PERKINELMER RIDES COVID DETECTION SPIKE; SUSTAINS LEADERSHIP IN ENVIRONMENTAL MARKETS WITH AUTOMATION AND ‘CONNECTED INSTRUMENTS’

PerkinElmer is a trusted innovator of testing and analytical solutions around the world and helps scientists drive the preservation of human and environmental health.

Suneet Chadha, VP/GM Applied Markets & Solutions. Mr. Chadha joined PerkinElmer, Inc. in 2014 and he has served in a variety of positions. He is responsible for global strategy and execution for Applied Markets and the Analytical Solutions Portfolio. He previously led the Analytical Instrumentation, Consumables & Service business and delivered above-market revenue and margin growth.

Kathleen Young, Environmental Market Leader. Ms. Young joined PerkinElmer in 2018 and has served in several positions related to the Environmental Analytical market. As Environmental Market Leader, she is responsible for the global growth strategy for penetration and expansion into the environmental testing market. She also develops actionable insights about market needs and opportunities to drive product and workflow innovation critical to this market.

EBJ: Can you tell us more about the company’s overall portfolio and business performance?

CHADHA: PerkinElmer is committed to helping scientists, researchers and clinicians address critical challenges our world is facing — from newborn health, food safety, COVID-19 testing and therapeutic and vaccine discovery … to air, water and soil quality. In short, our mission is innovating for a healthier world, delivering unique solutions that serve the diagnostics, life sciences, food and applied markets. Our dedicated team of about 13,000 employees worldwide is passionate about helping create healthier families, improving the quality of life and sustaining the wellbeing of people and our earth.

Specifically, in the area of environmental analysis, our instruments, software and services span across key natural resources that are critical to our global health and wellbeing. This means helping scientists detect harmful contaminants like PFAS, lead, heavy metals and more. As part of this, we equip labs with ICP-MS, ICP-OES and AA technology to test billions of gallons of drinking water annually — treatment and reuse of wastewater for potable water- and perform in-situ soil testing. We also provide GC, GC/MS, LC, LC/MS and FT-IR solutions that monitor indoor and outdoor environmental contamination and drive the study of microplastics in and at our oceans, waterways and shorelines.

On the business front, the company reported revenue of approximately $2.9 billion in 2019 and most recently reported our Q3 2020 results showing 36% revenue reported growth led by strong demand for our COVID-19 detection, prevention, treatment and protection solutions.

EBJ: What has driven the sustained growth of the environmental testing market and what trends have you seen in recent years - and what changes do you expect in the next few years?

YOUNG: The environmental instrument and testing market has experienced consistent yet modest, single digit growth over the past several years. Key to fueling this growth is continued regulatory activity globally focused on more stringent pollutant limits, new contaminants and technology as well as testing laboratory accreditation requirements.

Several countries saw a substantive increase in environmental regulations and governmental investments including India where the government has committed a $7 billion investment in air pollution abatement infrastructure, the European Union which is in the process of a comprehensive revision to its drinking water standards and in China, issuing the Law on Prevention and Control of Soil Pollution targeting soil pollution, with new testing and remediation obligations for businesses and landowners that went into effect in 2019.

Another driver for environmental testing is the impact of climate change. Natural disasters and the frequency of extreme weather events are increasing with climate change being a significant factor. Events such as tornadoes, cyclones and flooding can cause tremendous damage and disruption to the potable water supplies and wastewater treatment operations. Routine testing and treatment can be more challenging, with increased frequency of sampling to ensure access to safe water.

Wildfires have substantial impact on the quality of soil, including erosion and nutrient degradation. They also affect natural water sources where high ash concentrations in the air and surface waters release chemicals, many of which are hazardous, and enter these critical water systems.

Extreme drought can present challenges beyond water scarcity; soil nutrients are depleted, and chemicals are concentrated in what water resources remain. Thus, the demands for testing environmental matrices greatly increased, requiring ongoing monitoring as cleanup and remediation activities follow post weather event aftermath.
Academic institutional and non-governmental organizations (NGOs) conduct studies that also contribute to the demand for environmental testing through their research, feeding the future regulations’ pipeline. Research is focused on chemicals whose impact on human health or the environment is not fully understood. Their forward-looking analytical work is often incorporated into agencies’ regulation development and promulgation process. There are nearly 1,200 institutions globally that focus on environmental impact research; their role is critical to the environmental regulatory and testing ecosystem.

Looking into 2021 and beyond, emerging contaminants research performed by academic institutions and NGOs will continue to feed the future regulatory activity pipeline. How these regulations become implemented may evolve considering the pandemic and federal/country government priorities. Processes, such as environmental law ratification, are having to accommodate more virtual and electronic processes. Governments that are nimble or technology early adopters will be able to shift to more effective regulatory processes.

We envision a migration towards decentralized regulatory activity where many regulations are sponsored and promulgated at state or province levels. As an example, in the US, this trend has started over the past several years on contaminants such as hexavalent chromium, per- and polyfluoroalkyl substances (PFAS) and 1,4 Dioxane.

Much of the early regulatory focus on contaminants of emerging concern (COECs) was on drinking water; as research continues to drive new insights on COECs in wastewater, soil, air and other matrices. We see an expansion of regulatory limits for these contaminants, such as PFAS and pharmaceuticals, to non-drinking water matrices which will drive new analytical techniques and future instrument investments.

Current and future resource scarcity including water, as experienced in parts of Europe, Australia, India, and Africa, and quality soil due to erosion will drive the need for more testing of existing resources smarter reuse, recycling and treatment which will further drive the need for environmental testing into the foreseeable future.

The sustainability and circular economy movement, whereby an economic structure eliminates waste and has continued use of resources, is growing. This is fueling standardization activities for the plastics sector, expanding beyond material science to environmental testing. Characterization of plastics in the context of the environment (accidental release, waste management, biodegradation) will spur method and technique development as well as testing.

EBJ: What trends have you observed in the environmental instrumentation market?

CHADHA: We are seeing that atomic spectroscopy and our portfolio play a strong role in the environmental instrument marketplace. This segment continues to be one of the largest for us. Though there are a finite number of elements that can be targeted for analytical testing, drivers for new capabilities and functionality are linked to regulatory agencies requiring lower limits of detection, technical advances to reduce interferences and occasionally adding new analytes to regulated contaminant lists, especially for drinking water.

With many regulated contaminants at ultra-trace levels, PerkinElmer has observed a continuing trend with testing labs migrating from atomic absorption spectroscopy (AA) and inductively coupled plasma - optical emission spectrometry (ICP-OES) to inductively coupled plasma mass spectrometry (ICP-MS), which offers lower limits of detection, higher analytical sensitivity and the ability to analyze all targeted element analytes simultaneously with the additional capability of speciation and analysis of nanoparticles and single cell. ICP-OES is an analytical technique of choice for non-drinking water matrices; it is an affordable technique that can achieve the sensitivity needed for these matrices. In emerging economies, there has been substantial growth in elemental analysis in soils which has increased demand, especially for AA, which offers a cost-effective, ease-of-use method for a targeted subset of trace metals.

To meet the productivity demands of the environmental testing market, which is ever expanding and moving towards more automated workflows, we introduced our High-throughput System (HTS) and autosamplers for our NexION ² 2000 and Avio ² 500. These automation accessories are simple to install, enable unattended analysis for up to 450 samples and provide significantly improved throughput.

Another critical product portfolio for us and the testing industry is chromatography. Gas chromatography (GC) represents approximately 40% of the chromatography instrument purchases and techniques, while liquid chromatography (LC) comprises one-third.
Environmental testing labs seek ways to save costs and increase productivity in all aspects of analytical testing. We have established unique and invaluable sample preparation accessories for our GC portfolio addressing these needs with our TurboMatrix™ Automated Thermal Desorption (TD) technology which offers a simpler and more cost-efficient airborne organic compound sample preparation method for GC that saves time and GC/ Mass Spectrometry (MS) which reduces the solvent volume needed. Our TurboMatrix™ Headspace (HS) and Headspace Trap samplers simplify volatile organic compounds (VOCs) sample preparation and introduction, in addition to concentrating the target analytes, providing lower detection for VOC analysis by GC.

Our customers seek ease-of-use and convenience, which are delivered through an intuitive touchscreen interface and the 24-hour automated run capability with shut down and wake up modes. With a tight labor market, the ability for labs to staff their labs can be challenging so simplified operation and automation are paramount. Our molecular spectroscopy portfolio is another good example of instrument optimization, with flexible, intuitive operation while not sacrificing sensitivity for environmental matrix testing.

Further, as environmental labs strive for more efficiencies and productivity balancing need to analyze more contaminants, at lower detection limits, in a single run, they are finding GC and LC less robust than they need. Sample preparation and introduction, with multiple columns and detectors is cumbersome; labs are shifting to coupling GC and LC to MS. Testing labs see improved productivity in sample preparation and introduction, tremendous sensitivity for trace and ultra-trace analysis and ability to characterize complex contaminants such as pesticides. GC-MS is becoming popular and required for the testing of pollutants in air, water and soil.

Time is money for test labs; our Clarus® SQ 8 GC/MS offers compatibility with virtually all sample introduction systems, a GC oven that heats up and cools down more rapidly for unsurpassed productivity and sample throughput. Detectors need to deliver sensitivity and customization so analyses can be optimized while re-runs and recalibrations are minimized which is achieved through our Clarifi™ detector.

There is a shift in utilizing LC-MS for more complex environmental matrices and compounds, such as solvents, pesticides and COECs, like pharmaceuticals, personal care products and (PFAS). Environmental testing labs are seeking maximum sensitivity and exceptional uptime, PerkinElmer’s QSight™ Triple Quad LC/MS/ MS offers a self-cleaning interface design StayClean™ technology, which handles complex matrices, reducing chemical noise while providing a higher signal-to-noise ratio that translates to saving time on cleaning and maintenance for an estimated 15% higher uptime.

Environmental testing labs are seeking the advantages of the extended performance of GC/MS and LC/MS which is fueling the movement to enhancing or upgrading from stand-alone GC and LC capabilities.

Although a smaller portfolio within the context of environmental testing, the Material Characteristics space involving FT-IR is growing and providing value in the area of particle characterization and more specifically, in the area of identification and quantitation of microplastics in water. The Spotlight™ 400 FT-IR, from PerkinElmer, has been a popular instrument for the study of microplastics within our customer base. Delivering high spatial resolution, fast efficient data collection, automated data analysis routines and unattended operation, this instrument enables outstanding productivity to testing labs and researchers.

With numerous institutions conducting research on microplastics’ impact in marine ecosystems and several countries working on standards for identification methods, we see the opportunity to leverage our expertise in microplastics detection and workflows in this small but growing and significant trend in environmental analysis.

EBJ: What technology advances and trends are impacting the environmental instrumentation market?

YOUNG: Ubiquitous connectivity to analytical data is an evolving need and expectation of the environmental testing market. Being able to access instrument diagnostics remotely, perform in-situ analysis in air, soil, and water through portable, hand-held instruments or through on-line monitoring or conduct analytical work in the laboratory with less human intervention is where we see technology going. These trends help laboratories future-proof themselves and provide opportunities to generate additional return-on-investment (ROI) from their instrument purchases.
Benefits range from ensuring adequate capacity to handle unexpected influxes of samples, to preparing for potential regulations, to adapting to unexpected events such as natural disasters or the recent COVID-19 pandemic. Many of the advances discussed below are enabling the lab and environmental testing of the future.

CHADHA: We see five advances driving the market into 2021:

First, there’s automation. The ‘unattended’ or automated user experience is increasing in demand; scientists and technicians can focus on driving actionable insights while sample preparation is being handled by reliable and precise automation technologies. From a training standpoint, workflow tools such as touch interfaces provide Lab Managers and their teams with a sense of confidence, especially in organizations where seasonal work or high turnover rates need to be managed.

With the cost of automation becoming more affordable and coupled with next generation instruments, automation can result in increased efficiency, output, productivity and reproducibility. This drives increased ROI and capacity expansion capabilities to meet future demands, both expected and unexpected.

Secondly, is continuous expansion of IoT. Connecting the lab environment is becoming a priority where costs related to service and time-to-results is a challenge. This idea of ‘Connected Instruments’ is not limited to the instruments and their diagnostics it’s also linked to the data being produced and analyzed for customer reporting. The integration of the lab environment as unit comprises of hardware, data, software analysis and reporting tools to drive further productivity and cost-efficiency, and ensures that users not only have flexibility in their workflow but real-time access to data they need to complete their tasks more effectively.

Sensors will be proving their value in 2021. Smart diagnostics that integrate the lab environment with, for example, instrument performance and maintenance will offer Lab Managers and/or Operations Managers further insights into the overall lab operations and related costs.

Fourth, for truly state-of-the-science labs, laboratory information management system (LIMS) are absolutely de rigor. Remote sampling is a key requirement for many environmental LIMS customers. Special consideration should be given to the procurement, storage and transportation of samples to be analyzed. LIMS will need to be portable, accessible to mobile devices (smartphones & tablets) to allow anywhere access to the lab operations (especially logging samples and work orders) and connectivity via Wi-Fi or 4/5G. Improved mobile experiences will support better accessibility to training content, in-lab productivity, reduced time-to-results and cost per sample.

Finally, there is Centralized Data Management. Remote access to data across the lab environment (or enterprise) is becoming increasingly important. This gives users in an organization the ability to access the data and perform workflows, once locked to the instrument workstation, to environments outside of the lab which are more suitable to the needs of the task.

EBJ: PerkinElmer works a lot with emerging contaminants. Can you tell us about the solutions that you provide and how you’ve used different technologies to achieve this? And what ranges of accuracy have you been able to achieve?

YOUNG: PerkinElmer supports a wide range of academic researchers, government scientists and potable water professionals in emerging contaminant research. Some examples would include work focused on some specific compound classes such as PFAS, PPCPs (Pharmaceuticals and Personal Care Products) and microplastics.

In the area of PFAS, including compounds such as PFOA and PFOS, LC/MS/MS is one of the most employed analytical techniques due to its high selectivity and sensitivity for both biological and environmental samples. PerkinElmer’s UHPLC System coupled with the QSight triple quadruple mass spectrometer has been used to determine PFAS with LOQs below that set by many regulatory bodies.

Similarly, PPCPs require highly sensitive LC/MS/MS technique to identify and quantitate contaminants like estrogen and Naproxen.

An additional challenge is that PPCP testing can encompass a wide variety of chemical classes that can be present in low concentrations in drinking waters. Therefore, developing an optimal analytical method requires balancing analytic sensitivity with effective chromatographic separation. One way to tackle that is to use online SPE. Using the PerkinElmer QSight SP50 Online SPE System coupled to a Qsight MS/MS detector, we have seen effective and robust sample concentration, chromatographic separation and quantitation of PPCPs.

We are also seeing that 1,4-Dioxane, entering our drinking water, is garnering focus and regulatory activity. Our HS trap-GC/MS is uniquely suited to analyze this compound, achieving detection limits lower than current regulations.

Microplastics present a unique challenge with global studies focused on quantifying and addressing the problem. One such effort is the eXXpedition research project which consists of an all-female crewed research vessel traveling over 38,000 nautical miles across the world’s oceans, focused on investigating the causes and sources of plastic pollution. We have provided this team with a Spectrum Two FT-IR which is used to gather near-real-time research data.

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Strategic Information for a Changing Industry

time data to help identify the types and quantities of plastics in their samples.

EBJ: Who are your main clients? What are some of their key needs?

YOUNG: We work across a broad spectrum of clients, collaborators and partners on environmental testing solutions. Leveraging 80 years of technology innovation, method development, and research, we bring a broad analytical portfolio and expertise to address the global challenges faced by contract testing laboratories, academic institutions, governmental laboratories, utilities, environmental consulting and engineering firms and industrial companies.

Environmental contract testing laboratories, also known as environmental third-party laboratories, represent our largest segment of customers. Critical to their success is high sample analysis throughput and instrument uptime translating to higher productivity and profit margins. This customer segment has gone through tremendous consolidation and it is realistic to expect this trend to continue in the near-term. We are seeing a significant increase in the number of private labs in areas such as China, where there’s a shift from government-owned and operated labs to privatization of the sector.

Another important customer for PerkinElmer is government labs. Their analytical work supports regulation development, compliance and enforcement monitoring as well as emergency response to environmental catastrophes. For governmental agencies, the tight labor market has driven a shortage of skilled labor. Instruments must be easy to set up, intuitive to run and have straightforward operational maintenance activities. As governmental labs are establishing new, lower, more stringent limits of contaminants, they are sensitive to the performance of instruments and their limits of detection, thus they do seek high-performing, future proof technologies. At the local and state level, we have drinking water and wastewater treatment providers, both from the public and private sector.

There is a privatizing trend for water treatment in regions of Latin America as well as Europe. These customers demand high analytical instrument uptime; thus, they seek redundancy through back-up instruments that can be quickly brought online or aggressive service contracts where service must be restored in a matter of hours and not days.

The COVID-19 pandemic has brought a tremendous amount of additional waste into our environment. We have seen increased demand for leachables testing and extractables from masks, gloves, medical and hospital waste such as gowns and related items.

Academic institutions and NGOs are another customer segment that we support. With much of their research focused on emerging environmental issues, the unpredictable nature of time-to-results for the complex issues and analyses provides a substantial and unique challenge. At the same time, they require instruments that are easy to onboard, intuitive to use and robust enough to require little maintenance. This segments focus is often several years ahead of those of our other customer groups. They look to solve challenges of tomorrow and provide us with valuable insights into the solutions that we need to be developing for the future.

When delivering environmental solutions, our holistic approach includes looking at the entire analytical workflow and scope. For example, with microplastics, much of this research is invested into looking at these particles in the environment – how they are affecting ecosystems, entering food chains and effect the health of organisms. In that work, we are supporting the efforts of academic researchers and government agencies investigating and quantifying the problem.

On the other hand, we are also supporting the work of industrial partners as they research alternative materials, recycling and reuse and production alterations to prevent microplastics from entering the environment. When we focus on creating new solutions, methodology and applications, we want to be sure that we have a meaningful impact – not just on detection and analysis but also in the creation of a solution to an environmental challenge.

EBJ: What are some analytical testing instrumentation trends in environmental matrices testing?

YOUNG: Water analysis is focused on three broad areas – natural waters ecosystem health, drinking water supplies and wastewater treatment. In all instances, rising populations and industrialization increase demand of water resources, spurring legislation focused on water quality. Analytical instrumentation is supporting these activities with one of the most critical parameters being sensitivity. The latest instruments, including UHPLC/MS/MS, allow for the quantification of contaminants at lower levels than ever before as well as the analysis of COECs. This drive towards ultra-low detection limits is also crucial when faced with unique challenges of radiometric analyses, which can have human health impacts even in minute concentrations.

This capability supports efforts for more stringent limits on sources of contaminants as well as the research into the effects these chemicals have on both human and environmental health. There have also been instrument innovations related to online systems which allow for water treatment and testing to be monitored remotely helping to improved water treatment operation and efficiency. There has also been an increase focus on simplifying analytical instruments with intuitive interfaces, and plug-and-play capabilities making it much easier for these tools to be implemented both, in the field and the laboratory.

Air quality analysis has continued to grow in importance with most of the world’s population living in cities where air quality levels exceed World Health Organization (WHO) limits. Both, indoor and outdoor monitoring require accurate,
A significant advancement has been the incorporation of online and remote sensors. Urban areas have typically employed environmental monitoring stations, which are often costly to operate. With advances in sensor technology and remote communication less expensive solutions covering wider areas improve testing coverage and more localized measurements. Air monitoring often needs to be conducted in remote locations or in response to an emergency, which has also driven the use of portable air analysis solutions such as portable GC/MS technology.

There is also a focus area for soil analysis in agriculture since increasing global populations are highlighting the importance on achieving optimum crop quality and maximum yields. Monitoring soils for nutrient content, erosion, surface run-off and moisture can help to minimize the costs associated with water, fertilizers, pesticides and other inputs.

Technologies such as atomic spectroscopy, molecular spectroscopy and elemental analyzers for metals analysis and GC/MS for organic compounds continue to be important solutions for scientists who focus on this type of analysis. Recent analytical trends which will be important within these applications include the simplification of instrumentation, portable instrumentation, remote communication and multi-parameter instruments, all of which will contribute to expanding access to this valuable information.

**EBJ: What has been the impact of COVID-19 on the environmental testing market and how has PerkinElmer addressed their shifting needs?**

CHAHDA: From detection through drug and vaccine discovery and development and even hand sanitizer testing, PerkinElmer’s COVID-19 innovations include testing kits, instruments, informatics, automation and workflow solutions and services. PerkinElmer is also committed to donating instruments and testing kits around the world to help screen and diagnose the disease in hot spot locations. The pandemic has also brought into focus the importance of labs having business continuity and disaster recovery plans so through our OneSource® Services we are helping labs assess operational gaps and executional challenges during the COVID-19 pandemic and beyond.

Specifically, in Applied Markets, our company has been able to leverage core competencies and technologies in new ways to help customers during the COVID-19 pandemic. For example, we’ve seen a strong interest in personal protective equipment (especially masks), respirator and related medical equipment testing to ensure quality standards are met for those manufactured goods. PerkinElmer brings innovative solutions to the market to validate quality of raw materials – such as hand sanitizer testing for alcohol content and impurities – and label claims of final packaging. Additionally, the COVID-19 Pandemic has brought a tremendous amount of additional waste into our environment. We and many of our customers have seen increased demand for leachables testing and extractables from masks, gloves, medical and hospital waste such as gowns and other related items.

YOUNG: Regarding environmental labs, there was not a cessation of operations in most cases. Sample volumes from their customers were, for the majority, fairly steady compared to pre-pandemic times as monitoring and testing for commercial and municipal operations are governed by regulatory agencies and related permits, sampling and analytical testing have continued. Testing related to remediation activities did decrease as environmental engineering and remediation firms figured out logistics for getting staff, personnel protective equipment (PPE) and remediation supplies to locations where travel restrictions were in place.

Within environmental testing, as all labs, social distance guidance required scientific teams to rethink spacing for lab employees, including adding another shift for analysis or reconfiguring existing lab footprints to expand the space in order to maintain analytical productivity. Some laboratory staff chose not to work in the early stages of lock down putting further pressure on labs’ throughput. Redundancy in analytical skills was vital to many labs continuing their operations, which many labs did not possess. Many of our customers reached out for technical support through our Technical Support Service Centers and Field Application Scientists to fill skill or knowledge gaps. Our high throughput systems and autosampler capabilities for trace element and organic compound analysis were in high demand and utilization so that customers could maintain high sample throughput and productivity with reduced lab staff.

Also invaluable to labs was the ability to monitor instrument status remotely during overnight analysis or during secondary or third shifts. Our tech support and service were available and provided the support needed for laboratories to maintain their operations. Supply chain disruption (PPE, reagents and consumables) was also a challenge for environmental testing labs. Many existing and new customers reached out to PerkinElmer to supplement or replace their suppliers.

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info@ebionline.org