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NOTE

MECHANICAL SNAKE RIVER UNDISTURBED SOIL CORE SAMPLER[1]

C. W. HAYDEN AND C. W. ROBBINS

Snake River Conservation Research Center, Kimberly, Idaho 83341

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ABSTRACT

A power-driven undisturbed soil core sampler was designed to obtain undisturbed soil cores from a much greater depth than the original hand-operated sampler.

This note is in response to the many inquiries concerning the handoperated Snake River Sampler for obtaining undisturbed cores (Hayden and Heinemann 1968) and the possibility of obtaining samples to a much greater depth. Although the original sampler worked well in the upper 50 cm, we needed a unit with a power drive to obtain undisturbed cores to bedrock (Fig. 1). The advantage of the new sampler is the ability to sample to much greater depths simply by adding an outside auger tube without having to pull the entire sampling equipment out of the soil. The unit can be converted to, or mounted on a small trailer, which can be pulled by car or pickup truck. This makes the sampler highly maneuverable for sampling in areas where larger units could not operate.

The power-driven undisturbed core sampler we developed can be adapted to any unit with a rotating power drive. A direct-drive, 9-hp gasoline motor with a centrifugal clutch powers the drilling unit of the modified sampler. A two- or three-speed transmission with a hand-operated clutch would be useful, especially in sampling wet soils where slower turning is desirable to prevent the sampler from drawing down faster than soil can be removed from around the sample.

The construction and purpose of the cutting tip of the deep sampler is the same as that of the original sampler. That is, the inside sample tube remains stationary while the outside auger tube removes the soil away from the sample. The sample tube and split sleeve holder has a slightly larger diameter than the spring steel cutting tip. This allows the sample to slip into the split sleeve holder without any distortion or compaction. The I.D. of the split sleeve was scaled down from 8 cm (3⅛ in.) to 5 cm (2 in.) and the split sleeve lengthened to 51 cm (2 ft). The split sleeve holder is 63 cm (25 in.) long and the outside tube is 91.5 cm (36 in.) long.

Several auger tubes were constructed to extend the auger tube until desired sampling

FIG. 1. Mechanical Snake River Sampler in operation.

[1] Contribution from the Western Region, Agricultural Research Service, USDA; University of Idaho College of Agriculture Research and Extension Center, Kimberly, cooperating.

depth had been reached (Fig. 2). After obtaining the last sample, the outside auger tube is raised while it continues to rotate in the same direction as during sampling.

A four-jaw chuck (Fig. 3) is permanently connected to the power drive. This allows the hollow drill rod to extend through the gear housing. A threaded driving plug welded to the lower end of the drill rod screws into the top of the outside auger tube.

The split sleeve holder has two left-hand L-shaped notches cut on opposite sides of the upper end. An insert was machined with two flanges so that, when turned counterclockwise, it locks under the lip of the L-shaped notch. The insert holds the sample tube and split sleeve together. A solid 1.3 cm (0.5 in.) rod is welded to this insert and extends through and above the hollow drill rod where it is clamped to a stationary rod fastened to the gear housing. The solid rod sections are connected with left-hand threaded couplings to prevent unscrewing. This arrangement keeps the sample tube from turning as the outside auger tube is rotated.

Seven sample holes, from 3 to 5 m deep, were drilled. Bedrock in the soils sampled was approximately 5 m (15 to 16 ft) below the soil surface. A very hard, compacted layer encountered between 25 and 100 cm was sampled easily. The undistrubed cores were taken in 61-cm increments, and cores were obtained to the 5-m depth in about 8 hr. This time includes setting up for sampling, sampling, and preparing and storing samples. This time would vary, depending on soil type and water content. We sampled very dry soils and sampling probably took longer than would be necessary for soils with ideal water content. All samples were recovered, even in the very dry moisture range. The greatest difficulty was encountered while trying to store the samples where moisture content was below 6 percent moisture by weight. There was no measurable compaction or distortion of samples.

The samples collected in this study were immediately placed in 5-cm-diameter shrinkable tubing. The tubing prevents damage to the cores while transporting or storing, and can also be shrunk around the sample by heating to form

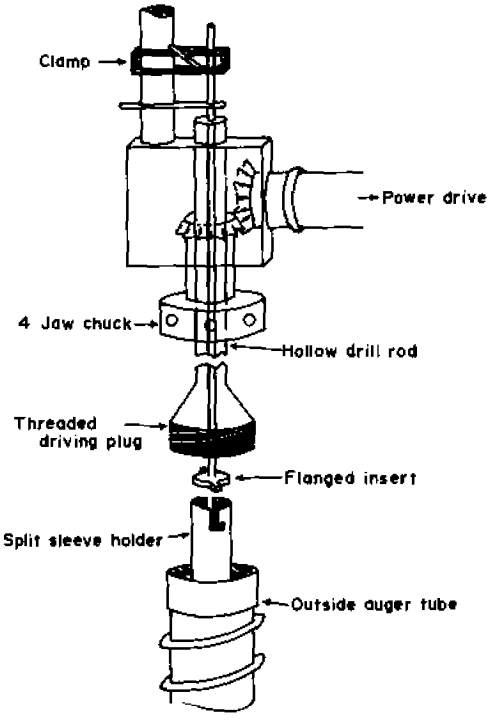

FIG. 3. A simplified view of the proper alignment of sampler components.

FIG. 2. Installing the split sleeve and split sleeve holder in preparation for sampling.

a watertight container for hydraulic conductivity and other flow studies. The dimensions of the sampler and the power unit described in this note are optional. If sampling to greater depths is necessary, it would be advisable to use a larger power unit. Also, difficulty could be encountered in sampling very dry or gravelly soils.

REFERENCES

Hayden, C. W. and W. H. Heineman, Jr. 1968. A hand-operated undisturbed core sampler. Soil Sci. 106: 153–156.