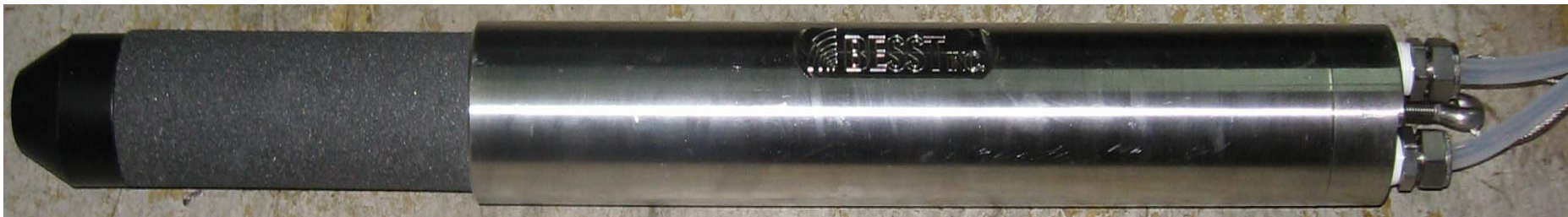


QuickTime™ and a  
TIFF (Uncompressed) decompressor  
are needed to see this picture.

# Stainless Steel Blatypus

## Standard Operating Procedures

How to set up and operate pump and  
spool system for use in deep  
applications



Besst Inc. 50 Tiburon St. Bay #7  
San Rafael, CA  
94901  
Phone (415)453-2501  
Fax (415)453-2509  
[www.besstinc.com](http://www.besstinc.com)

# Table of Contents

Section	Page
Section 1: Blatypus mode set-up	3
Section 2: Purging and sampling in blatypus mode	4
Section 3: Hydrobooster mode set-up	5
Section 4: Purging and sampling in Hydrobooster mode	5
Figure 1	6
Figure 2-3	7
Figure 4a-c	8

## Section 1: Blatypus Set-Up Using Control Box (see Figures 1-3)

1. Attach the **regulator** with **gas line** to the nitrogen tank
2. Attach the **gas line** from **regulator** to **gas-in** fitting on control box. (figure 1) Attach another tube from **gas-out** fitting on control box to **3-way valve** on tube spool. (figure 2)
3. Make sure control box is **OFF** and plug it in.
4. Attach **sample return line** by pressing male quick-connector into female quick-connector on side of tube spool opposite motor and 3-way valve assembly (not pictured).
5. Attach deep cycle (car) battery or other 12v DC 70 Amp power source to positive and negative **motor leads** on tube spool.
6. Plug **control switch** into black plug mounted on the tube spool.
7. Engage **motor clutch** by pulling out on black handle, this will allow motor to drive tube spool.
8. Deploy **pump** system to desired depth for purging/sampling using control switch, or by disengaging clutch (pushing it in) and manually lowering tubing into well.
9. Begin purging/sampling per procedures described in section 2 for Blatypus mode or section 3 for Hydrobooster mode.



## Section 2: Purging and sampling in Blatypus mode

1. Once the pump is at depth, wait for the entire tube bundle to fill up with water. To ensure the system is full place the end of the sample return line in a bottle of water, it will bubble as the line fills up, and once it stops bubbling the line should be completely full and ready to begin pumping.
2. Make sure the **3-way valve** is in the **purge/sample** position in order for gas to flow through the control box from the gas line to the pump. (figure 3)
3. Calculate lift pressure for a given pump depth using the following calculation: *depth of pump below ground surface ( in meters) X 10.8 = sampling pressure (in kPa)*
4. **If calculated lift pressure is 4309 kPa or less: dial regulator to calculated pressure and proceed to step (5) DO NOT EXCEED PRESSURE OF 4309 kPa. USING THE SYSTEM AT A PRESSURE ABOVE 4309 kPa RUNS THE RISK OF BURSTING THE TUBING.**
5. Follow table 1 for timer on/off settings refer to figure 1 for a description of timer functions. *Note: These times vary in relation to pumping head, pump depth, and recharge rate in well. You will need to adjust the on/off times to attain optimum flow. The given times are, however, an estimate. If the well has a very high or low recharge rate, the off time could be considerably lower or higher, respectively.*
6. Turn on control box using the **power switch**
7. The system will need to go through a multiple on/off cycles before any water flows from sample return line. The process may take 10 or more minutes depending on depth of pump and amount of head within well.
8. If water flows out of sample return line until air blows out, the purge cycle is either too long, or the recharge cycle is too short, adjust the cycles until water exits sample return with no air. For a see figure 4a-c for an explanation of how Blatypus mode works.

Depth (m)	On (purge) (seconds)	Off (recharge) (min)
250	30	2-3
500	60	4-5
1000	120	6-10

**Table 1. Purge and recharge settings**

9. Each time the pump is set at a new depth you must purge the system twice completely before sampling in order to ensure a pure sample. To purge system completely of water follow instructions in sections 3 and 4. When you purge between samples there must be one continuous pulse that empties the entire system so that it can fill entirely with water from the new sample depth. To achieve this you must purge in the Hydrobooster mode covered in sections 3 and 4.
10. Once the system has been purged twice you can reattach the control box and collect a sample per section 2 steps 2-8.
11. Remove the quick-connect sample return line when you change depths.

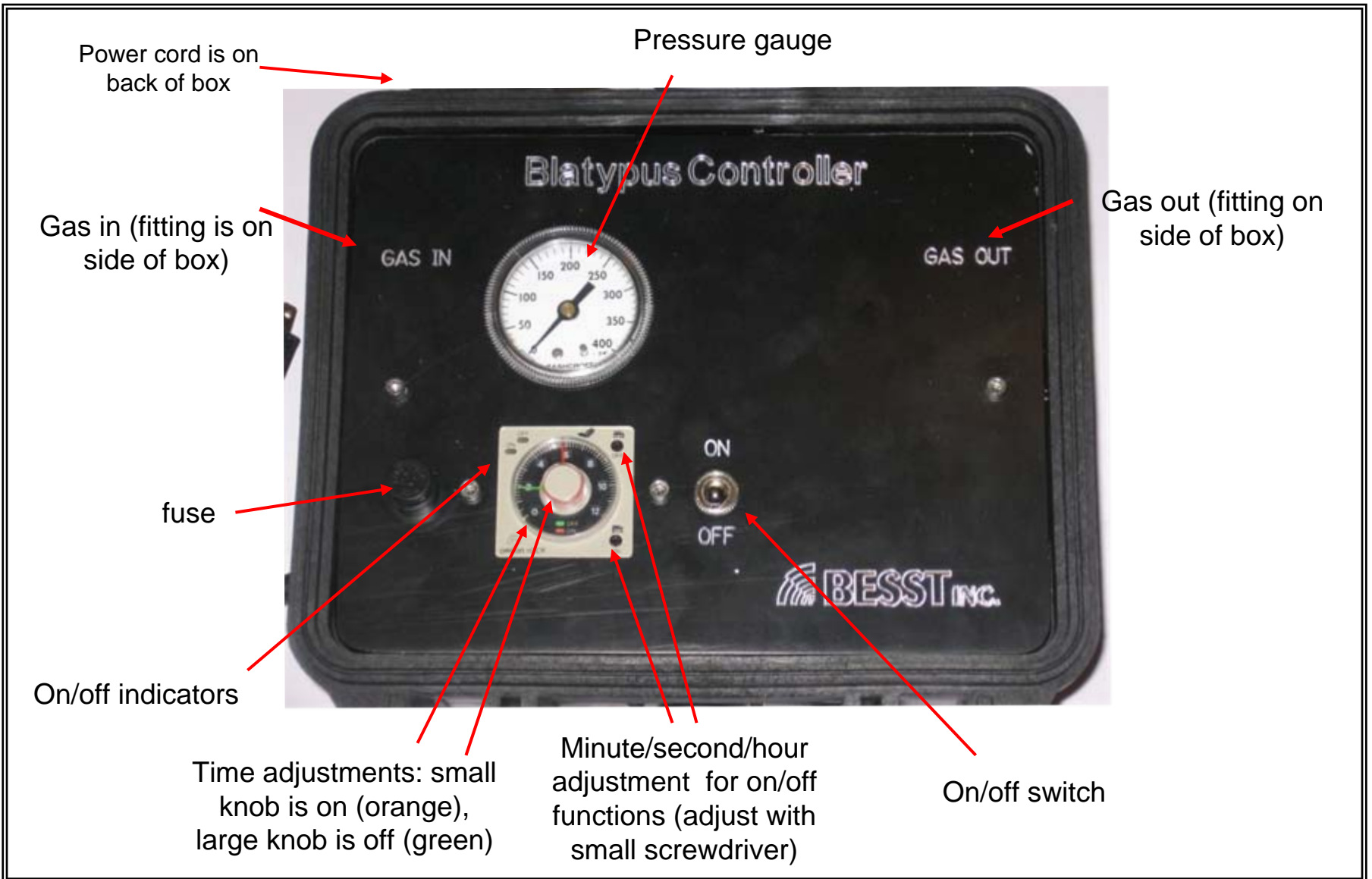
### Section 3: Setting up the system for Hydrobooster mode (without control box)

1. Attach regulator with gas-line to nitrogen tank
2. Attach gas line directly from regulator to 3-way valve
3. Follow follow steps 4-9 in section 1

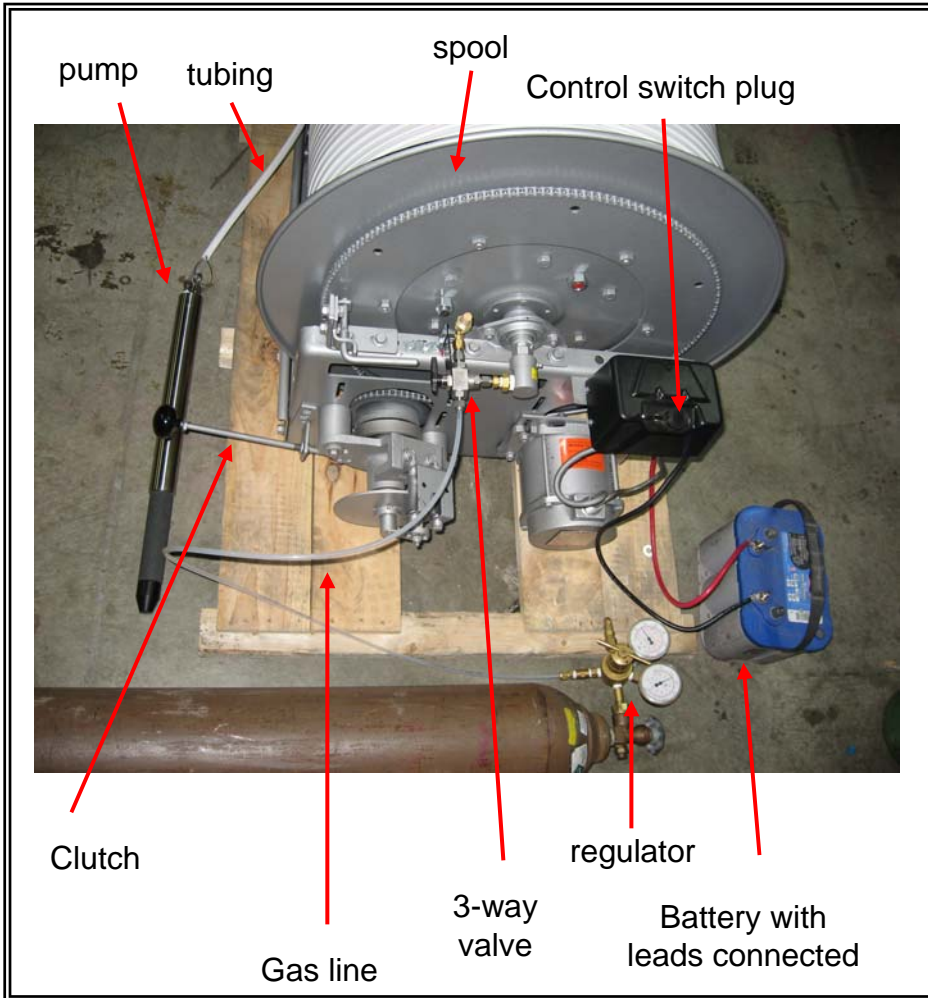
### Section 4: Purging and sampling in Hydrobooster mode

1. Calculate lift pressure for a given pump depth using the following calculation: *depth of pump below ground surface (in meters) X 10.8 = sampling pressure (in kPa)*
2. *If lift pressure exceeds 4309 kPa do not use Hydrobooster mode,*
3. Dial the **regulator** pressure to calculated lift pressure
4. Turn the **3-way valve** from **exhaust** to **purge/sample** position. You should hear air flowing through the system. *note: the difference between Hydrobooster mode and blatypus mode is that in Blatypus mode the system goes through incremental purges and produces a given volume of water per cycle. In Hydrobooster mode there is one continuous pulse of gas that pushes one continuous stream of water out of the sample return line. This method uses less gas, but is less delicate on the sample.*
5. Wait for sample or purge volume to exit sample return line. Note: it may take some time for purge or sample to reach surface, it can take 20 minutes or more for very deep samples and then a few more minutes for the entire sample or purge volume to exit system.
6. At each depth purge twice before sampling. The third cycle of the system is the pure sample and can be collected.

# Figure 1. Control Box Diagram

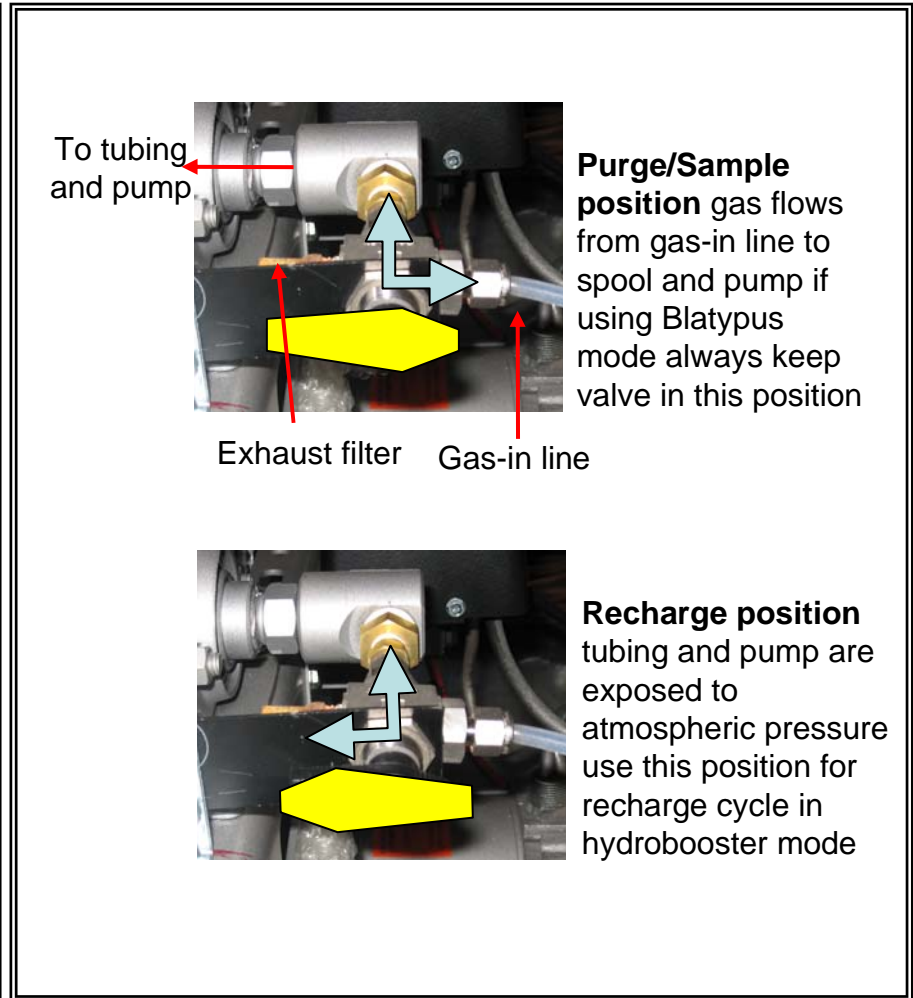


## Figure 2-3 Reel Assembly and 3-Way Valve Function



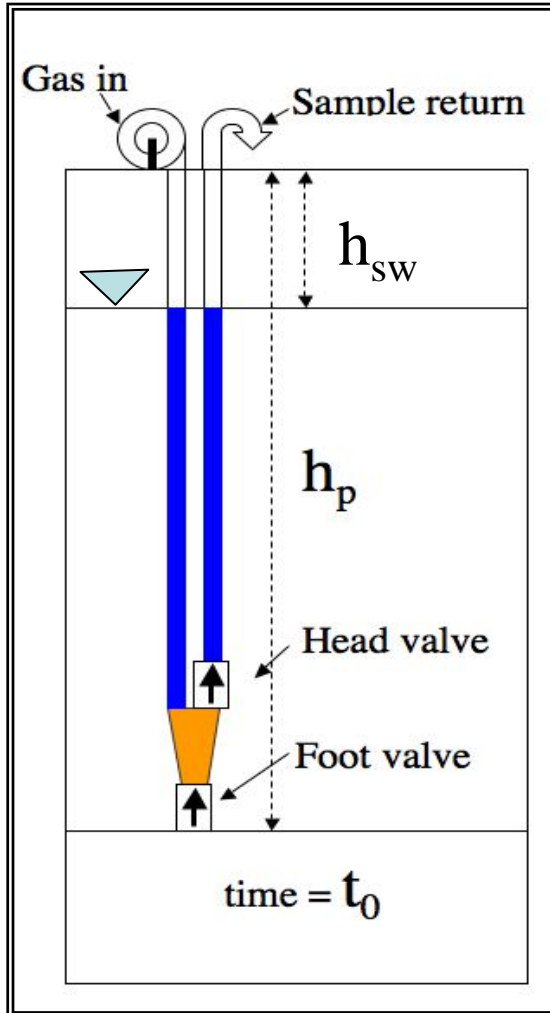
**Figure 2. Reel assembly**

Note: in figure 2 counter/stabilizer assembly is not shown, but will arrive bolted onto the front of the frame, and control switch is not shown, which is used for raising or lowering the pump. Pump is shown set up in Hydrobooster mode.



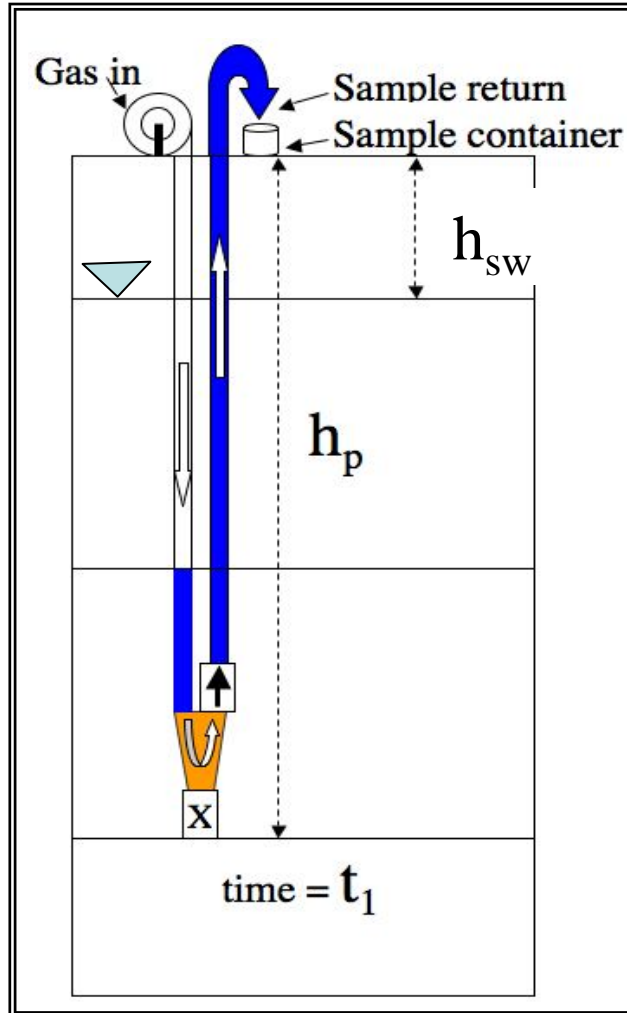
**Figure 3. Three way valve function**

## Figures 4 a-c Blatypus function



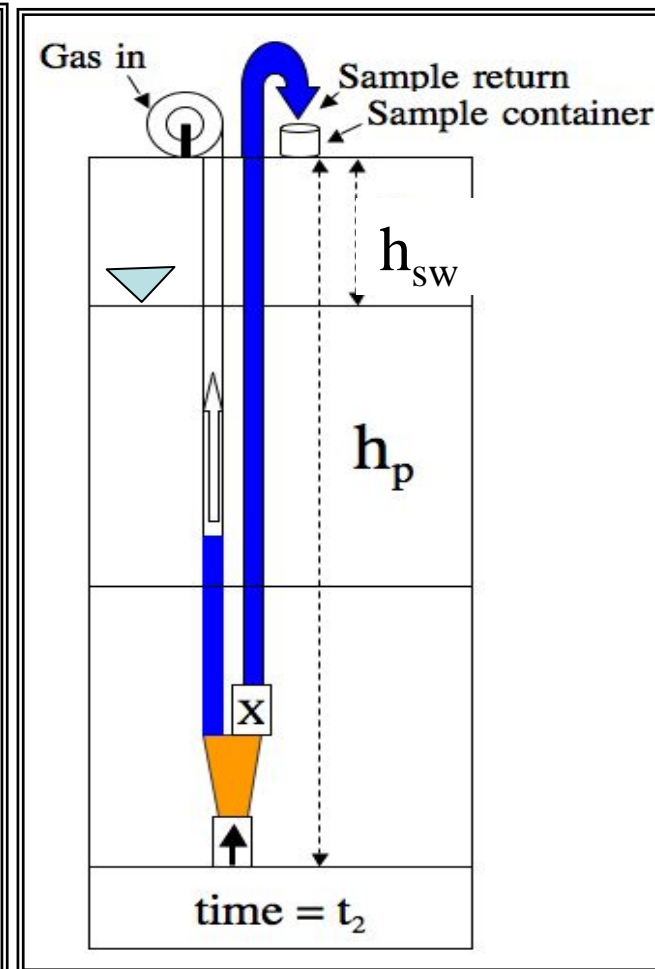
**Figure 4a**

At time  $t_0$  water flows up through head and foot valve to static water level



**Figure 4b**

At time  $t_1$  the purge/on cycle begins, the foot valve closes and water is pushed up through the sample return line



**Figure 4c**

At time  $t_2$  the recharge cycle begins, the gas line is exposed to atmospheric pressure and refills while the head valve holds the column of water in the sample return line