

Improved Probe for Evaluating Compaction of Mold Sand

Sand is not perturbed during switching among different measurement positions.

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A nominally stationary tubular probe denoted a telescopic probe has been developed as an improved alternative to a prior movable probe used to evaluate the local degree of compaction of mold sand. The prior movable probe consists mainly of a vertically oriented tube with screen vents at its lower end. The upper end is connected to a source of constant airflow equipped with a pressure gauge. The probe is inserted vertically to a desired depth in a sand-filled molding flask and the back pressure at the given rate of flow of air is recorded as a measure of the degree of partial impermeability and, hence, of the degree of compaction of sand in the vicinity of the probe tip.

Because it is necessary to determine whether sand is adequately compacted at depths throughout the flask, it is necessary to raise or lower the movable probe to place the tip at various depths. Unfortunately, raising or lowering the probe perturbs the sand around the tip, thereby

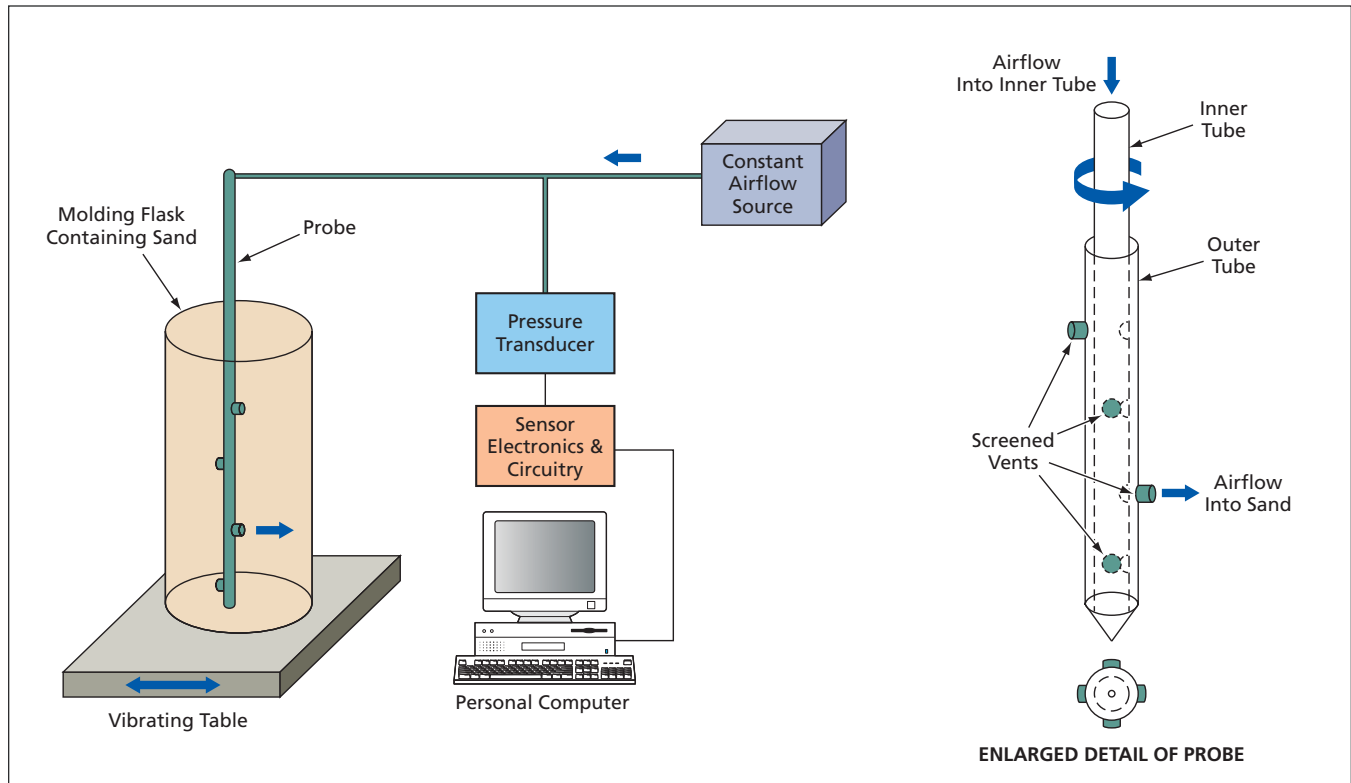
possibly introducing error into the back-pressure reading. Moreover, it can be difficult to raise or lower the probe in well-compacted sand. The design of the telescopic probe overcomes these disadvantages of the movable probe.

The telescopic probe (see figure) includes two concentric circular tubes tightly fitted to each other. There are series of holes along the outer and inner tubes. Screens covering the holes in the outer tube prevent penetration of sand into the probe. Twisting the inner tube relative to the outer tube through a specified angle brings one of the inner-tube holes into alignment with one of the outer-tube holes. The upper end of the inner tube is connected to an airflow-source/back-pressure-measuring apparatus like that of the prior movable probe.

In use, the outer tube of the telescopic probe is mounted in a fixed position in a mold flask and left there as sand is poured into the flask and compacted.

Because the outer tube is not moved during the operations described next, the sand is not perturbed as it is in the case of the movable probe. During pouring and compaction, the inner tube is twisted to prescribed angular positions for aligning inner- and outer-tube holes at corresponding prescribed depths in order to take backpressure readings at those depths. This action is repeated throughout the filling and compaction process to obtain data on backpressure versus depth and time, thereby enabling characterization of the degree of compaction as a function of depth and time.

This work was done by Ruel A. Overfelt of Auburn University and Sayavur I. Bakhtiyarov of New Mexico Institute of Mining & Technology for Marshall Space Flight Center. Inquiries concerning rights for the commercial use of this invention should be addressed to Sammy Nabors, MSFC Commercialization Assistance Lead, at sammy.a.nabors@nasa.gov. Refer to MFS-31678-1.



The Inner Tube Is Rotated to different angles to switch on probe ports at different axial (vertical) positions.