

# Inhaled Drug Delivery Device Testing

## Imaging Contract Services Laboratory

*Visualise and Evaluate Product Performance and Consistency*



Analysis of Sprays in  
Respiratory Device  
Development

Contract Services for  
Device Testing

SMI | pMDI | BAI  
Intra-Nasal | DPI



Oxford Lasers' imaging laboratory provides access to the latest advanced imaging techniques to analyse the dynamic performance of inhalers.

Pharmaceutical and medical device companies are focusing on increasing sustainability with new low-carbon propellants and alternative designs. Oxford Lasers supports these sectors with a full array of testing services available at all stages of the development journey from R&D to regulatory submission including:

- Dynamic plume geometry
- Spray pattern
- Flow field velocity
- Actuation stability and consistency data
- and more...

Advanced imaging analysis enables customers to adjust formulations, evaluate design, and determine effectiveness for delivery of therapeutic products. Whether you are working on a Softmist Inhaler (SMI), a Pressurised Metered Dose Inhaler (pMDI), a Breath Actuated Inhaler (BAI), a Dry Powder Inhaler (DPI), an Intra-nasal delivery device or the latest smart device, we are able to provide rapid screening tests to bring your device to market faster.

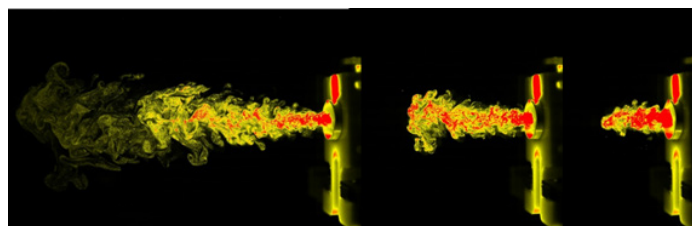


# Applications & Case Studies

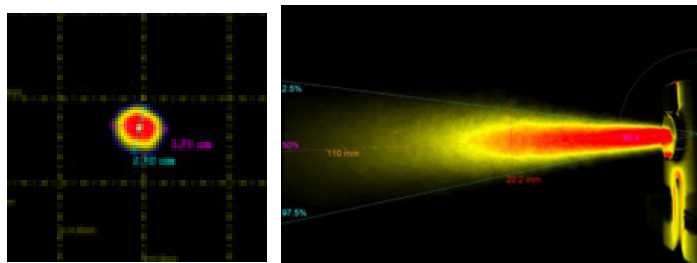
## SMI - Softmist Inhaler

**Question:** How would you know if your SMI actuation events were consistent between events or between devices?

**Solution:** Oxford Lasers provides advanced imaging services to capture and evaluate plume development, spray pattern, velocity and full release profiles of SMI performance. We enable customers to understand if the device is behaving in a consistent manner by fully investigating the spray behaviour.

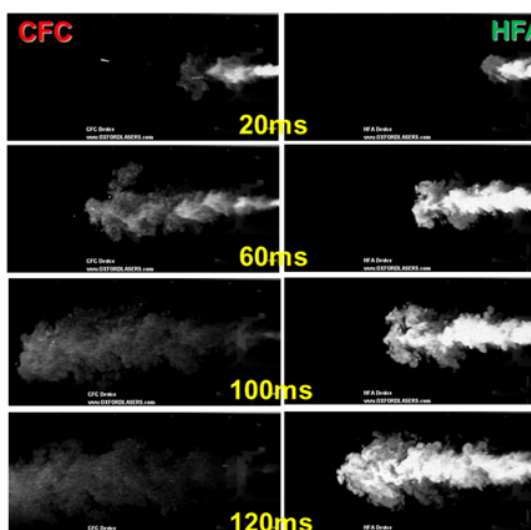


Plume development of a softmist inhaler actuation event



Spray pattern (left) and plume geometry (right) of a softmist inhaler

## pMDI - Pressurised Metered Dose Inhaler

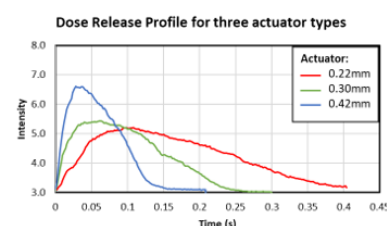
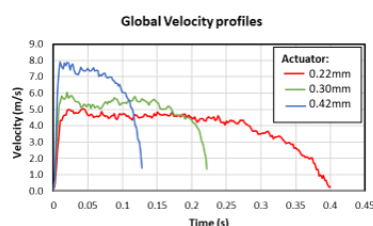


Comparative plume evolution of two formulations of a pMDI (G Brambilla, R J Davies, A Ferraris, D Gander-ton, F Key, D A Lewis, B J Meakin, S D Murphy, T R Nicholls, Plume Profiling of Three Beclomethasone Dipropionate pMDIs, AAPS 2001)

**Question:** How would you know if a change in propellant impacted your formulation?

**Solution:** Oxford Lasers performed a comparative dynamic plume evaluation for a client to understand if the new product met performance and equivalency requirements. The imaging of the plume development, and velocity analysis created a comparative dose release profile. The customer was able to successfully evaluate the impact on product formulation and performance.

### Examples of Device and Product Performance Matching

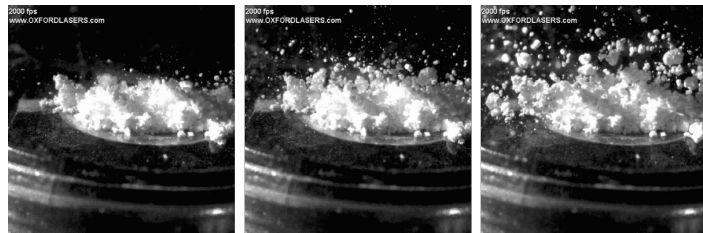


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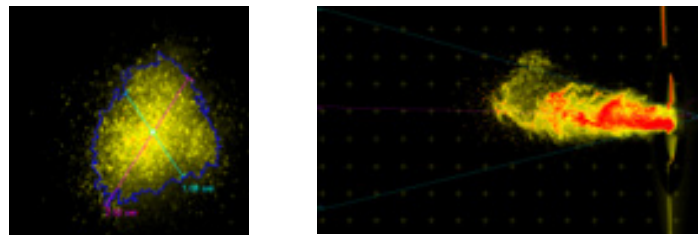
## DPI - Dry Powder Inhaler

**Question:** How do you know if your powder formulation flows through your device and releases its API effectively?

**Solution:** Oxford Lasers enables pharmaceutical and medical device companies to evaluate powder bed breakup, product release and impact of API through high-speed imaging. We provide answers with our OL breath-actuated imaging arrangement for uncovering the complexities of dry powder release.

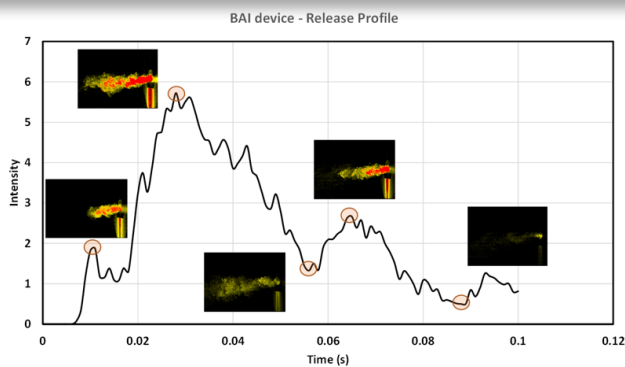


Powder bed breakup (Shur J, et al, Investigating Vibro-Fluidization of Dry Powder Inhaler Formulations. RDD 2012 P789 – 792)



Spray pattern (left) and plume geometry (right) of dry powder inhaler release (Murphy S - Evaluation of Dry Powder Device Using High speed imaging 2011 DDL22)

## BAI - Breath Actuated Inhaler



Product release profile of a BAI (intensity over time). Combining this with a spray pattern evaluation enables Oxford Lasers to capture the full characteristics of the device under various conditions.

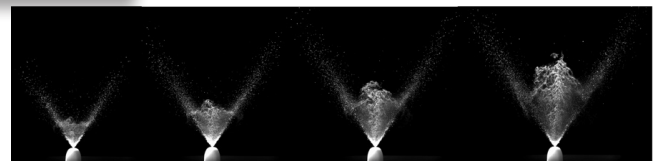
**Question:** How do you know what the consistency of performance is of your BAI over a range of conditions?

**Solution:** Oxford Lasers utilises an innovative technique to test BAI devices under flow conditions. This techniques enables us to capture spray pattern and plume geometry for full device testing to ensure consistency of performance on product delivery.

## Intra-Nasal

**Question:** How well is your intra-nasal device performing?

**Solution:** Oxford Lasers has significant experience on a diverse range of nasal delivery platforms. Our work ranges from standard spray pattern and plume geometry measurements for regulatory submission through to R&D testing. We enable understanding of device performance from detailed velocity information to back to back pump testing.



Plume development for the evaluation of an intra-nasal device



**Addressing the challenges to develop more sustainable products in the pharmaceutical and medical device sectors through advanced imaging capabilities**

### EnVision Technology for Qualifying Devices

Using our in-house, high-speed imaging systems with EnVision technology, we provide our customers a wide range of qualitative and quantitative data in the evaluation of their devices.

Oxford Lasers has over 20 years of experience supporting global companies with advanced imaging techniques. Choose Oxford Lasers for all your inhaler device imaging testing needs. Let us help you bring safe and effective healthcare solutions to patients worldwide.

Contact us today to discover how we can assist you in achieving your goals.

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