A white hand is shown placing a green link into a chain of blue links. The chain is arched over a light blue circular area. Below the circle, a chromatogram with several peaks is visible. The background is a light blue gradient with a pattern of small squares.

# The Missing Link Between HPLC and UPLC

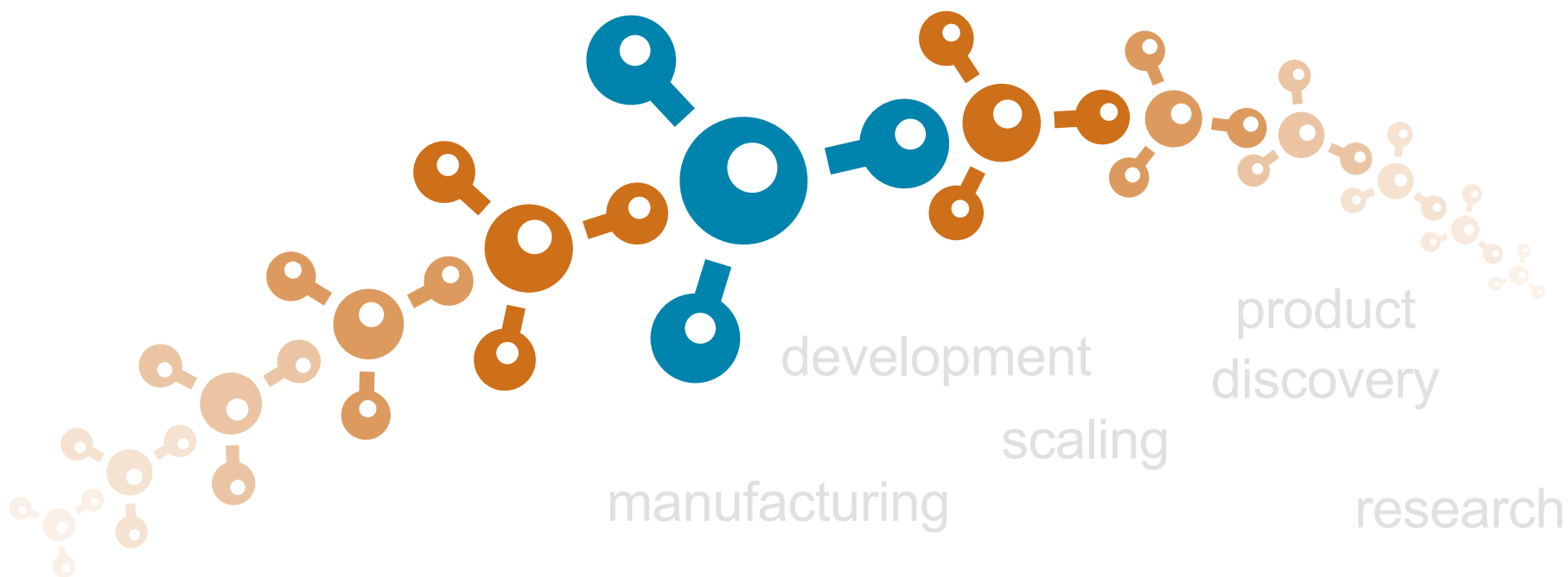
# The Missing Link

## GETTING FROM HPLC AND UPLC DOESN'T HAVE TO BE HARD

Over the past 30 years, liquid chromatography has proven to be the predominant analytical technology within laboratory-dependent organizations around the world. No other single technology supports a company's analytical needs from product discovery, research, all stages of development, scaling, and manufacturing to final testing for release with the performance and efficiency of LC.

Yet even with its role as a primary analytical tool, not too long ago **LC technology came dangerously close to becoming a stagnant technology – similar to GC –** where new systems and methods merely offered incremental advancements with a relatively minor competitive advantage.

**While the world of science took great leaps forward, analytical chemistry lagged behind. High-performance liquid chromatography has not kept pace with the urgency of today's business demands to analyze more samples, faster, and with better results.**



## THE ACQUITY UPLC H-CLASS SYSTEM PROVIDES UPLC PERFORMANCE WITH HPLC FAMILIARITY

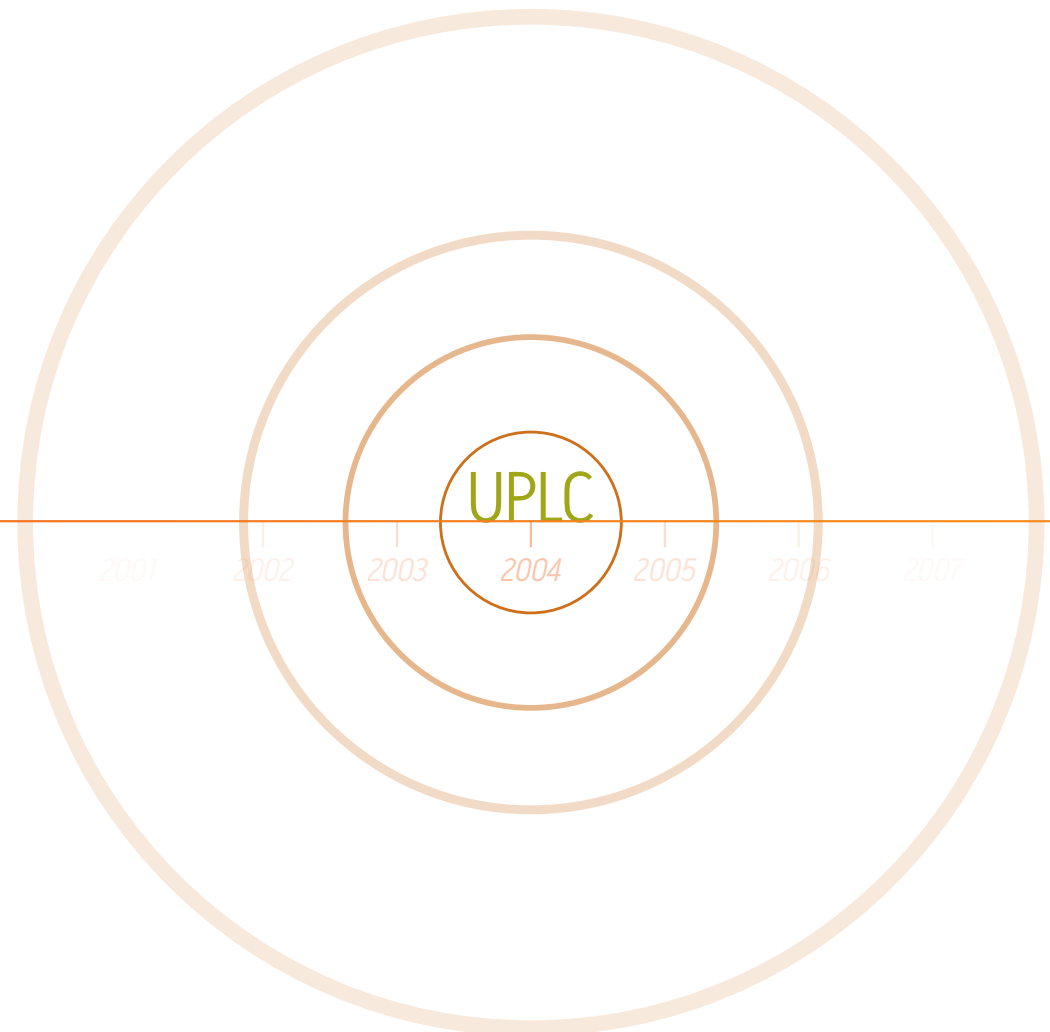
Over a decade ago, Waters pioneered a new category of chromatographic performance with the commercialization of sub-2- $\mu\text{m}$  particle columns engineered in tandem with advanced instrument design featuring modern fluidics modules that deliver very high performance. The result of smaller column material particle sizes and reduced system dispersion? Significant improvements in analytical resolution and sensitivity while increasing sample throughput.

**This LC revolution was fueled by the introduction of UltraPerformance LC,<sup>®</sup> or UPLC.<sup>®</sup>**

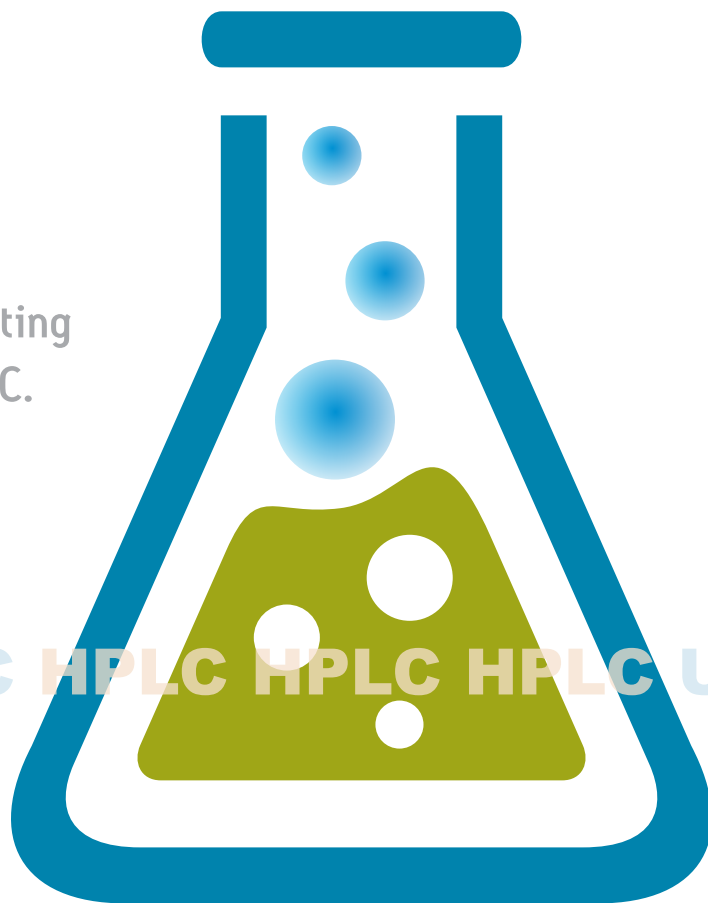
Since 2004, this disruptive technology has gone on to **replace thousands of HPLC systems**, demonstrated **reduced solvent consumption up to 95%** for greener laboratories, **support thousands of peer-reviewed papers**, and **served the needs of regulated laboratories** around the globe.

Having proven its performance and reliability under extremely rigorous conditions for the most demanding applications, UPLC technology has brought routine benefits to increasing numbers of scientists. Today's HPLC users, many of whom are not able to or prefer not to change their approach to LC, are looking for the benefits from UPLC technology in a way that is compatible with their laboratory procedures. With that goal in mind, the ACQUITY UPLC<sup>®</sup> H-Class System was developed, which provides UPLC performance with HPLC familiarity.

Since 2004, UPLC has replaced thousands of HPLC systems and reduced solvent consumption.



Achieving UPLC-quality separations without changing how HPLC operators work was identified by Waters customers as the key challenge to accelerating their adoption of UPLC.



## YOU DON'T HAVE TO CHANGE THE WAY YOU WORK

The ACQUITY UPLC H-Class System, with its quaternary solvent manager (QSM) and sample manager with flow-through needle design (SM-FTN), features a nearly identical work flow compared with a traditional HPLC system. Its low-dispersion characteristics enable the chromatographer to achieve desired high-efficiency separations. The QSM module offers **expanded solvent blending capabilities** through built-in Auto•Blend Plus™ Technology, and the SM-FTN features an intuitive, flexible injector with low carryover. The result is seamless upgrade of chromatographic capabilities.

In addition to simplifying the use of UPLC technology in HPLC applications, consistent separation chemistry is required throughout the transfer of methods. The ACQUITY UPLC H-Class System is a premier technology that routinely supports both HPLC and UPLC performance on a single platform. Method transfer kits from Waters facilitate choosing an appropriate column to maintain the integrity of a separation when scaling from HPLC to UPLC and back.

The multisolvent blending capabilities of the ACQUITY UPLC H-Class System also make it an **effective platform for methods development**. A series of method development kits consist of several UPLC columns that encompass a range of selectivities to accommodate different method development approaches. The kits enable methods to be developed efficiently and effectively on the system.

## SPEND LESS TIME PREPPING – AND MORE TIME CONDUCTING ANALYSES

Included as a standard feature with the ACQUITY UPLC H-Class System, Auto•Blend Plus Technology **delivers multisolvent blending that significantly reduces the need for manual solvent preparation**, managing the desired pH and ionic strength requirements for the selected mobile phase. This solvent management system significantly reduces the time spent in the prep lab by automating the formulation of mobile phases from reservoirs of pure solvent or concentrated stock solution, blending them online and virtually eliminating errors.

First developed for use with protein separations, where pH is one of the most powerful tools for adjusting a separation, especially in ion-exchange and size-exclusion chromatography, Auto•Blend Plus also **works with reversed-phase separations**. Now, in addition to screening typical parameters – such as temperature, gradient, slope, and percentage of organic modifier – you can also automate screening of pH adjustments without any change in workflow.

Small, incremental changes in pH can have a dramatic impact on a chromatographic separation – even reversing the component's elution order – which can significantly affect the method robustness and the reliability of the results. Peaks can be moved further apart for unequivocal identification; analytes can be moved away from interferences; and the reliability of quantitation can even be improved by putting peaks on a flat baseline, and sometimes by putting the small peaks first.



**Auto•Blend Plus Technology delivers multisolvent blending that significantly reduces the need for manual solvent preparation.**

pH 3.1



pH 3.2

1, 2



pH 3.3

2

1



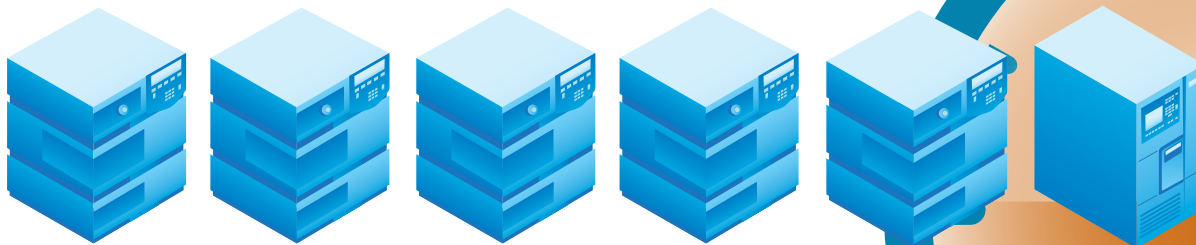
# Case Study 1

## SMALL BIOPHARMA MOVES FROM THE AGILENT 1100 SERIES LC SYSTEM TO ACQUITY UPLC H-CLASS SYSTEM

*Client: Small biopharma firm focused on natural products*

*Location: Northern Germany*

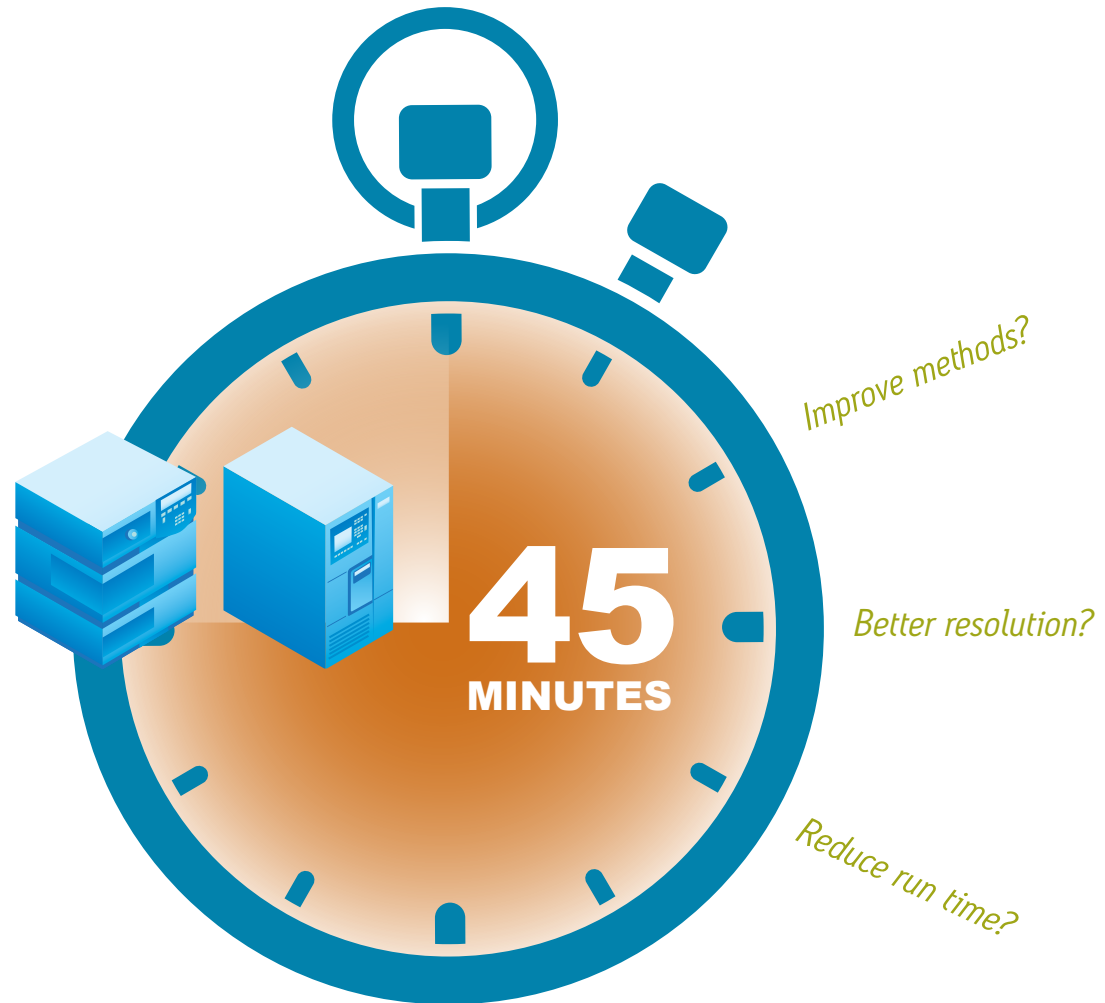
Everything was going along quite smoothly for this small biopharmaceutical company in the quiet German countryside. The company had five Agilent 1100 Series LC Systems in their installed base. One of them was used in process development, as well as a Waters Alliance® HPLC System. Running a typical analysis took about 45 minutes. Resolution was fine.



Until one day, a new big project came into the lab.

**The status quo was suddenly changed and 45-minute run times were no longer acceptable.** This small German firm needed a way to improve methods, reduce run times, and improve the resolution of separations... or risk losing control of the process.

With this new project also came a greater emphasis on compliance. Everything absolutely had to be within the guidelines of U.S. FDA 21 CFR Part 11.



OPTION 1?  
HPLC  
HPLC  
HPLC

OPTION 2?  
UPLC  
(HPLC?)



## EXAMINING THE OPTIONS

### Option 1:

They could purchase two or three HPLCs and squeeze them into the lab.

### Option 2:

They could buy one UPLC system. But then what would happen to their HPLC methodologies?

Agilent was the preferred vendor for this client, so there was some sentiment for buying for buying Agilent LC systems.

The Waters Alliance HPLC System with Empower® Software had done an excellent job and also had its share of supporters.

But there was one other choice.

### Option 3:

The ACQUITY UPLC H-Class System from Waters.

OPTION 3.

ACQUITY  
UPLC H-Class  
System

## FINDING THE SOLUTION

So, could the ACQUITY UPLC H-Class System really do the work of two or three HPLC instruments? Was transferring between HPLC and UPLC actually going to be simple? Were the chromatographic resolution and sensitivity truly going to live up to the level of the ACQUITY UPLC family name?

The only way to answer so many questions would be to conduct a sample analysis. Which is exactly what happened at the Waters demonstration laboratory in Eschborn, Germany. The ACQUITY UPLC H-Class System was put through its paces for a day. Its main objective was the analysis of the compounds of interest that normally took the client 45 minutes to complete. With the ACQUITY UPLC H-Class it took 5 minutes!

And with better resolution.

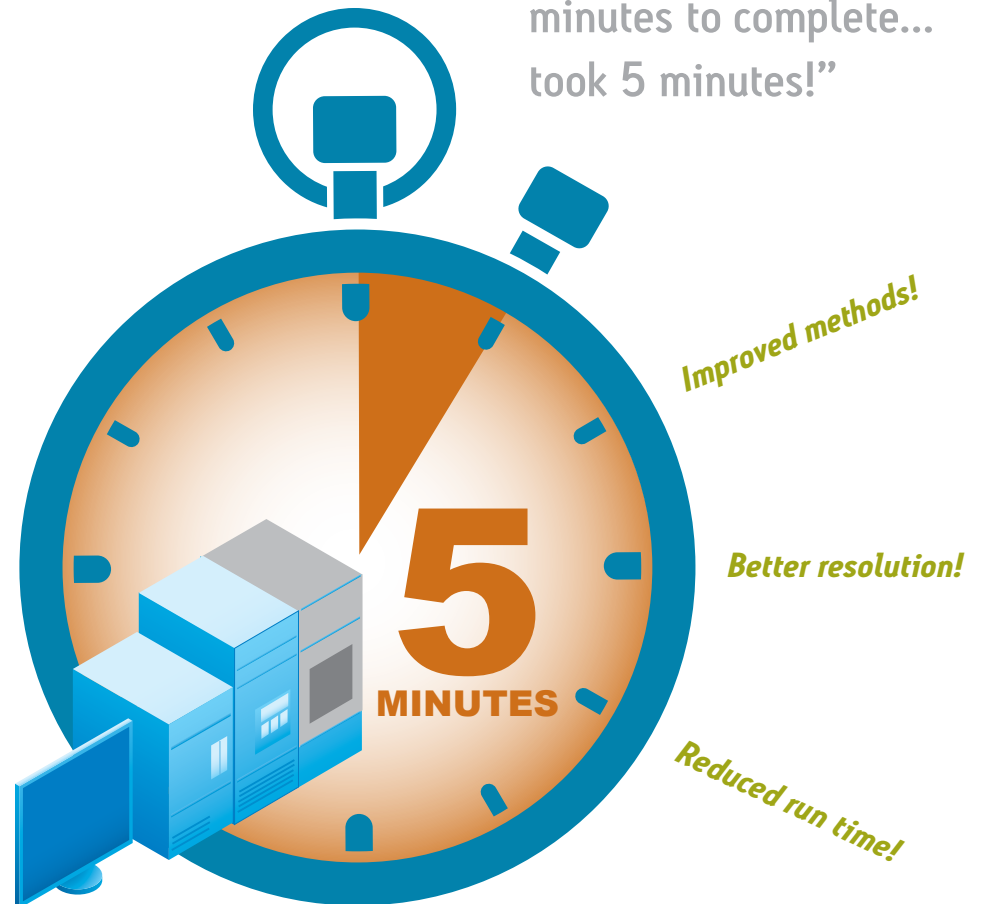
The customers could barely believe what they had seen in the result report.

**And, they quickly saw that transferring methods from HPLC to UPLC was a simple, intuitive procedure.**

Even the worries over budget were put to rest. They found out the ACQUITY UPLC H-Class System is actually a money-saver, using up to 95% less solvent than HPLC systems and priced less than a standard UPLC.

Rounding out the result was Waters' new version of Empower Software with enhanced 21 CFR Part 11 compliance capabilities.

“The analysis that normally took 45 minutes to complete... took 5 minutes!”



# Case Study 2

## JANSSEN SAYS “HELLO” TO PROMPT ROI

*Client: Janssen Pharmaceutical Companies, Division of Johnson & Johnson  
Location: Beerse, Belgium*

Like many pharmaceutical companies, Janssen’s primary LC technology was HPLC. This limited technology sometimes took up to 60 minutes for one analytical injection, a pace the company could no longer live with. Release dates were being pushed back because of the slow analytical turnover time. The company’s business depended on being able to make decisions quickly.

Janssen needed faster results to make earlier judgments and earlier releases. On the research side, the client also needed new technology for improved separations.

**On top of it all, the economy was forcing them to do more with less. Implementing new technology was vital to their business and future success.**



## EXAMINING THE OPTIONS

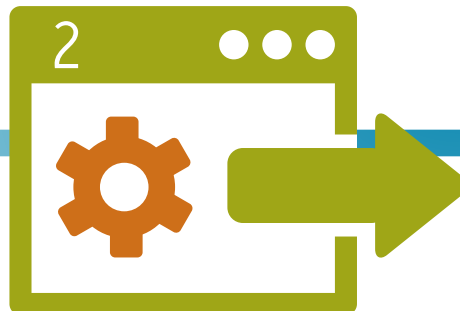
Janssen was most interested in two new technologies: the Waters ACQUITY UPLC H-Class System and the Agilent LC systems. Whatever system was to be purchased, it needed to accomplish four important tasks:

Continue running existing methods



Enable the QA/QC team to continue running their existing HPLC methods on a forward-looking LC platform without investing in more HPLC technology.

Seamlessly transition from HPLC to UPLC



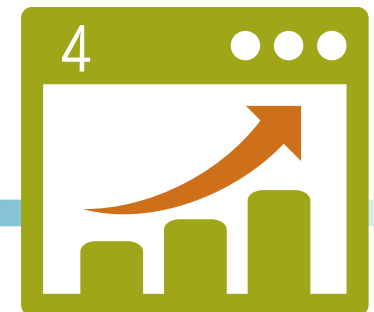
Allow for a confident and seamless transition from HPLC to UPLC separations at their own pace, using integrated system tools and reliable column kits to simplify migration.

Improve resolution and sensitivity



Improve upon the resolution and sensitivity Janssen needed to generate quick, risk-free decisions that would result in earlier product releases.

Improve laboratory productivity



Improve laboratory productivity, leading to a quick return on investment.

## FINDING THE SOLUTION

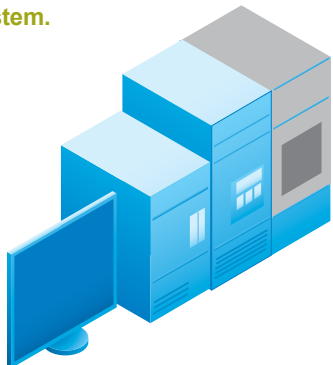
Janssen was impressed with the multiple business advantages of the ACQUITY UPLC H-Class System.

To start with, the ACQUITY UPLC H-Class could save Janssen the cost of five liters of solvent per day. At \$50 per liter, that equaled savings of \$250 per day. But there was more – much more.

The potential impact of exchanging **one ACQUITY UPLC H-Class System to do the work of three HPLC systems** meant even more savings. Because of the improved throughput, the managers at Janssen could now accomplish more with less. In essence, saving about three hours a day, every day. They happily calculated what that was worth.

Analyses were completed quicker. Separations were more resolved and robust. They could easily envision using the ACQUITY UPLC H-Class System for legacy methods as well as for newer UPLC methods. They could implement the technology across the board, going from research into late development into operational QC. They could save time, save money, and say “hello” to a prompt ROI.

**What about the Agilent LC systems? Janssen tried that too. But its trumpeted performance paled in comparison to the ACQUITY UPLC H-Class System. The Waters technology was simply superior.**



SAVE \$250/DAY



operational QC

SAVE 3 HOURS/DAY



research

hello!

late development

# Case Study 3

## METHOD TRANSFERABILITY FROM HPLC TO UPLC

*Client: Seed and herbicide division of an international agribusiness company*

*Location: Research Triangle Park, North Carolina, USA*

An existing Waters customer was in charge of developing methods for pesticide analysis that would eventually be transferred to other facilities across the U.S. and around the world. The lab's installed base consisted of two ACQUITY UPLC Systems with PDA detectors, an ACQUITY UPLC System with a Xevo® TQ MS, and about 15 Agilent 1100 Series LC and Agilent 1200 Infinity LC systems.

Management had determined that it was time to replace the old LC systems with their next global platform. There was a corporate-wide focus on economy of cost. They needed something more affordable. But they also needed an instrument that would allow the operator to move effortlessly from HPLC to UPLC, from older technology to new high-pressure separation applications.

The answer would come in the form of a new instrument based on hybrid technology. But there was more than one choice.

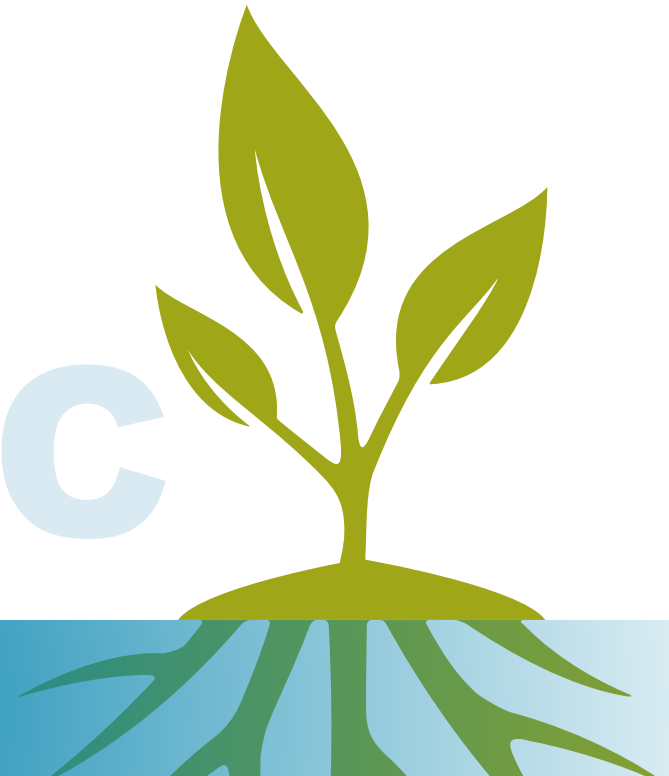


economy  
of cost

next  
global  
platform

effortless  
transition

UPLC



## EXAMINING THE OPTIONS

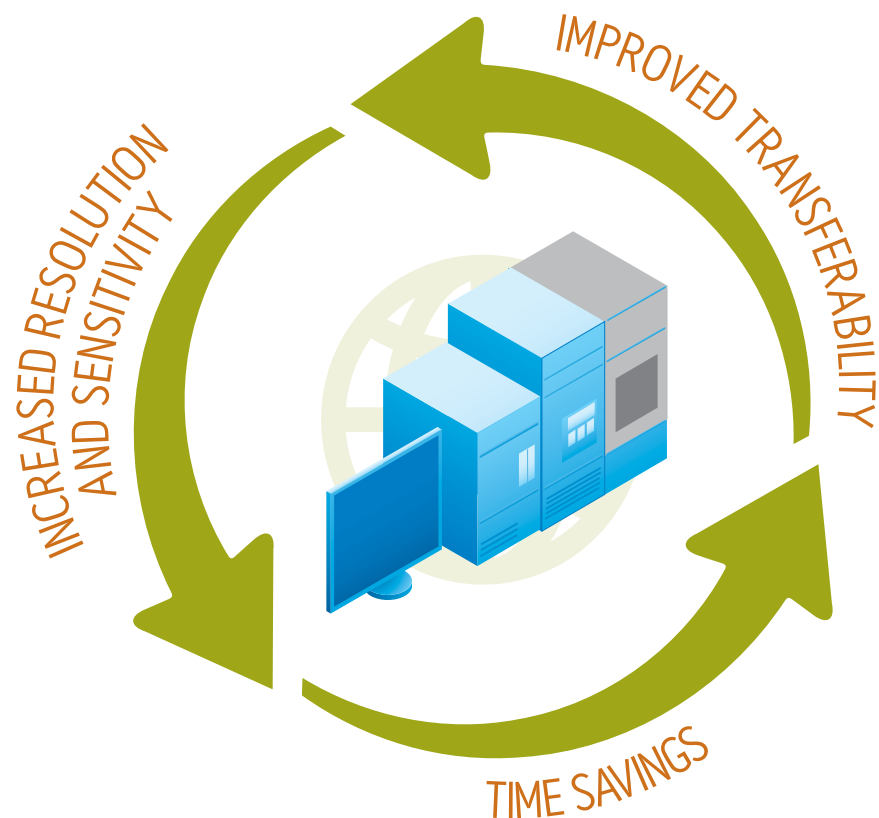
It was the Waters ACQUITY UPLC H-Class System versus the Agilent 1200RRLC System.

It was a classic example of a holistically designed UPLC system versus just a modified HPLC. Both offered improved productivity, however only one could truly claim improved performance.



improved  
performance  
and  
improved  
productivity

The ROI of the ACQUITY UPLC H-Class System was shown to better align with the company's overall economic requirements.



## FINDING THE SOLUTION

The fact the ACQUITY UPLC H-Class System was a quaternary-based system would make it easier to transfer methods to and from other LC systems – in their U.S. sites, as well as around the world. Their scientists could now form their own gradient combinations with no pre-mixing by using Auto•Blend Plus Technology with stock solvents. Other attractive features that promoted consistent method transfer and accurate results were the system's new column heaters and managers that are standardized with easy-to-access, low-volume, active solvent pre-heaters.

One last key feature the customer identified was the needle-in-flow-path design of the Sample Manager (SM-FTN), so vital because it helps deliver high-precision injections with excellent sample recovery.

**The client witnessed a demonstration of the ACQUITY UPLC H-Class, confirming it could run their most common and most critical applications.**

In reviewing the Agilent LC system, the client found it simply couldn't match the resolution of the ACQUITY UPLC H-Class System.

A second limitation that couldn't be dismissed was the poor method transferability being experienced with an Agilent LC system at one of the client's European sites.

Since implementation, the results to date include **significant time savings** in method development, **increased resolution and sensitivity**, and, most importantly, **improved transferability**.

In addition to realized laboratory benefits, the ROI of the **ACQUITY UPLC H-Class System** was shown to better align with the company's overall economic requirements.



## ACQUITY UPLC H-CLASS SYSTEM

### The highest resolution of any quaternary LC system.

With the ACQUITY UPLC H-Class System, your laboratory can achieve the ultimate in LC performance without changing the way you work with your current quaternary-based system. With automated solvent blending, the system delivers the advanced performance expected of UPLC separations –

**high resolution**

**sensitivity**

**improved throughput**


– while maintaining the robustness and reliability that ACQUITY UPLC systems are known for.

Choosing the ACQUITY UPLC H-Class System enables you to continue running existing HPLC methods on a forward-looking LC platform, allowing you to confidently and seamlessly transition to UPLC separations – when you're ready.

[www.waters.com](http://www.waters.com)


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# Waters

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