The Technique of Soil-Moisture Determination

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Briggs and McLane define "moisture equivalent" as "the percentage of water retained by a soil when the moisture content is reduced by means of a constant centrifugal force until it is brought into a state of capillary equilibrium with the applied force." They suggest that the soil be subjected to centrifugal force equivalent to 1,000 times gravity. Many factors affect the results of the determination and it has been necessary to standardize these as follows:

The r.p.m. of the centrifuge using the standard disked head should be 2,440 plus, or minus 20. This head holds 16 centrifuge cups. The amount of sample taken should make about 30 grams of oven-dried soil. The samples should be wetted for a period of 18 to 24 hours. The time required to bring the centrifuge to full speed should be the same for all tests and the time of spinning at full-speed constant. A 5-minute acceleration on 30-minute spinning has been accepted as standard. The filter papers used in the centrifugal cups should be removed.

The centrifuge catalogued for this work is a rather expensive piece of laboratory equipment. At the Woodland plant we were able to adopt the standard laboratory centrifuge to this work by using a 1/3-h.p., synchronous motor to control the speed. The small motowas connected by a V-belt with pulleys proportioned to give the desired speed. The regular motor and rheostat were used to bring the centrifuge up to speed and then the small motor's switch was closed. This kept the machine at a constant speed. Instead of the expensive speed indicator we used a pair of neon-glow lamps. By painting a black section on the head cover you can count the apparent r.p.m. deviation.

Where a large number of determinations are to be made it is advisable to have a rapid-weighing dampened balance. We used the Vechmeyer, Hoffman-Gavan attachment, made in our own shops and applied to a Voland pulp balance.

Procedure

Prepare samples by removing them from the sample cans and placing them in paper sacks. When nearly air dry pass them with the aid of the fingers only through a sieve with 2-mm. openings. If necessary, a sieve with 1/4-inch openings may be used on extremelyverized by a mortar and pestle or by a grinding machine will give a

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higher-moisture equivalent than the true value. Duplicate samples are taken from the sieved soil.

Fit each of the special centrifuge cups with a small piece of filter paper. In each cup place 32 grams to 34 grams of the sieved sample of air-dry soil, depending upon the moisture content, so as to make 30 grams of an oven-dried sample. It is not necessary to make the samples smooth when placed in the cups.

Place the 16 centrifuge cups in a tin cakepan and add about 500 cc. of tap water. This amount should completely cover the surface of the soil in the cups. The samples are then allowed to stand in the saturated condition from 18 to 24 hours. A variation of 6 hours makes little or no difference in the moisture equivalent.

Tilt the cakepans so as to allow drainage for a period of 15 to 30 minutes. Place the cups in the special centrifuge head and bring them up to a speed of 2,440 r.p.m. (1,000 x gravity) within 5 minutes. Centrifuge for an additional 30 minutes at this speed. Remove the samples from the centrifuge cups and filter papers. This is done by inverting the cups on a clean sheet of paper and then tilting the paper so as to slide the sample into the weighing cans.

Place the lids on the weighing cans and weigh them. After weighing, remove lids and place in the oven and dry for 20 to 24 hours at 110° C. Re-weigh and calculate the percentage of moisture on a dry basis. This is the moisture equivalent. Duplicates should check within 0.9 percent.

A Study of the Accumulation of Chlorides and Their Effect on Beet-Sugar Factory Operations

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The following discussion deals with an investigation of beet-sugar manufacturing operations made for the purpose of determining some of the causes for the variations in yields and losses observed at different factories when operating under apparently identical conditions.

The non-sugars always present in sugar beets show wide differences in both composition and quantity, which depend on the agricultural methods used and on the geographical location of the fields in which the beets are grown. In a general way it may be said that

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