

# Chromatography Focus

## “AN INCONVENIENT TRUTH”

### THE MISSING ERGONOMICS IN MODERN LABORATORIES

Dr Martine Barnes

#### “BENCH-TOP” INSTRUMENTS - A THING OF THE PAST?

*Ergonomics seems to remain something suppliers have yet to consider integrating with respect to the use of analytical instrumentation in laboratories.*

*Laboratory benches were traditionally built with bunsen burners, storage of glassware and use of solvents in mind, rather than bulky instrumentation.*

*Whilst many laboratories have undergone refurbishments, such as the incorporation of fume hoods, this has primarily been responsive to the needs of health and safety in the workplace, as well as improving outdated décor. Little attention has generally been given from suppliers in the laboratory market to the integration of analytical instrumentation with its surroundings – especially from an ergonomic perspective.*

*Instrument manufacturers have focused over the last five to ten years on the development of walk-up “bench-top instruments.” The purpose to provide instrument access to all analysts.*

*Previously, analytical instrumentation such as mass spectrometers, required highly-trained analysts and considerable floor space for the large console. Facilitated by the ease of use, cheaper production costs and compatibility, analytical instruments are nowadays designed for, and marketed as “bench-top”. Strange, because using an analytical instrument on a bench-top is not really that convenient for analysts.*

To begin with, not many laboratories have benches positioned at such a low level that analysts can comfortably use them at good eye level. Quite often, analysts find it difficult to install consumable products, without maneuvering into uncomfortable positions or stretching to refill HPLC bottles. The positioning of the instruments in the laboratory also makes it difficult for natural light to flow onto the instrument, including internal positions where the analyst is required to perform tricky operations, such as the installation of GC columns. Research capacity is also limited that instruments often outgrow available bench-top space so that analysts are forced to sit directly in front of draws and cupboards.



But there are even further obstacles. Often laboratory benches are positioned against walls, and back to back with each other. This not only makes access very difficult for service engineers performing instrument maintenance, but is not ideal from the instrument function perspective. A lack of space behind instruments which generate or use heat, can minimise the cool down efficiency of the fans placed inside them to precisely control this.

There is also the vertical consideration. HPLC workstations have been developed to comprise of stacked detector modules. An average system comprising of pump, column and PDA detector sitting on a laboratory bench, without additional modules, is so high that the solvent bottles inconveniently hover just out of sight. Helping to ensure that your solvent bottle has just become empty and too late to prevent all the air bubbles getting into the system. Robotic liquid dispensing systems are also commonly placed on top of HPLC and GC systems. And loading the samples or changing the syringe or a needle can become tricky, as one has to stretch across the front of the instrument.

And where there are HPLC's, GC's and MS's, there are HPLC and GC columns. Often these are stocked away in cupboards and drawers underneath the bench to protect them from dust. Because they come boxed, they are placed stacked on top of each other. But analysts find it awkward to read the label, usually positioned on one side of the box, without either crouching onto the floor and/or taking the boxes out. A wall-mounted alternative would be far more ideal.

Taking these factors into account, it becomes questionable as to why a laboratory would need a bench system these days? What are the advantages? Wet work is almost exclusively done in a fume hood, or processed automatically in-vitro by robotics. Disposable technologies are also far more common place than the use of bulky volumetric glassware that previously required large storage mechanisms.

#### INSTANT GROWTH IN RESEARCH CAPACITY

So what would happen if laboratory benches in the lab were eliminated, and replaced by innovative consoles “positioned” on adjustable platforms? Well the biggest opportunity of all would be an instant growth in research capacity without the need for investment in a new building or extension. The building of new laboratories are one of the most costly investments that academia and private companies are faced with.

But analysts would not just be able to alter the height of the console to their own personal level of comfort. Such platforms would pertain to creating a mobile laboratory - enabling better shared facilities and energy savings. Large pharmaceutical companies are now investing millions of euros into making their laboratories “mobile” in order to expand to the changing needs of the projects and workforce.

#### BENEFITS TO ANALYTICAL MANUFACTURERS

Of course more research capacity would also benefit analytical manufacturers themselves. More lab space means more instruments and more consumable product business. Wall-mounted cupboards with rotating cabinets could both store and vend consumable products customised to the needs of a particular lab.

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If consumable products were automatically dispensed in laboratories, this would also save on the large overheads of administration costs for order processing for purchase managers, end users and vendors. Also ensuring immediate access to products for analysts, and overcoming delivery and stocking issues for manufacturers.

### ENERGY COST-SAVING STRATEGIES

There is also the important environmental consideration. A typical laboratory, uses far more energy and water per square meter than the average office building. Primarily due to intensive ventilation requirements and other health and safety concerns. The Labs21 (Laboratories for the 21st Century) initiative, founded in the US, is a non-profit organisation set-up to reduce the impact of laboratories on the environment.

The Labs21 approach examines the entire lab facility from a "whole building" perspective. At a recent meeting in Ghent, Belgium ([www.labs21.org.uk/events\\_presentations.htm](http://www.labs21.org.uk/events_presentations.htm)), Lab21 representatives and European participants discussed how mobile laboratory design and better refurbishment, coupled with improved ventilation and extraction design, can result in substantial energy cost savings.

### MORE FENG SHUI IN THE LAB

Accompanying energy efficient modules could supply gas delivery and extraction systems to the mobile instrument platforms. Vacuum driven technologies, such as mass spectrometers requiring oil pumps could sit in sound-proof module and be kept cool by a simple fan. Reducing the impact of heat into the lab, as well as noise. Oil vapour generated by pumps could be directly channeled through an extraction module resulting in not having to build a separate room to house the pumps, or possible oil vapour contaminating lab air.

Using a mobile platform for an instrument would also reduce concern about the restrictions of length of vacuum tubing between pump and instrument. Also this would result in far easier access for service engineers when performing annual PM's along with less surface areas for dust to accumulate, also benefiting analytical laboratories.

### SAFETY CONSTRAINTS

What sorts of constraints would be presented to manufacturers to proceed with development of solutions? Well, all materials for such a mobile platform would have to be constructed out of chemical- and fire-resistant materials to meet strict health and safety regulations. Also there would be a requirement to incorporate appropriate built in storage options for solvents, and gas lines and extraction systems constructed to local safety standards.

### REDUCING CARBON FOOTPRINTS IN THE LAB

But it's not just cost savings that are important drivers for suppliers to change the way laboratories are currently designed. We are now living in the very real threat of global warming. With labs having up to a 10 times greater carbon footprint compared to a normal office, it would be highly unethical that those in the industry, who perhaps better understand the implications of global warming, do not take action with respect to reducing carbon footprint of laboratories.

European legislation concerning environmental impact, is already affecting the analytical manufacturing industry with the imminent enforcement of the WEEE (waste electrical and electronic equipment) regulations. Analytical manufacturers in the UK, where the EC legislation recently came into effect, talk of the difficulties they face in factoring in the costs for collection and disposal of replaced models.

In an attempt to bring awareness of the impact within the industry, further legislation will shortly come into effect in Europe regarding the publishing of carbon footprint statistics for laboratories. And as legislation begins to take effect, the metrics of laboratory product purchases will also begin to change. The only way laboratories will become sustainable is to reduce their energy, as fuel prices begin to soar. Analysts will begin to opt for products that will help them achieve this, from both ethical and cost-saving reasons, as well as ergonomic factors.

### ARE ANALYSTS PREPARED TO PAY EXTRA?

Convenience of course does come at a price, at least in the short-term. But nevertheless, the convenience factor seems to be almost a universal force in attracting purchase power.

Just take computer users. Ten years ago, people primarily considered the purchase of a laptop to enable "work on the go." Nowadays, users are increasingly buying laptops as replacements for cheaper pc's - only to place them on a docking station and use a flat screen monitor with a wireless mouse and keyboard set-up. Why pay for all the extras on top of a more expensive laptop when one could opt for an all-in bargain price of a pc system?

### SMART SOLUTIONS SELL THEMSELVES

The choice of solutions from one key computer manufacturer is so smart that one is not even bothered to go scrolling through the internet to consider the offerings of their competitors. The comforting experience of seeing smart solutions is enough to make you want to buy. The price issue suddenly appears to have got lost somewhere in the midst of excitement that a solution you have wanted for ages is about to happen. Clearly the number of businesses now using a static laptop set-up reinforces the convenience-consumer-culture we enjoy living in. Couple that with energy-reduction technology and one truly achieves innovative products.

The leading manufacturers of computers and laptops make it really difficult not to be able to personalise your own workspace. No matter what your set-up is. It's time for laboratory suppliers to now focus on lab ergonomics - benefiting research, analysts, the environment as well as themselves.

So only one question remains as to which of the analytical instrument manufacturers will be first to step up to this big opportunity and develop some "platform solutions", that will also net them some nice returns?



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