

Nine duty cycles (0, 5, 10, 25, 50, 75, 90, 95, and 100%) were tested to compare sampling efficiency of the PSP and reference cyclones to the ISO/CEN/ACGIH respirable convention. Figure 1 shows the sampling efficiency curves for each duty cycle generated with sigmoid function using three parameters. Coefficients of three parameters for each sampling efficiency curve are listed in Table 1.

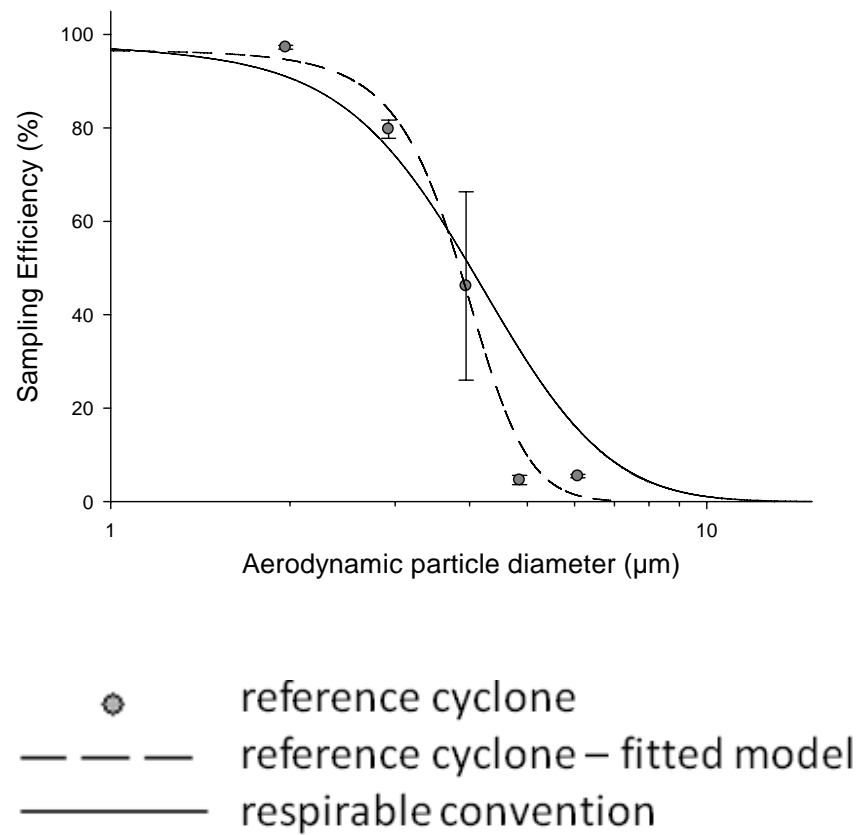
Table 1. Coefficients of three parameters in sampling efficiency curve ⁽¹⁾

Duty cycle (%)	Reference cyclone			PSP cyclone		
	<i>a</i>	<i>b</i>	<i>x0</i>	<i>a</i>	<i>b</i>	<i>x0</i>
0 ⁽²⁾	96.89	-0.51	3.88	-	-	-
5	101.45	-0.55	4.29	83.59	-0.72	4.72
10	112.85	-0.87	3.63	110.77	-0.80	3.85
25	89.50	-0.36	4.29	82.49	-0.45	4.47
50	94.26	-0.54	4.28	103.34	-0.56	4.27
75	86.96	-0.23	4.28	92.16	-0.30	4.28
90	98.05	-0.49	4.29	101.60	-0.55	4.17
95	92.19	-0.56	4.31	97.16	-0.54	4.33
100	91.66	-0.24	4.19	94.99	-0.30	4.32

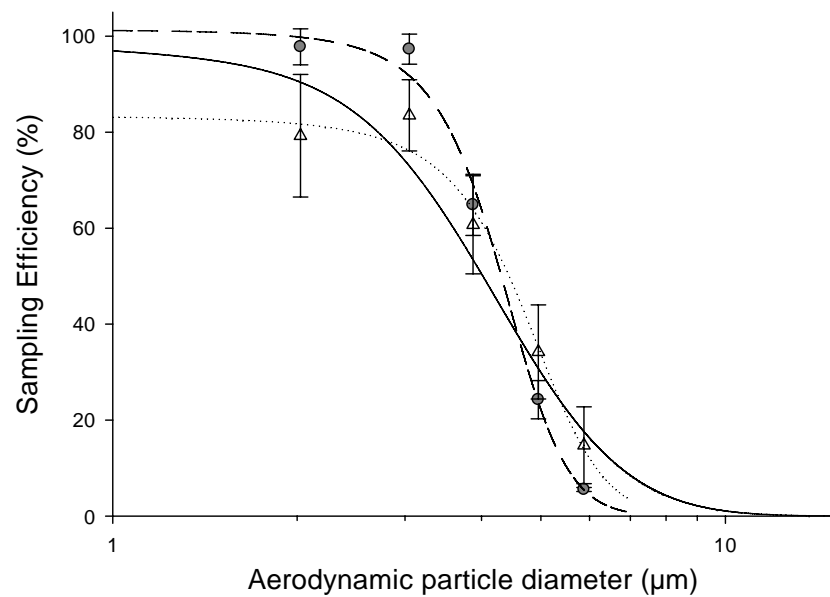
⁽¹⁾ Sigmoid function using three parameters ($y = \frac{1}{1 + e^{-a(x - b)}}$) was used to generate sampling efficiency curves; ⁽²⁾ The PSP sampling efficiency curve for 0% duty cycle was not generated because particles exiting the cyclone were not directed to the PSP filter and therefore, only trace leakage appeared on the PSP filter.

Figure 1. Sampling efficiency curves for the two cyclones compared to the ISO/CEN/ACGIH respirable convention

(a) Duty cycle – 0%

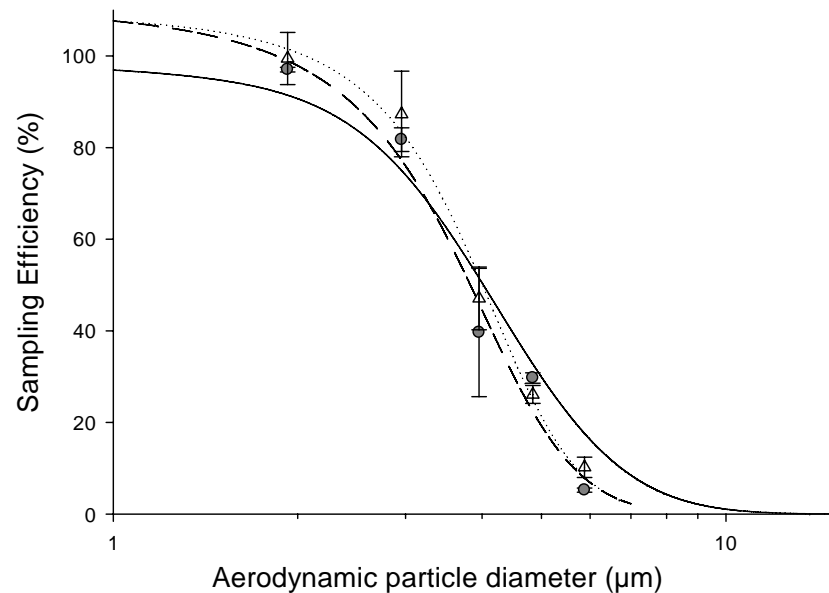


(b) Duty cycle – 5%



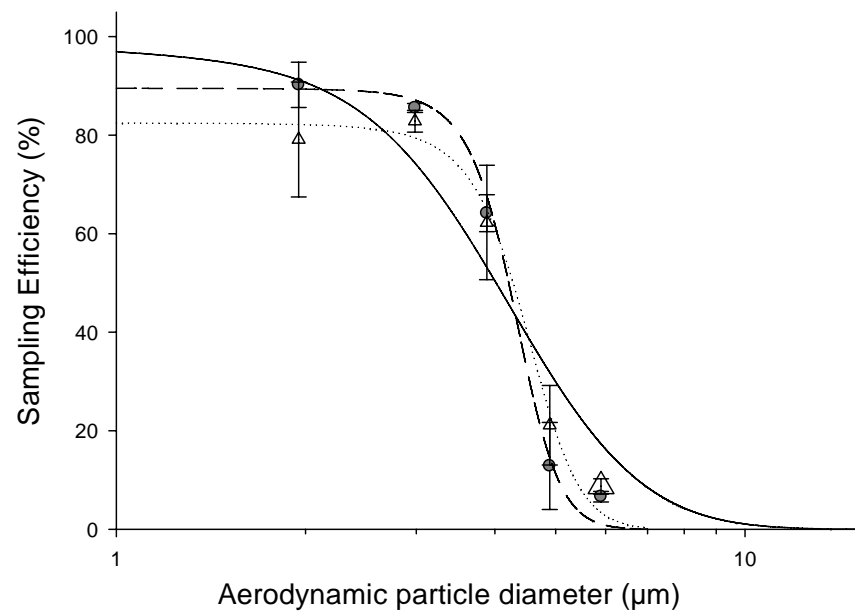
- reference cyclone
- — — reference cyclone – fitted model
- — — respirable convention
- △ PSP cyclone
- PSP cyclone – fitted model

(c) Duty cycle – 10%



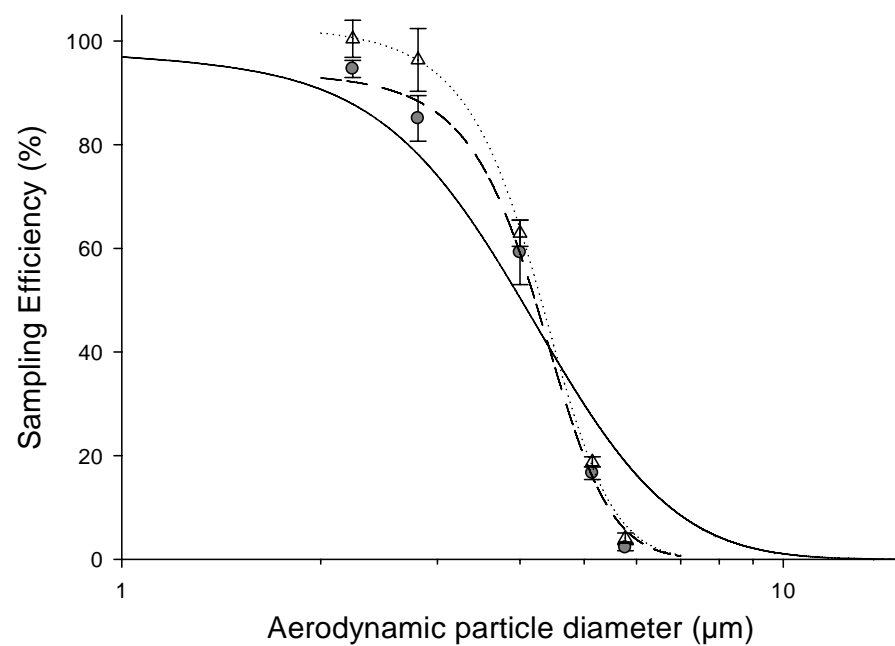
- reference cyclone
- — — reference cyclone – fitted model
- — — respirable convention
- △ PSP cyclone
- PSP cyclone – fitted model

(d) Duty cycle – 25%



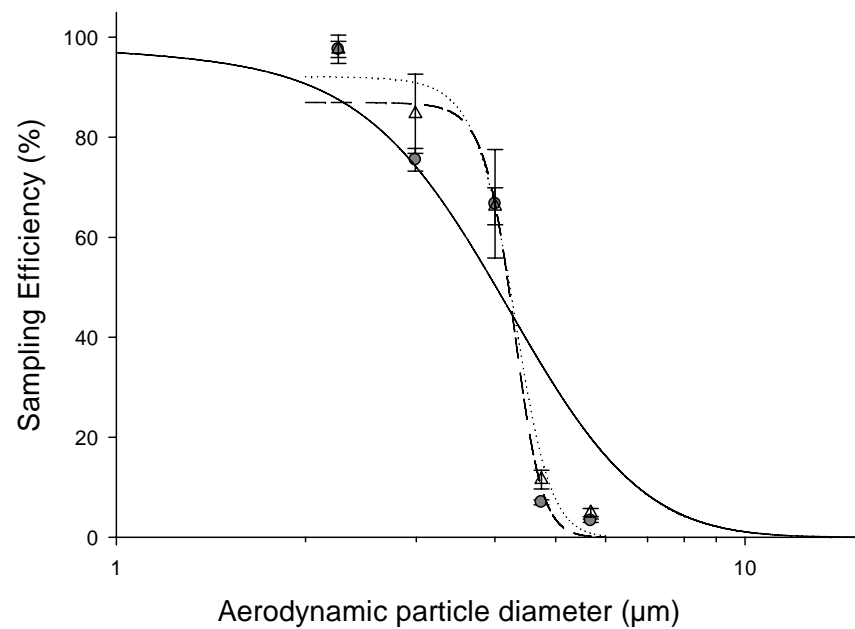
- reference cyclone
- — — reference cyclone – fitted model
- — — respirable convention
- △ PSP cyclone
- PSP cyclone – fitted model

(e) Duty cycle – 50%



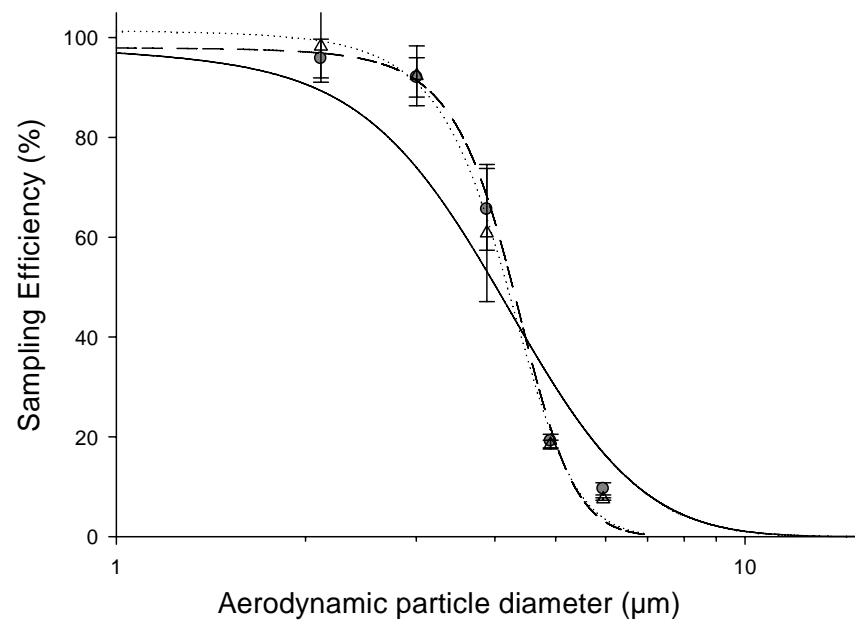
- reference cyclone
- — — reference cyclone – fitted model
- — — respirable convention
- △ PSP cyclone
- PSP cyclone – fitted model

(f) Duty cycle – 75%



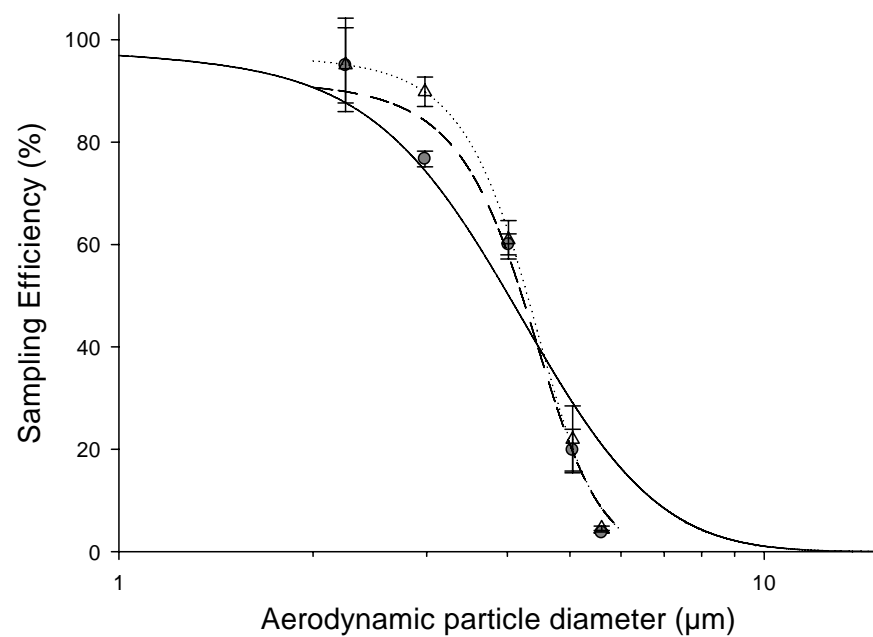
- reference cyclone
- — — reference cyclone – fitted model
- respirable convention
- △ PSP cyclone
- PSP cyclone – fitted model

(g) Duty cycle – 90%



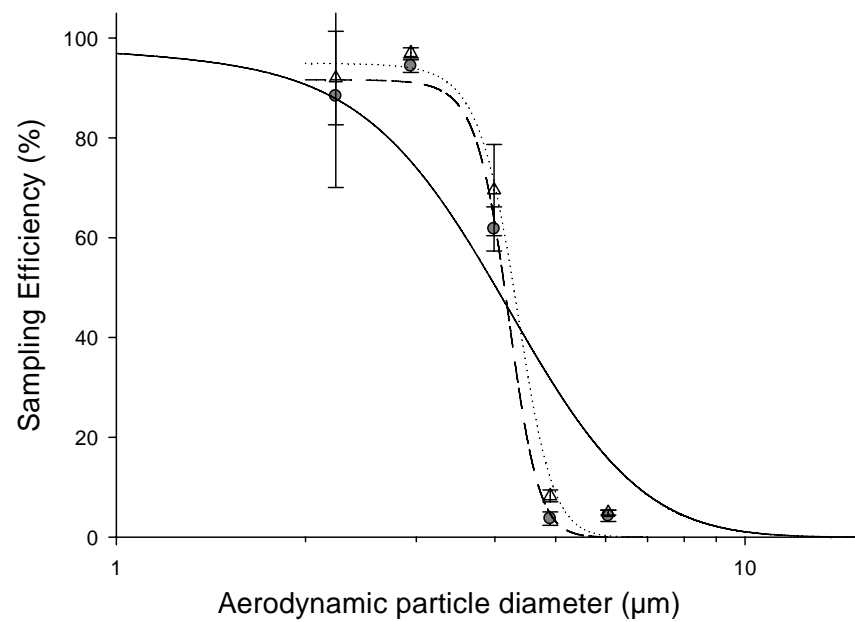
- reference cyclone
- — — reference cyclone – fitted model
- respirable convention
- △ PSP cyclone
- PSP cyclone – fitted model

(h) Duty cycle – 95%



- reference cyclone
- — — reference cyclone – fitted model
- — — respirable convention
- △ PSP cyclone
- PSP cyclone – fitted model

(i) Duty cycle – 100%



- reference cyclone
- — — reference cyclone – fitted model
- — — respirable convention
- △ PSP cyclone
- PSP cyclone – fitted model