Potassium soil testing and potash fertilization have recently come under increased scrutiny. As the price for potash increases so does the need to fine-tune soil testing techniques and methodology. Currently, the most common way to test for soil potassium levels is to take a “standard” dry (heat treated) sample, which involves drying and grinding the sample before the analysis can begin. The process of heating soil affects the measurable potassium level. There is another testing option; a field moist or “Wet K” test conducted on samples as they are received without drying.

**A Brief History**

Since the late 1920s, research has been conducted to measure the effect of the drying process on soil potassium measurements. These studies have resulted in a few common observations.

First, the differences noted between wet and dried soil sample methods and the resulting potassium test results are not uniform across all soil types or geographic regions. As clay mineral types change so do the comparison statistics. Native potassium levels have an effect as well. When native potassium levels are high, the difference between a wet K and a dry K test is minimal. When native potassium levels are low, as is commonly the case throughout the state of Iowa, the difference between a wet K and a dry K test can be more noticeable.

### Types of Potassium in Soil

- **Kex** = Exchangeable (and solution K) = 1-2% of total K
- **Knex** = Non-exchangeable (slowly exchangeable) = 5-8% of total K
- **Fixed** = Physically part of the soil composition = 90-95% of total K

### Potassium Movement in Soil

A mechanism for potassium movement in the soil is diffusion (moving from high concentration to a lower concentration). When soil has low levels of exchangeable K (Kex), non-exchangeable (Knex) will diffuse from the soil layers and add to Kex levels. See Image A (1). This results in an elevated standard K test result relative to the wet K test results. When soil has high levels of exchangeable Kex, Kex will diffuse into the layers to add to Knex. See Image A (2). This results in a reduced standard K test relative to a wet K sample.

### Temperature Impacts on Potassium

As temperatures increase, the lattice of the clay mineral expands and the slowly available phase of the tested potassium is released to diffuse into the soil solution and “exchangeable” extraction pool. The reverse can also be true. If there is a high concentration of potassium in the extraction pool, diffusion can carry that phase out of the solution back into the clay lattice structure and back into the slowly available phase. In the state of Iowa, the first example, with slowly exchangeable K diffusing in exchangeable K, is the most common occurrence.

It is important to note that this effect of expanding clay mineralogy is only related to potassium. The other soil cations (Calcium and Magnesium) display a different behavior and very little dependence on methodology.
Potassium Analysis

Slurry and Moist Methods
A Wet K test focuses more on purely exchangeable potassium. There are two primary Wet K methods, both developed at Iowa State University. The “Slurry” method, adopted in the 1960s, and the “Moist” method, developed in 2006. The two methods are highly correlated and produce comparable end results. See Graph 1.

Accuracy
The goal of a soil test is to take a representative sample from a highly complex system and use the results to make the best possible management decision. Neither testing method is “correct” in an absolute sense, but both are valuable tools. Each method presents its own useful information. When making potassium assessments, both data sets offer useful agronomic information. Looking at only wet K test results ignores the portion of the potassium that is slowly available and that which can be released through the normal biological and chemical processes. Utilizing only a dry K test ignores the fact that potassium moves between the two phases of available K and slowly available K. This process is what causes potassium soil test levels to vary from one year to the next. Together, wet and dry test data sets act as a double check of soil potassium fertility levels.

If both the wet K and dry K test results are low, then the need for additional potassium fertilizer is the greatest.

Interpreting Wet K
What is a high, medium or low soil test? See the reference table, developed at Iowa State, located below. It is important to note that the wet K test has its own interpretation table. The Iowa State current “standard” chart cannot be used for evaluating wet K results.

<table>
<thead>
<tr>
<th></th>
<th>Wet K (ppm)</th>
<th>Standard K (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Low</td>
<td>35</td>
<td>90</td>
</tr>
<tr>
<td>Low</td>
<td>68</td>
<td>130</td>
</tr>
<tr>
<td>Medium</td>
<td>100</td>
<td>170</td>
</tr>
<tr>
<td>High</td>
<td>150</td>
<td>200</td>
</tr>
<tr>
<td>Very High</td>
<td>150+</td>
<td>200+</td>
</tr>
</tbody>
</table>

In Conclusion
AgSource offers two potassium testing methods: standard (dry) and moist (wet). For the most complete understanding of a field’s potassium needs, compare wet K and standard K test results. When reviewing test reports, be sure to reference the correct wet K and standard K interpretation tables. Contact AgSource today to learn more about how these tools can help improve your understanding of soil potassium levels. More information can be found at www.agsource.com.