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APPLICATION AND PROCUREMENT
OF
AUTOMATIC WASTEWATER SAMPLERS

By

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FOREWORD

Man and his environment must be protected from the adverse effects of pesticides, radiation, noise and other forms of pollution, and the unwise management of solid waste. Efforts to protect the environment require a focus that recognizes the interplay between the components of our physical environment--air, water, and land. The National Environmental Research Centers provide this multi-disciplinary focus through programs engaged in

- studies on the effects of environmental contaminants on man and the biosphere, and
- a search for ways to prevent contamination and to recycle valuable resources.

This report is part of a continued effort by the Instrumentation Development Branch, Methods Development and Quality Assurance Research Laboratory (MDQARL), NERC-Cincinnati, to investigate instruments and provide information to both users and suppliers. The intention is also to upgrade instrumentation, and to make it possible to choose the most suitable instrument for a particular application.

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ABSTRACT

Application and procurement of automatic sampling devices are discussed. Different sampler characteristics including compositing, proportionality, preservation, lift, and power are described. Manufacturers are listed. Application is discussed with reference to compliance with the National Pollutant Discharge Elimination System permit program, treatment plant control, and other uses. Method of selection and procurement (involving application, familiarization, and purchase) are discussed.

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The author gratefully acknowledges the assistance of R. H. Pohlkamp for his help in preparing the section on procurement of automatic water samplers.

SECTION I

CONCLUSIONS

The National Pollutant Discharge Elimination System (NPDES) permit program has intensified the importance of automatic wastewater samplers. Automatic samplers have been used for years to collect routine samples from sewers, effluents, and streams, and now these samplers will be required to provide even more accurate information; information that is proportioned to time or flow and used for the specific purpose of determining permit compliance or noncompliance.

Many different types of automatic samplers are commercially available, and they employ different methods of compositing, proportioning, preserving, and lifting the sample. Most all sampling requirements can be fulfilled with commercially available units, although most of these units still require improvement in accuracy, dependability, method of preservation, proportioning, and overall design.

Along with automatic sampling for permit compliance, the automatic sampler has application involving treatment plant control, materials balance, specific process waste, storm and combined sewers, instrumentation evaluation, and sewer district surcharges.

Sampler purchase should be preceded by a conscientious review of the application and an awareness of many different types of automatic units available and the situations in which they are used. Questions that arise when purchasing sampling equipment should be resolved by contacting procurement officers or purchasing agents.

SECTION II

RECOMMENDATIONS

Before automatic samplers are used, they should be thoroughly evaluated to determine their performance, including accuracy and precision of timer or flow proportioning, adequacy of preservation, spurious cycles, battery endurance, and other criteria.

The proper method of collecting a representative sample, including intake design, positioning of the intake within the channel, and correct inlet velocity for representative suspended solids, must be researched.

Rather than designing your own unit, commercially available samplers should be purchased if they will fulfill one's needs. Presently, many companies manufacture this equipment; the strong competition encourages continuous incorporation of new ideas and, therefore, samplers for most application are commercially available. For special applications an established manufacturer can put the ideas of both the user and vendor into practice.

A thorough knowledge of the application of and familiarity with samplers should be obtained before purchase. Procurement offices can provide information on and answer questions about purchasing these samplers.

SECTION III

INTRODUCTION

The Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) sets a national goal to eliminate pollutants discharged into navigable waters by 1985.[1] This law requires industries to use the "best practicable" technology to control water pollution by July 1, 1977, and the "best available" technology by July 1, 1983. Publicly owned waste treatment plants are required to provide a minimum of "secondary treatment" by July 1, 1977, and to apply the "best practicable" technology by July 1, 1983.

The U.S. Environmental Protection Agency (EPA) is required to establish national effluent limitations and national performance standards for sources of water pollution. Effluent limits may allow some or no discharge at all depending on the specific pollutant to be controlled.

The NPDES[2] permit is the mechanism for ensuring that effluent limits are met. This permit regulates what and how much may be discharged; the permittee is committed to reduce or eliminate his discharge in an orderly fashion, in specified steps, at specified times. The permit contains a compliance schedule; without waiting for final compliance, each step is legally enforceable and clear limits are put on discharges while the polluter is moving toward compliance.

A waste monitoring program is necessary to assure the regulatory agencies that the effluent requirements are met and that the implementation schedule set forth in the permit is being maintained.[3] Monitoring is also required to control in-plant operations so that violations of permit specifications can be prevented. Under the permit system, the burden of monitoring a waste stream is placed upon the party creating the discharge. Regulatory agencies will monitor only as a check upon the accuracy of the results of the discharger. The discharger must collect effluent samples for analyses of the specific parameters listed in the permit. Reports including these data are required periodically by the Federal or state agency that issued the permit. Hence, the need for automatic sampling devices is readily apparent. Automatic equipment, when properly installed, will accurately and precisely take waste samples in proportion to time or flow, preserve the sample, and save the use of manpower.

SECTION IV

METHODS OF SAMPLING

BASIC SAMPLER TYPES

Samples may be taken in the following ways:

1. Grab
2. Simple composite
   a. continued
   b. sequenced
3. Discrete composite
   a. single aliquot per sample
   b. multiple aliquot per sample
   c. multiple samples per aliquot
4. Continuous monitoring

These basic methods of sampling can all be proportioned to either time or flow. The basic method is discussed here, and proportionality is discussed later.

A single grab sample is sufficient to characterize waste for a period of time through which the concentration and flow rate were essentially constant. A new grab sample is required if the concentration or flow rate changes. Possibly, the concentration will change and not flow, but this is unlikely.

A simple composite sample is collected into a single container over a known period of time. The sample can be composited continuously with a low-flow-rate pump or a dipper mechanism, or it can consist of aliquots periodically pumped into the container.

The discrete composite sampler contains a number of bottles that are filled sequentially. These samplers can be programmed to take single aliquots per bottle, multiple aliquots per bottle, or multiple bottles per aliquot. Depending on the manufacturer, one, two, or all three of these methods of filling are included on the same sampler. The ability to deliver the same aliquot to more than one bottle is necessary if different preservatives are required. Discrete bottle samplers are used to detect changes in waste concentrations at specific times during the sampling period, and portions of the discrete samples can still be composited into a single sample if desired.

Continuous monitors may be needed to obtain information that is required on specific parameters for treatment plant control. Toxic substances from an industrial effluent may also require continuous monitoring so they can be diverted before entering a treatment plant, where they could upset the process, or before entering a receiving stream, where they could cause a fish kill or impair human health. Continuous monitors are beyond the scope of this report, but one should be aware of their availability for situations were instant, on-line data are required. Mentink[4,5,6] gives details on continuous monitors and functional components such as telemetering and computerization.

PROPORTIONALITY

The above sampler types can collect samples proportional to time or flow. Time proportionality consists of an accurate and precise timer that initiates a sampling cycle at preset intervals. Timers can be powered by electricity, pressure, or a spring. Electrically-powered timers are probably the most accurate. Another method of time proportioning a sample is to use a constant speed, low-flow-rate metering pump.

Collecting the sample proportional to flow is more difficult. One time-consuming method is taking grab samples at definite intervals and using the record of plant flow to make a flow-proportioned composite. Samples from an automatic discrete sampler can also be manually composited proportional to flow. In all modern waste treatment plants, flow should be measured and recorded; a signal from this existing flow-measuring equipment can be used to make the simple composite and discrete samplers automatically proportional to flow. Some sampler manufacturers also supply their own flow-proportioning equipment. This equipment consists of a device for measuring water level (usually a float, bubbler, dipper, or electrode) above the crest of a weir or flume. This head signal is processed electrically or electromechanically to supply a flow-proportional contact closure. Some flow-proportional samplers are also programmed to apply Manning's equation for open channel flow; here the characteristic channel dimensions, slope, and roughness must be known, but a weir or flume is not required.

Flow-proportioned samples can be taken in one of these four ways:

1. $T_{CS}V_V$ (continuous sample, volume varying) - sampling pump flow rate proportional to stream flow.

2. T_cV_v (time constant, volume varying) - sample volume proportional to instantaneous flow rate.
3. T_cV_v (time constant, volume varying) - sample volume proportional to flow since last sample.
4. T_vV_c (time varied, volume constant) - time between samples is proportional to flow.

The sample obtained with Method (1) gives a sample that is most representative of the stream. In most instances, however, this method is not practical because the sample flow rate should always be high enough to give accurate suspended solids results and such a flow rate would require an excessively large sample volume. Accurate electronic control of this system is also complicated and expensive. Methods (2), (3), and (4) are most commonly used, and all three have an inherent error, which has been illustrated by Shelley[7] in specific examples. The error, however, is not as great as that obtained by a simple composite sample that is proportional to time.

PRESERVATION

Methods[8] for sample preservation, such as cooling or chemical addition, or both, should be incorporated when automatic samplers are used. Some samplers include refrigeration and others have sample compartments that can be iced. It was mentioned earlier in this report that some discrete samplers fill more than one bottle with the same aliquot, allowing the addition of different chemical preservatives to these bottles. Biochemical oxygen demand (BOD), an important parameter for biological treatment plants, changes rapidly after the sample is taken. The maximum holding period for BOD samples is 6 hours at 4C[8]; this indicates that four consecutive BOD samples made up of 6-hour flow-proportioned composites, which were iced at approximately 4C, could be used to estimate plant effluent over a 24-hour period. The acceptance of chemical oxygen demand (COD) or total organic carbon (TOC) results in lieu of BOD was proclaimed in the Federal Register[9] for situations where long-term BOD:COD or BOD:TOC correlation have been demonstrated. COD and TOC can be preserved for longer periods than BOD when the appropriate preservatives are used and, therefore, are more conducive to automatic sample takers.

The sanitary engineer should always discuss his sampling program with the chemistry laboratory personnel responsible for sample analysis before the study begins. This will result in data that are more accurate and in fewer scrapped samples. For example, hydrolyzable phosphorus is preserved by cooling and H_2SO_4. Orthophosphate requires only cooling; the addition of H_2SO_4 would scrap this sample. The chemistry staff also has an idea of the buffering capacity of the waste and can tell the engineer the quantity of H_2SO_4 required to preserve certain samples. Good relations and teamwork are required between all disciplines (biology, chemistry, and engineering) to get the best results.

TYPE OF LIFT

The following methods are used to force a water sample from the source to the sampler: gas pressure, gravity, pump, scoop, and flow proportional scoop (Trebler).

The basic gas-pressure type of sampler consists of a small chamber and check valve, which are located within the waste stream. Two lines connect this chamber to the main sampler where the sample container, a small cylinder of freon or nitrogen, and the controls (including a pressure regulator, timer, and valves) are housed. The entire unit, including the timer, is powered from the gas cylinder. Gravitational forces unseat the check valve when the chamber is vented, and a water sample enters. Valves, activated by the timer, allow gas pressure to enter through one line and force the water sample up the other line into the sample container. With this type of sampler, the chamber fills immediately after the sample was taken and the sample is not forced into the sample container until the timer initiates a new cycle. Samplers of this type are useful when a simple composite sample is required from a field location with no electric power.

One type of gravity system consists of a container with two openings placed under the surface of the waste stream. One opening is the sample inlet, and the other is attached to a line and needle valve. The sample enters the container at a rate proportional to the air leaving through the needle valve. Various types of siphoning mechanisms are also classified as gravity systems. Gravity systems clog readily because of lack of power, and the samples are not accurately proportioned to time or flow. More representative samples can be obtained from samplers that are powered from sources other than gravity and that have been purchased from reputable manufacturers.

Most samplers use a pump to force the water from the waste stream to the sampler. Pumps are either mounted within the waste stream (submersible) or within the sampler. Submersible pumps obstruct the flow, catch debris, and may become clogged; however, they have the advantage of supplying sample under positive pressure, can overcome greater lifts, and cannot lose prime or suck in nonrepresentative material from the atmosphere. Pumps located within the sampler, operate under negative lift and cannot draw water through a vertical distance of more than one atmosphere (about 34 feet at sea level). From a practical standpoint, it is best to locate the pump as close to the water as possible, and a good rule of thumb is not to exceed half an atmosphere of vertical lift (about 17 feet). Sampler-mounted pumps are handy, and they usually present no problems. It is easier to mount an intake within a waste stream than a pump, which is large and also contains electrical leads. Sampler-mounted pumps are usually positive displacement and of one of the following types: peristaltic, piston, impeller, or diaphragm.

The peristaltic pump can be either rotary or reciprocating; it merely squeezes the flexible tubing and the sample does not come in contact with pump components, which could cause contamination. Piston pumps are usually of the small, syringe type that supply sample continuously at a low rate. Flexible, neoprene, impeller pumps usually supply a continuous flow at a high rate; periodically a timer-activated valve opens and a portion of the sample enters a container. Diaphragm pumps (paced by a timer or flowmeter) periodically create a vacuum on the sample container; water is sucked into the container but does not pass through the pump.

The lifting mechanism can also consist of a number of scoops or buckets mounted on a belt or chain. Periodically these buckets automatically dip samples from the waste stream.

The Trebler sampler is a scoop with characteristic dimensions such that it delivers a sample proportional to flow when mounted upstream from a weir or flume.

Illustrations of different lifting mechanisms are given in the Handbook for Monitoring Industrial Wastewater.[10]

POWER REQUIREMENTS

Samplers are powered by gravity, pressure, or electricity (115

VAC or battery). Pressure and electrically operated units are more accurate and reliable than are gravity flow samplers. My experience has been that electrically powered timers are more accurate than those that are powered by gas pressure. Pressure or battery powered units are almost a necessity for remote field locations. Many electrical units operate from 12 VDC, which can be supplied from a 115 VAC/12 VDC converter or a 12 volt battery. The converter is also used to charge the battery. Some sampler manufacturers supply 12 volt nickel-cadmium rechargeable batteries that are light in weight and dependable. When battery powered samplers are used, an extra converter and battery should be purchased so that one fully charged battery is always ready for field use.

MANUFACTURER

There are many sampler manufacturers. Shelley[7] describes most of the samplers made in the United States, and Wood[11] reported on the results of a survey on English samplers. At present, the art of sampling is changing so fast that no attempt is made here to describe all the samplers. Current information can be requested from the list of manufacturers that follows. (And I apologize to any company that was inadvertently omitted.)

BIF Sanitrol
P.O. Box 4
Largo, Florida 33540
(813) 584-2157

Brailsford and Company, Inc.
Milton Road
Rye, New York 10580
(914) 967-1820

Brandywine Valley Sales Company
P.O. Box 243
Honey Brook, Pennsylvania 19344
(215) 273-2841

Bristol Engineering Company
204 S. Bridge Street
Box 696
Yorkville, Illinois 60560
(312) 553-7161

Chandler Development Company
1031 E. Duane Avenue
Sunnyville, California 94086
(408) 738-1060

Environmental Equipment Division, FMC Corporation
1800 FMC Drive
Itasca, Illinois 60143
(312) 893-1800

ETS Products
12161 Lackland Road
St. Louis, Missouri 63141
(314) 878-1703

Fluid Kinetics Inc.
3120 Production Drive
Fairfield, Ohio 45014
(513) 874-5120

Horizon Ecology Company
7435 North Oak Park Avenue
Chicago, Illinois 60648
(312) 647-7644

Hydragard Automatic Samplers
850 Kees Street
Lebanon, Oregon 97355
(503) 258-2628

Hydra-Numatic Sales Company
65 Hudson Street
Hackensack, New Jersey 07602
(201) 489-4191

Instrumentation Specialties Company, Inc.
P.O. Box 5347
Lincoln, Nebraska 68524
(402) 799-2441

Lakeside Equipment Corporation
1022 E. Devon Avenue
Bartlett, Illinois 60103
(312) 837-5640

Manning Environmental Corporation
120 DuBois Street
Box 1356
Santa Cruz, California 95061
(408) 427-0230

Markland Specialty Engineering, Ltd.
Box 145
Etobicoke, Ontario, Canada
(416) 625-0930

N-Con Systems Company, Inc.
Clean Waters Building
New Rochelle, New York 10801
(914) 235-1020

NP Enterprises Inc.
P.O. Box 69
Lewiston, New York 14092
(716) 754-4828

Phipps and Bird, Inc.
Sixth and Byrd Streets
P.O. Box 2-V
Richmond, Virginia 23205
(804) 644-5401

ProTech Inc.
Roberts Lane
Malvern, Pennsylvania 19355
(215) 644-3854

Quality Control Equipment Company
P.O. Box 2706
Des Moines, Iowa 50315
(515) 285-3091

Sigmamotor, Inc.
14 Elizabeth Street
Middleport, New York 14105
(716) 735-3616

SIRCO Controls Company
8815 Selkirk Street
Vancouver
British Columbia, Canada
261-9321

Sonford Products Corporation
100 E. Broadway, Box B
St. Paul Park, Minnesota 55071
(612) 459-6065

Testing Machines, Inc.
400 Bayview Avenue
Amityville, New York 11701
(516) 842-5400

TRI-AID Sciences Inc.
161 Norris Drive
Rochester, New York 14610
(716) 461-1660

SPECIAL SAMPLERS

Many samplers have been designed for special purposes, and the results of using some of these devices have been reported.[7,11-18] Earlier, I suggested that purchasing a commercially available sampler is economically more feasible than developing an in-house design. Special application, however, may require custom equipment. First, find out what is available, read reports, request brochures. Then, contact an established manufacturer to build the individually designed equipment. The result will be a better sampler.

SECTION V

SAMPLER APPLICATION

PERMIT PROGRAM COMPLIANCE

Under the NPDES permit program, dischargers are required to monitor and report the amount and nature of all waste components. Therefore, factories, power plants, sewage treatment plants, and animal feedlots must sample their waste for permit compliance. The type of sample required to fulfill permit obligations can be determined from the permit. A grab sample might be satisfactory; a 24-hour composite could be required; and in some cases such as for toxic substances continuous monitoring might be necessary. An example of effluent limitations from an industrial waste is given in the following table which was taken from reference 2.

FINAL EFFLUENT LIMITATIONS

	Discharge Limitation[1] kg/day (lbs/day)		Other Limitations		Monitoring Requirements	
Effluent Characteristic	Daily Average	Daily Maximum	(Specify Units) Average	Maximum	Frequency Measurement	Sample Type
Flow					DAILY ESTIMATE	
Total Susp. Solids	4.4 (9.5)	6.5 (14.3)			Weekly	24-hr. Composite
Chromium, Total	.06 (.14)	.09 (.21)			Weekly	24-hr. Composite
Copper, Total	.06 (.12)	.09 (.18)			Weekly	24-hr. Composite
Iron, Total	.27 (.6)	.41 (.9)			Monthly	24-hr. Composite
Nickel, Total	.11 (.24)	.17 (.36)			Weekly	24-hr. Composite
Oil & Grease	3.2 (7.1)	4.8 (10.7)			Weekly	6 Grabs/24 hrs.
Chloride					Monthly	24-hr. Composite
Sulfate					Monthly	24-hr. Composite
Sulfide					Monthly	24-hr. Composite

[1] Net additions to intake

The monitoring requirements given in the table are six grab samples per 24 hours for oil and grease and monthly and weekly 24-hour composite samples for the other effluent characteristics. Discharge limits are given in pounds per day, and therefore, the samples must be proportioned to flow. Existing methods of compositing a flow-proportional sample have an inherent error;[7] however, present samplers that perform within specifications may be used. The reading in parts per million from these composites times the daily flow times the corresponding specific weight divided by 10^6 will give sufficiently accurate results at this time. The parameters listed in the table require four different preservatives[8]: nitric acid for chromium, copper, iron, and nickel; sulfuric acid plus cooling for oil and grease; cooling for sulfate;

and zinc acetate for sulfide. Therefore, four different composite samples are required to allow for the four different preservatives.

Because the EPA and the state water pollution control agencies can also sample a permittee's effluent, they also require automatic wastewater samplers. PL 92-500 requires all U.S. Government agencies to comply with Federal, state, interstate, and local water pollution control laws and regulations, just as any nongovernment source must comply. Therefore, automatic samplers are used by Federal agencies in monitoring their own effluent.

There are also instances where an industry passes on its effluent to the local municipal plant for treatment. Automatic samplers along with flow records are required here to determine the surcharge due to the local sewer district. If the effluent is toxic, continuous monitoring may be required. The effluent might have to be diverted to keep a local plant using a biological treatment process from being upset.

TREATMENT PLANT CONTROL

Automatic wastewater samplers are useful for treatment plant control and for determining plant efficiency. Discharge permits may also require data showing overall treatment plant efficiency. Samplers are also useful to determine efficiencies across specific parts of the treatment plant, such as the primary clarifier and the activated sludge process, or across specific chemical treatment processes. Samplers can be used initially to point out locations within the treatment plant where continuous monitoring for control or identification of toxic materials is required.

SPECIAL APPLICATIONS

A very beneficial use of automatic wastewater samplers is collecting waste samples after specific processes within an industrial plant to point out a process wherein raw materials are being wasted. The use of wastewater samplers to run a materials balance for an entire plant many times will result in both reducing pollution and saving raw materials and their costs. In many cases, the use of raw materials may be reduced at specific processes or they may be salvaged from the final effluent for recycling.

Automatic samplers also aid in evaluating continuous monitors (single or multiparameter). O'Herron[19] evaluated a cyanide monitor in which an ISCO[20] sampler was used to collect some of the comparison samples.

Automatic water samplers can be used in combined storm/sanitary sewers and within waste bypass sewers. In these situations, the sampler can be programmed to turn on during the storm or overload period.

SECTION VI

PROCUREMENT OF AUTOMATIC WATER SAMPLERS

Understanding the intricacies of the procurement process is helpful because, if satisfactory samplers specific for application are to be obtained, the user must become involved along with the Procurement Officer. In the paragraphs that follow, R. H. Pohlkamp (Director, Contracts Management Division, NERC-Cincinnati, USEPA, Cincinnati, Ohio) discusses several regulations and considerations governing procurement procedures and practices applicable to the USEPA.

METHODS OF PROCUREMENT

Only contracting officers are delegated authority to enter into contracts for equipment, supplies, and services on behalf of the Government. Before any contract is entered into, modified, or terminated, all required reviews, clearances, or approvals must be obtained, and all requirements of the applicable Federal Procurement Regulations must be met.

The Federal Procurement Regulations require that all purchases and contracts shall be made by Formally Advertising Invitation for Bids (IFB) that contain adequate specifications and conditions and that allow sufficient bidding time before being opened to permit full and free competition consistent with the needs of the Government and the type of item being procured.

Exceptions to the IFB requirement exist but only under well-defined circumstances where the use of IFB is not feasible and not practicable.

Four examples of exceptions that may apply to the purchase of Automatic Water Samplers are:

1. The aggregate amount of the purchase does not exceed $2500.00.
2. The equipment can be obtained from only one manufacturer (sole source of supply).
3. Competition is precluded because of the existence of patent rights, secret processes, or control of basic raw material.
4. When it is impossible to draft, for an IFB, adequate specifications or any other adequately

detailed description of the required equipment.

Such exceptions become the authority to procure by negotiation and utilize the Request for Proposal (RFP) mechanism. Following are excerpts from the "EPA Guide for Contract Project Officers" inserted here for the purpose of distinguishing between the IFB and the RFP mechanism.

"Many people consider the word 'advertised' to be synonymous with 'competition' and the word 'negotiation' to be synonymous with 'sole source'. This is not the case and often causes much confusion for the Project Officer and eventually the Contracting Officer. The basic criteria for an advertised (IFB) contract situation are as follows:

1) It is possible to define adequately the contract requirements to the extent that qualified bidders can provide fixed price bids on an equal technical basis for like equipment.
2) The Contracting Officer is willing to make a contract award to the lowest responsive bidder without a need for a technical evaluation and without discussion with the bidders.
3) It is reasonable to believe that more than one source can provide a bid on the equipment requirement.

"In contrast, the basic criteria for negotiated situation are as follows:

1) It is not possible to adequately define contract specifications to the extent that the Government would be satisfied by awarding the contract to the lowest offeror based on price competition alone.
2) The Contracting Officer determines that another form of evaluation is required.
3) If after a market survey of existing scientific equipment, it is determined by the Contracting Officer that there is only one source who can meet the requirements of the proposed contract.

"According to existing laws, regulations, and good business practice the Contracting Officer must first consider the element of competition in a negotiated contracts situation. If the RFP method is determined to be more appropriate than the IFB method, this is not justification in itself for sole source contracting. In both IFB and RFP situations, competition is the first consideration."

All requests for purchase shall be initiated on EPA Form 1900-8 Procurement Request/Requisition, and be accompanied by specifications that adequately and accurately describe the requirement. To the extent possible, specifications for use in formal advertising should be performance specifications setting forth the minimum requirement of the Government. The specification must be complete and specific but designed to enable the widest competition by qualified bidders.

(Author's note: EPA has continually employed the philosophy of widest competition in water quality monitor procurement with its own specifications[4] and has provided similar opinions to other agencies such as California State Water Pollution Control Board[21] and discussions provided to the NERC-Cincinnati Training Center have also given consideration to specification formulation.[22] Including details peculiar to one brand or make of equipment and not critical to the need to be met results in unnecessary restrictions of competition and is to be avoided.)

Where it is impossible, impracticable, or uneconomical to prepare performance specifications or where design specifications, if prepared, would unduly restrict competition, a "Brand Name or Equal" purchase description may be used. Under this technique, one or more brand name(s) (and model number) of acceptable equipment together with a listing of its <u>salient</u> characteristics is used in lieu of a specification. The requirements are advertised and IFB's sent to all interested bidders. Bids offering the referenced brand name or other equipment purporting to be equal to the brand name and having the salient characteristics listed in the IFB will be considered for award. A technical evaluation of all equipment offered will be performed by the requisitioner or other technical personnel based on the manufacture's descriptive literature submitted with his bid. Award will be made to the lowest bidder offering a product that is determined to be equal in all material respects of the brand name product and in the <u>salient</u> characteristics referenced in the IFB.

SAMPLER SELECTION

Three steps should be followed in purchasing automatic sampling equipment:

1. know the application
2. become familiar with automatic wastewater samplers
3. pick sampler and purchase equipment.

Initially, the user must know the exact application for the sampling equipment that he is going to purchase. It was mentioned earlier in this report that automatic samplers may be required for permit compliance, treatment plant control, and various other applications. When picking a sampler for a specific application the following must be considered: power requirements, flow or time proportioning, single composite or multiple discrete samples, multiplexing, lift, preservatives, cooling, portable or stationary, weight and dimensions, and will the unit collect a representative suspended solids sample for the specific application.

If the user is not already familiar with automatic wastewater samplers, he should become familiar with them. He may do this by contacting agencies that are presently using samplers; they are usually more than willing to show off their equipment. Some of these agencies are:

1. EPA Regional Surveillance and Analysis Divisions located in each of the 10 regions.
2. State and local environmental protection agencies.
3. EPA, National Field Investigation Centers in Denver, Colorado, and Cincinnati, Ohio.
4. EPA, Methods Development and Quality Assurance Research Laboratory in Cincinnati, Ohio.

Finally, pick a sampler to satisfy your needs. Contact manufacturers and study the brochures describing their samplers, including the prices. Shelley's report[7] is a handy guide to sampler selection, the U.S. Army[23] has initiated an evaluation of water samplers, and EPA[20,24,25] can supply sampler information. After obtaining this information and reviewing it conscientiously, one can rationally select the proper sampler. If questions or problems arise in purchasing the needed equipment, consult your Procurement Officer.

SECTION VII

DISCUSSION

The NPDES permit, which evolved from (PL 92-500) is the mechanism for ensuring that effluent limits are met; it requires dischargers to analyze effluent samples for specific parameters listed in the permit. These data will be used to determine permit compliance and this raises the level of importance of the automatic wastewater sampler and illustrates the necessity for sampling equipment that is both accurate and precise. Data obtained must be representative of the effluent, and their accuracy can be no better than that of the equipment used to collect the sample.

Many different manufacturers produce various types of wastewater samplers. When a sampler is purchased to collect samples for permit compliance, the type of sampler selected should be based on the data requirements of the permit. If the effluent limitation is listed in pounds/day, then the sample must be proportioned to flow and the equipment must be able to collect samples that are proportional to flow. Most methods of collecting a flow-proportional sample have inherent error because they sample periodically and only the time between samples is flow proportional or the size of the aliquot is flow proportional. A continuous sampling pump with a flow rate that varies in proportion to wastewater flow rate would give a sample that is truly proportional, but this type of sampler presents functional and design difficulties.

Continuous monitors should be installed where instant data are required, such as detecting toxic substances or detecting parameter limits that mandate immediate changes in plant control.

Preservation requiring cooling and chemical addition is necessary for many parameters and this must be considered when purchasing a sampler.

Power requirements, whether they be gravity, pressure, battery, or utility company, must be considered before purchase.

Collecting a representative sample involves intake design, placement within the channel, and velocity; these items need to be considered before purchasing. Additional research is also required to determine the best method for collecting a sample that is representative of the waste stream for all parameters including suspended solids.

Although purchasing a sampler may require written specifications, the mechanics of the purchase should not become involved if one is aware of procurement methods and consults his procurement officer when advice is required.

SECTION VIII

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16. ABSTRACT

Application and procurement of automatic sampling devices are discussed. Different sampler characteristics including compositing, proportionality, preservation, lift, and power are described. Manufacturers are listed. Application is discussed with reference to compliance with the National Pollutant Discharge Elimination System permit program, treatment plant control, and other uses. Method of selection and procurement (involving application, familiarization, and purchase) are discussed.

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