The Business of Making a Lab Field-Portable

Getting the Big Picture on an Emerging Market

With the wide range of field-portable instrumentation now available, it is possible to perform rapid, high-quality analyses at the site of investigation. In fact, this approach is quickly becoming more accepted and even required. People who use field-portable equipment quickly realize—often the hard way—that there is a lot more to doing analyses in the field than owning a cool instrument. In fact, there are several business and logistical ramifications involved in making a lab field-portable. This article will discuss the challenges and concerns, strategies and successes of life in the field.

By Craig Crume

Defining Field-Portable

What do we mean by field-portable instrumentation? The simple definition is that such instrumentation is fast, lightweight, small enough that one can check it in as luggage, operates on a simple infrastructure, and is capable of generating laboratory quality data. Each of these factors is important, because there is a difference between a "transportable" instrument and a truly portable one. To illustrate the difference, one could use the "Two Men and a Boy Theory," which means that if it takes two men and a boy to lift an instrument, then it may be *transportable,* but it is not truly portable. Or, if the instrument takes its own dedicated power source and the lights dim when it is turned on, it isn't necessarily portable either.

It is important to note that any time an environmental laboratory conducts on-site analyses, the overall goal should be that the instruments are capable of generating *effective* data, a term introduced by Deanna Crumbling of the U.S. Environmental Protection Agency (EPA) at a recent industry conference. This means that the goal is to generate the quality data required to accomplish the data quality objectives (DQOs) of the project, and that may mean laboratory quality data and it may not. Field-portable instrumentation that is capable of providing effective data offers good value for the investment.

Many advances have been made in the development of field-portable instrumentation. Some of the categories of instruments that fall within this definition of field-portable include gas chromatographs (GCs), micro-GCs, GC/mass spectrometers (MS), continuous flame ionization detectors (FIDs), photoionization detectors (PIDs), extractive Fourier transform infrared (FTIR) spectrometers, filter-based and other infrared (IR) spectrometers, X-ray fluorescence (XRF) spectrometers, and selective monitors. Many of these instruments are small or hand-held, rugged, offer very rapid results in the field, and are useful for a wide range of analytes of interest.

Typical Applications

Once the lab has acquired field-portable equipment, what can it be used for? Essentially, field-portable capability is useful at any time in which immediate data is required in order to facilitate critical decisions in the field. Typical areas in which environmental laboratories have the opportunity to provide field analyses include health and safety/industrial hygiene, source/process monitoring, Brownfields, odor investigations, site characterization/remediation, fence line monitoring, and emergency response situations.

Emergency Response, Health, Safety and Industrial Hygiene. Typically, these applications are incident-related, such as a possible exposure of personnel to contaminants in an industrial location. If you're not able to respond quickly with your equipment, the cow's already left the barn, so to speak. In the past, when a suspected exposure incident ocurred, the site personnel were sent sample containers from the laboratory, collected samples, and returned them to the lab. After a few days, the lab would return results. Of course, the downside to this approach is that information about whether people were actually exposed to a contaminant, at what level, or from what location came days after the initial exposure. When you are able to take an instrument to the site, the real-time results can be shared within hours and any health or safety concerns can be addressed immediately.

Additionally, the field analyst will be able to achieve an appropriate data density. In many cases, the number of individual samples taken is limited in terms of the amount of money available to spend. For example, the client may want to spend "x" amount of dollars, which will get him five samples. The analyst will collect the samples from the five best possible locations, but are five samples really going to be enough? The advantage of using a field-portable instrument in this scenario is that the analyst can perform analyses until he is either tired of doing analyses, or until the problem is resolved, whichever comes first. In this way, one can get the right amount of data to fit the situation.

Source/Process Monitoring. This application involves regulatory compliance-related monitoring of stack emissions in which industrial operations must measure emissions on a fairly routine basis to meet state or federally permitted levels.

The New Field Classics

ET&A asked environmental professionals from industry, government and academia to identify a few of the top tools for on-site sampling, testing and analysis most useful for environmental chemists and engineers, and to offer an opinion on the area of field-portable methods and instrumentation in which we are most likely to see significant advances in the next five years. What these experts had to say appears throughout our cover story.

—Editor

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"The top analytical tool has been and continues to be the gas chromatograph (GC). With the various detectors available, including mass spectrometry (MS), the GC can be configured for rapid screening and/or definitive data analyses for a wide range of analytes of concern in a variety of sample matrices.

"I see two areas where I think we will see significant growth in on-site analyses. The first is with the so-called screening methods. This usually involves less expensive instrumentation and rapid turnaround times for which the data can be used to make decisions or form opinions concerning the general characterization of a given area. The second growth area I see, and one which represents a significant change in thinking concerning field analyses, is the move to obtain final, definitive data in the field. This is being accomplished by utilizing standard U.S. Environmental Protection Agency (EPA) methodologies in the field and performing the analyses as you would at any properly operating fixed laboratory. Methods being employed include standard GC, GC/MS, high-performance liquid chromatography (HPLC), inductively coupled plasma (ICP) and atomic absorption (AA) analyses. The difference is that the waiting period for receiving final data can be dramatically reduced."

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"The top tools used in today's on-site environmental testing and analyses include micro-GCs, because these provide semi-continuous field applications, and hand-held photoionization detectors (PID)/flame ionization detectors (FID) for rapid GC field screening. I would also mention Hg-amalgam furnaces, which are field units able to detect Hg in soils, and semipermeable membrane technology for total volatile organic carbons (VOCs).

"In my opinion, field instrumentation mounted on the end of a geoprobe will see significant advances. Examples include micro-GCs, direct probe mass spectrometry (MS), filter-based and other infrared (IR) and ultraviolet-visible (UV-Vis) spectrometers. Micro-GCs will also be useful for continuous or semi-continuous monitoring of stacks and off-gas units."

This is one of the more significant areas of opportunity for environmental laboratories that have field-portable capability. Again, the typical approach has been to collect samples and send these off-site for analysis. Unfortunately, if you've mobilized a big crew to go out and collect these samples and it turns out that there is a problem or that the levels recorded indicate compliance failure, you aren't going to know that right away. Similarly, if the off-site laboratory has a problem with the samples collected and is not able to give good analyses for whatever reason, this is also a compliance failure that will result in a remobilization of that crew for a repeat sampling effort at additional costs in time and money. From a logistical standpoint, if you are able to perform the required analyses on-site, you will know whether you have a good test before you ever leave the site and in time to meet the compliance monitoring deadline.

The second part of this application is process monitoring. There is story after story related by industry professionals who have conducted on-line process stream measurements in order to facilitate optimization of those processes in which they have tweaked a step in the process, gone back to see if the number changes, tweaked the process again, checked to see how the number changes, and so on. Since the dollars involved in a company's process can be on the scale of millions of dollars per day, the ability to perform real-time monitoring to determine whether or not that process is acting optimally is huge. The primary advantage of using a portable instrument instead of an on-line monitor is that the portable instrument can be used long enough to optimize a particular part of the process and then moved. One piece of equipment can be used to optimize many different processes instead of on-line monitors on each process.

Brownfields. The main idea behind the EPA's Brownfields Program is to get in, do as much as you need to do, and get out. As such, Brownfields should be considered an up-and-coming application area in which field-portable analytical technologies will play an important and useful role. These are essentially industrial sites where people will want to do some measurements, determine the extent of contamination and institute a plan. The sampling plans for these projects will be dynamic in nature and as a result, the real-time analytical capability offered by field-portable instrumentation will be essential in successful sampling.

Odor Investigations. Most major manufacturing plants in the U.S. have an "odor squad," which deals with in-plant odors or complaints from neighbors. Using field-portable equipment to investigate odors on site is a good way to get rapid information about whether a health hazard exists. There is a portable GC/MS that will perform a full analysis for unknowns, and then switch to real-time sniffing (leak detection), which enables the user to track the odor back to its source. This is followed up by full GC/MS confirmatory analysis with the same piece of hardware.

Fence Line Monitoring. In these applications, field-portable capability can provide immediate peace of mind during the on-site project. In one case in which our company was involved, a new subdivision was built next to an old landfill that was being relocated and had not been capped properly. The recapping required a lot of digging, but the engineering crew did not know what they were digging into. The neighbors were concerned about this, and the on-site EPA official's aim was to be able to look the neighbors in the eye, and with a high degree of confidence, tell them there was no problem. The field-portable equipment capability allowed us to surround the perimeter and perform the analysis twice a day at every point,

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"The two field analytical tools we use most are the gas chromatograph (GC) for organic analyses and the field X-ray fluorescence (XRF) spectrometer for lead and other metals. Typically, a project manager wants information on volatile organic compounds (VOCs) and other compounds of interest for a particular site, and he knows he can get that information from a field instrument. The GC is quick, you can manipulate it with an array of detectors, and you can hit a range of different analytes—all of which are important in the field. The XRF spectrometer is a good field tool, because it offers measurement information in 30 seconds to one minute, enabling you to conduct a survey and respond to the data very rapidly, instead of having to wait to get results from a traditional analysis. In other words, I can make a measurement and before I move on to the next area of the site, I can decide where I am going to sample based on the information I just received from the instrument. Beyond that, I like the field-portable XRF because the particular one we use is small (Niton), very portable, is battery-operated, and stores up to 500 measurements. We use this technology for projects in which we characterize lead in residential soils, for example, and our lab is starting to get more requests for this type of work.

"In the next five years, there should be some significant developments in field-portable mass spectrometry (MS), especially for BNA analysis. Also, we expect some advances in field extraction techniques for organics, especially by pressurized fluid extraction (PSE). And we will see field-portable XRF and similar instruments developed for alloy analyses.

which helped the official meet his goal.

Site Characterization/Remediation. This is potentially the single biggest market opportunity for environmental laboratories that are considering adding an element of field analytical services. In project after project, field-portable analytical capability has saved clients money and kept their programs headed in the right direction. Typically, in site characterization and remediation projects, there are several factors reviewed, including the geology of the site, the expected plume, the groundwater, and so on, to determine/guess where to sample. Following collection, the samples are sent to a laboratory to see how well this characterization process was done. If results show that areas of concern were missed, the characterization is continued a second time at further cost.

Currently, there is a big push for instituting dynamic sampling plans in which the goal is to perform a rapid characterization with only one mobilization, and field-portable equipment is well suited to supporting these types of plans. In a dynamic sampling approach, you dig a hole, test and if it comes back clean, you're done. If it is dirty, you continue. Also, some programs are becoming even more sophisticated, and some are able to conduct both vertical and horizontal delineations. In these cases, they are only going down as deep as there is contamination. It may be 300 feet to groundwater, for example, but if after 100 feet nothing is found, the drilling is finished. The only way you can do this, however, is with an instrument or methodology that provides a fairly fast analytical response, because if you've got a rig in the ground at 100 feet and you've got to wait even an hour to determine whether or not that particular location is dirty, that rig is sitting there costing money. The cost of analytical pales in comparison to the cost of idle equipment and an idle drilling crew, including geologists and the project manager, all sitting on their hands waiting for that number. The cost of analytical is also very little in comparison to the cost of misidentifying the source of the problem. For remediation, real-time results can provide information so that only contaminated dirt is moved and this type of fast information can also help with compositing efforts.

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> "A few of the top tools we've found most successful for field applications include those that aren't technically instrumental methods. The total petroleum hydrocarbon (TPH) kits (Chemetrics, Dexsil, and SDI) are easier to operate than the instrumental methods. We've also found the use of prepackaged materials, disposable equipment and simple processes have facilitated rapid analysis of field samples. These include such items as the Horiba Solvent Reclaimer, which has been shown to be effective, though there is a 30%-40% loss due to absorption on the carbon, aluminum and volatilization due to heat of absorption; and the use of preweighed sodium sulfate, Fluorosil, and ampoulized solvent (RemediAid), proved excellent, although keeping track of color development with the extraction could be difficult for less skilled analysts. We've also found the use of disposal centrifuge tubes that are in disposable holder (PetroFLAG) and the disposable filters were excellent, though it should be noted that reruns may yield lower results due to color stability.
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> "No big advances in on-site sampling, testing or analysis, however, are anticipated without government acceptance of the techniques."

Field-portable analytical capability will become increasingly important in site characterization and remediation projects in the near future because it supports the dynamic approach by providing real-time feedback. Our company is able to provide full, definitive analyses in 30 minutes routinely. Beware: This rapid result time is addictive. Often, clients who have received 30-minute results will begin to come to us after just 10 minutes asking for the numbers, even though for years they waited for two weeks. The cost-effective element of performing field-portable analysis will also drive its use in site characterization and remediation efforts.

Why Should You Consider Adding Field-Portability to Your Menu of Services?

In today's industrial and regulatory climate, the client must be able to make immediate decisions based on dependable, representative data. Dependable data means that the project manager *can* make a decision with good confidence, and representative data means that there is some stability in the samples, as well some assurance of data density. Field-portable analysis offers this type of decisionmaking assurance to the data end-user, and there are some significant advantages to the analytical firms that can provide these data rapidly, including:

- *You're Part of the Team, Not a Black Box.* Historically, the analytical lab has been left out of the information loop on environmental projects in order to ensure that results are not biased. However, when the lab professional is in the field, he or she becomes part of the project team, which fosters interaction and feedback more conducive to achieving the project goals. For example, the field analyst can share with the project team test results that might indicate an area of contamination previously undetected at the site which could have an impact on revisions to the sampling plan. The project manager can then make a rapid decision based on expert information.
- *Dedicated Analysis, Not Part of a Batch.* When a client sends samples to a laboratory, there are three samples that are part of 20 samples in the total batch. The quality control (QC) performed on one sample in this batch does not necessarily include one of the client's three samples. In addition, the industry is becoming data quality objective (DQO)-oriented, which requires that the quality assurance project plan (QAPP) is based on the very specific needs of each individual site. These site-specific needs don't fit well into a laboratory's "one method fits all" production schedule. But, when the laboratory is out performing analysis in the field, you're doing only what that client requires and special requests can be easily accommodated.
- *Representative Sample Collection.* Real-time results means that you are able to spend your time collecting samples where the contamination has been detected. You are not collecting a whole grid of samples in which 40% of them turn out to be

nondetects. And importantly, the client is not paying for nondetects, which is information that cannot be used; rather, the client is paying for real results that help the investigation continue.

• *Higher, More Effective Data Density.* Once the source, the plume or the area of concern is found, efforts can be concentrated, saving time and money. Rapid field-portable analytical results can be provided constantly to the client until the data density of those results show that the identification or characterization is complete. Since the client is not paying per sample, but rather per day, he is more likely to take advantage of this data density aspect and spend the time necessary getting all the information needed to make a decision. If the client is paying per sample, budget constraints will come into play and he may have to make decisions on only a portion of information.

No More Status Quo: From Fixed Lab to Field-Portable

For environmental laboratories that want to successfully make the transition from fixed to field-portable, they must start thinking like a consultant, not a lab. There is a trend today among some laboratories toward this type of consulting business approach. What are some ways to think and act like a consultant? Consultants bill by the hour or day, not per sample, for example. Consultants propose solutions and make an effort to be involved in the preparation of QAPPs. As many people in analytical laboratories can attest, it is a common occurrence that plans are made in which the people doing the analysis have not been involved in the preparation of the work that is going to be done.

Successful laboratories are those that are part of the whole project or investigation, are solution-oriented and quality objective-oriented instead of analytical method-oriented, and are trying to be team members. These characteristics are imperative in field operations, where interaction with the client fosters more effective information and facilitates the achievement of specific project goals.

Also, if you're a fixed lab aiming to be field-portable, determine how you are going to dedicate your resources and personnel in advance to the best of your ability. If there are not enough billable hours for the field analyst at first, decide how that will impact in-lab and field project scheduling for that person. Problems can and will occur when the time comes to go out on a field project and the dedicated field specialist is in the midst of a time-consuming sample analysis in the laboratory. Similarly, when it comes to equipment, dedicate certain instruments for field use only in order to avoid conflicts.

It is also important to use your best people, because they completely represent your company to the client. There is no buffer, no sales manager and no client services when problems or misunderstandings arise. Make sure that they represent you well and reward those people accordingly. By the way, the most available analyst is typically not your best analyst. The choices are to provide strong resources and people to do the right job, or do a poor job and give the whole approach a bad reputation.

Biggest Obstacles

The single biggest challenge in developing a field-portable component to the environmental laboratory can be expressed in the following statement: Field analysts currently do not exist. Training or retraining high-quality people to go out in the field, with the accompanying travel schedule and logistical obstacles, is not easy.

Life on the road is difficult, especially if that person is used to sitting in a laboratory from 8 to 5. The choices are either take a chemist and teach him to be a field analyst or take a field person and teach him to be a chemist. The person must be able to think on his feet, because there is a "crap happens" factor in the field. The field analyst must be amazingly creative, not in the analytical routine but in the logistics; in other words, know that duct tape is your friend. The person who isn't afraid of duct tape is just as important as the person with strong analytical skills.

The person you send into the field is the analyst and the QA/QC, reporting, MIS, maintenance, client services and marketing departments representative all rolled into one. This person is not only expected to be the entire staff, but is expected to be an integral part of the client's team. Clients want more than just a black-and-white data point, they want results and information that the field analyst is expected to provide them. All the various shades of gray that come with a number are now important, and these shades are beneficial to users in that they provide more meaningful, more specific data. The field analyst has that unique opportunity to provide this kind of information to the client. Overall, there is myriad nuances to this person–from the ability to deal with unexpected weather to dealing with clients who've received unexpected or unwelcome data–and the reputation of your company rests strictly on this person's ability to deal with all of these various nuances, as well as their ability to analyze samples.

Another obstacle is the status quo mindset, which simply put, states that "Things have to be the same as they always are and the only way you can deliver high quality analyses is if there is four walls around you." Related to this is a fear factor: Somebody, somewhere has to sign off on this, and they might not do so if I use a new or innovative method approach. The status quo/fear factor is an obstacle to further developments in field analytical methods and technologies, and as such, affects regulators', end-users' and laboratories' use of these approaches. The regulator, for example, will feel very comfortable signing off on an SW-846 analysis, since the guideline exists and has been used for years. No one ever got fired for approving SW-846. However, field analytical methods are perceived as outside the safe zone, because they are new and different and do not necessarily fall into existing protocol.

It is difficult for regulators even when they find benefit and advantage in using field methods and technologies. Often they don't have the ability to determine whether the field analytical technique presented is good and yet they have to sign off on it. We need more people in the regulatory community who have a working understanding of these approaches to provide review and definitive answers as to whether those approaches work or not. As we work more closely with the regulatory community to facilitate the accep-

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"I have been actively designing and carrying out dynamic field investigations for the last 10 years and I strongly believe that utilizing a triad approach—systematic planning, dynamic work plans and field analytical tools—is an effective way to obtain the data necessary to make scientifically valid decisions that rely on environmental data. It is important to point out that to successfully utilize field analytical tools you must utilize a systematic planning process to determine what data is required and how it will be used in the decisionmaking process. In addition, the true benefits of utilizing field measurement tools is not realized unless you have developed a dynamic data collection strategy. The analytical tools I have used most in the field include XRF; immunoassay field test kits for PAH, PCP, PCBs, explosives, and pesticides; GC/MS; GC; colorimetric method for RDX and TNT; SCAPS LIF and CPT; direct push sampling rigs for soil-gas, soil, and water. I think one of the most successful tools I have used was the SCAPS CPT/LIF for characterizing creosote NAPL plume. The density of data obtained allowed for an understanding of the conceptual site model that would not have been even remotely possible utilizing traditional sampling and analysis techniques.

"Hopefully, we will see advancement of direct measurement technologies that can be utilized with standard direct push rigs. This is the area in which I see the largest market. In addition, I think we will begin to see more people understanding and utilizing the triad approach to data collection. When people start to understand the benefits of utilizing a triad approach we will start to see a significant increase in use of on-site measurement technologies that currently are underutilized. People have access to many field measurement technologies that they just do not understand how to use. Many more projects are moving into the RA phase and this will be a large market as people learn how to utilize field measurement technologies to guide remedial actions and optimize remediation systems already in place."

tance of these methods, the fear factor will become less of an obstacle.

The status quo/fear factor also affects end users, the people who have to base decisions on the data. Field analysis may save me money, it may give me results faster, but it is not SW-846. In our experience, this obstacle can be overcome when the end user's need outweighs his fear, when it is scarier not to have the results than to have a result the client is not quite sure about. Of course, after you've worked with a client once and shown that the methods work, the fear factor goes away. One way to address this is to conduct project-specific audits, where the client or regulator comes out into the field with the analyst to see for himself that the standard operating procedure (SOP) and QAPP is followed, that the method can be verified, and that the analyst is doing what he said he could do. This is a simple way to inspire confidence.

The next obstacle is that laboratories are perceived as having little interest in adding a field analytical component. Although there are emerging economic incentives for labs to lead the way with these new technologies in new markets, labs have not yet committed resources to capturing a share of this market. Until laboratories see field analysis as a potential rather than a threat, this will be an obstacle.

Certification is another challenge to be overcome, because there is no simple box to check. Even though the field analyst will stay as close to the reference methods as possible in order to maintain a comfort level with clients and regulators, the fact remains that field analytical approaches are not categorized officially in certification protocols. Currently, the National Environmental Laboratory Accreditation Committee (NELAC) is the best route for possible certification, but as presently structured, it does not have built-ins for new technology acceptance. The field component is currently being considered for inclusion.

In general, the first field analytical project a laboratory takes on will be a challenge, but once you've demonstrated to the client that field methods and technologies provide rapid, accurate, representative data, the client will be hooked. In our company's experience, once clients have seen the data and validated the results, they will call every time there's even a potential of an opportunity use rapid on-site methods. Once you've proven that it works, that it saves time and money, and that the results are defensible and can often be used for compliance purposes, getting subsequent projects will be a slam dunk.

The Quality Factor

Field analysis quality can be as good as or better than a fixed laboratory's. First, the degree of potential error associated with collecting the sample as opposed to analyzing the sample is eye-opening. The number of things that can happen during the collection of a sample is incredible, and the closer you can get to the sample, the more you can minimize the possibility of those things happening. Anytime you reduce the number of steps and amount of time the sample has to travel, the quality will increase. Simply put, the sample integrity of a one-hour-old sample is always better than that of a 14-day-old sample.

On the less tangible side, if there is an issue with the sample, field-portable analysis allows you to get another sample quickly and you don't have to lose that data point. Also, regardless of the method, you don't have to give up general quality parameters that you expect to see in a decent analysis, such as calibration curves, analytical duplicates or spikes. With field analysis you can generate duplicates, blanks and linear curves, just as you can in the laboratory.

Issues with sample heterogeneity from stratified geology can also be satisfactorily addressed by field analysis techniques. When you are on site and can get real-time feedback, you are able to play with the parameters, get a good sample density, and see what works best for that site very rapidly, improving the quality of results substantially.

The bottom line is that while the field analyst's goal is to do lab-style analyses in the field, the quality factor is really more closely linked with getting effective data. In other words, rather than setting one's sights on being as good as a laboratory analysis, the key is being as good as the project requires. Often field analysis can provide better-than-lab results, since the field analyst is able to choose the analyti-

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"Some of the top tools in field analysis include portable pH meters, automatic volatile organic compound (VOC) samplers (both separate vial and composite), check-valve boilers and portable bladder pumps, and other field samplers.

"Significant advances will be made in micropurge techniques in groundwater wells and in passive sampling. Advances have already been made in data loggers for pH and water levels, and we should also see improvements in instrumentation for the on-site analysis of metals in soil and water."

cal methods and instruments to meet the requirements of each specific site, rather than just trying to fit in with the existing workload.

Sample delivery is another important quality factor. Getting a representative sample and delivering it to the instrument correctly and with a minimum amount of loss is much more of a challenge than determining whether or not the curve is 10% or 12%. Right now, manufacturers of portable instrumentation are concentrating on the hardware, but not on the delivery systems. Manufacturers will need to begin to develop a whole solution approach to this in order to make field-portable instruments of higher value for users.

Speed Spells Success

Of course, today's field-portable instrumentation offers amazing capabilities for real-world savings, particularly with regard to speed-to-result. Once upon a time, the lab analyst would be given a goal of 8 samples a day, which would take 10 days to analyze, write up and report. We have provided more than 100 water samples per day on only two GC-MS instruments without compromising quality. For the client, who paid per day instead of per sample, this was a very inexpensive analysis. With today's speedier instrumentation we are able to perform a full source analysis in one hour instead of three, which means we can get in multiple sources over the course of the day, as well as shorten by days the time we have to be on site.

On the flip side of 100 samples per day, we had a project in which there was only one or two samples per day, and this project was equally successful. The project involved delineating a site where the client was using conventional drilling technology. The lithography of the site was such that it took the drillers a long time to get down to groundwater, which meant that they were only capable of generating a few samples per day. Clearly, it would have been painful for the client to spend that much time collecting that sample and then have to wait to get the numbers back before the next hole could be drilled. The rapid results provided by the field-portable GC/MS instrument meant that by the time the rig was decontaminated, the drillers knew where to go for the next location. Even though this was a project in slow collection mode, the crew was able to spend less time on site, because every sample was an effective sample.

(On a side note: The targets on this project were benzene, toluene, ethyl benzene and xylene (BTEX). This was chosen based on the site history. Because we used GC/MS, we found trichloroethene (TCE) in the sample as well. We ended up chasing this separate TCE plume at the same time. The project manager was able to immediately modify the sampling plan, and we characterized the separate plumes without remobilizing. Sending the samples to an off-site lab would have, at minimum, resulted in a second effort to chase the TCE plume and may not have found TCE at all since it wasn't requested.)

The Future of Field-Portable Analysis

With a wide range of applications, the ability to get results as good as or better than a fixed lab, and strong evidence that today's instrumentation offers fast and effective analytical support, field-portable analysis has a good future in the environmental industry. Clients must be able to make immediate decisions based on dependable, representative data, and laboratories that provide this service will come out ahead.

From an environmental laboratory standpoint, the last 10 years of consolidation has ensured that the market pie is pretty well divvied up, and the only way a lab can get pie is to take it away from another lab by charging less. Of course, a lab has to have competency, give good results, deliver on time and provide good customer service to be successful in today's market, but one of the few controllable factors in obtaining marketshare is price. With field analysis, that's no longer the case: It is one of the last few avenues of new revenue for the environmental laboratory, because there's a whole new pie available. These market areas have traditionally been the bastion of environmental consulting/engineering firms or mobile lab operations, and proactive labs that enhance their field-portable analytical capabilities will be able to take those markets away from the traditional approaches.

There are still challenging factors to the recognition of the advantages offered by field-portable analytical approaches, such as acceptance of field analytical data, regulatory issues and reference methods. However, these issues are being resolved as EPA regulators and other field analytical professionals continue efforts to remove those barriers as evidence mounts in favor of using these fast, reliable techniques. Ultimately, labs will either hop on the train or watch this potential roll over them, because the projects are going to continue to move toward field analysis. If consulting/engineering firms can't get this service from labs, they are going to figure out how to effectively use increasingly easy-to-operate field-portable equipment, reducing their need for laboratory services altogether.

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