The Guide to Improved Efficiency

An eCompendium based on the findings of "Your Efficiency Challenge"

Over the last two years, The Analytical Scientist has been working with Agilent Technologies on an exciting project that began with your views on efficiency in terms of liquid chromatography and associated workflows. The resulting survey results helped define topics for three lively roundtable discussions, and spawned a series of articles that cover the most important aspects of efficiency across three scales: i) analytical, ii) instrument/software and iii) the whole laboratory.

Welcome to The Guide to Improved Efficiency!

KEY

- Webpage
- Video
- Application Note

Begin Your Efficiency Journey Here!

(click the boxes to navigate)

Take just two steps to start your efficiency journey...

Click the boxes to navigate!

STEP 1: SELECT YOUR MAIN ROLE

HPLC method development

Routine Workflows

Analytical Lab Management

STEP 2: HOW DEEP?

I have only 5 mins for a snapshot...

Take me to the "Analytical Efficiency" Highlights

Take me to the "Instrument Efficiency" Highlights

Take me to the "Laboratory Efficiency" Highlights

I have 15 mins to compare myself with my peers...

Take me to the full results of the "Laboratory Efficiency and Liquid Chromatography Survey," which shares the views of over 1200 LC users across the globe

I can spend 30 mins to learn from the experts...

Play me the expert discussion on how to push results to the next level by selecting suitable technology

Play me the expert discussion on how to survive the sample onslaught and even create a little breathing room

Play me the expert discussion on how to plan for success and secure my (lab's) future

I want to delve straight into the solutions...

Help me navigate solutions that boost analytical efficiency...

Help me navigate solutions that boost instrument/software efficiency...

Help me navigate solutions that boost the overall efficiency of my laboratory.

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Analytical Efficiency in 5 minutes

MENU

Which is most important for you when it comes to liquid phase separations?
[click answers to reveal survey response and what the experts say]

Robustness of workflow	Low limits of detection	Fast sample turnaround	Other

Pearls of Wisdom

"I think there is a way for everyone to improve analytical efficiency – but you really have to commit to it! People sometimes don't want to change, but without change there will be no efficiency gains." – Udo Huber, Agilent

"When we talk about overall analytical efficiency, we certainly need incremental optimization to make current processes more robust and faster – but we must also be on the lookout for game-changing technologies. For example, when we analyze a sample, we must normally use multiple methods – but what if there was a single technology that could provide us with all quality attributes at the same time? It would be a huge improvement in efficiency!" – Kelly Zhang, Genentech

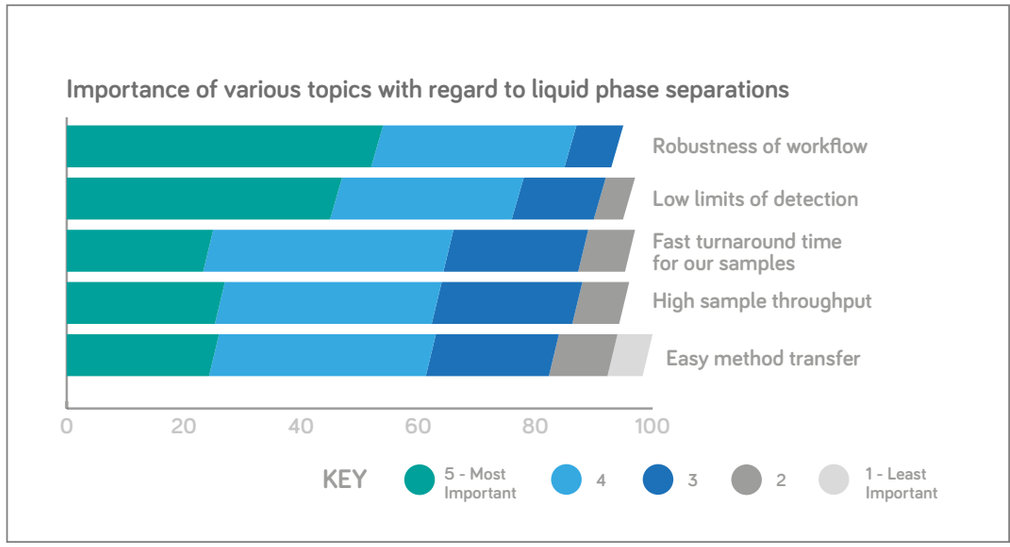
Show me the full article on analytical efficiency

Analytical Efficiency in 5 minutes

MENU

Which is most important for you when it comes to liquid phase separations?

I want more robust workflows	I want faster method development	I want better data quality	I want more efficient sample preparation
Take me to the solution!	Take me to the solution!	Take me to the solution!	Take me to the solution!



What the experts say...

"I would rate robustness number one. When it comes to patient safety, nothing can compromise the robustness; without a robust method, and technology generating quality data, we cannot make sure that our medicines are safe enough."
– Kelly Zhang, Genentech

"Remember that robustness is more than the instrument and the chromatographic run – if you think about the whole workflow, there are so many points where something can go wrong. Nobody wants mistakes" – Udo Huber, Agilent

Download the full results of the "Laboratory Efficiency and Liquid Chromatography Survey" WEBPAGE

Play me the expert discussion on how to push results to the next level by selecting suitable technology VIDEO

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Analytical Efficiency

MENU

I want more robust workflows...

Automate Your Workflows

- **InfinityLab Multi-method System** — WEBPAGE
- **InfinityLab Multi-method System** — APPLICATION NOTE
- **Online-SPE** — WEBPAGE
- **Amino Acid Analysis** — WEBPAGE
- **Impurity Analyzer** — WEBPAGE
- **Food Application Solutions** — WEBPAGE
- **Bio LC System** — WEBPAGE

Benefit from Easy Method Transfer

- **Method Transfer System** — WEBPAGE
- **Method & Application Services** — WEBPAGE

Automate Your Data Analysis

- **Chromatography Data System** — VIDEO
- **Chromatography Data System** — APPLICATION NOTE

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Analytical Efficiency

MENU

I want faster method development...

Automate Scouting and Optimization

- InfinityLab LC Method Development Solutions — WEBPAGE
- InfinityLab LC Method Development Solutions — APPLICATION NOTE
- InfinityLab LC Method Development Solutions — VIDEO

Access Method Development and Validation Kits

- Method Development — WEBPAGE
- Method Validation — WEBPAGE

Automate Your Data Analysis

- Assisted scanning of LC parameters — WEBPAGE
- Pharmaceutical method development with SFC–TOF MS — APPLICATION NOTE

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Analytical Efficiency

MENU

I want better data quality...

Access Lower Limits of Detection

- **UV detection with spectra** — WEBPAGE
- **High dynamic range UV detection** — WEBPAGE
- **Variable wavelength UV detection** — WEBPAGE
- **Evaporative light scattering detection** — WEBPAGE
- **Mass selective detection** — WEBPAGE

Push for Better and Faster Separations

- **Higher peak capacity** — WEBPAGE
- **Faster separations** — WEBPAGE
- **More column chemistries** — WEBPAGE
- **More column chemistries** — APPLICATION NOTE

Use Complimentary Separation Techniques

- **Capillary electrophoresis** — VIDEO
- **Capillary electrophoresis** — WEBPAGE
- **Supercritical fluid Chromatography** — VIDEO
- **Supercritical fluid Chromatography** — APPLICATION NOTE
- **Gel permeation chromatography** — WEBPAGE
- **Play me the expert discussion on how to push results to the next level by selecting suitable technology** — VIDEO

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Analytical Efficiency

MENU

I want more efficient sample preparation...

Automate your sample prep

Automation solutions for superior analysis
WEBPAGE

InfinityLab Online SPE Solutions
WEBPAGE

Make sample prep more selective

Filtration
WEBPAGE

SPE
WEBPAGE

Support liquid extraction
WEBPAGE

SPME
WEBPAGE

Play me the expert discussion on how to push results to the next level by selecting suitable technology VIDEO

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How to Boost Analytical Efficiency

MENU

I want more robust workflows...

I want faster method development...

I want better data quality...

I want more efficient sample preparation...

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Your Efficiency Challenge – Part III

Taking the next step on the road to efficiency

"Your Efficiency Challenge" is an exciting project from Agilent Technologies and The Analytical Scientist that helps you identify and address inefficiencies in your lab. Part I introduced the project – and kicked off a survey gathering views on efficiency in liquid chromatography from over 1,400 respondents. In Part II, we shared some of the results of the survey, and determined topics for a series of lively roundtable discussion webinars. Parts III–V bring together key points from the survey results and webinars, to help move the conversation forward.

In the first roundtable video, we sat down with pharma pioneer Kelly Zhang (Genentech) and LC expert Udo Huber (Agilent) to discuss efficiency at the analytical scale – and to discover how the right technology can help you push your results to the next level.

Read Part I
Read Part II

Watch the webinars:

What does analytical efficiency mean to you?
Kelly Zhang: In the pharmaceutical industry, our primary goal is to get first- and best-in-class medicines to patients as fast as we can. To do that, we need the data to be not only fast, but also informative. If we acquire data quickly but then have to spend a long time analyzing it to get the information we need, the overall process is not efficient.

Udo Huber: To me, analytical efficiency is everything that helps you to get better quality data, so you can be sure that you see all the peaks and all the impurities in your sample. In turn, higher quality data gives you more confidence – and I think that's very important, especially for the pharmaceutical industry.

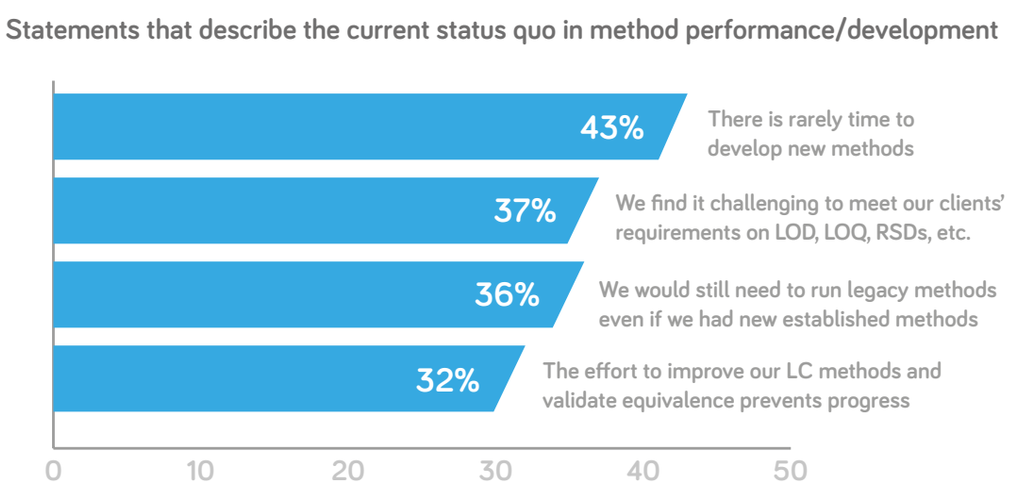
In our survey, the most important considerations in liquid phase separations were robustness of the entire workflow – 87 percent of people thought that was very important or important. Does that number surprise you?
Udo: I'm not surprised. Remember that robustness is more than the instrument and the chromatographic run – if you think about the whole workflow, there are so many points where something can go wrong. Nobody wants mistakes – and that's true in all industries, not just pharma.

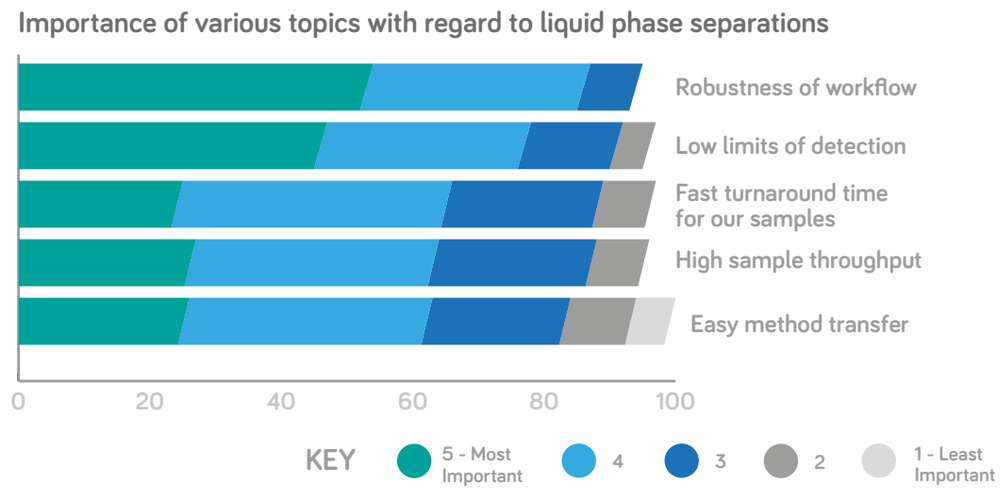
Kelly: I would also rate robustness number one. When it comes to patient safety, nothing can compromise the robustness; without a robust method, and technology generating quality data, we cannot make sure that our medicines are safe enough.

The second most important consideration was low limits of detection (78 percent) – but another part of the survey says that only 30 percent of users operate close to the limits of detection. Any comments?
Kelly: I think it depends on who you ask. My high throughput automation team, running hundreds of thousands of samples, are less concerned with sensitivity; they care more about how fast you can analyze one sample. But for the project team, sensitivity is a critical quality attribute – we don't want to miss any impurities, especially if they are toxic.

Udo: It doesn't surprise me that it shows up high on the list. For industries such as food safety or environmental analysis, the regulatory agencies are setting lower and lower limits, and customers can't achieve that with the current instrumentation. I am surprised that separation performance or power wasn't higher, however. What we hear from the pharmaceutical industry – as well as from other industries – is that customers are afraid they are missing compounds in their chromatograms.

How do we drive the analytical workflow to improve robustness?
Kelly: Simple: all methods must be validated. We need to follow the validation protocol, making sure we can achieve the same result day to day, instrument to instrument, site to site and operator to operator.





Udo: People also need to ensure they include basic system care in their standard operating procedures; it's an occasionally forgotten element that helps keep your analysis or your system robust.

How can we improve robustness from a technology point of view?
Kelly: We always try to get the best instruments we can from the most reputable vendors; for example, we are now moving to UHPLC. We also try to reduce human error – so automation is another area where we can try to make the technology more robust.

Udo: I always recommend that you choose the system according to your application. For example, if you need to run a shallow gradient for your analysis, you should use a binary high-pressure mixing pump – because by design those pumps have a higher performance for shallow gradients. It may mean you have to invest in a binary or even a UHPLC pump. You could consider investing in a thermostat for your autosampler that keeps the temperature constant. Such simple investments really pay off after a relatively short period of time.

36 percent said they would run legacy methods even if newer established methods were better or faster, with 19 percent prevented from applying the latest methodology because of regulatory risks. How can scientists stay at the cutting edge?
Kelly: We think about this constantly. We always try to keep ourselves at the cutting-edge, but it depends on the stage and the purpose of the technology. For example, we can apply a new technology within the research lab, but when it goes into a regulatory environment, it is not that straightforward. You have to make sure you do a full method evaluation. And there are always regulatory concerns. If you have an established method that works, not many people will be motivated to change it.

Udo: We always get this request from our customers and so we invest a lot of R&D resources into ensuring that our customers can run their legacy methods even on the new instruments. We understand that customers may be reluctant to move away from their legacy methods; however, it's always possible to make small changes that improve and speed up the method.

Any final pearls of wisdom?
Udo: I think there is a way for everyone to improve analytical efficiency – but you really have to commit it! People sometimes don't want to change, but without change there will be no efficiency gains.

Kelly: When we talk about overall analytical efficiency, we certainly need incremental optimization to make current processes more robust and faster – but we must also be on the lookout for game-changing technologies. For example, when we analyze a sample, we must normally use multiple methods – but what if there was a single technology that could provide us with all quality attributes at the same time? It would be a huge improvement in efficiency!

Instrument Efficiency in 5 minutes

MENU

Which of the following statements describe your current situation with regard to data analysis and documentation?
[click answers to reveal survey response and what the experts say]

There are many manual steps in our data analysis and review	Our current software setup is at least three years old	Time for training is limited	Other

Six Top Tips from GSK's Adrian Dunn:

1. Ease of use is key.
2. Robustness underpins efficiency.
3. Find time for training.
4. Sometimes, it's about getting the basics right.
5. Prevention is better than cure.
6. The most efficient way isn't always the fastest.

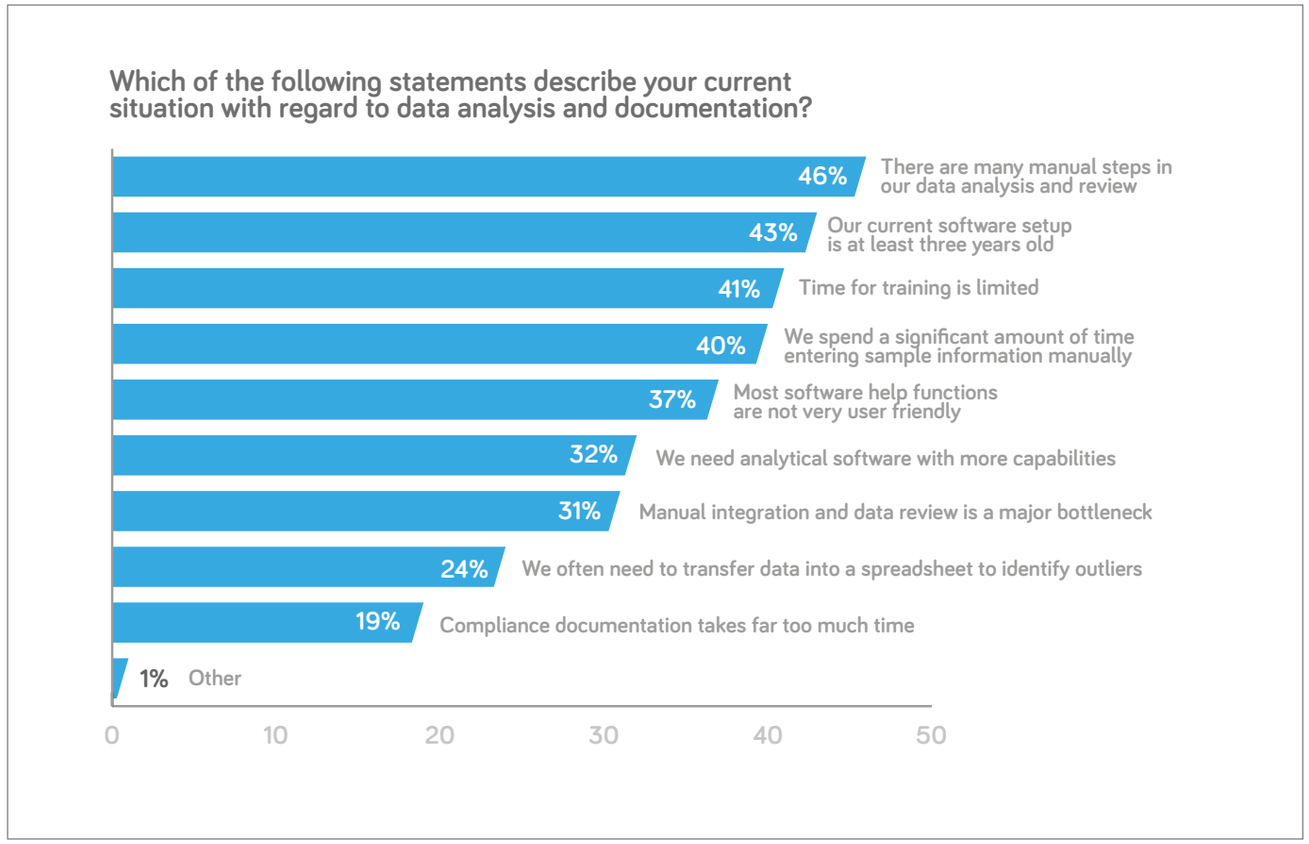
Show me the full article on instrument efficiency

Instrument Efficiency in 5 minutes

MENU

Which of the following statements describe your current situation with regard to data analysis and documentation?

I want to run more samples per day...	I want faster data analysis and reporting...	I want to reduce the time and effort spent on maintenance...
Take me to the solution!	Take me to the solution!	Take me to the solution!



What the experts say...

"When it comes to implementing new software, 41 percent of respondents in a survey of 1,200 LC users reported not having enough time for training. To me that's a false economy." – Adrian Dunn, GSK

"I predict in future we may have more intelligent software that can define the inputs that are needed and all the parameters that should be studied, so that we are less reliant on human input." – Stéphane Dubant, Agilent

Play me the expert discussion on how to how to survive the sample onslaught and even create a little breathing room VIDEO

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Instrument Efficiency

MENU

I want to run more samples per day...

Increase Your Throughput

- **Find your specific application for guidance** — APPLICATION NOTE
- **Multi-method LC Solutions** — WEBPAGE
- **High-throughput LC/MS system** — WEBPAGE
- **Robust workflow for pesticides and mycotoxins** — APPLICATION NOTE

Reduce Unnecessary Rework of Samples

- **OpenLab CDS Sample Scheduler** — WEBPAGE

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Instrument Efficiency

MENU

I want faster data analysis and reporting...

Complement Your Data System

OpenLab Software Suite
VIDEO

OpenLab Software Suite
WEBPAGE

Customize Your User Interface

OpenLab Chromatography Data System
VIDEO

Ensure Software Performance

User training
WEBPAGE

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Instrument Efficiency

MENU

I want to reduce the time and effort spent on maintenance...

Benefit from Easier System Care

- Workflow Diagnostics – Crosslab Smart Alerts — WEBPAGE
- Experience reduced downtime and sustained instrument performance — VIDEO

Plan for Preventative Maintenance

- Preventative maintenance services — WEBPAGE
- On-demand preventative maintenance — WEBPAGE

Access More Rapid Troubleshooting

- LC Lab Advisor — WEBPAGE
- Tips and tricks for LC troubleshooting — WEBPAGE

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How to Boost Instrument Efficiency

MENU

I want to run more samples per day...

I want faster data analysis and reporting...

I want to reduce the time and effort spent on maintenance...

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Your Efficiency Challenge – Part IV

In the latest installment of our series "Your Efficiency Challenge", we explore how you can get more from the tools you use every day. Using results of our reader survey on efficiency in liquid chromatography and a series of lively roundtable discussions, we continue the conversation on efficiency – this time with a focus on instrumentation and software.

Guru of Instrument Efficiency

Adrian Dunn draws on his 25 years in GSK's analytical chemistry division to offer his six top tips on boosting instrument and software efficiency.

1. Ease of use is key. Nowadays, many laboratory scientists using LC are not analytical scientists by training. We need to get these non-experts using the equipment more efficiently by improving workflows, making software easier to use, and cutting the time taken at all stages. I'd like to see the intelligence and the experience of analytical chemists distilled into the software, so that users no longer have to be experts. The ideal would be to do everything within one package. We're not there yet, but we're heading that way. Even troubleshooting could be automated to some extent, with instrument software suggesting potential causes for unusual results.

2. Robustness underpins efficiency. You've got to be able to rely on your results, and trust that they won't change from one run to the next. You also need your instrumentation to work efficiently to avoid downtime.

3. Find time for training. When it comes to implementing new software, 41 percent of respondents in a survey of 1,200 LC users reported not having enough time for training. To me that's a false economy. If you have software that's capable of doing your data analysis, why wouldn't you learn to use it and save time down the line? You may lose a day in training but, if you save three weeks over the year as a result, it's well worth it. This is true of instrumentation too – there are often lots of ways of saving yourself time and effort that you can easily find by studying the manual or asking an engineer.

4. Sometimes, it's about getting the basics right. If your instrument is not performing as you'd like, start by testing the simple, inexpensive parts of your system. For example, check you're using the right column chemistry, solvents and consumables.

5. Prevention is better than cure. One way to minimize downtime is to carry out regular system suitability testing, so you can spot problems early.

6. The most efficient way isn't always the fastest. I define efficiency by how useful your results are, balanced against the input required. If you spend an extra hour or two to get a better result it's not necessarily inefficient. You have to ask yourself: is it more efficient to save time but only complete 90 percent of a project, or spend a little more time and complete 100 percent?

Eye on the Future

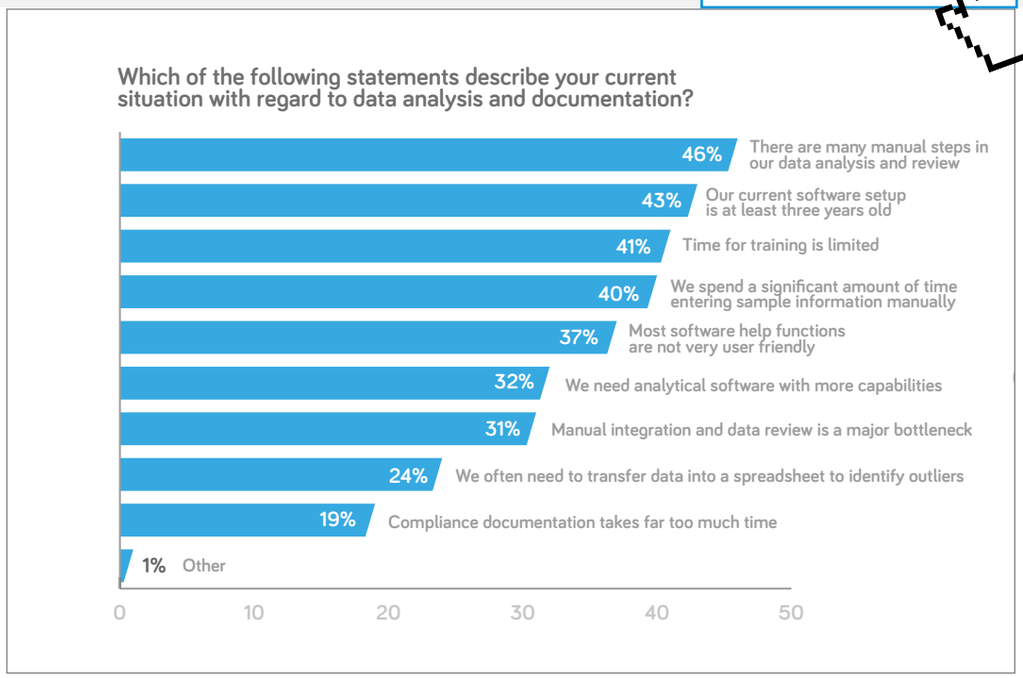
Agilent's Stéphane Dubant shares what's new in instrument and software efficiency – and the developments coming down the line.

Software

There are already some interesting software applications that can guide you to the optimal method for your sample. At present, you need to have a good level of understanding to be able to use the software – if you ask the wrong question, you will get the wrong answer. I predict in future we may have more intelligent software that can define the inputs that are needed and all the parameters that should be studied, so that we are less reliant on human input.

Automation

Automation is a big trend in industries such as biopharmaceutical manufacturing. The ideal is a line that takes a sample from your reactor to your instrument automatically every few minutes and confirms that all parameters are within acceptable limits. If a problem occurs, production is halted automatically and staff are alerted.



Sample handling

Using barcodes to track samples is still rare amongst the labs I visit, but I believe that as we start to see off-the-shelf systems becoming available, we will see greater uptake of this type of tracking system.

Troubleshooting

Already, a lot of instrument software offers some hardware failure identification, and will alert you to problems with pump pressure, potential leaks, blockages, and so on. But once you get into chromatographic issues, such as peak distortion, it's still largely down to experience – again, that's something that may change as software grows increasingly sophisticated.

Final thoughts

Regardless of how technology advances, it's important to keep things simple. For example, if you have a choice of mobile phases, use the simplest that is fit for purpose – it will be much more robust. And don't be afraid to try an entirely different approach, rather than persevere with a technique that is simply not suitable.

Laboratory Efficiency in 5 minutes

MENU

Where can quick gains be made in laboratory efficiency?
[click answers to reveal survey response and what the experts say]

Training	Design, Planning	Automation	Other

Top Tips from experts

"To improve efficiency, you must first quantify it – and that means considering how best to assign numerical values to various efficiency parameters." – Wolfgang Kreiss, lab management consultant

To improve efficiency in any lab, oneof the first things that I do is go to thework floor and look at the process. Talk to the staff; it's best to adapt to their experience and preferences wherever possible. – Martin Hermsen, Eurofins

When considering laboratory efficiency, start with a critical reflection of where you are today. Keep in mind that equipment is not the only important factor in efficiency – your team members will drive improvement. Are they trained in the best approach to the task? – Oliver Rodewyk, Agilent

Show me the full article on laboratory efficiency

Laboratory Efficiency in 5 minutes

MENU

Where can quick gains be made in laboratory efficiency?

I want to measure my lab's efficiency...

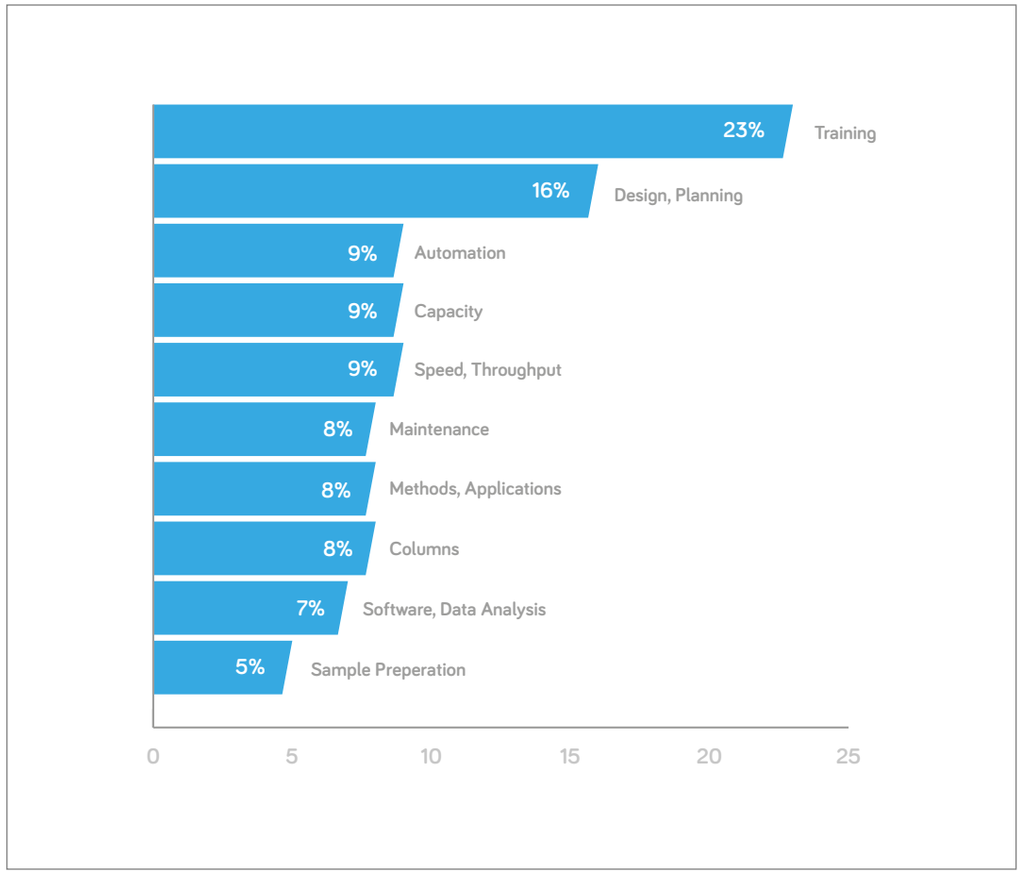
Take me to the solution!

I want to accelerate workflows in my lab...

Take me to the solution!

I want to plan a new laboratory...

Take me to the solution!



What the experts say...

"Keep in mind that equipment is not the only important factor in efficiency – your team members will drive improvement. Are they trained in the best approach to the task? Are they open to change? It's crucial you have the right people, with the right training, at the right time." – Oliver Rodewyk, Agilent

"Consider introducing automation – it can be a very powerful tool. Robots can take over the time consuming, low-skilled aspects, leaving staff free to focus on more complex issues." – Martin Hermsen, Eurofins

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Laboratory Efficiency

MENU

I want to measure my lab's efficiency...

Conduct an Inventory Analysis of Your Lab

- **Lab management software** — APLLICATION NOTE
- **Inventory management services** — WEBPAGE

Investigate Your Lab Setup

- **Laboratory analytics** — WEBPAGE
- **Leveraging laboratory analytics** — VIDEO
- **Remote Advisor** — WEBPAGE

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Laboratory Efficiency

MENU

I want to accelerate workflows throughout my lab...

Increase Throughput and/or Turnaround Time

- Crosslab Advisory Services — WEBPAGE
- Application Consultancy Services — VIDEO
- OpenLab Chromatography Data System — VIDEO
- InfinityLab LC Systems & Solutions — APPLICATION NOTE
- InfinityLab Autosamplers — VIDEO

Reduce Downtime

- Preventative maintenance — WEBPAGE
- LC Lab Advisor — WEBPAGE
- Method restoration services — WEBPAGE

Improve the Level of Competency in Your Lab

- Operator training — WEBPAGE
- Simplified user interfaces — APPLICATION NOTE
- Multi-Vendor Services — VIDEO

Reduce the Effort Needed for Regulatory Compliance

- Maintaining a compliant laboratory — WEBPAGE
- QbD Method Development — APPLICATION NOTE

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Laboratory Efficiency

MENU

I want to plan a new laboratory...

Transition made easy – Method Relocation Services
VIDEO

Instrument utilization – Inventory Management Solutions
VIDEO

Application services – CrossLab
WEBPAGE

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How to Boost Laboratory Efficiency

MENU

I want to measure my lab's efficiency...

I want to improve workflows throughout my lab

I want to plan a new laboratory...

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MENU

Your Efficiency Challenge – Part V

In the final part of our series, three laboratory efficiency experts offer their must-read advice for ambitious (or complacent) laboratory managers. Drawing on our in-depth reader survey and distilling just some of the key points in our video webinar (http://tas.txp.to/0918/YEC), we start you on your path to improved laboratory efficiency. To continue the journey, look out for our forthcoming eBook.

How will you survive in an increasingly competitive world?

Our survey discovered:

- 1 in 3 labs is under competitive pressure
- 1 in 5 labs is viewed as dispensable
- 1 in 5 labs is already in direct competition

Oliver Rodewyk has been in the chromatography business for 32 years and is now a strategic account manager in the service sales division at Agilent.

Here, Oliver offers advice on boosting efficiency in labs – old and new…
When considering laboratory efficiency, you should always start with a critical reflection of where you are today. Also, keep in mind that equipment is not the only important factor in efficiency – your team members are the ones who will drive improvement. Are they trained in the best approach to the task? Are they open to change? It's crucial you have the right people, with the right training, at the right time.

An "old" lab

- When inheriting an existing lab where much of the equipment is outdated, the priority for laboratory managers should be to identify critical systems and target investment to those areas.
- Don't do all your upgrades at the same time, but stagger them to spread the cost and avoid having multiple parts due for replacement at the same time in years to come.

A new lab

- When setting up a new lab, the most common mistake I see is to take a "copy and paste" approach – assuming that if it worked perfectly in the past, it will work in the future.
- Instead, use a "copy and adapt" approach that builds on a foundation of past facilities, but invest at least 10-15 percent of your time and capital on adapting to new challenges and looking for ways to evolve or develop the lab.

Our survey revealed that respondents are often challenged to improve throughput and do more with less.

- 64 percent said they would benefit from shorter LC run times.
- 44 percent said that sample numbers are increasing – but staffing levels are not.

Wolfgang Kreiss is an independent consultant in laboratory management, working on strategic and operational projects for analytical laboratories in industry and government agencies.

Here, Wolfgang helps you take the first step towards efficiency gains…

- To improve efficiency, you must first quantify it – and that means considering how best to assign numerical values to various efficiency parameters.
- You could think of efficiency as a simple ratio between input (amount of work, operating costs) and output (number of analytical results, timeframe or monetary value); this gives a firm basis for comparing efficiency with different setups.
- The laboratory is a very complex unit – it's not enough to simply collect numbers for the various efficiency parameters, you also have to look at all the possible influences that might affect the numbers.
- It's not easy to measure efficiency – do not be afraid to seek external support!

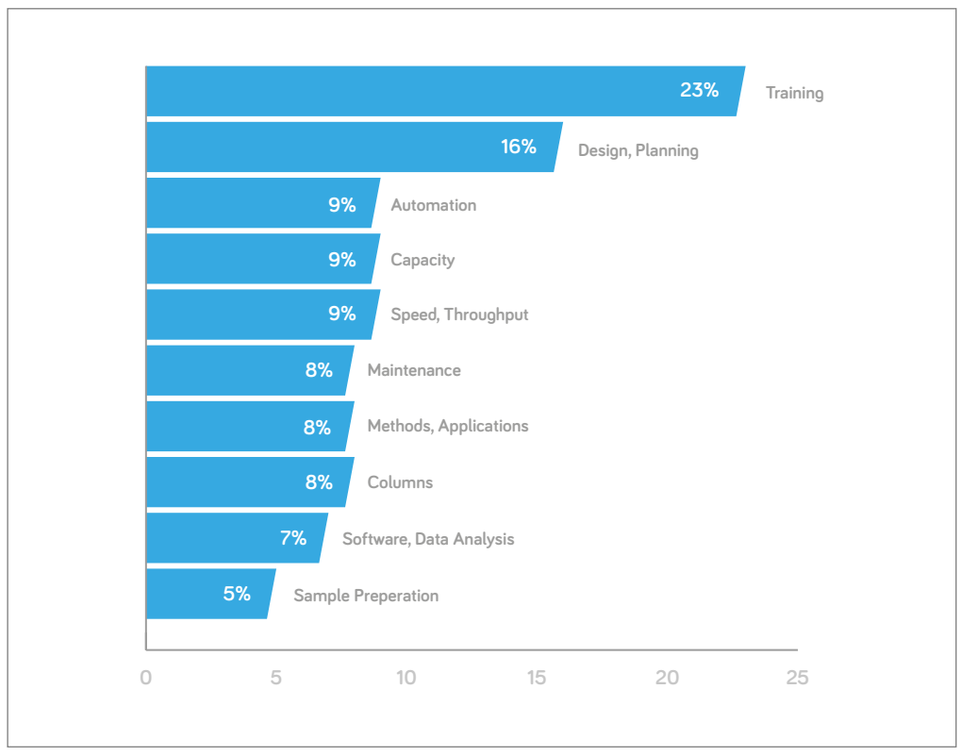
Martin Hermsen is a senior R&D analyst in the organics department in the Eurofins environmental lab based in The Netherlands, where he is in charge of technical aspects of data automation and robotics

Here, Martin shares his approach to making efficiency gains…

- To improve efficiency in any lab, one of the first things that I do is go to the work floor and look at the process.
- Talk to the staff. You may think that you have the 'right way' of doing something, but remember to consider the people who must do a particular task day in, day out. It's best to adapt to their experience and preferences wherever possible.
- I sometimes get insight from someone that has no lab experience; I ask them to look at the process with a fresh pair of eyes. Often, it brings up things I have never thought of.
- Look at the bottlenecks in your workflow – seek ways to remove them
- Where is the most downtime occurring? Think about where replacement systems would be most impact.
- Consider introducing automation – it can be a very powerful tool. Robots can take over the time consuming, low-skilled aspects, leaving staff free to focus on more complex issues.
- Above all, don't stand still.

What Does Laboratory Efficiency Mean to You?

A simple question, but ask a room of laboratory managers and you'll get a surprising variety of answers. We'd like to know your definition of efficiency – get in touch at charlotte.barker@texerepublishing.com.



Survey: Laboratory Efficiency & Liquid Chromatography

MENU

Analytical Efficiency

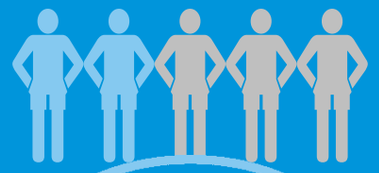
36%

…of analytical scientists adopt the latest methodology and exploit state of the art performance in LC.

And when it comes to developing new methods…

Two in Five …

rarely have the time



Lack of time and resources, lack of consideration or lack of foresight?

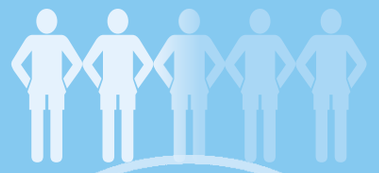
Instrument Efficiency

76%

… of laboratory analysts already work in a challenging multi-user, multi-method environment.

HALF

… work with old instrumentation



Are your current processes and systems enabling smooth workflows?

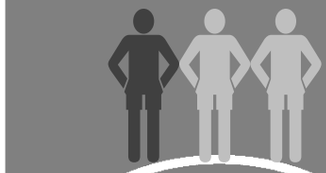
Laboratory Efficiency

70%

… of laboratory managers rarely (or never) compare themselves with the competition.

One in Three …

laboratory managers feel the threat of the competition…



How about you?!

Click to download the "Laboratory Efficiency and Liquid Chromatography Survey" report as a .pdf file

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