Microsaic Systems

# Development of a new analytical tool for biologics manufacturing

Microsaic Systems, GMS House, Boundary Road, Woking, Surrey, GU21 5BX, United Kingdom

## CHALLENGE

Modern biologic medicines, such as monoclonal antibodies (mAbs) are complex products which require controlled and complex manufacturing processes. Knowledge of how cell culture process parameters impact mAb Critical Quality Attributes (CQAs) is crucial to allow safe and efficacious medicines to be produced. Current technologies rely on off-line decentralised facilities, leading to expensive, complex and slow analyses. Following feedback from customers in the pharmaceutical industry the need for an analytical tool that could easily monitor mAb titre and CQAs at the site of production, in real time, and at low cost was identified.

## SOLUTION

Microsaic's existing miniature mass spectrometry (MS) platform was further developed to allow monitoring of higher mass molecules, such as mAbs. This utilised Microsaic's extensive knowledge of mass spectrometer electronics and theory to develop the RF drive to measure much higher masses than was previously possible. Use of MS allows the direct measurement of the mAbs' mass. In turn allowing information on whether the correct mAb is being produced and allowing any statistical variability in the product to be monitored.

Biologic cell cultures contain a large number of components, crucial to the health and growth of cells, which can make analysis complex and potentially damage analytical equipment. Critical to allowing the introduction of cell culture samples to the mass spectrometer, and the viability of this product, was development of an interface to allow rapid clean-up and preparation of the mAbs for MS analysis. Leveraging our own skills in fluidics and chromatography, coupled with our very strong and long-term relationship with a fluidic OEM, we were able to develop an automated protein A capture chromatography module which could directly interface to Microsaic's existing miniature MS platform. This allowed the product to be completely 'inject and forgot', freeing up the customer's resources.

Critical to freeing up the customer's resource was making the product easy to use. A graphical user interface (GUI) was developed by our in-house software team that simplified operation of the mass spectrometer and fluidics unit for the end user. This incorporated new analysis tools to automate analysis of the complex mAb mass spectra, generating easy to understand data. This allows non-specialists to operate the system, interpret and action the information.


The MiDex unit

## RESULT

From this, the MiDex point-of-need mAb analysis tool was created. The MiDex allows the easy measurement of mAb titre and CQAs in a small footprint. The system was trialled at the Centre for Process Innovation's (CPI) National Biologics Manufacturing Centre. Over two weeks mAbs, from cell cultures under two growth conditions, were monitored. During testing, feedback from potential customers was obtained to enable further development of the product with the customer in mind. Feedback included:

- *'Very small so ideal to fit in busy lab environments'*
- *'The ability to be used by users unfamiliar with mass specs is a huge benefit. Less training is required so the system is able to be utilised by more members of the team'*
- *'Sample analysis is quick and quantification is automatic'*