strongly skewed in passing over the wake.

The flow patterns described above to illustrate this new technique of flow visualization are highly relevant to the origin of certain sedimentary structures, which are being studied by the author. The pattern shown in figure 2A is pertinent to the origin of current crescents, while the pattern given in figure 2B has applications to the formation of three-dimensional bed ripples and dunes.

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USING AN ULTRASONIC DISRUPTOR AS AN AID TO WET SIEVING[1]

JOSEPH H. KRAVITZ
U. S. Naval Oceanographic Office, Washington, D. C.

ABSTRACT

Sonic agitation of sediments by an ultrasonic disruptor greatly reduces the difficulties encountered in wet sieving. The instrument readily disperses the fine grained material allowing a quick, neat separation of the sand from the silt and clay fractions.

INTRODUCTION

In order to make an accurate size analysis of a poorly sorted sediment containing a high percentage of silt and clay, the sand fraction must be separated out and the individual sand grains freed of adhering smaller particles. To accomplish this, the process of wet sieving preceded by some mechanical agitation of the sample such as stirring or shaking is usually employed.

Wet sieving is accompanied by a variety of problems among which are the following: clogged sieves, the need for large volumes of water, and incomplete removal of fine material from the sand grains. The disadvantages can be attributed to the inability of stirring and shaking to adequately disperse the silt and clay fraction. Preparing the sample by ultrasonic methods

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flow = 10.0 cm. Radius of cylinder = 2.5 cm. Height of cylinder = 8.0 cm. Mean flow velocity = 45 cm/sec. Duration of run = 6.0 hours.

B. Flow on surface of strongly skewed negative step, shown by flute-like marks. Flow from bottom to top. Separation line shown as continuous line. Stagnation line on lower tread of step shown as broken line. Width of channel 30.7 cm. Depth of flow on upper tread of step = 15.0 cm. Height of step = 2.5 cm. Angle of skew of step to approaching flow = 71 degrees. Mean flow velocity on upper tread of step = 45 cm/sec. Duration of run = 4.75 hours.

prior to wet sieving will greatly reduce these problems.

The use of sound to disperse sediment was tried by Olmstead (1931) and more recently by Moston and Johnson (1964). Both studies utilized "tank type" devices.

Moston and Johnson ground up dry sediment, passed it through a 0.5 mm sieve and split the sample. One split was dispersed by an ultrasonic instrument and the other split, after further sieving through a .0625 mm sieve, was dispersed by a stirrer according to the standard American Society for Testing Materials method. Their results showed, "that the sample disaggregated by ultrasonic energy contained a smaller percentage of silt-size particles than the sample disaggregated by the standard procedure." This indicated greater dispersion by the ultrasonic method.

The author made comparisons of stirrers and "tank type" ultrasonic devices in the sedimentology laboratory at Yale University. It was found that while the "tank type" instruments generally produce greater dispersion, their design and limited power output did not provide the characteristics needed to properly disperse the wide variety of sediment types.

Gipson (1963), attempting to disaggregate fine grained sedimentary rocks employed the Branson "Sonifier" model S-75. Operating at maximum power it was strong enough to successfully break down certain lithified rocks. This is the type of ultrasonic disruptor discussed here. The writer finds that its wide range of power settings and concentrated energy makes the "Sonifier" ideally suited for ultrasonic treatment of sediment before wet sieving. A simple procedure employing this instrument is described below.

PROCEDURE

The bulk sample is passed through a Sepor sample splitter, and a representative split of approximately 35 g is placed in a 400 ml beaker. Distilled water is added until the beaker is three quarters full. (If a pipette analysis of the fine material, less than 0.062 mm, is desired, then a normal solution containing a chemical dispersant may be used in lieu of plain distilled water.) The "Sonifier" horn is submersed in the water and sediment to a depth of 1 cm, and the instrument is turned on and operated at a power setting of five for 3 to 5 minutes. The "Sonifier" is then turned off and the contents of the beaker are poured onto a wet, 3-inch diameter, 0.062 ml sieve. Distilled water from a wash bottle is sprayed over the grains retained on the screen until the water passing through the sieve is clear. The fine fraction is either discarded or collected in a container for further analysis.

DISCUSSION

The Branson "Sonifier" provides the operator with eight power settings from which he can select the setting best suited for a particular sample; for example, samples containing forams require a lower power input than sediments without delicate constituents. The "Sonifier" leaves the sand grains free from adhering particles and the silt and clay in a highly dispersed state. This dispersion permits the fine portion of the sample to pass through the sieve without the usual clogging and mess; thereby reducing the amount of time and the quantity of water required for wet sieving. The procedure time after splitting the sample is less than 10 minutes, and the volume of water needed to wet sieve a 35 to 40 g sample seldom exceeds 700 ml.

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