SYRRIS

Atlas Syringe Pump XL and Ohaus Pioneer Balance

Pseudo-gravimetric dosing accuracy study

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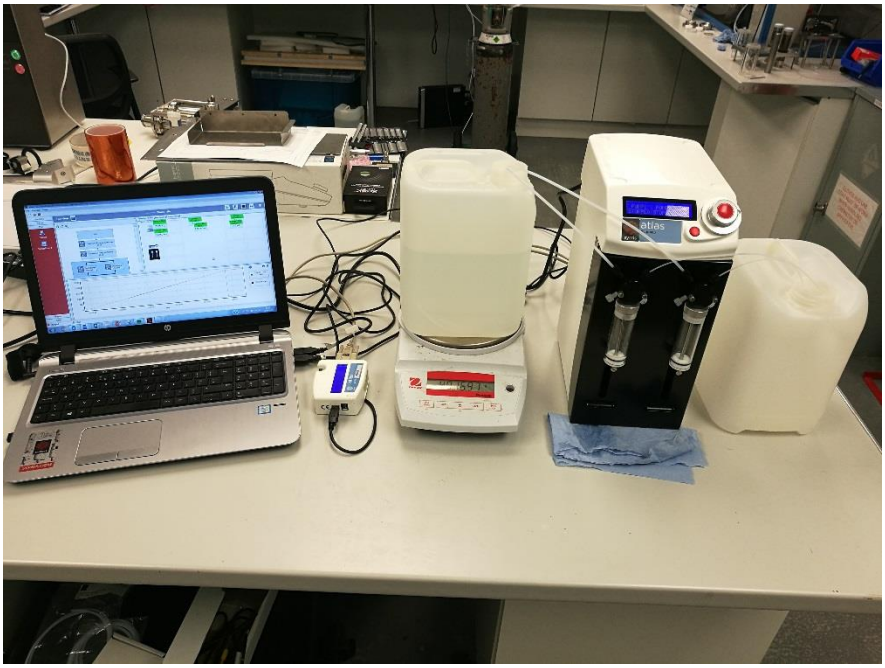


1 Summary

This application note demonstrates how to perform pseudo-gravimetric dosing using the Atlas Syringe Pump XL, Ohaus Pioneer balance and Atlas Software. The process involves dosing 2,500 mL of water into a collection vessel and assessing the accuracy of the dosing

2 Introduction

Gravimetric dosing is a powerful technique for the accurate introduction of a reagent into reactor, utilising a mass balance to ensure that the desired quantity of reagent is dosed.

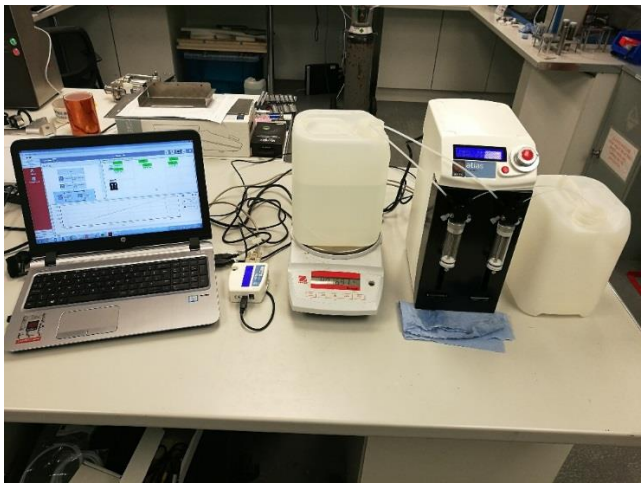
2.1 Equipment

The experiment uses the Atlas Syringe Pump XL (equipped with 25mL syringes) and an Ohaus Pioneer Balance controlled by the Atlas PC software. The balance is connected to the PC via Atlas Port, the Syringe pump is connected to the PC via USB-to-LEMO cable. Water is dosed from the feed vessel on the balance to the collection vessel.

- Atlas XL Syringe Pump (2200376)
- Atlas Port (2101020)
- Ohaus Pioneer Balance PA4102C (2200718)

2.2 Method

All equipment was set up as shown and described below:



Atlas XL Syringe Pump Setup:

Pump fitted with 25ml syringes, with each 4-way valve using port A for aspiration and port B for dispensing, ports were C/D blocked with blanking plugs. Each pump has the maximum fill rate set to 200ml/min (set manually in pump). The pump is connected to PC via USB to LEMO cable.

Prior to experimentation, each pump channel is filled and then emptied to ensure all tubing is full of water.

Balance Setup

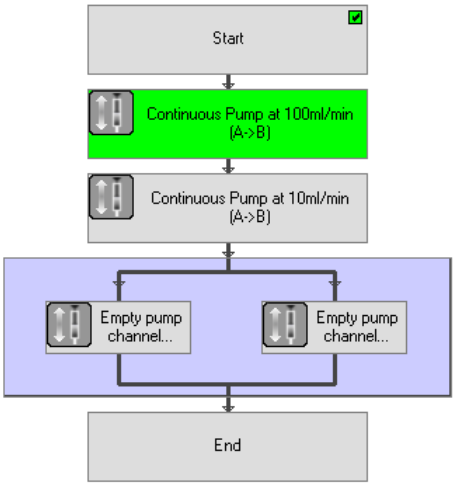
The balance was setup with a vessel containing approximately 4,000mL of water, and tubing from port A on both pump channels were placed in the vessel. The balance

was connected to a PC via Atlas Port (RS232 connection from pump to port, USB A-toB connection from port to PC).

Before starting the experiment, the balance was levelled and tared.

PC Setup

In Atlas PC software, a recipe was designed to continuously dose from the syringe pump until 2,500g of liquid have been removed from the feed vessel. In some examples, two flow rates were used, a high rate for initial addition and a slower rate when approaching the end-point, to improve accuracy of dosing. At the end of the experiment, any remaining liquid is emptied into the collection vessel to ensure all mass is accounted for.



3 Results

Flow Rate	Experiment Time	Collection Vessel Mass (g)	Post dosing weight (g)	Mass dosed (g)	Difference (g)	Error (%)
100ml/min	25 min	243.45	2749.90	2506.45	6.45	0.26
100ml/min for 2450g then 20ml/min	27 min	245.07	2744.60	2499.53	0.53	0.02
100ml/min for 2450g then 20ml/min	27 min	243.70	2746.72	2503.02	3.02	0.12
100ml/min for 2475g then 10ml/min	27.25 min	244.18	2745.40	2501.22	1.22	0.05
100ml/min for 2475g then 10ml/min	27.25 min	244.26	2744.26	2500.00	0	0
100ml/min for 2475g then 10ml/min	27.25 min	243.67	2745.65	2501.98	1.98	0.08
100ml/min for 2475g then 10ml/min	27.25 min	245.03	2747.47	2502.44	2.44	0.10

3.1 Conclusion

Initial results recorded with a flow rate of 100ml/min showed a good degree of accuracy, however some overshoot was observed due to the rate of syringe fill.

It was decided to run a stepped dosing profile, running at 100ml/min for the majority of the run and then lowering the flow rate (and hence fill rate) for dosing the last portion to reduce the overshoot and improve accuracy.

It was found that lowering the flowrate to 10ml/min for the addition of the last 25g gave excellent results. Following four repetitions, the error in dosing was less than or equal to 0.1% of the required dosed amount