Rig Testing to Determine the Ability of the Vexo X-POT Side Stream Filter and Dosing Unit on Reducing Gaseous Oxygen Levels and Expelling Air in Sealed Systems.

Prepared for:

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Executive Summary and Conclusions

From testing of the X-POT system in a pressurised rig, it can be concluded that:

- The X-POT unit was able to collect gaseous oxygen via coalescence of the system micro-bubbles via the non-magnetic filter.
- The X-POT unit was able to rapidly vent-off gaseous air and collected micro-bubbles via the X-POT Auto Air Vent.
- The system showed a decrease in dissolved oxygen levels within the system water as a whole.

1. Introduction

Hevasure was asked by Vexo International to test the ability of their X-POT Side Stream Filtration and Dosing Unit to reduce the gaseous oxygen and system micro-bubbles from within a sealed system.

A test specification was prepared and approved prior to starting the work and tests were undertaken using a pressurised test rig under laboratory conditions.

2. Method

A closed test rig was constructed with the X-POT unit installed in series as shown in figure 1. This test rig had a band heater connected (not used), a pump to allow the system water to be circulated and a manual pressure pump to raise the system pressure and an expansion vessel to maintain this pressure under different temperatures. Dissolved oxygen sensors were installed in a bypass loop which allowed continuous monitoring of this parameter. The test rig was initially filled with around 9 Litres of water.

X-POT installed in series containing, 0.5micron filter (non-magnetic), magnet filter, baffle plate and Automatic Air Vent.

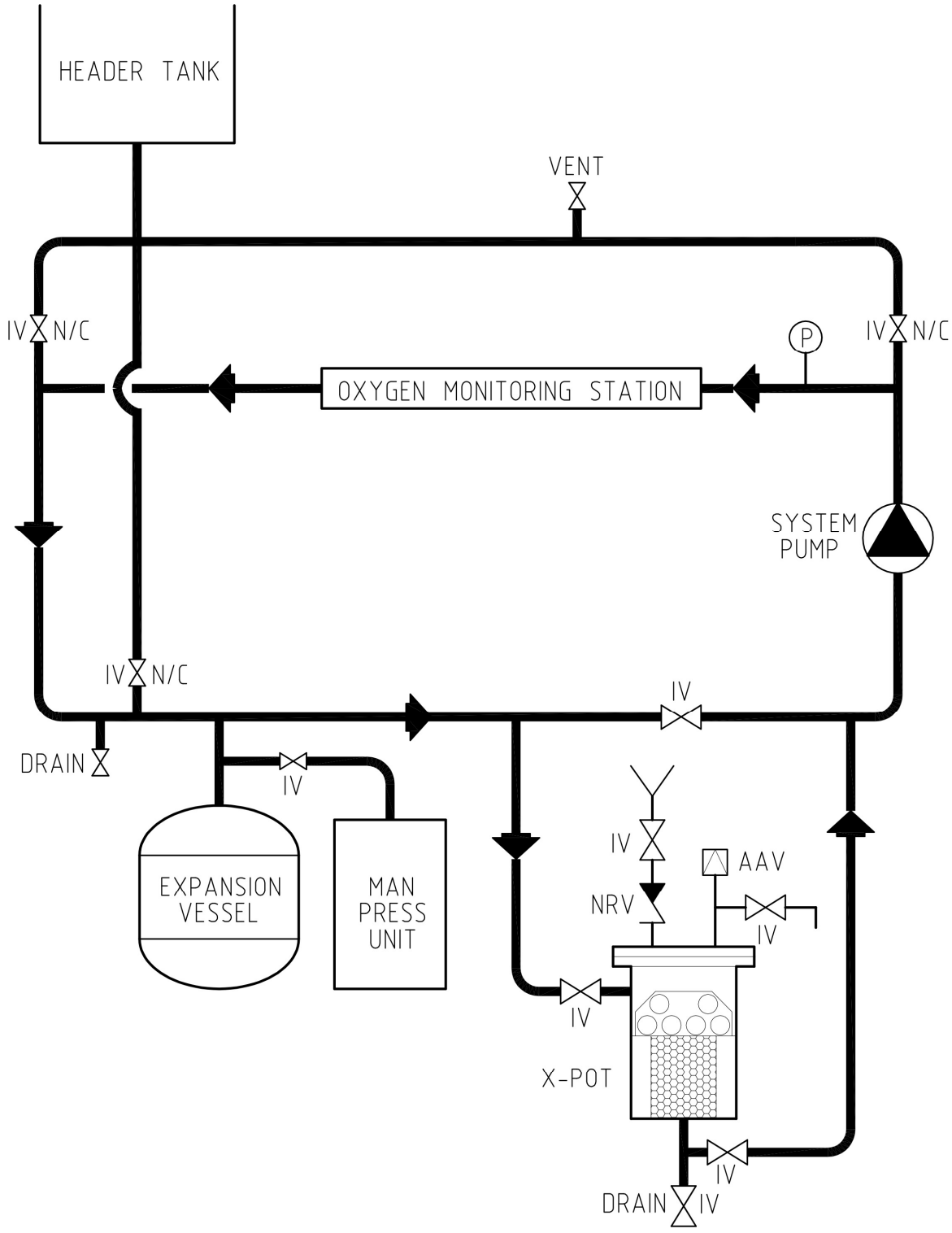
Test duration: 2 hours.

The test temperature was 20oC (Room Temperature).

Pressure: up to 3Bar absolute.

In order to see when air was ejected through the automatic air vent and the volume of air emitted, a balloon was fitted over the exit nozzle of the automatic air vent.

Fig 1.



Schematic layout of the Test Rig

3. Results

The result of the test are as shown in figure 2 below. The key events were as follows:

Point A: The system was pressurised to 3Bar (absolute), 2Bar (relative) and the system pump initiated. This caused dissolved oxygen to rise as would be expected in a closed water system saturated with air.

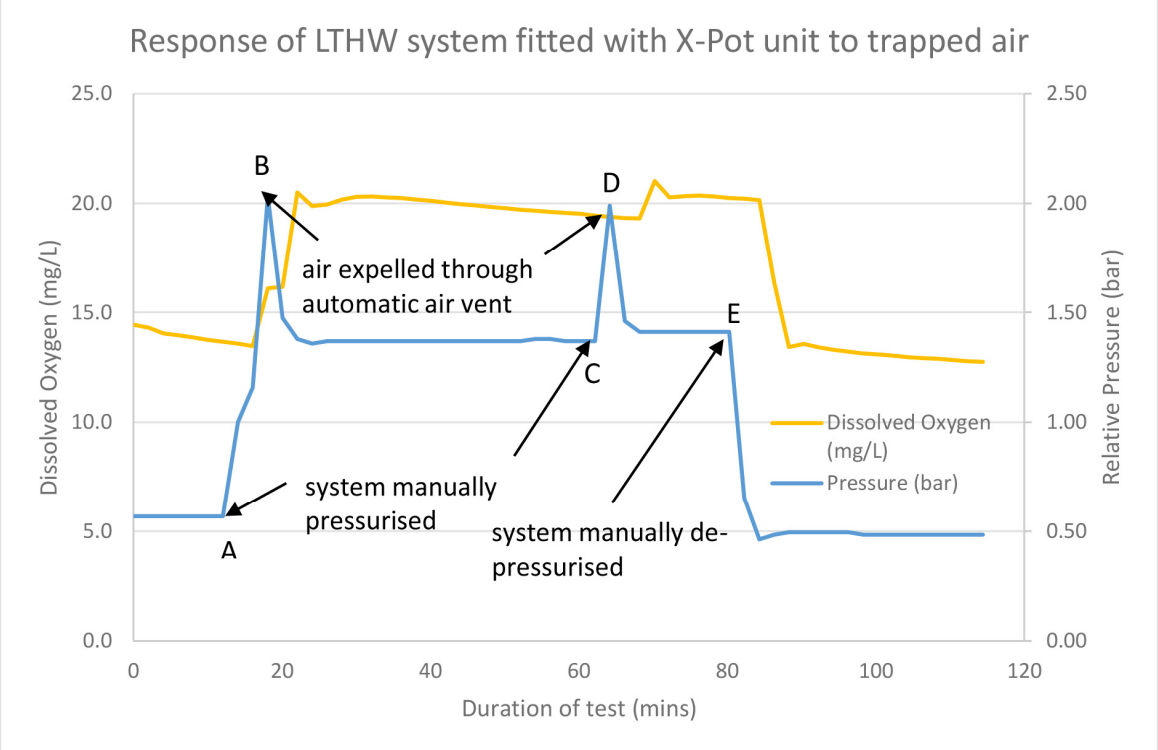
Point B: When the relative pressure reached 2Bar the automatic vent opened on the X-POT and expelled a large quantity of gaseous air as can be seen from the inflated balloon (figure 3). As the air was being expelled from the system, the pressure within the system dropped.

Point C: The system was manually pressurised again to 3Bar (absolute), 2Bar (relative) by introducing new fresh water via the manual pressurisation pump. It can be observed the dissolved oxygen levels increase again by this action.

Point D: Again, the automatic air vent opened, causing the air to be expelled into the balloon again which also dropped the pressure in the system again.

Point E: The system was manually depressurised. As expected the dissolved oxygen started to come out of solution and drop towards normal saturation levels at 1Bar. The quantity of expelled air was then measured at approximately 6 Litres in total.

Fig 2.



Dissolved Oxygen and Pressure readings obtained during the test

Fig 3.

Vented air captured in a balloon

4. Discussion

A test was carried out with gaseous air trapped in the rig (at room temperature). The automatic air vent was activated at pressures around 2Bar and it was not possible to maintain this pressure due to the air being expelled, so dropping the system pressure. The pressure was increased to 3Bar each time the air was expelled.

Large quantities of gaseous oxygen were emitted from the test rig and dissolved oxygen levels also decreased. This was achieved by the gaseous oxygen collecting via coalescence of micro-bubbles via the design of the non-magnetic filter inside the X-POT Unit and being expelled through the automatic air vent.

Coalescence is the process by which two or more micro-bubbles merge during contact to form a single bubble.

This test conclusively demonstrated that the X-POT Unit is effective at removing gaseous oxygen from a closed system.