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Preface

On-site analysis is continuing to progress as a practical method of dealing with environmental incidents. The last issue of the Journal of Hazardous Materials which was dedicated to on-site analysis was published over 5 years ago. Since that time, more progress has been made to move the laboratory to the field. This trend is taking place primarily by the development of new portable technologies, portable either in vehicles or carried by people. Little development is taking place by the movement of existing laboratory instruments or techniques into the field.

The benefits of on-site analysis are many. The primary benefit is the reduced cost of cleanup. This is particularly true where intensive cleanup procedures are being used. An example of this is the excavation of contaminated soil. Removal of excess soil could cost thousands of dollars as could the shut down of site work until sample analysis results arrive from the laboratory.

Another important benefit to on-site analysis is the significant improvement in the length of time of response. I had given an example of a PCB-contaminated site a few years ago. This site was being cleaned up by heavy machinery and depth of removal was controlled by analytical results from a laboratory with a 2- or 3-day turn around. There was an on-site test kit, but because the technique was new, the results were only used for test purposes. The procedure used was to excavate material and remove it to a warehouse for further treatment until the appearance of the soil changed. Samples were then taken of the soil remaining at the site and sent to the laboratory to determine the PCB content. In 2 or 3 days the results were available and work continued. During this time the equipment and operators waited for the results. The excavation lasted about 1 month and about twice the material was taken that was needed to be taken. Coincidentally, the experimental on-site analysis method yielded similar results to the laboratory method.

Another advantage is the lesser expense of on-site analysis. The field unit often can process the same samples at a fraction of the laboratory cost. The field samples require less handling, shipping, storage and work-ups. Furthermore, the field procedures often require the use of less consumables and much less processing time. An example of this is the PCB analysis cost from the above sample. At the time this cleanup was conducted, the laboratory cost was about US$ 250 per sample and that of the field sample, about US$ 50.

There are, of course, several disadvantages to using field procedures. The biggest disadvantage is that most field procedures are not accepted as being in conformity with standards such as set by EPA, NIOSH or ASTM (The Environmental Protection Agency, The National Institute for Occupational Health and Safety, The American Society for Testing and Materials). This means that controlled sites may not be able to use these procedures. Analysts

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may also not wish to use the procedures because of possible legal actions. Only ‘standard’ procedures would stand up in court. The acceptability of field procedures will be a long time in the future.

The second disadvantage of on-site methods is the reliability of such measurements. Often field methods do not have built-in checks such as the simultaneous analysis of surrogate standards. Often there are no quick or easy means to run a calibration standard. When any of these are the case, the reliability of field measurements is questioned. Reliability of field methods must be continually improved by including calibration procedures such as running standards and blanks between samples.

What is the future of on-site analysis? Since the last special issue, there has only been slow progress. We had stated, optimistically, that progress would be notable. My own feeling is that progress has been made but is slow. In addition to the disadvantages noted above, there appears to be a major acceptance problem. Several new units for on-site analysis have been marketed in the past few years. None of these has sold very well, some not at all. While the reasons vary, the biggest problem appears to be the acceptance of field methodologies to the potential customers. Manufacturers who have been ‘burned’ by the poor sales of this equipment have often backed out of the market entirely. An additional factor to the lack of acceptance is the smallness of the portable field equipment market, at least at this time. It is interesting that at the time of the last special issue of this journal, that the most promising technologies were the new portable GC’s, especially those on a single wafer. This development has stalled and commercial units are no longer on the market. On the other hand, the use of portable XRF (X-Ray Fluorescence) equipment has flourished and is expanding.

The requirements for on-site analysis are first that the method is reliable. The method need not be highly accurate, but should never result in a false negative. Extensive testing is needed to ensure that this result occurs with a particular method over the many possible situations. Users must also understand the limitations and interferences involved in a field method. Secondly, the field method must be rugged — irrespective if the technique involves a portable kit or a vehicle-mounted unit. The rigours of the field are often underestimated. Thirdly, the field method must be easy to use, especially for those carried by hand into the field. The rigours of the field do not allow users to carry our complex and demanding procedures. Finally, the methods must have a satisfactory accuracy. For field use, order-of-magnitude accuracy is sometimes sufficient. Users must also clearly understand the accuracy limits within the context of the samples they are analysing.

Field analytical techniques are being developed at a slow pace. Laboratories will still be needed for confirmation and precise quantitation for most field contamination situations. Field tests continue to focus on giving quick, rough but reliable estimations.

This issue of the Journal of Hazardous Materials highlights a number of developments in field analysis. Hopefully, this issue will also promote communication among developers and users of this new technology.

Merv Fingas
Emergencies Science Division, Environmental Technology Centre
Environment Canada, 3439 River Road, Ottawa, Ont., Canada K1A 0H3