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Future of HPLC needs to be innovative

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The acronym HPLC was coined by the late professor Csaba HorvÃ?Æ?Ã?Â¡th during 1970 for describing the term High-Performance Liquid Chromatography. However, with advances in performance in terms of separation of smaller particles and advent of
higher pressure systems, the acronym HPLC was changed to depict high-performance liquid chromatography.

Is HPLC technology evolving at a snail's pace?
However, despite its long history and periodic bursts in innovation, this category of (analytical) instruments has not been able to replicate the leap in technological innovation that we have witnessed in other categories of instruments across the world, may it be that in consumer electronics or industrial electricals. Today's scientists live in a technology savvy world and the use of advanced technology in other domains of their lives has now led their urge of using premier technology to percolate deep in their minds. They now expect their analytical instruments too to offer performance that is ahead of its time; to offer performance that is advanced and futuristic.

HPLCs have emerged as the most popular analytical instrument in a wide variety of domains such as Pharma, Biotech, Forensic Studies and Clinical Research among
many others. Shimadzu conducted a global survey across all these industries to understand what technology advancements the customers are seeking in their future HPLCs.

The revelations are startling: Need for innovative HPLC The survey found that HPLC users were really looking forward to an analytical instrument that allows great level of expandability and upgrade options. These features essentially will ensure the analytical system is always future ready and designed for wide applicability. They were looking for a system that can operate with multiple detectors for simultaneous analyses; a system that can handle large amount of analysis samples; a system that offers incomparable low carryover for reliable result; and most importantly a system that is easy to operate and support open access usage by multiple analysts. They were seeking HPLCs that can be easily upgraded to UHPLC for the usage of small particle size column, for outstanding peaks separation and resolution.

The Pharma and Biotech industries are well-known for their high volumes of work. Owing to this, they seek their HPLCs to have high throughput capabilities so as to evaluate a large number of analytes as quickly as possible. The best solution is to have a system that manages to handle large number analysis samples withÃ?Â utra-fast operation speed to minimize the wait time required for each analysis. The same expectation is seen to be required in domains such as stem cell research where rapid development in this area of research work results in increasing number of analytes, which can be dealt by only using high throughput instruments. HPLC has also become a commonly used analytical instrument in the forensic laboratories. Low carryover is the outmost important parameter that forensic scientists are looking for. This is to ensure the end result of each analysis is always reliable and highly accurate.

Facing with samples of different chemical natures, a system that can support the usage of multiple detectors will essentially reduce the time and cost imposed. Multiple detection allows simultaneous detection of analytes of different chemical natures, and hence a single system manages to produce multiple results using multiple detectors. HPLC is heavily used in the academic organisations for teaching and experiments purposes. A large column management compartment allows automated switch-use of different columns, which allows multiple users sharing
the same instrument. An ease to operate and understand instrument can serve as a perfect teaching material in the academic laboratory. This is to make sure the learning curve is always remained shallow to ensure the students can pick up the basics and knowledge of chromatography in the shortest time possible.

The same ease to operate functionality is also the outmost important feature that all the industries unanimously seek. They need HPLCs that are fully automated from start-up to shut down, allow multiple operators to work with just a touch of a button, HPLCs that have a touchpanel enabled graphical user interface that could provide real time feedback on the instrument's operations and prefer instruments whose operations could be taught easily to new personnel. They want a robust instrument that is futuristic not only in performance but also in looks. Furthermore, regulatory compliance continues to be one of the major concern which will only increase in the future. Thus all industries seek instruments that are compliant
to the latest regulatory norms.

Need for an intuitive HPLC

The survey also found that users were seeking their HPLCs to have intuitive features like interactive communication mode, auto validation capabilities, self-diagnostic capabilities, remote functionality with web monitoring and smart device control, quick batch functions, reduction of data volume and lock functions to prevent unintended parameter editing or operations. System validation is a very time consuming process, especially for both pharma and biotech industries. They
thus look for auto validation-enabled HPLCs that could run self-diagnosis and generate validation report intelligently. This function will significantly reduce the manpower required for instrument validation and report preparation. An intuitive feature that all the industries wanted to see in their futuristic HPLCs is the ability to remote operate the instrument using smart devices such as smart phones and tablet computers. This will enable the laboratory personnel to carry out all the needed operations without the mandatory presence of analyst in the lab. This along with the need to have a PC-free laboratory environment is what most organisations vehemently seek from their future HPLCs. With the ever increasing number of samples to be analysed, a smart batch file creation function can effectively design a batch file that contains hundred or event thousands of samples in a short time frame.

Need for an intelligent HPLC

Another startling revelation in the global Shimadzu survey was that today's lab personnel want their HPLC systems to be intelligent and showcase features such as auto start up and shutdown function to reduce power consumption, automation in column equilibration and sample re-injection, support a wide range of analytical
conditions, inter-system reproducibility, stability even at changing room temperature, fast analysis capabilities and the ability to conduct method transfer regardless of the brand of HPLC used.

The direction of most laboratories nowadays is moving towards green laboratories. Efficient power consumption is one of the key factors that these green labs are looking into. Smart features such as auto-shutdown and autostartup will not only run the instrument as specified but also help reduce a lot of energy wastage. In addition to that, putting the instrument in sleep mode also further conserves the consumable parts and in return most consumable parts can last for a longer period of time.

Great inter-system reproducibility ensure consistency in results produced by different systems. This great reproducibility ensures results are always consistent and less system optimization is required. On top of that, a HPLC system that offer high level of flexibility in matching system dwell volumes of other brands is also greatly required. With the installation of system dwell volume compatible kit, the system delay volume can be easily modified and method transfer can be done seamlessly from system from other brand.