VALVE NEWS & VIEWS

Fetterolf Corporation • P.O. Box 103 • Skippack, PA 19474 • (215) 584-1500 • FAX: (215) 584-5904

Vol. VIII No. 13

New From Fetterolf

by Peter P. Van Blarcom
Vice-President, Fetterolf

Chemical Sampling Systems

A Complete Guide To Sampling Systems

Some Things To Think About

"The way to change the world is to change your attitude towards it...not just once but all the time."
—Merrit Malloy

"Success is to be measured, not so much by the position one has reached in life, as by the obstacles that one has overcome while trying to succeed."
—Booker T. Washimngton

"Problems are not stop signs, they are guidelines."
—Robert Schuller

"The basic need of every company is to make a profit. Only then can it provide jobs and earnings for employees."
—I.W. Abel, former President, United Steel Workers

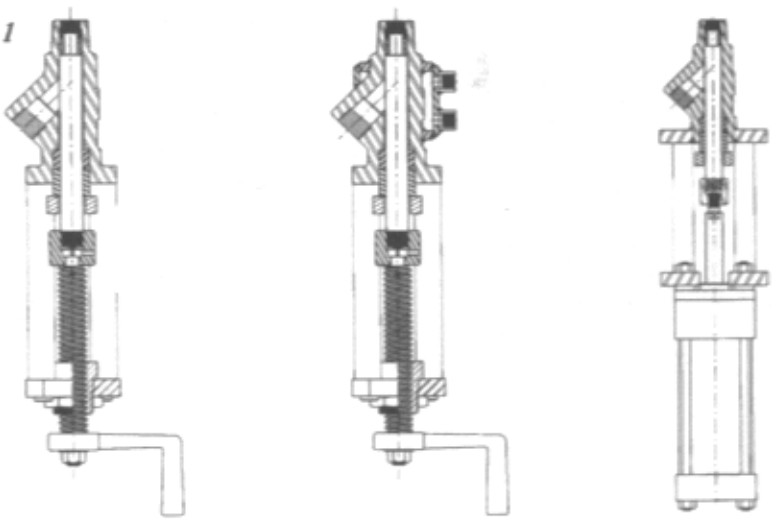
Product sampling systems for the chemical and hydrocarbon processing industries may be very simple or extremely complex, depending on many factors which should be considered:

1) Product characteristics: Toxicity, viscosity, flammability Corrosiveness, solids content Explosiveness
2) System pressure and temperature
3) Sample quantity
4) Sampling frequency
5) Materials of construction for product compatibility
6) Sampling location and valve-mounting method
7) Flushing systems required
8) Sample containment
9) EPA regulations
10) Company or plant safety regulations

The valve shown in Figure 1 is the standard of the chemical industry when it comes to sampling. It incorporates the Ram-Seal design in which the plunger fills the body cavity, and the end of the plunger is flush with the interior of the vessel or pipeline wall. The plunger is pulled downward on opening, allowing the sample to drain from the threaded outlet connection. On closing, any product residue in the body is pushed back into the tank or pipeline so that it will not contaminate the next sample.

Continued on page 2

Figure 1



Continued from page 1

Chemical Sampling Systems

This type valve provides absolute zero leakage in both vacuum and high pressure (5000 PSI) service. Standard metallurgy is 316 stainless steel but other alloys, titanium, nickel, alloy 20, Hastelloy®, Inconel, etc., are all available as well as pneumatic, electric, and hydraulic actuation.

Installation is simple and inexpensive using a half-coupling contoured to line size or tank contour. Mounting tees are also used for small line sizes. Extended plungers or extended bodies may be used for special installation requirements. As shown, this basic sampling valve may be supplied with an integral welded jacket to assure no sample solidification on cooling. This same valve is sometimes used to drain small reactors.

Figure 2 shows the same general type of sampling valve but flanged with a ninety degree sample outlet connection plus a special sample bottle adapter with bottle threads to match customer requirements. The adapter also has two

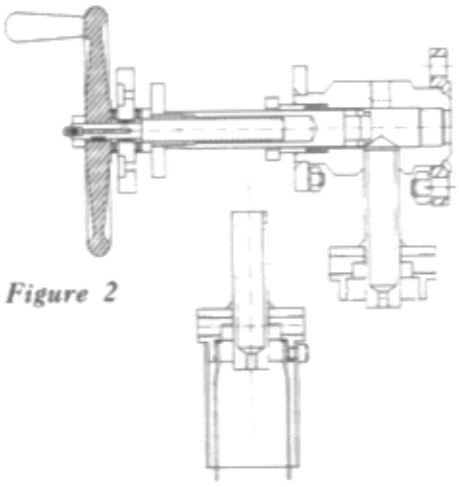
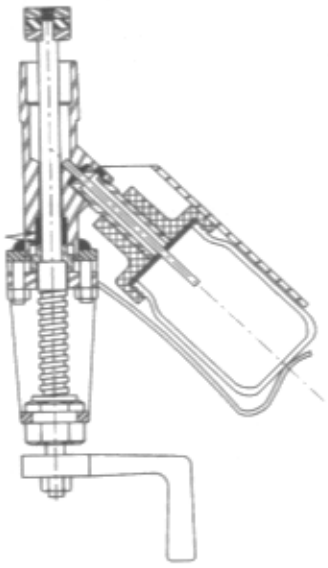


Figure 2

tapped vent holes to allow air to escape as the bottle fills. A small orifice in the adapter serves to limit sample flow velocity and to break down sample pressure when sampling a higher pressure system. Also shown is a flushing connection (optional) for flushing valve internals with liquid or nitrogen after the sample is drawn and the valve is closed. Valves of this type are also available with threaded end connections, 45 degree sample outlets.

Figure 3 shows another type of sampling valve and a special sample bottle which threads onto a short stub on the valve. The bottle also has a special Lexan® shield. In this design,

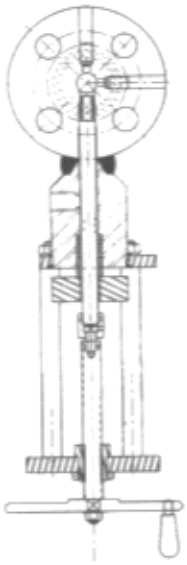
Figure 3



the valve plug rises into the pipeline or vessel to break through a film or crust which might bridge over the valve inlet, thus preventing or limiting sample flow.

Figure 4 shows a sampling valve welded into an interflange adapter (clamped between two flanges). When

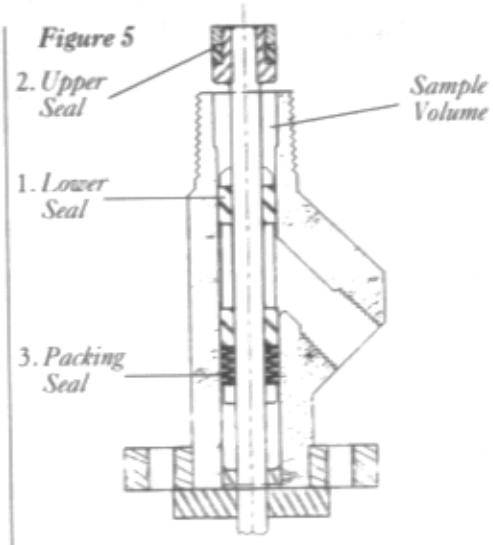
Figure 4



the valve is opened, the plunger uncovers the ninety degree outlet and the sample is withdrawn. The interflange adapter has two additional tapped connections, one for a pressure connection, the other for a temperature reading.

Sampling from a system operating under vacuum may be accomplished using a valve shown in Figure 5. The plunger rises into the area to be sampled as shown. The fluid will flow into the sample area by gravity and is

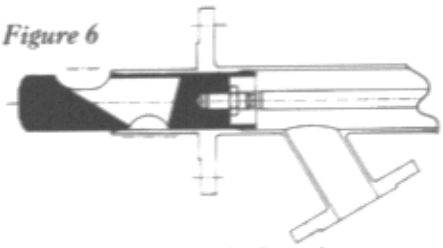
Figure 5



prevented from exiting by seal 1 which also prevents air entry into the system. As the plunger is moved downward, both seal 1 and seal 2 move as a unit. The sample is trapped in the area between seals 1 and 2, seal 2 closing off the valve inlet before seal 2 clears the outlet. Spring-loaded seal 3 prevents leakage to the atmosphere.

Solids (powder) sampling can be done using the special valve in Figure 6. As shown, the valve is in the sampling position. The powder sample fills

Figure 6



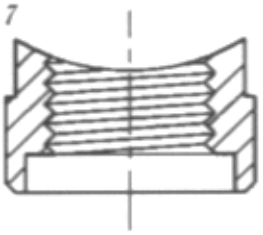
Dry Powder Sampler

the open area in the scoop-type plunger. As the plunger is withdrawn, the contained sample in the plunger will fall from the outlet port by gravity. Sizing of the open plunger area can control the size of the sample withdrawn. The valve can be equipped with an automatic timer to provide a statistically correct report on a production run.

Additional considerations should include valves for systems of category "M" service, lethal gas, and fire-safe valve designs. Spring-loaded packing, flushing ports, and lantern ring packing arrangements are available. Likewise, bellow-sealed designs, though expensive, may be used to positively assure no atmospheric leakage along the valve stem.

Sampling valves located on pipelines most frequently utilize a stepped half-coupling shown in Figure 7. The coupling is contoured to match

Figure 7



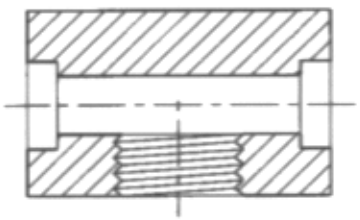
Contoured half-coupling sizes 2" and up. Specify pipe size and schedule.

the ID of the pipeline and the step in the coupling OD assures proper coupling insertion in the pipe for welding. The end of the sampling valve body and plunger will be flush with the pipeline ID when wrenched tight.

If threaded connections are not permitted, it is best to allow the valve supplier to weld the valve into the half-coupling to assure no distortion of the valve seating area during welding. Be sure to specify valve branch (outlet) orientation—parallel or perpendicular to the run direction of the pipeline to be sampled. Also be sure to specify the pipe size and schedule of the line for proper half-coupling fit up.

Sampling from pipelines 2" and less, a tee, supplied by the valve manufacturer (Figure 8), may be used.

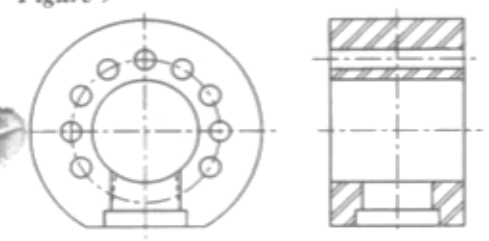
Figure 8



Tee
Sizes to 2"

The valve supplier will weld the valve and tee together if so desired. A special tee-type fitting is frequently used for sampling from small jacketed piping as shown in Figure 9. The center bore matches the ID of the core pipe while

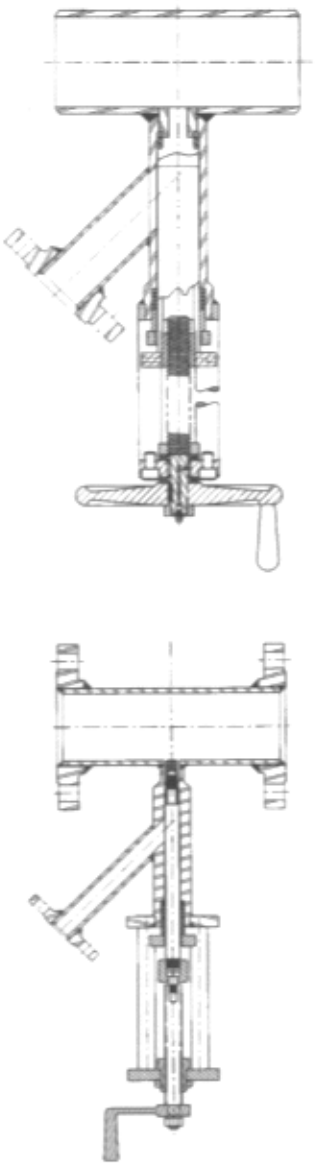
Figure 9



the fitting OD matches the ID of the jacket piping. The small holes allow for passage of the heat transfer fluid (hot oil, steam, hot water, vapor, etc.). Once again core and jacket pipe sizes, schedules, and materials must be specified.

Piping assemblies are very popular as shown in Figure 10, wherein the valve manufacturer welds the sampling valve into the process piping, be it jacketed or unjacketed. These assemblies may have flanged or welded ends

Figure 10

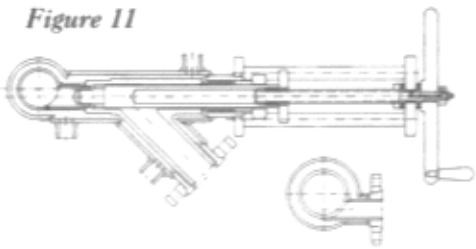


and may be provided with jacket connections as required. Again, orientation of the valve outlet (sample connection) must be specified—perpendicular or parallel to the run of the process piping. The welded valve eliminates one major connection point—and a source of leakage.

Flanged end assemblies cut down on the number of field welds and are particularly useful when noble metals like titanium are used to reduce the number of field welds required, thus reducing costs.

Should vertical space under the process pipeline be limited, an offset horizontal valve may be used in a factory fabricated, jacketed assembly as shown in Figure 11. The valve plunger is contoured tangentially to the bottom of the pipeline for ease in sampling and complete line draining. An additional

Figure 11

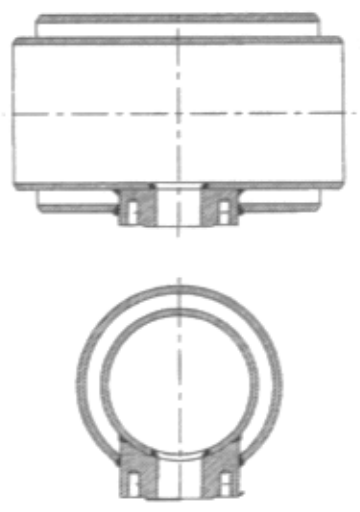


advantage of this design lies in the fact that any leakage which might occur through the packing falls on the ground (floor), not collecting on the valve handwheel, possibly endangering the operator.

Sampling connections may be varied to satisfy the installation. They may be 45 degrees or 90 degrees or any angle required and may be threaded, socket welded, flanged, quick-disconnect coupling, or special threads to match sample bottle connections. Special lengths of sampling connections may also be provided.

Flanged sampling valves are occasionally specified. In this case, contoured flange pads may be provided as shown in Figure 12, either loose or welded to a section of pipe as shown with or without jacket. Here an

Figure 12



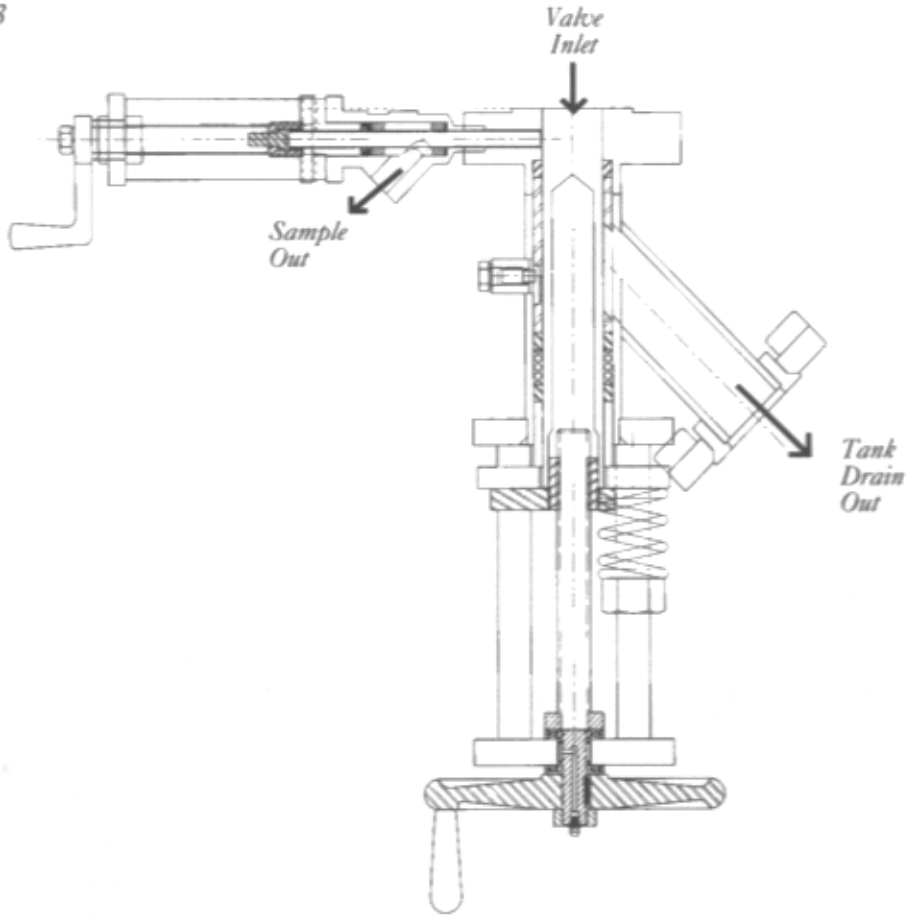
extended body and plunger design should be selected to minimize any dead space or stagnant areas where fluid might collect and contaminate following samples. This is likewise true when pipe nipples and flanges are used. Be sure to check with the valve supplier to assure that the sampling valve extended body and plunger will fit inside the pipe nipple size selected. Internally bored nipples are the best choice.

Combination reactor drain valve and sampling valves (Figure 13) are sometimes used. Here the sampling valve is integrally mounted in the body (inlet) flange of the drain valve. (The sampling valve could also be located in the drain valve body.) The reactor drain valve plunger is retracted to just clear the sampling valve plunger. The sample is withdrawn and the main valve closed, leaving no void areas where stagnant fluid could collect.

Valves of the types just described may also be used to inject material into a pipeline or reactor. "Kill" solutions, for example, are often injected to halt a run-away reaction; injecting dyes or coolants to change the color or timing of a reaction; adding an additional component partway through a reaction process.

Fetterolf Corporation has extensive experience in standard and custom-designed sampling systems. Contact our main office in Skippack, PA or any of the agents listed for assistance (see back cover) in selection of the most appropriate sampling system for your process. ♦

Figure 13



All illustrations are of Fetterolf Sampling Valves and were provided by Fetterolf Corp., Skippack, PA.

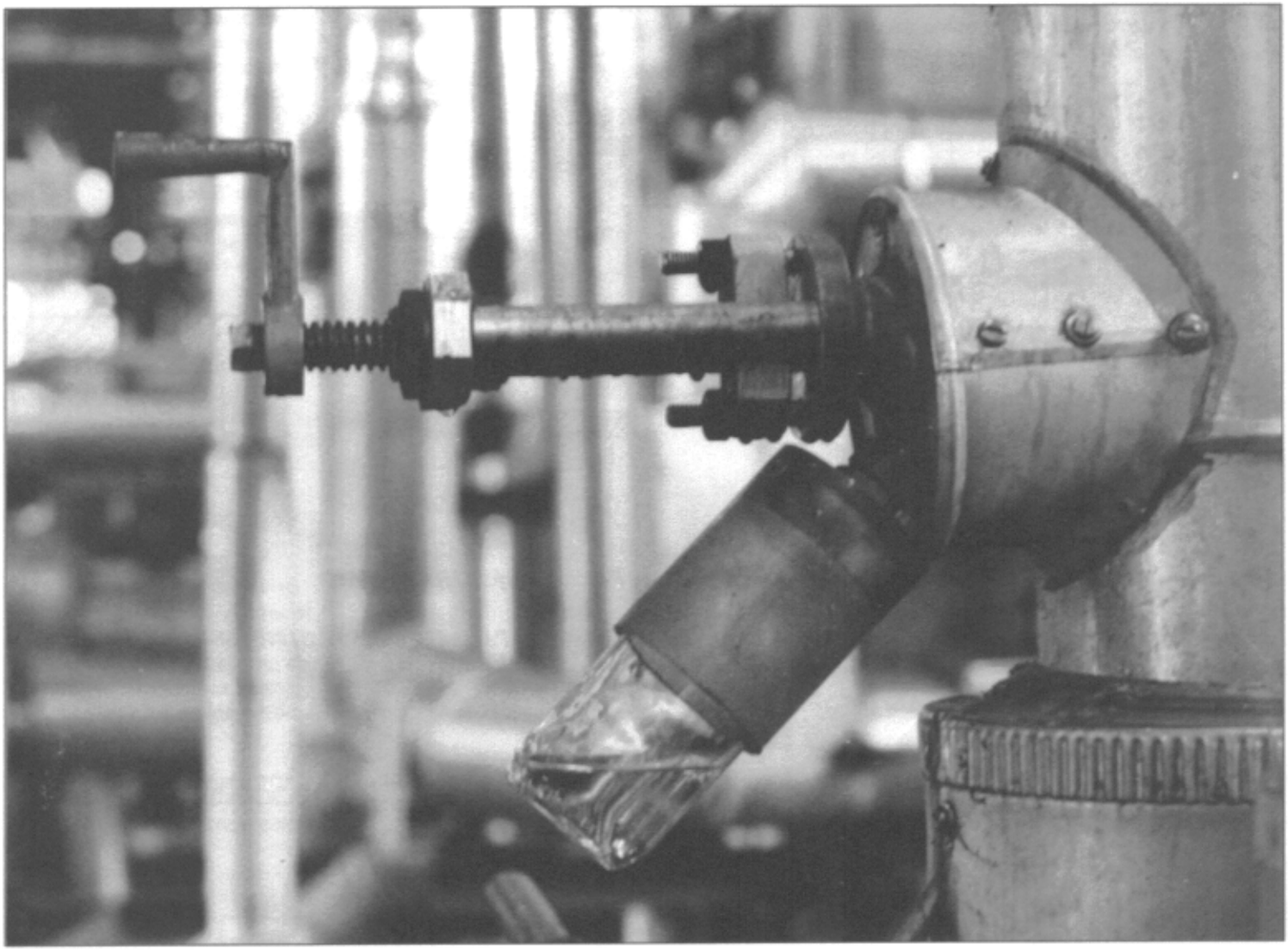
For additional information contact:
John B. Madill or Peter P. Van Blarcom, Fetterolf Corp., P.O. Box 103, Skippack, PA 19474 U.S.A. Tel: (215) 584-1500.
Additional copies of this article are available. Contact Fetterolf Corp.

AKZO ARAMIDE SAMPLING VALVE CASE HISTORY

Hitma (Fetterolf agent in the Netherlands) had an interview with Dr. Rob van den Bor, Environmental Coordinator of AKZO Aramide Company in Delfzijl, The Netherlands. This plant manufactures the basic polymer for ultra-strong Twaron fiber used as a metal substitute in the aerospace industry and for an asbestos substitute in automotive brake pads.

Obtaining proper samples is an important part of process control, and sampling systems must meet rigid standards for safety and protection of the environment.

"Labor and safety conditions and environmental conditions have always been very important in the AKZO, Delfzijl plant," says Dr. van den Bor, and they always will be. After plant start-up in 1985, a number of plant improvements were made to improve the production process as well as labor conditions and care of the environment. "What is very important when it comes to quality and environment is people's mentality." Flexibility and know-how in sampling systems led to the development, and now standard use, of the AKZO Sam-Bottler from Fetterolf shown in the photo. ♦



Fetterolf Sam-Bottler at Akzo Aramide.