The Volume flowrate, Power input and Volumetric efficiency should be calculated from the appropriate measured values and plotted against the Total Head. Different sets of curves should be plotted at each setting of the pump speed.

Equipment Set Up

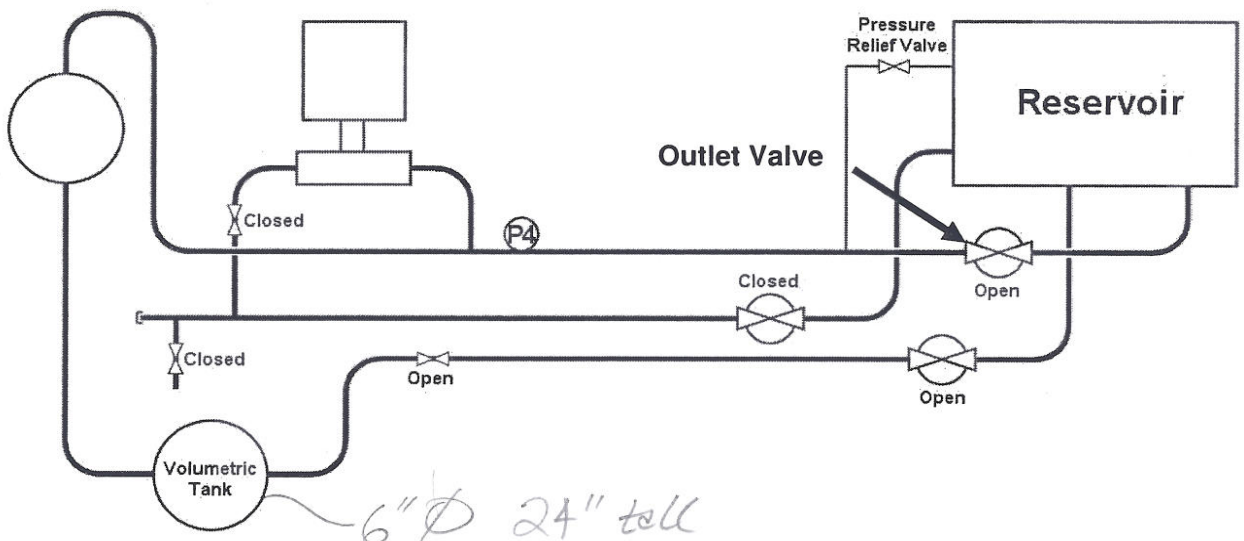
Check that the reservoir on the C3-MKII has been filled with clean water and that the equipment is connected to an appropriate mains electricity supply.

If a thermometer is available remove the reservoir lid and measure the temperature of the water. Remove the thermometer and replace the reservoir lid.

If using the optional C3-MKII software, check that the USB cable is connected to the PC. Run the C3-MKII software and check that IFD:OK is indicated in the bottom right hand corner of the screen.

The Plunger Pump should be installed in the space on the end of the support rails, beside the standard Gear Pump, and connected to the high pressure water supply system. Check that the base of the pump is securely fastened to the C3-MKII frame and that all pipework is connected and secured. Open pipe ends should be fitted with the end caps supplied.

Set the valves as shown in the following diagram:



6"Ø 24" tall
Dropped ~~10" in 39.16sec~~ 5" in 20.3 sec

Procedure

NOTE: use the outlet valve only to adjust the discharge from the Plunger pump. The other valves should remain open or closed throughout the experiment, as marked on the diagram above. Start with the outlet valve fully open.

take measurement of reservoir 420mm

Switch on the mains supply to the equipment, and switch on the power switch on the electrical console. The control panel on the front of the equipment will illuminate. Check for any warning messages – if 'Low water level' is displayed fill the reservoir to approximately 50 mm from the top then press the 'Exit' key.

Press the 'SELECT' key until 'Cyclic Pumps' is displayed then press the 'ENTER' key.

reservoir measurement 18¾" x 15" x 27½"

After taking an initial set of readings close the outlet valve slightly then repeat the appropriate procedure above. Continue closing the outlet valve and taking readings until the outlet valve is full closed - a pressure relief valve will limit the maximum pressure to 60 m (6 Bar) to protect the pump and pipework.

If time is available, further sets of results may be taken at different pump speed settings, for example 90%, 80% etc. If using the software then create a new results sheet for each set of data using the icon.

Fully open the outlet valve then stop the pump by pressing 'Exit' on the control panel.

If using the software, save your results using 'Save As...' from the File menu. Use a descriptive filename such as the date, equipment and exercise, so that the results can be easily retrieved later if required.

$Q = \frac{5'' \times \frac{\pi D^2}{4}}{T} = \frac{141.4\ in^3}{T}$

Results

If not using the optional software then you will need to obtain a value for the water density, ρ from the table in section 6.3. If a thermometer is not available assume the value to be 998 kg/m^3 corresponding to a water temperature of approximately 20°C.

Record the measured values under the following headings:

p_{out}	Vol	Time	T	N	t	ρ
kN/m^2	m^3	Sec	mNm	RPM	°C	kg/m^3
100% 0.182	0.01012	20.3sec 5"	833 max 0211 min			
100% 121	0.01012	21.3sec 5"	448 max 0 min			
100% 142	0.01012	24.35sec 5"	635 max 93 min			

Record the calculated variables under the following headings:

Q	H_o	P_m	P_h	E_o	Q_{th}	E_v
m^3/s	m	Watts	Watts	%	m^3/s	%
$1.14e^{-4}$						
$1.09e^{-4}$						
$9.54e^{-5}$						

Remember to convert the sensor outputs into the correct units before using them in calculations. Pressure should be in N/m^2 (Pa), the flow rate in m^3/s, torque in Nm and speed in RPM. If using the software, this is done automatically by the computer.

90% Pump Speed

in^3/s convert to m^3/s

	Pout	Time	Torque	Q
Full open	93	24.2s @ 5"	521 max 162 min	$9.57e^{-5}$ m^3/s
1 turn	104	24.4s @ 5"	576 max 123 min	$9.50e^{-5}$
2 turn	121	27.9 @ 5"	631 max 182 min	$8.31e^{-5}$