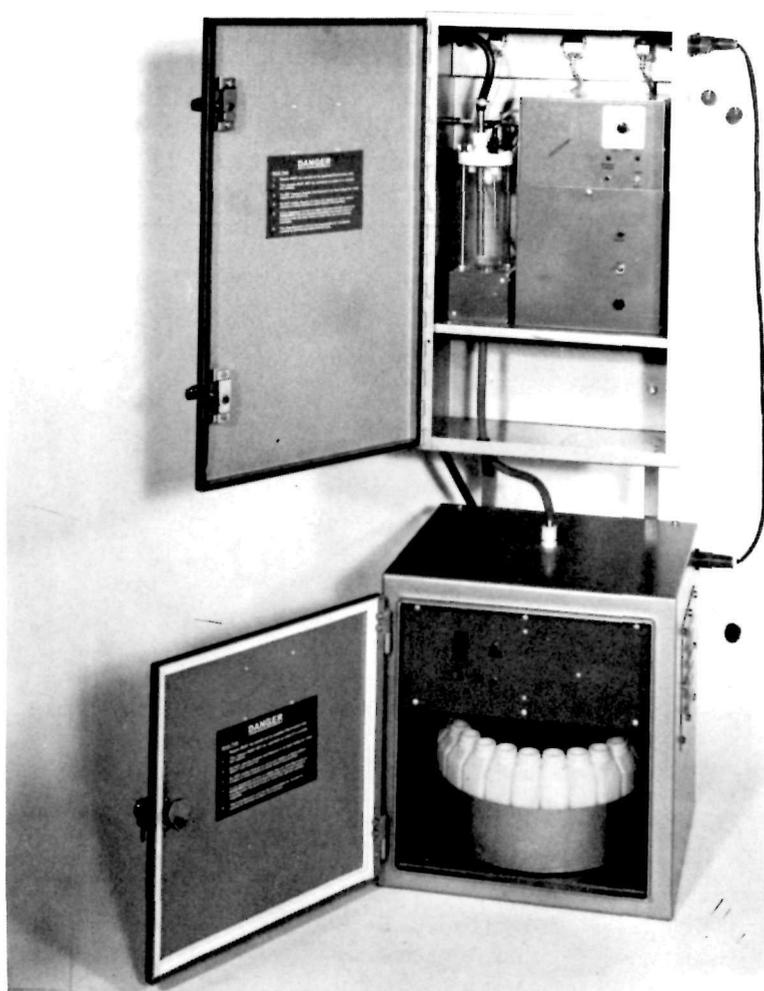


Figure 10. Sirco (vacuum/pressure) portable sampler.

NAME: QUALITY CONTROL ("Century 2000") WASTEWATER SAMPLER, Quality Control Equipment Co., 1916 Dean Avenue, P.O. Box 6010, Des Moines, IA 50309, (516) 266-2268.

COST: About \$1490 composite model w/ battery to about \$2000 for best discrete model with options.

DESCRIPTION: Upright box with controls at top. Insulated waterproof, fiberglass case 27½ x 15½ x 15¼", 36 lb without battery. Microcomputerized control module.

SAMPLE SIZES AND SAMPLING INTERVALS: Shoots 50-500 ml adjustable size aliquots into either composite jug (presume 2-3 gal) or 24 individual 500 ml plastic bottles. Microcomputer provides wide range of schedules including: purges 0-99 sec, sample interval 1-9999 min in 1 min intervals, delay start 1-9999 min, variable sampling intervals, multiplex sampling (1-25 shots per bottle) and other options/combinations.

OTHER: Diaphragm type pump with Teflon filled piston parts (for inert material). Sample icing arrangement. 20 ft lift. Over 3 feet per second sampling velocity. 12 V DC rechargeable battery powered or can use 120 V AC, also with separate emergency small computer battery. Flow proportion and float switch (triggering) signals can be used as well for automatic storm sampling and other needs. Dow Chemical Co. developed sampler.

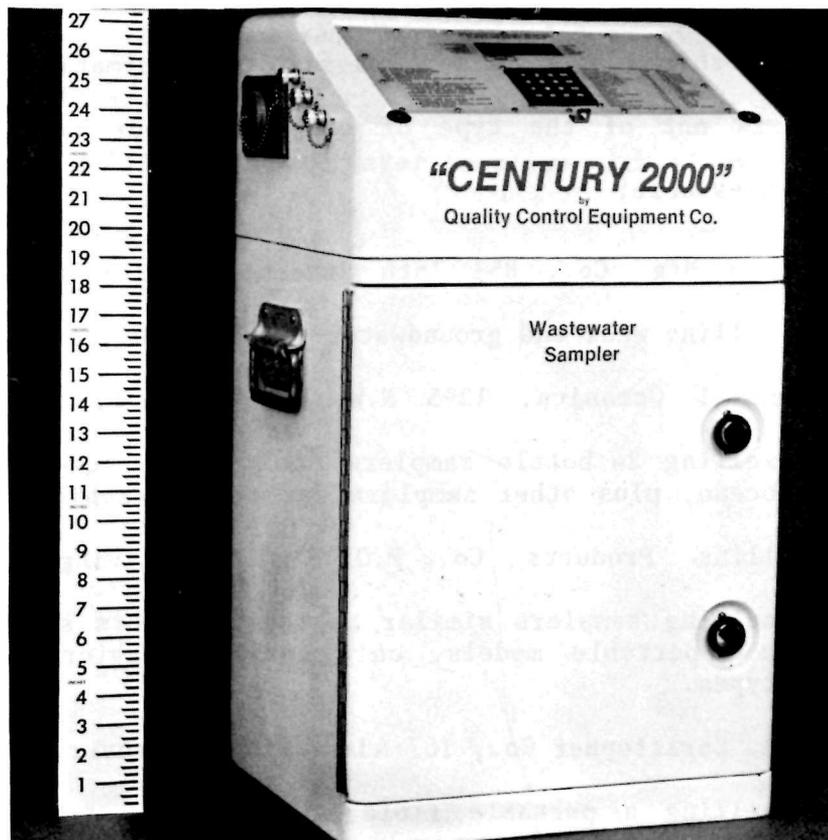


Figure 11. Quality Control ("Century 2000") wastewater sampler.

OTHER COMPANIES

Several other companies' names and complete addresses appeared in an Environmental Protection Agency (EPA) listing of sampler manufacturers in 1977, but our letters sent to them (with complete addresses) were returned "addressee unknown". Our follow-up in the 1983 American Association for the Advancement of Science (AAAS) directory of equipment suppliers also did not show them listed. These companies are as follows:

1. Nappe Corporation, Croton Falls, NY
2. Universal Engineered Systems, Inc., Pleasanton, CA
3. Protech, Inc., Malvern, PA
4. BIF Sanitrol, Largo, FL
5. Bestel-Dean Limited, Manchester, England

A number of other companies sent in sampler information; however, the equipment was not of the type of concern in our particular survey.

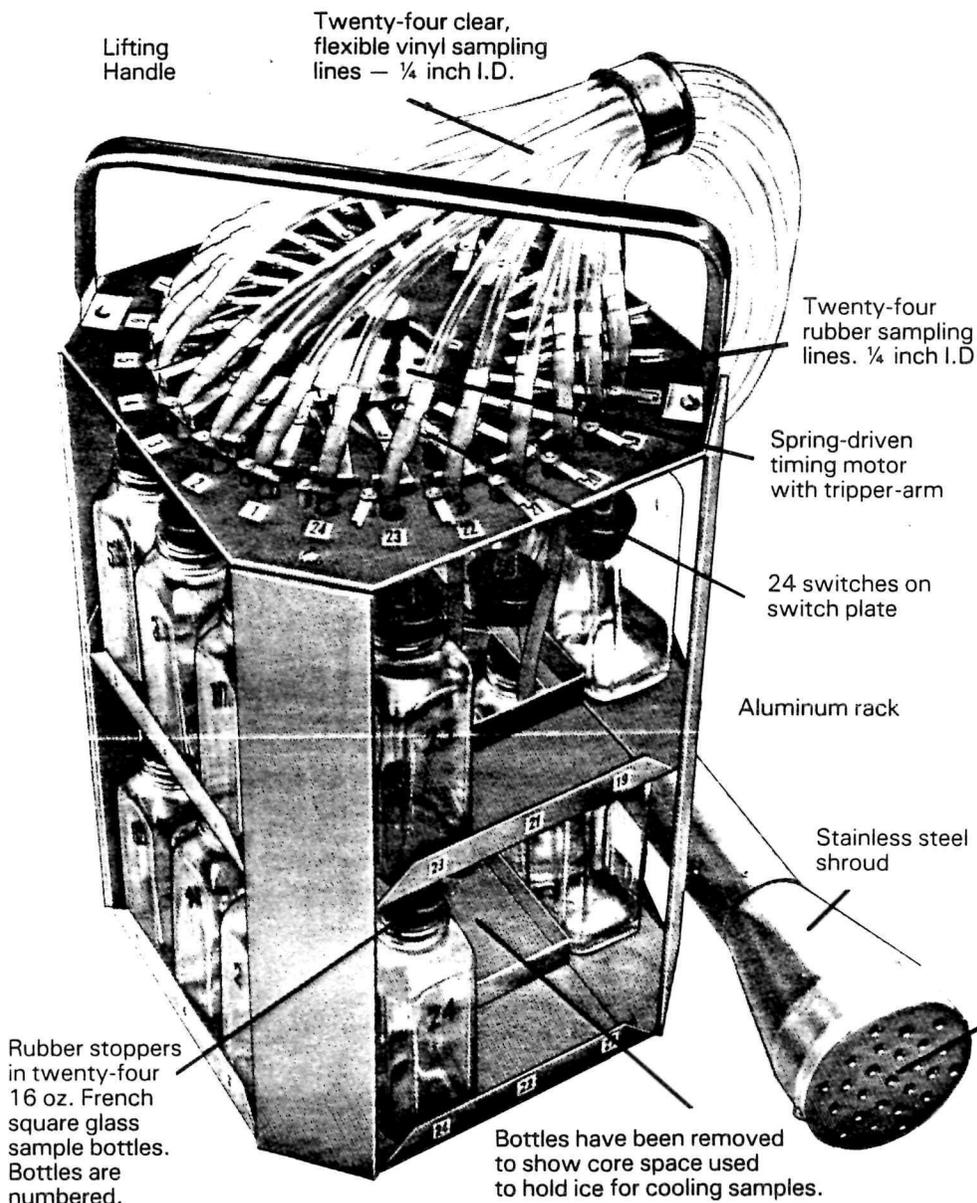
These companies were:

1. Timco Mfg. Co., 851 15th Street, Prairie du Sac, WI 53578
- selling well and groundwater sampling devices.
2. General Oceanics, 1295 N.W. 163rd Street, Miami, FL 33169
- selling 24 bottle samplers designed to lower into lakes or ocean, plus other samplers for oceanographic, shipboard use.
3. Collins Products Co., P.O. Box 382, Livingston, TX 77351
- selling samplers similar to those in this survey report but not portable models, only larger, heavier 110 v, in-place types.
4. L.A. Christopher Co., 167 Adams Street, Denver, CO 80206
- selling a portable field model, well water or groundwater sampler with lawnmower type engine, that will suck sample from 100' below surface.

5. InterOcean Systems, Inc., 3540 AERO Ct., San Diego, CA 92123
 - selling 5 to 24 bottle samplers designed to lower into lakes or ocean, plus other devices for oceanographic work.
6. Hydro Products, P.O. Box 2528, San Diego, CA 92112
 - selling lake or ocean type sampling equipment primarily.
7. Kahl Scientific Instrument, P.O. Box 1166, El Cajon, CA 92022-1166
 - selling lake or ocean type sampling equipment primarily.
8. Grundy Environmental Systems, Inc., 3939 Ruffin Rd., San Diego, CA 92123
 - selling oceanographic instruments mainly.
9. Forestry Suppliers, Inc., 205 W. Pankin Street, P.O. Box 8397, Jackson, MS 39204-9987
 - selling some lake and water samplers (e.g., Surber nets).
10. Williams Instrument Co., Inc., 25217 Rye Canyon Rd., Valencia, CA 91355
 - selling water sample pumps and pump controllers.
11. Fluid Kinetics, Inc., 4859 Factory Dr., Fairfield, OH 45014
 - selling portable water samplers with electric motors.

1984 Supplement

Serco Automatic Sampler



Lifting Handle

Twenty-four clear, flexible vinyl sampling lines — 1/4 inch I.D.

Twenty-four rubber sampling lines. 1/4 inch I.D.

Spring-driven timing motor with tripper-arm

24 switches on switch plate

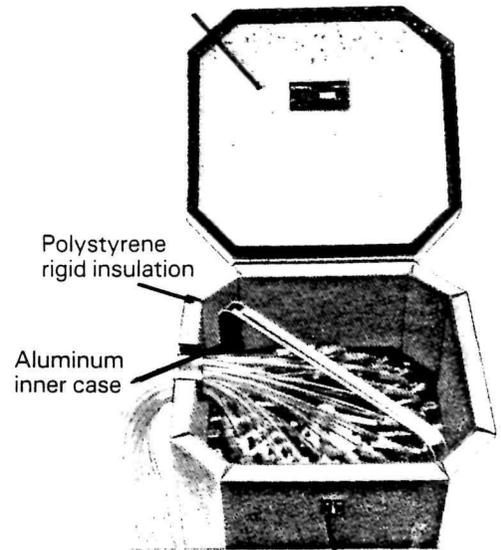
Aluminum rack

Stainless steel shroud

Rubber stoppers in twenty-four 16 oz. French square glass sample bottles. Bottles are numbered.

Bottles have been removed to show core space used to hold ice for cooling samples.

Double-hinged cover



Polystyrene rigid insulation

Aluminum inner case

Stucco aluminum outer case

View of sampler in position for use

Stainless steel sampling head

View of sampler removed from case: Model NW-3

Outstanding Serco Features

- Self contained — No outside source of power — No batteries
- Individual samples taken at pre-set time intervals
- Samples taken through unobstructed passage ways
- Samples stored and cooled immediately in insulated case
- Lightweight — Portable — Simple to operate

Sonford Serco NW-3 sample quality proven

Sonford Samplers have been used for years and give accurate and truly representative samples in sufficient quantity to allow for analysis of samples individually or when composited. Many wastes containing considerable amounts of suspended materials have been sampled using the Sonford Samplers. Suspended solids data for several of the sampled wastes are shown below:

WASTE MATERIAL	SUSPENDED SOLIDS, Mg/l
Domestic	200-300
Meat Packing	3000
Combined Meat Packing and Domestic	1000-1500
Paper Mill (Screened Wood Room Waste) (Kraft Mill Waste)	2000
Activated Sludge Solids	2500-17,000

Detailed analytical data for the above waste water is available on request.

ACCESSORIES

- Additional marked bottles
- Gear heads or clocks to sample at several different intervals ranging from 5 minutes to 8 hours
- Longer sampling lines for higher lifts
- Available with electrically timed actuator (Battery or 115V AC)
- Vacuum pump
- Electric timer (AC or DC current)
- Bottle rack plastic covered steel — holds 24 bottles

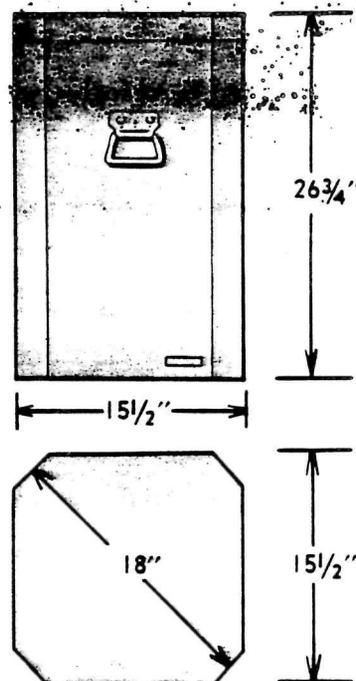
Please feel free to inquire in regard to your special sampling conditions.



SONFORD SAMPLERS

A DIVISION OF COMELEX CORPORATION
905 North 5th Street • Minneapolis, MN 55401
PHONE (612) 332-0362

Specifications Model NW-3*



Sampler complete and ready to use includes:

- Aluminum switch plate with 24 switches and tubing.
- Aluminum outer case with rigid insulation.
- Aluminum carrying rack.
- Spring driven timing motor rotating once each 24 hours.
- Samples taken at hourly intervals.
- Sampling lines outside of case: 8 ft. long.
- Two sets of 24 glass bottles numbered 1-24 with caps.
- One mounted vacuum pump 115/60/1 motor — capable of over 25 inches Hg. Vacuum manifold used for evacuating bottles is furnished.

Sampler Weight: 55 lbs. without samples
Shipping Weight: approximately 100 lbs.

*U.S. Patent No. 3,362,222



As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environment and cultural value of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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