SKC Plastic Cyclone Notice

Models 225-69 with 25mm cassette and 225-69-37 with 37mm cassette

It was brought to our attention, after a paper was presented at 'The Australian Mine Ventilation Conference' in Brisbane in August 2017, that the SKC plastic Higgins-Dewell style cyclone may oversample.

To verify the degree of any oversampling, SKC arranged for the SKC plastic cyclone to be assessed against BS EN 481 by the UK's Health & Safety Executive at their laboratory in Buxton (HSL) at the current flow rate of 2.2L/min. The HSL report confirmed that at this flow rate the SKC plastic cyclone can oversample by up to 30%.

However further testing at various different flow rates confirmed that if used at a flow rate of 3.0L/min the performance conforms extremely well to the respirable convention described in BS EN 481. The test results showed that at 3.0L/min the average D50 for the SKC plastic cyclones tested was only 5% higher than that given in BS EN 481 and that, for the majority of theoretical aerosols with MMAD of 1-30 micron and geometric standard deviations 1.75-4.0 the SKC plastic cyclones tested exhibited a low positive bias of less than 10%.

Below is an extract from the HSL report that confirms this;
The results, expressed in terms of D_{50}, are shown in Table 9. The penetration curve and bias map for the cyclone sampler are shown in Figures 19 and 20 respectively. The respirable convention is also shown for comparison.

The measured D_{50} with original o-ring seal at a flow rate of 3.0 $l.min^{-1}$ was 5% higher than the target D_{50} of 4.00 µm.

I.D.	D_{50} (µm)
C1 3.0	4.18
C2 3.0	4.3
C3 3.0	4.12
Mean	**4.20**
SD	**0.09**
Target	**4.00**

Table 9

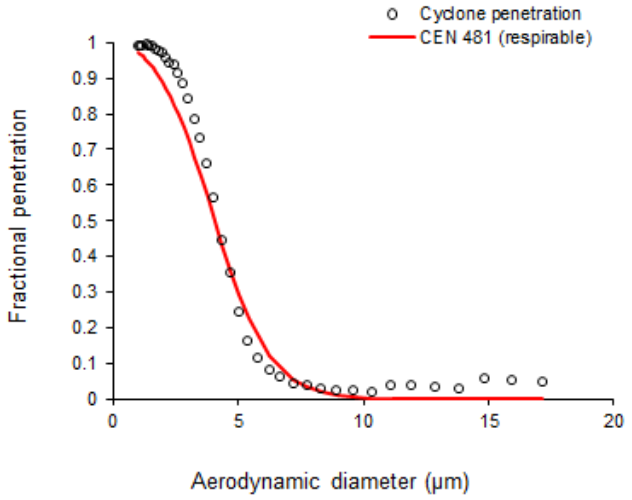


Figure 19

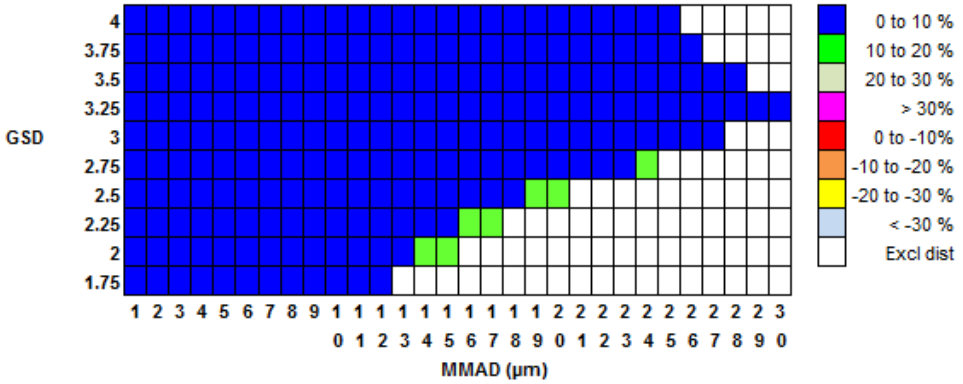


Figure 20

Given these test results, SKC recommends that customers now use the SKC plastic cyclone at a sampling flow rate of 3.0L/min. It is worth noting that at 3.0L/min the total volume collected over an 8-hour period would be 36% higher than at 2.2L/min, therefore giving a lower limit of detection.

Note that whilst tests confirm that at 2.2L/min the SKC plastic cyclone can oversample by up to 30%, it is not possible to state the exact degree of oversampling for a specific site due to the fact that dusts from differing sources have different particle size distribution. However we can state that historic sampling results performed at 2.2L/min would in fact have been lower than recorded and it would be possible to compare results by performing side-by-side sampling at both flow rates.

For further information or help please contact your local representative or SKC Limited.

20 August 2018

SKC

Cyclone Samplers for Respirable Dust

Operating Instructions

This instruction sheet covers the following sampler models:

- 225-69 Cyclone sampler with re-usable cassette for 25mm diameter filter
- 225-69-37 Cyclone sampler with re-usable cassette for 37mm diameter filter

Introduction

The cyclone sampler is designed for dust (aerosol) sampling to the respirable convention as defined in standard EN481:1993.

Design flow rate is 3.0 l/min, giving a 50% sampling efficiency (cut point) at 4.0µm (micron) particle size.

The SKC plastic cyclone is manufactured from conductive plastic which dissipates electrical charges to the surrounding atmosphere and prevents static interference on the collection of the dust particles.

The filter is held within a re-usable plastic cassette, which is supplied complete with a metal filter support grid and a sealing clip to prevent contamination of the sample during transport for laboratory analysis.

For detailed instructions on air sampling in general and use of the cyclone sampler in particular refer to SKC's 224-G1 Step by Step Guide to Air Sampling.

It is also recommended to obtain and read the document MDHS 14/4 "General methods for sampling and gravimetric analysis of respirable, thoracic and inhalable aerosols", available from the HSE website www.hse.gov.uk, before carrying out any sampling using the cyclone sampler.

Preparing the Cyclone Sampler for Use

The following instructions give basic details on how to prepare for sampling by gravimetric analysis according to MDHS 14/4.

Select two filters from the same box or batch. One filter is used whilst calibrating the sample flow rate and is then discarded, and the other is pre-weighed to carry out the actual sample.

It is recommended to wear powder free gloves and to use tweezers when handling filters in order to prevent contamination prior to taking the sample.

Loading the cassette

Ensure that the cyclone sampler components are cleaned of any contamination, using a detergent solution. Allow the components to dry fully before use.

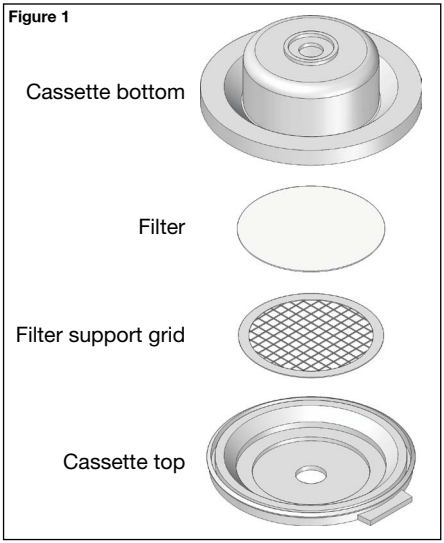
Place the top part of the cassette (labelled "TOP") upside down on a flat surface.

Place the metal filter support grid into the top part of the cassette. Place the filter to be used for calibration onto the support grid.

Fit the bottom part of the cassette onto the top part and press down gently on the edges of the bottom part to close the cassette.

Avoid exerting undue pressure on the filter. The closure is intentionally stiff to avoid accidental opening, and to ensure a leak tight fit.

Figure 1



Fitting the cassette into the cyclone sampler

Referring to Figure 2 on page 2, ensure that the large O ring is fitted to the sampler body beneath the sampler insert and the small O ring is fitted over the short tube in the middle of the insert.

Fit the assembled cassette into the cyclone insert with the cassette top upwards.

Check that the thin O ring is fitted into the recess in the underside of the sampler top. Place the sampler top on the cassette. Fit the retaining ring over the sampler top and screw down firmly to secure the cassette within the sampler and seal the cassette inlet and outlet.

Ensure that the grit pot is securely fitted over the ridge around the bottom of the sampler body.

Flow Calibration

Connect the inlet hosetail of the sample pump to the air outlet of the cyclone sampler with a length of flexible tubing. Connect the flow calibration device (such as a rotameter or chek-mate flowmeter) to the air inlet of the cyclone sampler using a second length of flexible tubing.

Calibrate the sample flow rate to 3.0 l/min.

Disconnect the tubing from the cyclone sampler inlet and outlet. Remove the cassette from the cyclone sampler.

Hold the cassette upside down and prise the two halves apart using the side tab. Remove and discard the calibration filter. Place the pre-weighed filter to be used for the sample, onto the filter support grid and re-assemble the cassette. Fit the cassette into the cyclone sampler.

Quickly re-check the flow rate and make any final adjustments. Switch the sample pump off.

The cyclone sampler is now ready for sampling.

After Sampling

Away from the sample location quickly check the sample flow rate, then disconnect the tubing from the cyclone sampler air inlet and outlet.

Carefully remove the cassette from the cyclone sampler and split the two parts of the cassette apart.

Post Weighing the Filter

Carefully lift the filter out of the cassette using tweezers. Post weigh the filter.

The difference between the pre and post weights will give the respirable sample.

Transportation

If further analysis is required, prepare the sample for transportation to the laboratory by carefully placing the filter back in the cassette, and fitting the yellow, U shaped sealing clip over the cassette inlet and outlet holes. Use of the sealing clip prevents unwanted ingress or loss of contaminant during transport. Alternatively, a 225-67 filter transport cassette can be used, freeing the filter cassette for immediate re-use.

Figure 2

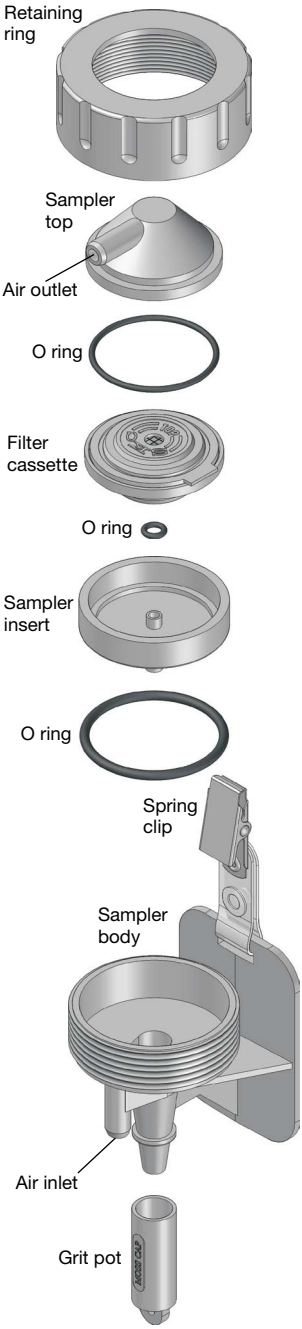
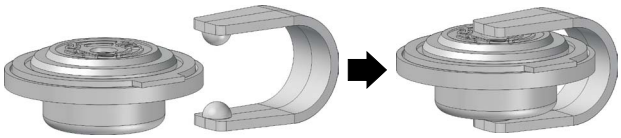


Figure 3



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SUMMARY OF SKC LTD PUMP RUN TIMES USING 225-69 CYCLONES AT 3.0L/MIN

Filter	Average Filter Back Pressure at 3 l/min (inches of water)	Pump	Run Time (hours)
225-1930 0.8µm 25mm MCE	16.3	210-3311 AirChek 3000	9 ½
		224-52MTX Sidekick	12 ½
		224-PCMTX8 Universal	13
225-5-25 5µm 25mm PVC	5.6	210-3311 AirChek 3000	13 ½
		224-52MTX Sidekick	19
		224-PCMTX8 Universal	20
225-58F 1.6µm 25mm GFA	5.9	210-3311 AirChek 3000	13
		224-52MTX Sidekick	18
		224-PCMTX8 Universal	19

The above run time figures are either based on actual run time testing or estimated from actual run time testing. Figures stated are the minimum run times observed over a number of tests.

The run time tests utilised new pumps and batteries, and were performed in an office environment. Prior to testing the batteries were charge / discharge cycled as per SKC Ltd recommendations to ensure optimum available battery capacity.

Testing was carried out on SKC Ltd pumps only as these all utilise 2Ah capacity batteries. All other pump models in the SKC range intended for dust sampling utilise higher capacity batteries and will therefore achieve longer run times than those detailed in the table above.

Additionally, testing of a 2 year old AirChek 3000 battery pack returned after extensive use in Australian mines showed that it still had 94% of its original capacity. Run time testing with this battery identified that it could still provide run times at 3 l/min flow rate in excess of 8 hours with a 225-1930 MCE filter and in excess of 12 hours with 225-5-25 PVC and 225-58F GFA filters.

20 August 2018