

# Perten Instruments Application Note

## Liquid Manure

### Analysis of Liquid Manure for Moisture, Nitrogen, Phosphorous, Potassium, and Ammonia Using a DA 7200 NIR Diode Array Based Analysis System

#### Introduction

Liquid Manure is an important, cost effective fertilizer for farmers. By accurately analyzing key constituents, the proper amount of manure can be applied and mixed with more expensive fertilizers. By optimizing manure usage, significant savings can be achieved. Realizing these savings is dependent both upon the accuracy of the analyses and the availability of real-time results. Using the DA 7200, staff can perform their own analysis 24/7 and have instant access to the results. The results can be used for application optimization (adding supplements etc.) and to avoid costly mistakes and potential penalties.

The Near Infrared Reflectance (NIR) technique is particularly suited for measurement of liquid manure, but past instrument limitations have not allowed users to reap the full benefits of NIR. Sample presentation requirements such as glass sample cells that had to be filled properly and were difficult to clean made analyses laborious, time consuming and error-prone.

#### Diode Array 7200

The DA 7200 is a proven full-spectrum, NIR instrument designed for use in agricultural industries. Using innovative diode array technology it performs a multi-component analysis in only 6 seconds. During this time a large number of full spectra are collected and averaged. Since the sample is analyzed in an open, disposable dish, the problems associated with cells are avoided and operator influence on results and handling requirements are minimal.



#### Experimental

Over 100 liquid manure samples from several facilities served as the calibration set. The set encompasses manure from swine and dairy farms. Spectral data was collected in triplicate to monitor settling effects. Each replicate was poured into a 2oz. disposable cup for analysis and spectral data was collected. The sample and cup were discarded alleviating cleaning steps and further risk of contamination to the analyst. Calibrations were developed using Partial Least Squares (PLS) regression. A proprietary data pre-treatment was used to improve the calibration models.



#### Results and discussion

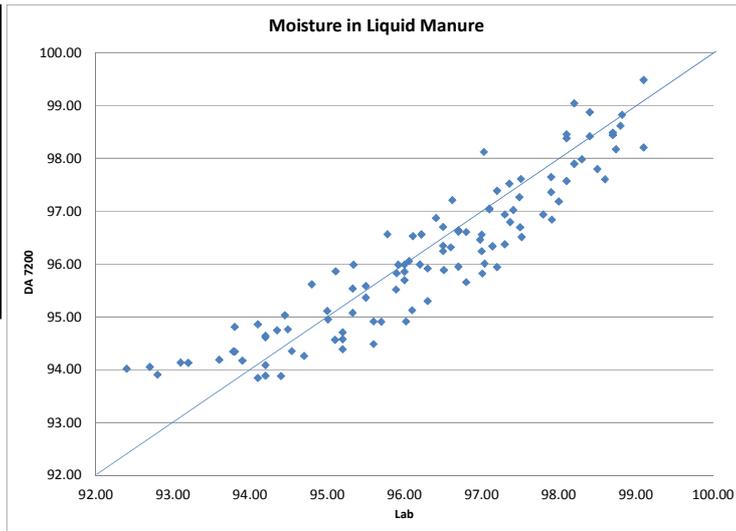
The DA 7200 results are very accurate when compared to the results from the reference methods. Statistics for the respective parameters are presented in the table below and graphs are displayed on page 2.

Parameter	Range	Samples	R
Moisture	91.9 – 99.1%	+100	0.924
Nitrogen	0.17 – 0.83%	+100	0.947
Phosphorous	0.03 – 0.40%	+110	0.900
Potassium	0.07 – 0.53%	+120	0.807
Ammonia	0.09 – 0.58%	+60	0.946

The differences between the DA 7200 and the reference methods are of the same magnitude as typical differences between two different reference labs. The DA 7200 is more precise than the reference methods meaning that replicate analyses are generally more repeatable and representative. Additionally, a single calibration applies to both swine and dairy herd manures.

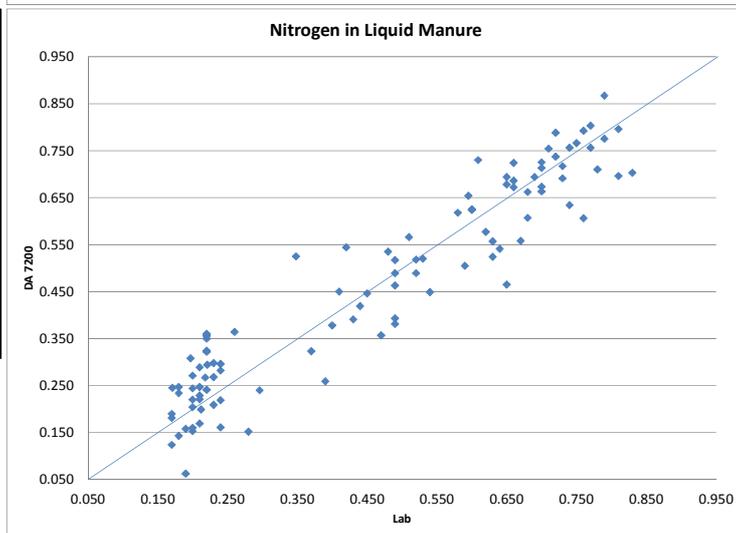
### Moisture

Moisture is accurately and readily measured across a wide range of values.



### Nitrogen

Nitrogen is an important component of proper fertilization. The DA 7200 quickly and accurately measures this key attribute.



### Phosphorous

Phosphorous is vital to plant health and thus an important fertilizer component. It can also be a pollutant so proper application is critical.

