



Phosphate analysis at mines and chemical plants using NMR

Summary

Nuclear Magnetic Resonance (NMR) provides accurate measurement of phosphorus (P_2O_5 , BPL) and fluorine. These on-line measurements offer potentially significant economic and environmental benefits.

progression, inc. is the leader in the development and service of on-line NMR in the chemical and mining industries. In 2003 **progression** won the prestigious R&D 100 award for the development of its second generation on-line NMR system—the MagModule II™. Also, in 2003, the company successfully entered the phosphate industry with its first commercial application, which was used to measure BPL of phosphate rock slurry during the beneficiation step at phosphate rock mines. Other uses and applications are in development including phosphate analysis at phosphoric acid plants and aluminum and magnesium analysis at phosphate mines.

Benefit

On-line NMR provides operational and economic benefits to phosphate producers. **progression's** instrument provides an analysis every 5 to 10 minutes. The data is transmitted to the plant's control system for either closed loop or operator control.

Mining applications

Many plants currently depend on either operator experience or infrequent laboratory analysis to control beneficiation operations. Adding **progression's** on-line analyzer can allow a plant to improve beneficiation control as well as monitor rock feedstocks thereby improving the use of reagents and increasing recovery of P_2O_5 .

Chemicals applications

The MagModule II could be used in a phosphoric acid plant at a variety of feed, reaction, filtration, and evaporation sample points. Measurements of gypsum repulp and reactor feed rock may offer the most promising economic benefits. Analysis of phosphate content in the reactor feed would provide reactor

control benefits. Similarly, measurements of both soluble and insoluble phosphate in the gypsum repulp stream could be used to aid in sulfuric acid feed optimization.

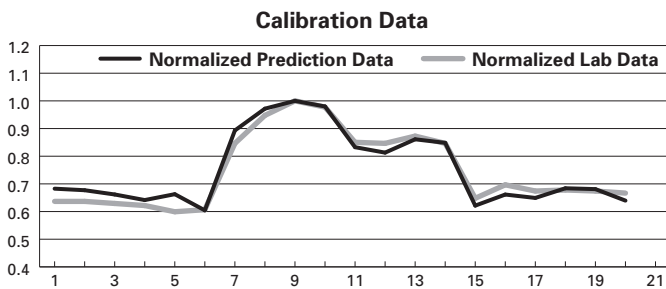
Sampling

In conjunction with the MagModule II, **progression** designs and installs application specific, customized sampling systems. Samples are taken automatically from the process stream and may be returned into the process or sent to a disposal area depending on the needs of the customer.

Sample conditioning is typically not necessary. NMR has the ability to measure solids, liquids, and slurries, without special sample preparation. Further, the relatively small size (~30 ft³) of the instrument allows for optimal placement near sample points.

Calibration and results

System calibration and modeling is performed by **progression**. Reference data is generated from samples taken at the instrument.



NMR calibrations are made using reference values obtained by other techniques. Since the accuracy of these techniques can vary, it is impossible to specify an absolute accuracy. However, phosphate NMR measurements have proven to be extremely accurate based on both calibration and operational results.

