

## PHOSPHINE MEASUREMENT AT ENVIRONMENTAL LEVELS

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The perceived threat of bans on phosphine use has put pressure on the grains industry to show that concentrations in the vicinity of grain stores do not exceed levels about 100 times lower than permitted workplace levels. Trace level phosphine analysis is thus vital to the continued use of this fumigant by the grains industry. This has prompted us to develop reliable field measurement methods.

The proposed Environmental Management Standards (ISO 14000), emphasises pollution management by industry and open communication with workers and the public rather than prescriptive regulations. The dynamic tension between regulators, the community and industry hinges on the ability to obtain reliable analyses of phosphine in the environment. The grains industry is one of several sources of environmental phosphine. The difficulty of trace analysis of phosphine, coupled with questions of sample instability and interference from other substances have led to disagreement in the literature.

A major source of error in trace phosphine analysis by gas chromatography is variability of manual injections. In addition, standards can be compromised by breakdown of phosphine at high dilution. We have constructed a repetitive computer-controlled system which samples dilutions of calibrated metered gas flows, affording excellent reproducibility and stability of standards. This also allows peak detection where signal to noise ratios are normally too low to measure. Using GC with flame photometric or thermionic detection we equalled reported limits of detection in the picogram ( $\text{ng L}^{-1}$  or ppb v/v) range.

Several auxiliary techniques for detecting low phosphine concentrations have been tested in our laboratory against the standard GC analyses. Some of these involve novel sensors which are used as GC detectors, and others involve amplification of existing electrochemical and opto-chemical sensors.