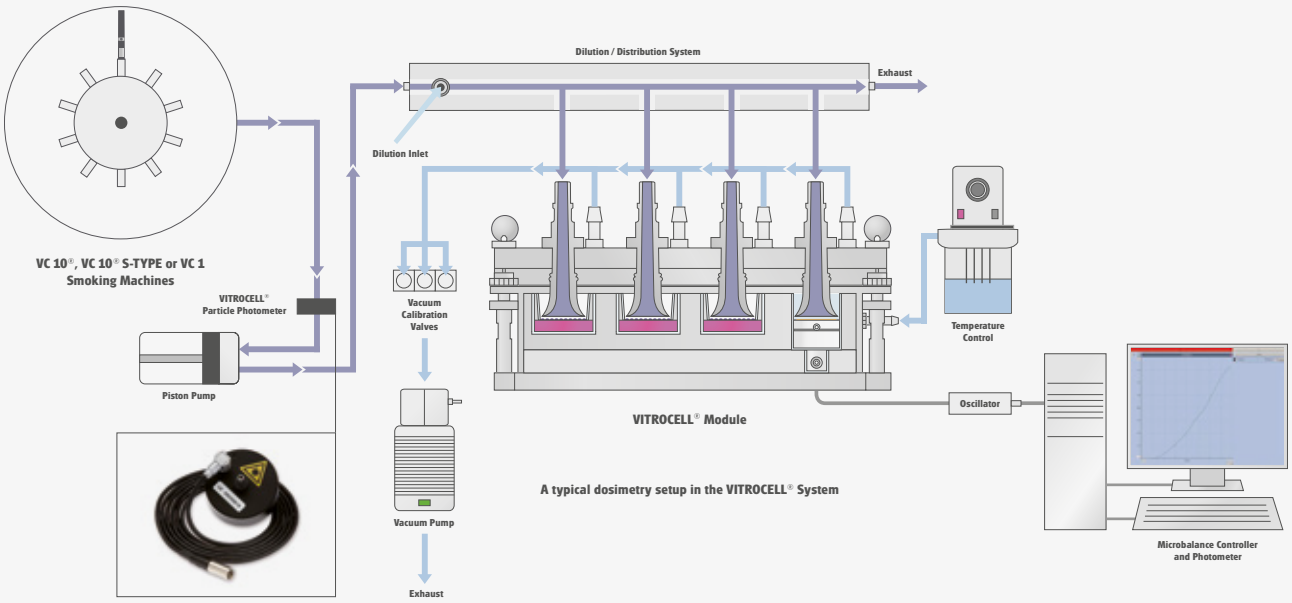
Monitoring of delivery performance of e-cigarettes in VITROCELL® Smoking Machines using VITROCELL® Particle Photometers

Objective

To establish a monitoring system for particle delivery of electronic cigarettes.

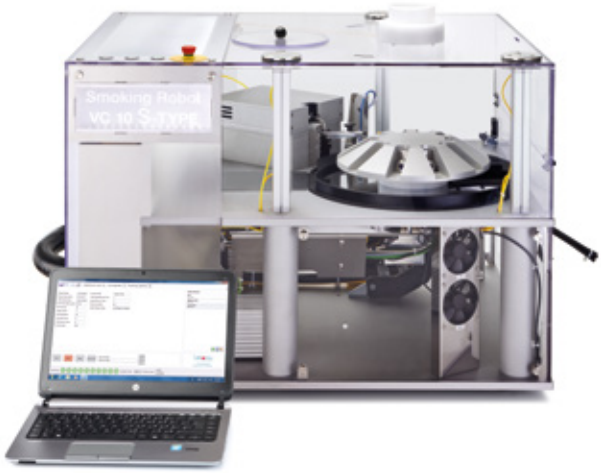
Overview chart



A typical dosimetry setup in the VITROCELL® System

Setup

The new VITROCELL® VC 10 S-TYPE smoking machine was used for the comparison of two different button activated e-cigarette brands. Both products had a refillable tank for e-cigarette liquid. The actuation of the devices was performed by the automatic button actuator of the smoking machine. For each product 180 puffs were performed. The smoking regime was 50 mL puff volume, 30 s puff frequency and 3 s puff duration. Prior to each run, the devices were recharged and refilled with the same amount of e-liquid.



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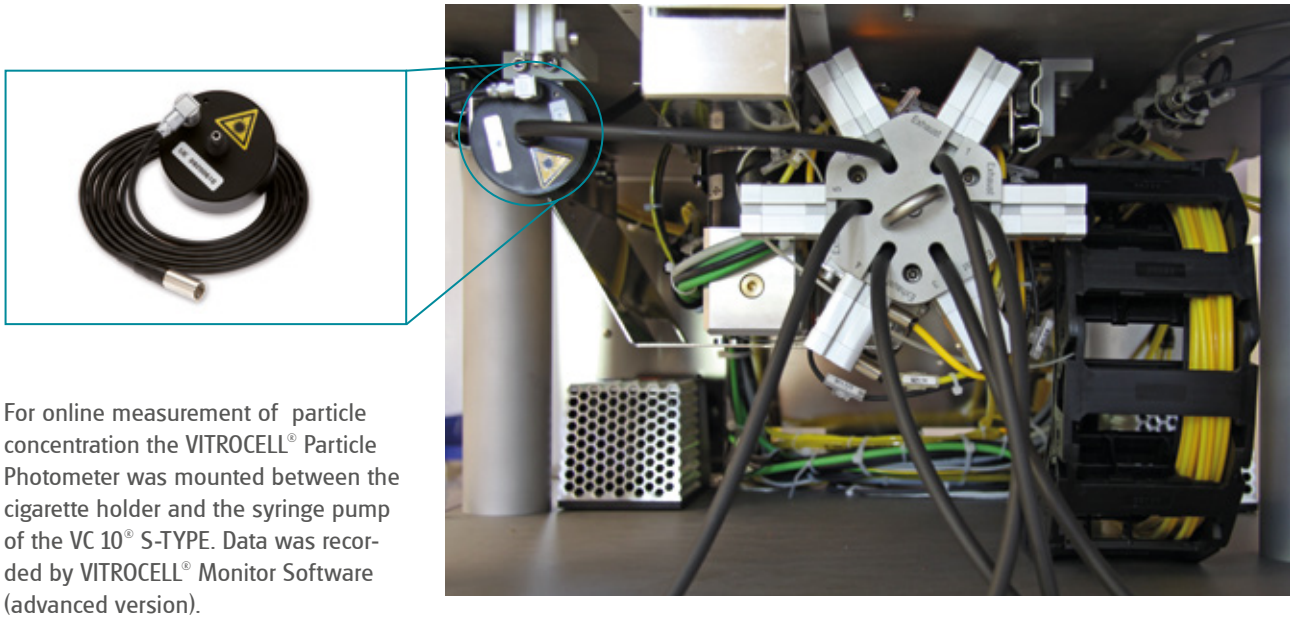
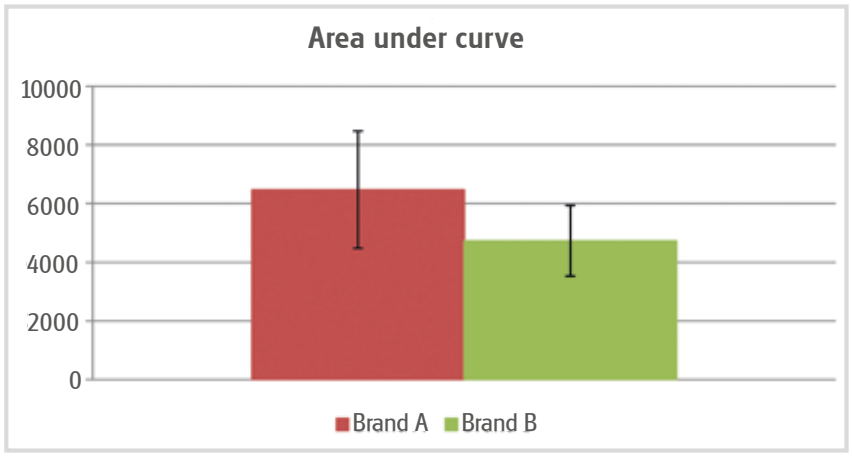


For online measurement of particle concentration the VITROCELL® Particle Photometer was mounted between the cigarette holder and the syringe pump of the VC 10® S-TYPE. Data was recorded by VITROCELL® Monitor Software (advanced version).

VITROCELL® VC 10 S-TYPE with VITROCELL® Particle Photometer for online particle delivery monitoring.

Results I

An area under curve calculation was performed for 3 runs for each brand using the VITROCELL® Monitor Software. The overall value is related to total particle release per brand.



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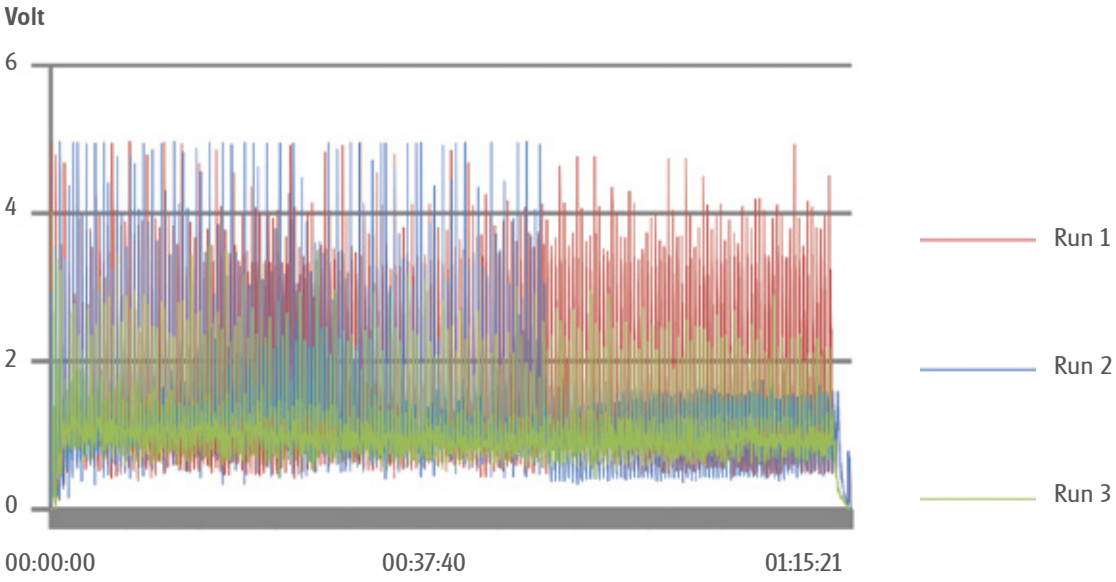
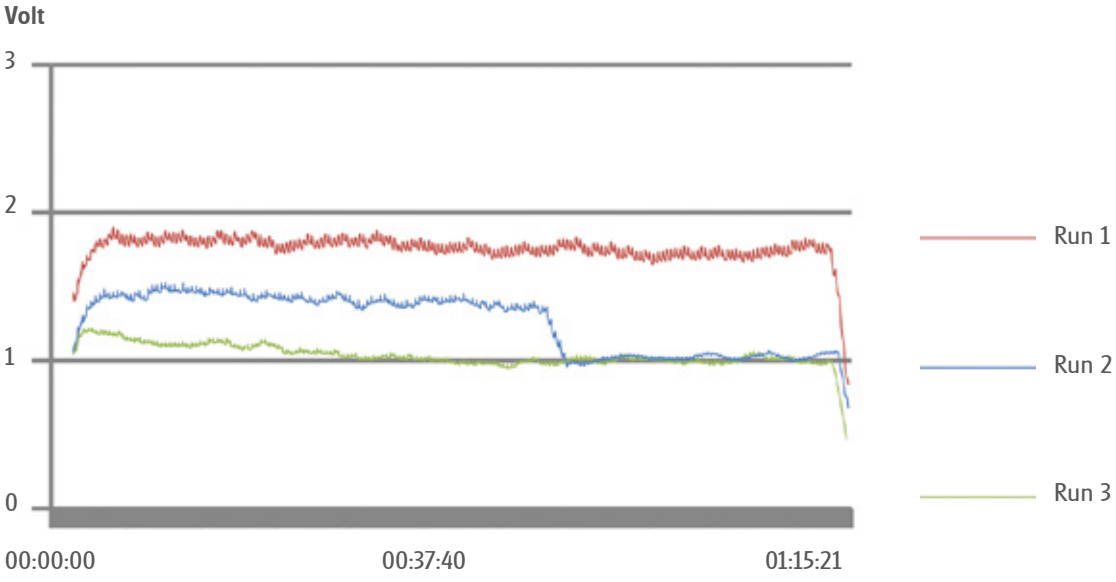
Results II

Scattered light measurement for each puff of the two different e-cigarettes is shown below. The graphs of the voltage signals show the individual data for 3 repetitive runs per cigarette. The trend lines below show that significant differences between both e-cigarette types could be detected.

Brand A

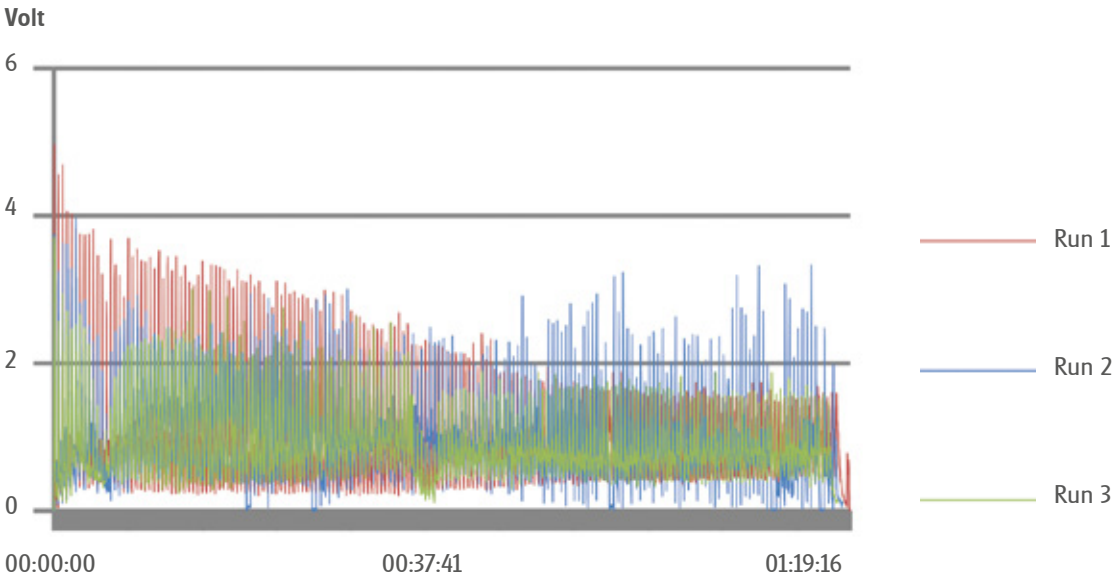


Single Signals

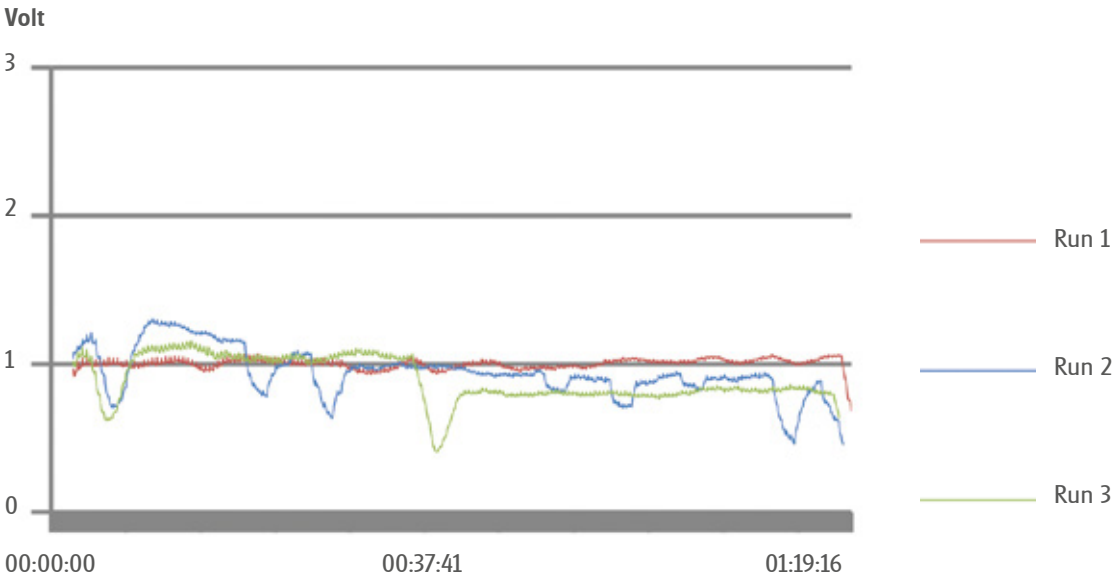


Trend Line

Brand B



Single Signals



Trend Line

Conclusion

Brand A released more particles over time than brand B, but has a higher variation. Brand B had a more stable particle delivery. The VITROCELL® Particle Photometer combined with the VITROCELL® Monitor Software is a powerful analysis tool to compare delivery profiles of e-cigarettes.

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