Measurement Resources Pty Ltd
A.B.N. 62 003 247 738

160 SERIES
PNEUMATIC PURGE CONTENTS GAUGE

USER MANUAL

UM/160/A/00

SECTION 1

INTRODUCTION

The pneumatic purge tank contents gauging system allows ease of installation and versatile tank contents measurement. A complete system is designed to suit your requirements, from the items detailed in this manual. These include Indicators, Pressure Relief Valves, Standpipes, Multiway Valves, Standpipes Isolating Valves, Airflow Regulator/Indicators, Pressure Switches and Airline Filters. These components are interconnected by impulse lines (pipework) and powered by clean dry instrument air at pressure of 700kPa maximum. The minimum pressure should be at least double that of the head of liquid in the tank.

The dip tube (standpipe) is a length of rigid tubing, inserted in the tank, to which the impulse lines are connected. The dip tube should be suited to the liquid to be gauged, with an air bell for viscous liquids.

Provided that special care is taken with the installation of impulse lines (avoiding leaking joints and contamination in the event of overspill) the system will provide long and trouble-free service.

DESCRIPTION AND OPERATION

The basic system is made up of (a) air supply, (b) a suitable indicator and (c) a dip pipe (or standpipe). See figure 1.1 Basic system.

In this system the air pressure in the dip pipe builds up until it equals the static head of the liquid in the tank any increase over this figure will be stopped by the release of bubbles of air from the base of the dip pipe. The pressure of the air in the impulse lines acts on a diaphragm within the indicator. Deflection of this diaphragm actuates a scale. The gauge will indicate this pressure and can be used as a contents gauge.

The air supply can be from any suitable source and the most useful are:

A hand pump.
A pressure source. eg. Compressor and air receiver.

A drain filter unit should be fitted to the air supply to the system if there is any possibility of the compressed air containing water, oil mist or dirt. These could cause faulty operation of the flow regulator, gauge or valves and a clean, dry air supply will extend the life of the components considerably.

The hand-pump system is used for 'local' indication on vented tanks (up to 80m (250ft) of interconnecting pipework) and also where 'spot checks are required. It is not suitable for continuous indication.

The pressure source is used for continuous indication on vented tanks (and certain pressurised duties) and is suitable for systems with up to 300m (1000ft) of interconnecting pipework.

The interconnecting pipework is normally 6mm (or Ĉ") o.d. copper or nylon tubing in either single or double run systems but 12mm (or ć") o.d. should be used in single run systems. This is explained in greater detail in the section on installation. Multicore tubing can be used with advantage where a large installation requires multiple runs.

The dip pipe may be difficult to clear because of high viscosity of the tank contents and to minimise this problem it is usual practice to use larger bore dip pipe than interconnecting pipe. A typical dip pipe would consist of 12 or 18mm (ć" or ĉ") bore pipework ending in an "air bell" of 38mm or 127mm (1 ć" or 5") diameter depending on the duty.

SECTION 2

INSTALLATION

2.1 General

It is usual practice to mount the equipment, excluding the standpipes in a panel or in a control room and hence a long run of small bore pipe may be necessary between control room and tank top.

Because of the friction losses in the pipeline between A and B (see figure 2.1) it is obvious that the gauge will read a higher pressure than that caused by the static head in the tank. On short runs this may not be significant but on runs in excess of 30m (100ft) special precautions should be taken by either:

a) The use of large bore (12mm ć" o.d.) pipe, or preferably.
b) The use of a "double run" system (see Figures 2.2 and 2.3).

The use of large bore pipes reduces the friction losses in the connecting pipe considerably, but the double run system eliminates them as there is no air flow along the pipe connecting indicator to stand pipe.

As the indicators do not use any of the air employed in the system there can be any number of indicators or pressure switches (used as level switches).

If there is any danger that the tank may be overfilled the dip pipe should run vertically to a height in excess of that of the vent/filling point so that the small bore connecting pipe does not become contaminated with the tank contents in the event of air failure or shut-off. If it is not possible to run the dip pipe to this height then the connecting pipe should do so to prevent tank overflows draining into the indicator. Alternatively, a standpipe isolating valve may be fitted at the top of the standpipe above the normal full tank height.

With shallow tanks having large overloads, eg. marine applications on double bottom tanks which vent at deck level (or higher), the gauge must be protected against the overload by means of a pressure relief valve (Measurement Resources PRV/10) or similar, as well as having a standpipe run vertically higher than the overflow, or a standpipe isolating valve fitted. (Figure 2.7).

A pressure relief valve should be fitted to protect all indicators in the event of standpipe blockage.

2.2 Multiple Tank Systems

All previous examples have been applicable to single tank operation, but multiple tank systems are possible by the use of suitable tank selector valves. The following examples show three tank system, but any number of tanks can be handled by means of suitable valve arrangements. (See Figures 2.8 and 2.9).

The preferred multiple tank system is as shown in Figure 2.8. The system as in Figure 2.9 will have a delayed readout response when selecting each tank, depending on the length of airline and standpipe between selector valve and tank and the viscosity of the tank contents.

2.3 Recommendations

It is vitally important that there are no leaks on any of the pipework and Measurement Resources provide special brass ferrules with units which are to be used with nylon tubing to help ensure that all joints are tight and leakproof.

For long life, it is necessary to ensure that:

a) The air supply is clean and dry. If there is any doubt Measurement Resources can supply a suitable filter/drain unit of either the manual or the automatic pattern.
b) The system is not subject to excessive overloads.
c) Vibration and shock loadings are kept to a minimum.
d) Indicators, flow regulators, pressure relief valves and selector valves are placed in a reasonably protected position.

The recommended air pressure for the system using compressed air is between the static head in the tank and 700kPa

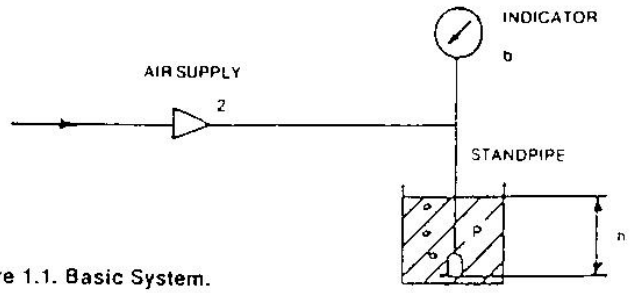

Figure 1.1. Basic System.

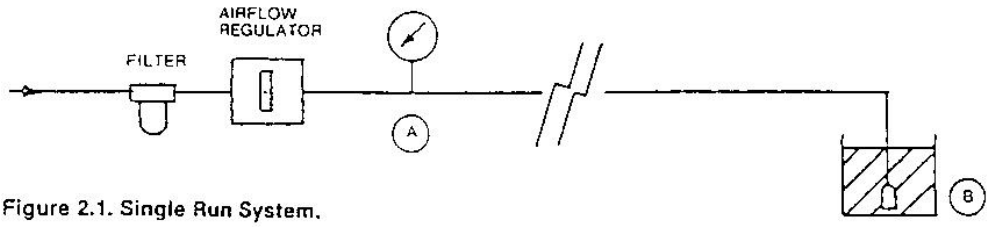

Figure 2.1. Single Run System.

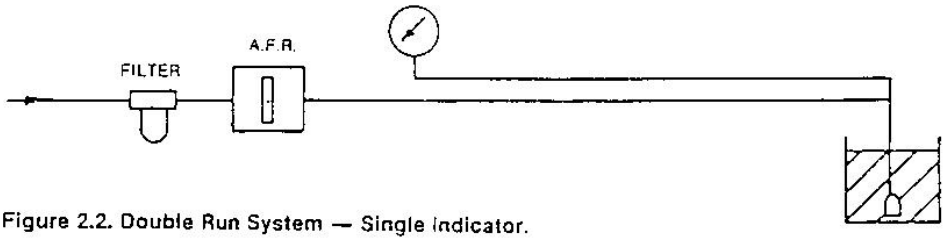

Figure 2.2. Double Run System — Single Indicator.

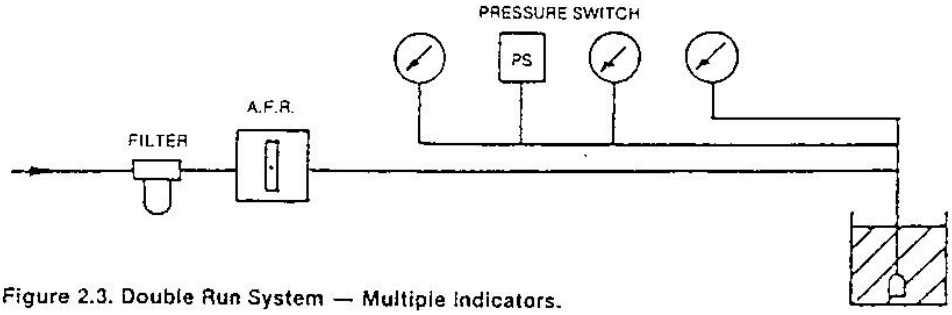

Figure 2.3. Double Run System — Multiple Indicators.

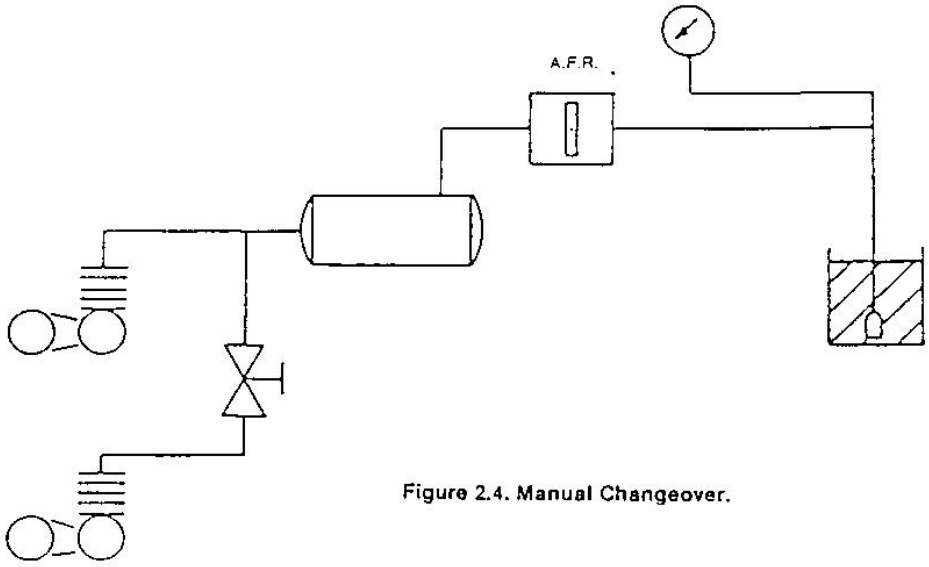

Figure 2.4. Manual Changeover.

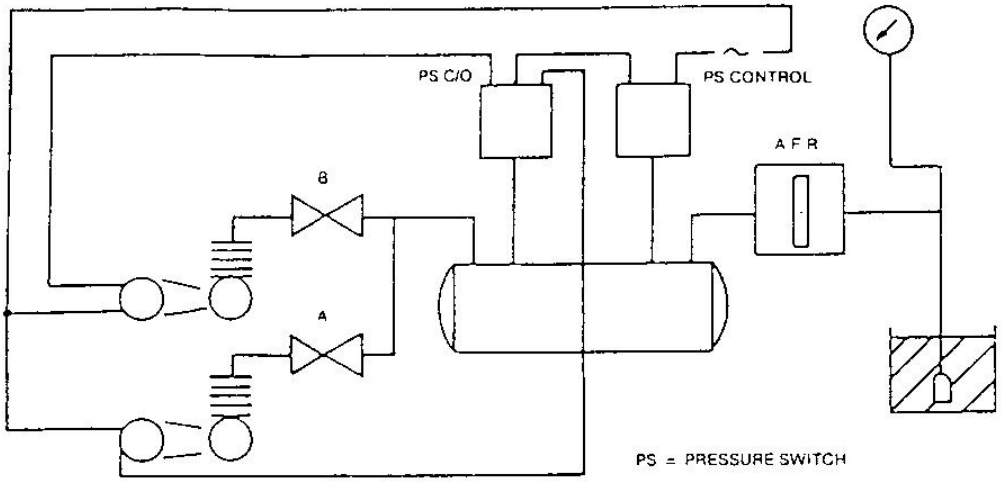

Figure 2.5. Automatic Changeover.

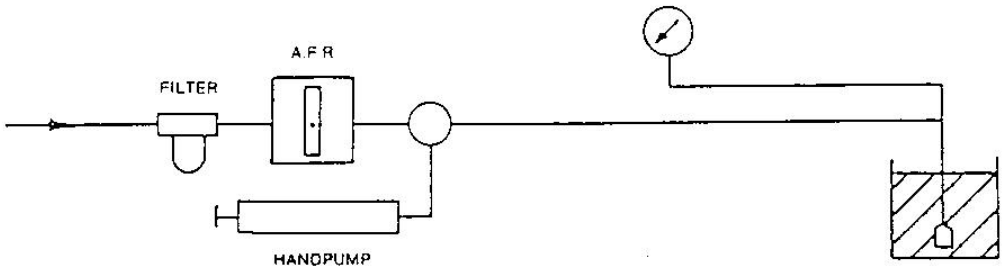

Figure 2.6. Handpump Connection.

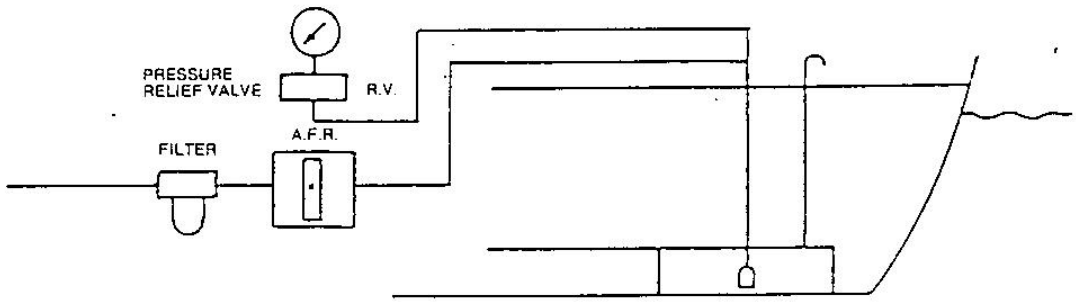

Figure 2.7. System With Relief Valve.

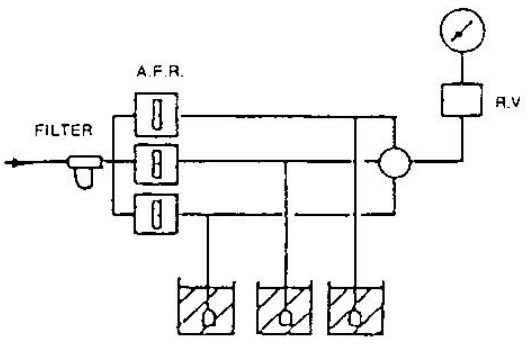

Figure 2.8. Multiple Tank System 1.

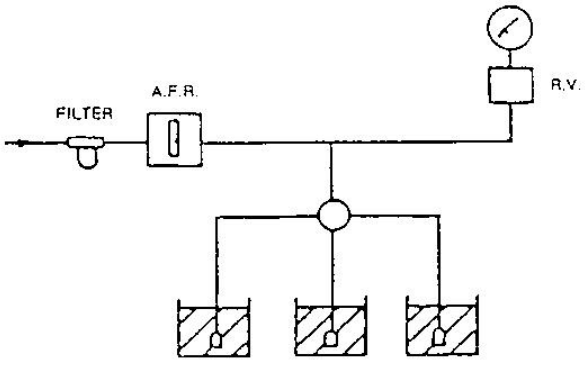

Figure 2.9. Multiple Tank System 2.

SECTION 3

MALFUNCTION AND REMEDY

1. No reading on gauge. Check that:
a) Tank contains liquid.
b) Air is passing through regulator. The bobbin in the flow indicator should rise to the first mark (approx) when air is turned on at source.
c) All joints are tight and tubing intact.

NOTE: Special brass ferrules are supplied with the unit for use where nylon tube is used to ensure tight and leakproof joints.

2. Gauging reading low. Check that:
a) Tank dimensions agree with those supplied to Measurement Resources at the time of manufacture. This also applies to tank slope, if any, together with position of transmitter on tank.
b) Gauge is not calibrated from datum other than tank base.
c) Specific gravity of liquid is as shown on the dial of the gauge.
d) All joints are tight (see item 1 c)
e) Air supply is clean and dry.
f) The pressure source develops a pressure higher than the static head of liquid in the tank.

3. Gauge reading high. Check that:
a) Tank vent, standpipe or interconnecting pipework are not blocked.
b) Specific gravity of liquid agrees with that shown on dial.
c) Air supply is clean and dry.
d) Tank dimensions agree with those advised to Measurement Resources. (see item 2a) at the time of ordering.
e) Readings are correct after the flow of air ceases. If this occurs advise Measurement Resources of all the system details for analysis.

4. Erratic readings. Check that:
a) Air supply is clean and dry.
b) Joints are tight.
c) Pointer is not loose.