

KEY CONSIDERATIONS WHEN PURCHASING AN ADVANCED GPC/SEC SYSTEM

Introduction

Buying a new piece of laboratory equipment is always a big decision. Many thousands of dollars are often being invested based on relatively little information. Through self-education on the web, reading marketing materials, discussions with sales and technical representatives, and perhaps a brief demonstration or single sample analysis, you have to convince yourself that a particular solution will work for your situation. We know this can be a difficult decision with a lot riding on it so we've put together a list of things to consider when buying an advanced GPC/SEC system. The final decision should depend on your own priorities but this should provide a starting point for the buying process.

1) What's my return on investment (ROI)?

If you are investing heavily in an expensive research tool, you want to know that your investment will come back to you in the long term. This could be higher value, better graded product with fewer quality issues, or it could be a stronger publication record helping to open up future research funds.

Coupled in with this question is whether your chosen vendor has a good reputation. You want to be sure that your instrument is supported by a thorough understanding of the underlying principles it uses and you want to know that the vendor can explain those principles to you and that they will support you in your research.

2) What's the real performance?

Advanced GPC/SEC systems can be used for a wide array of applications from polymers in plastic containers, to inks, and proteins in biopharmaceuticals. A brochure or a specification sheet can make amazing claims with respect to standard materials under ideal conditions, but how does this relate to your own samples? Does the light scattering detector have the sensitivity you need? Is the viscometer a robust design proven across many applications? Will the results be repeatable and reproducible and can it calculate inter-injection precision? The best conclusions come from the best data and you need to be confident the instrument you buy will give you the best data to put you a step ahead of your competitors.

Does the vendor back up their specifications with actual data demonstrating that performance? Ask the vendor to make some measurements of your own samples, either in their applications lab or at an on-site demo. The data generated will be a valuable reference tool when making the final decision and give you an idea of the performance you can expect in your own lab.

3) Is this instrument appropriate for my application and will it give me the information I need?

The application and desired information should determine the configuration of your advanced GPC/SEC system. Absolute molecular weight is the most common requirement for such a system and this requires light scattering measurements of some kind. Different detector designs (known as RALS, LALS and MALS) can measure the molecular weight of synthetic and natural polymers and proteins. A MALS detector can also be used to measure size and R_g (radius of gyration) for large enough polymers (typically >10 nm radius). When looking to measure structure and branching, this is best done with a viscometer which can make measurements across the entire distribution range. Copolymer or conjugate measurements require two concentration detectors, where refractive index (RI) and ultraviolet (UV) are typical.

The separation itself is also extremely important. Some applications require solvents that run better at higher temperatures, for example, DMF or DMSO. In these situations, an integrated, temperature controlled system is critical. This maintains the temperature of columns, detectors and inter-detector tubing. It keeps the entire solvent path heated to reduce back-pressures and prevents repeated heating and cooling which can affect the sample.

Make sure your vendor has a good understanding of your application requirements and isn't trying to force a one-size-fits-all solution or one which may be inappropriate for your application and molecular weight range.

4) What compromises am I making?

All choices involve compromises of some kind. For example, you can drive a faster car but it'll be less fuel efficient. Instrument design is the same and choosing the best system involves prioritizing your requirements. For example, some instruments offer true integration of the detectors within a single temperature controlled environment. This minimizes inter-detector tubing and subsequent band-broadening. The benefit of this is maximum chromatography data quality, and maintenance of sample resolution. Detector sensitivity is also maximized and preserved. The alternative is a modular setup with multiple detector modules placed close to each other. The advantage here is flexibility and the ability to add or remove detectors to other systems but the cost is significant in terms of chromatography data quality. Larger flow cells, longer inter-detector tubing and significant band broadening all contribute to reduce data quality. This will affect the precision of the measurement meaning you cannot measure such fine differences between samples.

If you are considering advanced GPC/SEC detectors, it is likely you are already committed to making measurements of the highest quality, but flexibility is valuable too. Are you willing to sacrifice some of that data quality for greater flexibility? How likely is it that you will want to move around the components of one of your most precious pieces of laboratory equipment?

Furthermore, some instruments claim complete application flexibility but then require you to make modifications when switching mobile phases, for example, by switching flow cells. Real flexibility comes from a system which can handle all applications without modification.

5) Can your chosen vendor support you from installation and beyond, whenever you need?

No matter how accessible the system, sometimes you need some additional support and direction. When that support is needed, you need to know where to turn.

Does the vendor offer training from the point of installation and further advanced training to get you familiar with all aspects of the measurements including background theory, software, and practical training? Finally, is there a strong support team that will always be available to you?

6) Can they service your instrument in the field?

In a production or a research environment, downtime due to instrument failure can place a significant strain on deadlines. In this case, the last thing you want is to have to ship a unit back to the manufacturer for a repair that could take weeks.

7) Will they take ownership from mobile phase to waste?

One question which you have to consider is whether to buy a complete dedicated GPC/SEC system, or whether to upgrade your existing setup by adding a couple of advanced detectors.

Adding detectors to an existing GPC/SEC system will reduce the cost and allow for quicker integration into existing methods and can be highly desirable for these reasons. There is a risk, though, that when things go wrong, your two vendors start blaming each other and the resulting situation can be difficult to resolve.

Choosing a complete solution from a single vendor means that they must take ownership of the system from the mobile phase inlet to the waste outlet. Any issues that arise can be diagnosed and resolved at a single point of service without any back-and-forth between the vendors of the separation and detection systems. A complete system purchase will be more expensive but that cost buys the knowledge that if anything goes wrong, you know exactly who is going to take responsibility for fixing it.

8) Is the software clear, and easy to learn and use?

Advanced GPC/SEC detection involves combining data from up to four different detectors into meaningful results. To somebody more interested in the results than becoming a high-level expert in another technique this presents a problem.

You want to produce high quality data with high confidence but you need certainty that your data are being analyzed accurately and appropriately.

A high quality software package is essential to this. Data should be presented clearly and it should be easy to navigate between injections and result sets without losing track. It should be clear whether a numerical result comes from a single point or from the distribution and it should be easy to go back a step when things go wrong.

Ask your vendor for a demonstration of the software. Is the calibration a single-step process or do you have to navigate through multiple menus? Are the results clear and easy to find again once you've moved on? Does the software offer real statistics based on multiple injections? Is there a clear user manual that explains not just the buttons to click but the meaning and utility of the different results generated?

9) Can I afford it?

As in almost all purchases, budget is always a key consideration. Additional detectors or options all come at a price. The correct GPC/SEC system for you should be one that solves the main application problem. If additional functionality for future experiments is required or the planned uses are varied from the start, then consider what will work the best in the most situations. Ticking as many boxes as possible may sound like a good investment but make sure that the additional features or versatility do not detract from the primary purpose of the system.

10) What is the true cost of ownership?

When it comes to servicing, both downtime and cost are critical considerations. A robust instrument that requires fewer repairs will save money and downtime over the longer term.

Ask your vendor what they are doing with your system to make it as robust as possible and to reduce the cost of ownership as much as possible. No matter how powerful a system, it does you no good if it's not working or is too expensive to support.

11) What other technologies can this company offer me long-term?

At Malvern, we take great pride in our instruments, but also in our range of applications knowledge in different industries and technologies. Taken together, this knowledge exceeds the sum of its parts. Only with a Malvern system can you measure the molecular weight of a polysaccharide with GPC/SEC and then see its effect on formulation viscosity using a rheometer, or study the molecular weight and oligomeric state of a protein with SEC and then monitor its aggregation using DLS, NTA, and RMM, taking you from the soluble monomer all the way up to sub-visible particle characterization.

Investing in a Malvern system buys not just a piece of hardware but expertise and understanding about how to fully characterize and understand the behavior of your samples.

Why choose Malvern as your partner?

In response to all of these questions, Malvern has more to offer, which is summarized below. For a longer discussion in all the ways we can support your research, please have one of your team arrange a conversation with one of our technical specialists.

- Our industrial partners are using advanced GPC/SEC to make accurate and precise measurements of molecular weight and intrinsic viscosity to produce the highest quality products from simple polymers to food additives, and from pharmaceutical viscosity modifiers to biopharmaceuticals. They are controlling branching or molecular weight grade and other physical properties to reduce off-spec material and ensure that every product they sell has the desired properties. This keeps their customers happy and also guarantees their reputation as a reliable and valued supplier.
- Our academic partners have published over 5,000 papers on an equally wide range of GPC/SEC applications. When synthesizing or working with novel polymers, information is critical. The ability to identify small differences in molecular weight or structure and discriminate between apparently similar materials is key. Malvern's advanced, multi-detector systems provide market-leading sensitivity and a wealth of information in a single GPC/SEC experiment, taking them from research to publication in the shortest period of time with the greatest confidence in their data.
- We back up claims of our instrument's performance with data we can show, and our applications lab is always ready to run your samples to show how we can meet your particular requirements.
- We train our users, initially at installation and then with an advanced training course offering training on theory, software, and best practice. Our Helpdesk is always free to use and our technical specialist and applications teams have a wealth of experience in different applications from polymers to proteins and are always willing to support users.
- Most repairs of Malvern GPC/SEC systems can be made on site by one of our excellent team of field-based service engineers. Wherever you are based, we can send a service engineer to you to repair your system in the field saving significant downtime.
- At Malvern, light scattering is the core of our business. Laser diffraction, dynamic light scattering, and static light scattering instruments are all developed in-house by teams of highly knowledgeable engineers. Their use and application is backed up by teams of technical specialists around the world meaning application and technical support is available wherever you might be located.
- And our expertise doesn't stop with light scattering alone. Advanced, multi-detector GPC/SEC featuring light scattering, viscometry and concentration detectors has been the mainstay of our chromatography business for over 20 years. With a large and ever-expanding global user base of satisfied customers, you know you'll be dealing with a company you can trust.
- Malvern's latest advanced GPC/SEC system, OMNISEC offers a number of technological advances that reduce the risk of failure and mitigate the cost should anything go wrong:
 - OMNISEC's pump contains a continuous back-seal wash mechanism to prevent a build-up of salt that can cause wear on pump seals leading them to fail early.
 - OMNISEC's viscometer has a self-balancing mechanism to correct for or minimize the effect of a partial capillary blockage. In the event of a full blockage, the capillaries can be replaced in just a few minutes by a user without the need for a service visit or back-to-base repair.
 - The SEC-MALS 20 has a specially designed vertical flow cell. This prevents contaminant build-up so if you've struggled with noisy light scattering detectors in the past, this is an option to reduce the need for repeated dismantling and cleaning of the cell.

Summary

We know that buying an advanced GPC/SEC system is an expensive investment but Malvern's success is built on yours and we aim to stand with our customers in making the right decisions and then supporting in their choice. If you are thinking about purchasing an advanced GPC/SEC system, consider the options above carefully to make the right choice for you and your application. If you want more information, then we are always ready to discuss our many options and help you make the right choice.

MALVERN PANALYTICAL

Groewood Road, Malvern
Worcestershire, WR14 1XZ
United Kingdom
Tel. +44 1684 892456
Fax. +44 1684 892789

Lelyweg 1,
7602 EA Almelo,
The Netherlands
Tel. +31 546 534 444
Fax. +31 546 534 598

info@malvernpanalytical.com
www.malvernpanalytical.com