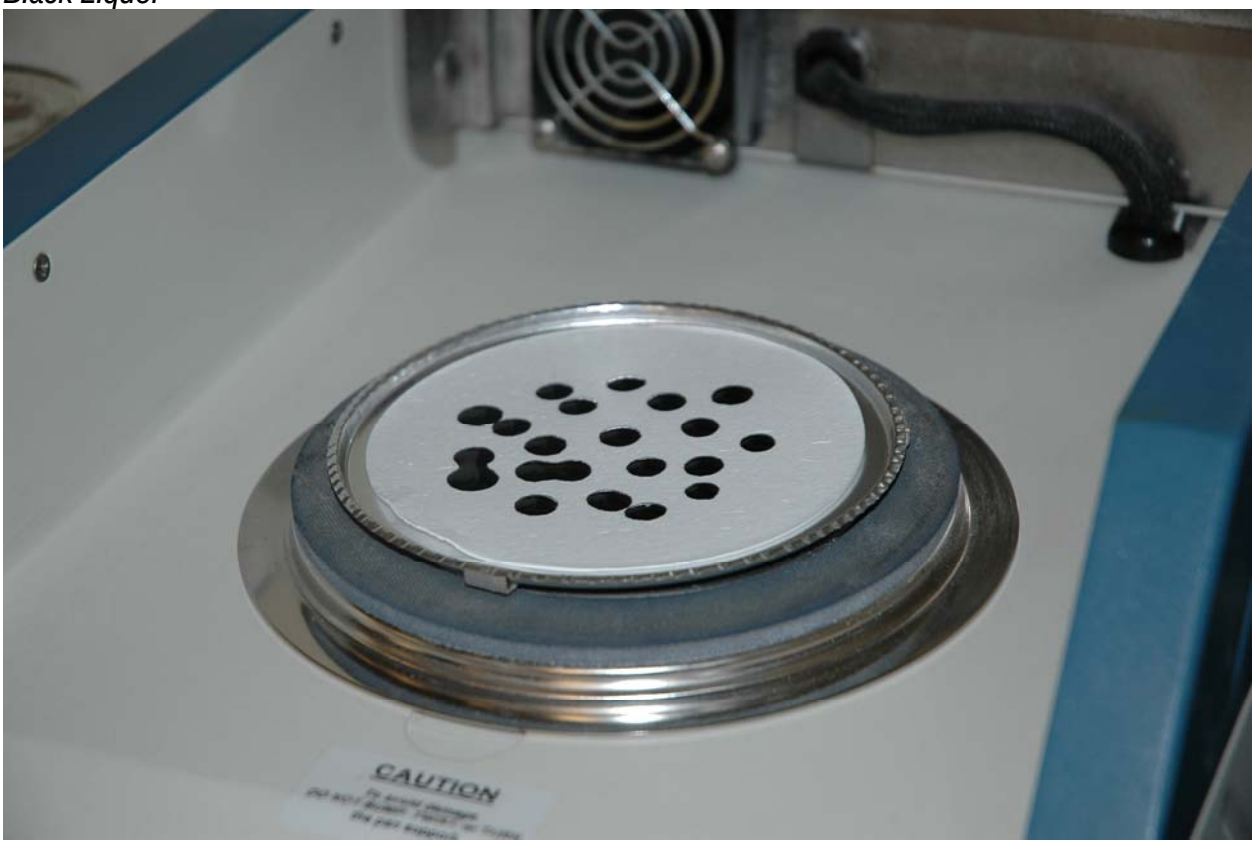
Black Liquor



Here at AZI there is always a never-ending flow of new and different samples that present different obstacles for us lab folks. Recently, I tested moisture in a by-product of the paper industry: black liquor.

The name “black liquor” is deceiving in hiding its toxicity… and its overall smelly, sticky, and disagreeable disposition. Its physical state ranges from solid to liquid depending on the temperature. At warm temperatures it has the consistency of melting tar; or thick syrup that you would never in a million years want to put on your pancakes. I lack the words that describe how it smells (especially after testing), but I can assure you it is one of the most offensive smells you run into while working in a moisture analysis lab.

Black liquor is composed of water, cellulose, lignin, sodium sulfide and sodium hydroxide and does range from dark brown to black.

To test this material, we follow a TAPPI method, which consists of weighing the sample beforehand, heating it in an oven at 105°C for six hours, and then reweighing after to determine the amount of moisture driven off. We then test the sample on one of our Computrac line of instruments to insure it conforms to our reference testing.

This sample posed several problems;

1. Black Liquor is highly caustic so it needs to be disposed of as hazardous waste and needs to be handled accordingly
2. Condensed black liquor is a solid at room temperature so it needs to be heated before handling
3. It tends to trap moisture during testing

4. The sodium hydroxide in the sample reacts with aluminum which is the material our oven and instrument pans are made of. This reaction lowers the percent moisture by a couple of percentage points.

It's unusual that one sample would present so many problems, but fortunately we were able to find solutions to all of them.

1. Our lab is well equipped to handle a hazardous waste like black liquor. All instrument testing was done in a hood and all testing materials were bagged, labeled, and disposed of in our hazardous waste container. All the necessary personal protective equipment needed was available; numerous gloves and bench covers were used as the liquor tends to get everywhere pretty quickly!

2. The black liquor had to be maintained in a water bath to soften it up enough to use a syringe. The syringes themselves had to be stored in a furnace on low heat so the liquor wouldn't solidify in the syringe between tests.

3. To combat moisture trapping; the sample was diluted with de-ionized water prior to oven testing. The amount of dilution was weighted beforehand and factored into our moisture calculations. Silica sand was heated to 850°C to remove contaminants and added to the sample bottles. The sand acts as a filter to keep the black liquor from condensing and trapping moisture.

4. We have glass weighting bottles with stoppers for corrosive samples such as this for oven testing. For our instrument testing we have a different solution: fiber glass filters. Two pieces of fiber glass filters were used to keep the liquor from reacting with the aluminum pan used in our Computrac Max instruments. Not only does this separate the sample from the pan but it keeps the test times under 15 minutes: it serves the same role as the sand in our oven testing.

Using these methods described above we were able to get quick and effective results; which was great considering the challenges presented with this sample. Testing black liquor was a first for me, but it's probably not the last difficult sample I'm going to run into… there is always that new different material you never thought about testing right around the corner!

Manuel Oropeza
Lab Technician
Arizona Instrument LLC