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Changing HPLC trends in today's lean laboratories

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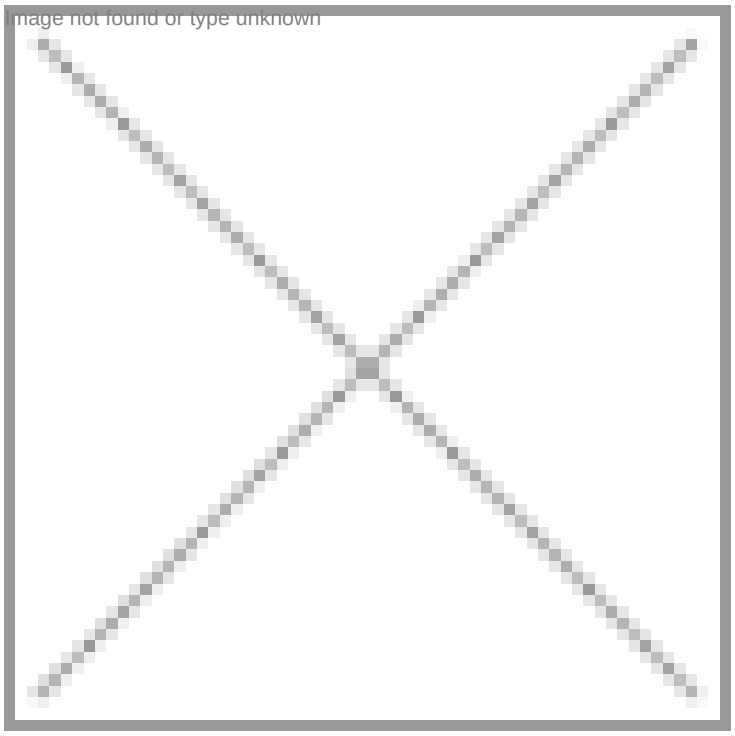

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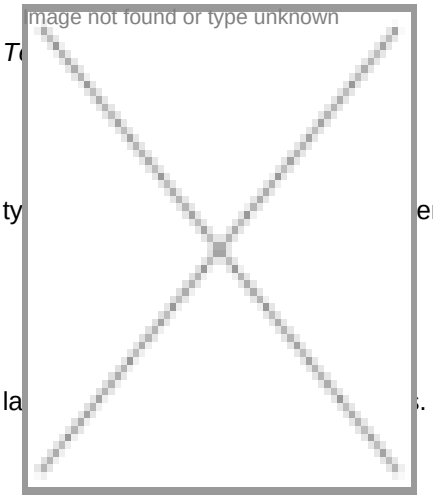

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High pressure liquid chromatography (HPLC) has for many years been a routine analytical technique built on robust column technology and reliable instrumentation. Each analytical laboratory has accumulated dozens, if not hundreds, of methods

However, laboratory managers have precious little time and resources to update their methods to assure that they are keeping pace with improvements in technology. At the same time, they are continuously being asked to accomplish more and obtain better results without increasing the size of the laboratory staff. Column technologies and improvements to HPLC system components can help to realize this goal by enabling la .

Conscious decisions are required while tuning methodologies that best take advantage of the technological development using existing instruments and while planning investments for new instrumentation. A plan to upgrade the laboratory’s HPLC capabilities in a phased, stepwise fashion can help to use budgets and resources most effectively. For example, column packings that utilize a unique superficially porous particle technology made with a layer of porous silica on a solid core of silica. Operating at 40–50 percent less pressure than conventional high-resolution columns, they can provide the separation efficiency of a sub-2 mm particle, without the need to upgrade to a high-pressure system. These columns can provide even more peak capacity on the new high-pressure LC and LC–MS systems. Larger pore sizes and standard frits reduce the

frequency of column clogging and minimize downtime. Improvements in instrumentation like UHPLC technology are also being made on a continuous basis, and they can be incorporated into existing labs. Adopting all of these advances in technology in a rational, measured way can provide higher quality results and thus assure the excellence and safety of products whose quality is controlled using LC.

HPLC has been traditionally one of the strongest and widely used analytical techniques since past several decades. The advent of liquid chromatography happened in the early 1900s and since then this technology has undergone manifold changes in size, performance and flexibility. Be it a pharmaceutical manufacturer or a lab testing food quality, all such industries see a strong need of this technique in their analytical testing. The need for innovation has brought in lot of changes and automation. Standard LCs with multiple detection techniques are seeing growing application suitability. Mass spectrometry has seen a growth in its usage as an advanced detection technique and hence the need for a good front end has fueled the need for innovation in LC technology.

HPLC is nearing the state of a mature technique as the technical advances are slowing down and with the entry of Ultra High Pressure Liquid Chromatography (UHPLC), an extension of HPLC, into the realm of high pressure operation (> conventional 400 bar pressures) that affords advantages in terms of speed for shorter columns and improved resolution for longer columns. However, the higher pressures can put greater demands on instrumentation, require more careful practices regarding lab and instrument hygiene, and cause some unintentional effects due to changes in fundamental phenomena such as solvent compressibility, retention factor behavior and so on.

In 2003, Agilent Technologies was the first company that took a lead in venturing into a new arena by reducing the column particle size from the traditional 5 um to 1.8 um Rapid Resolution High Throughput (RRHT) columns. Later on Waters introduced Acquity UPLC system and 1.7 um columns. Since then over the last five years over 10 UHPLC systems have been introduced into the market and every vendor claims superior performance on some or the other aspect. Lately, the 1290 Infinity LC from Agilent Technologies is the newest UHPLC to hit the market that offers highest power range as well as the first system that delivers the foundations for method transferability from and to any UHPLC and HPLC systems.

The trend to speed up separations (more specifically for complex samples), has been and will continue to be a major growth engine for the technique in years to come. Part of the reason for the continuation of this trend is that businesses will focus on advancements in technology and methods to maintain profit margins in an economic climate that is dominated by increasing competition. Thus, the emphasis will be on increasing throughput, which can be obtained by the use of smaller particles, often in combination with higher operating pressures, which in turn will result in additional purchases of UHPLC or UHPLC-like instruments. Market research has shown an annual growth rate of between 20 percent and 30 percent for UHPLC systems

Speed of analysis and low solvent usage tends to be the most compelling reasons to convert from HPLC methods to UHPLC.