

## Modified Interstitial Water Squeezer for Trace Metal Analysis

B NAGENDER NATH, V S RAJARAMAN & A V MUDHOLKAR

National Institute of Oceanography, Dona Paula, Goa 403 004, India

Received 10 July 1987

Hydraulic squeezer of Manheim, used in the extraction of pore water of sediments, has been modified by providing teflon inner lining and increasing the volume of squeezer. The modified version facilitates collection of pore water sample, for trace metal analysis, without exposure to the atmosphere and oxidation effects.

Interstitial water is extracted from sediments using pressure operated and centrifugation techniques. Among the pressure operated ones hydraulic squeezer<sup>1</sup> and gas operated squeezer,<sup>2,3</sup> are very often used.

The present design of the pressure operated squeezer is a modification of the stainless steel hydraulic squeezer of Manheim<sup>1</sup>. The improved design enables to overcome the difficulties encountered with the Manheim's design.

**Construction**—The squeezer is a stainless steel (No. 316) cylinder with a teflon inner lining. Design details are given in Fig. 1. The maximum volume of the cylinder is 80 cm<sup>3</sup>. The ram is used to apply the pressure on the sediment from top. Between ram and sediment one neoprene rubber disc and a teflon disc are kept to prevent the metal contact and to make the cylinder watertight during squeezing thereby preventing any loss of fluid upward. On the bottom side of the sediment there is a filter unit. The lower part of the filtering assembly, fitted with a rubber washer, protrudes into a recess in the steel base. When pressure is applied the gasket is squeezed against the cylinder and prevents leakage of water around the filter unit.

In the Manheim's model<sup>1</sup>, during squeezing instead of pore water, the sediment oozes out piercing the filter paper. This problem is overcome in the improved model by providing an array of perforated teflon filter discs with offsetting holes. There is also a provision to keep 2 to 3 filter papers in such a way that the pore water collected is virtually filtered from sediments. The bottom most part of squeezer is provided with a vertical slot to house sample collectors (plastic vials) so that the squeezed/interstitial water will be directly collected without any contact with air. Thus, the

interstitial water collected is free from metal contamination and air contact.

**Modifications**—The original Maheim's squeezer<sup>1</sup> is made of stainless steel body and its application is limited to studying only major metals like Mg, Ca, etc. and nutrients like NO<sub>3</sub>, Si(OH)<sub>3</sub> and PO<sub>4</sub>. Whereas the present squeezer is completely lined with teflon and teflon being chemically inert, the interstitial water will be free from contamination. Pore water samples thus collected can be studied for trace metals also.

One of the major difficulties in the Manheim type squeezer is the time factor, wherein it generally takes 60-90 min to collect 20 ml of pore water. Therefore the volume of present squeezer is increased to reduce the time to less than 20 min for collecting the same amount of water.

Unlike in the Manheim's squeezer, the collection of pore water is made directly into the vial without loss during extraction.

In the improved version, the use of teflon filter plates one above the other with offset holes aids in distributing pressure equally on holes. Secondly, the ram of the squeezer gets stuck up in the cylinder after squeezing in Manheim's model. In order to overcome this, a threaded hole is made on top of the ram which facilitates removal from the cylinder with the help of a cork-screw type opener. This squeezer can be operated by a commercial load lifting hydraulic jack of 2 tons capacity. The unit, including the hydraulic jack and frame weighs about 30 kg. The cost of jack, frame and the fabrication of squeezer works out to be Rs. 3000 approximately.

The work was carried out with the financial support from DOD, New Delhi, under their programme on Polymetallic Nodules Surveys. The authors are thankful to late Dr. H. N. Siddiquie

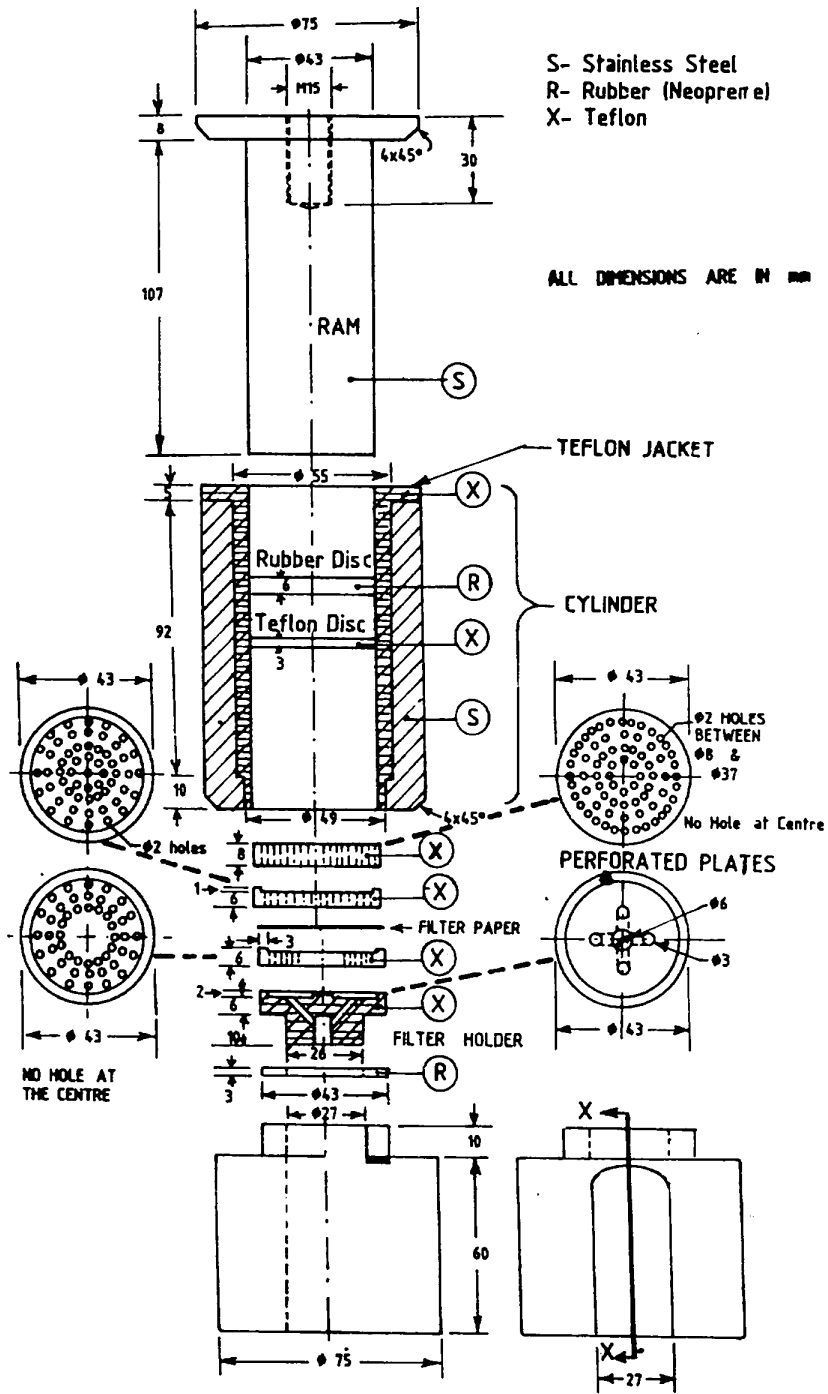


Fig. 1—Modified design details of pore water squeezer

for encouragement. Thanks are due to Mr. M. N. Surlikar and Mr. E. D'Silva for technical help and to Director, Head of G.O.D. and Mr. R. R. Nair, Project Leader (PMN) for permission to publish.

**References**

- 1 Manheim F T, *U S Geol Surv Prof Paper*, 550-C (1976) 256.
- 2 Reeburg W S, *Limnol Oceanogr*, 12 (1967) 163.
- 3 Kalil E K & Goldhaber M, *J Sed Petrol*, 43 (1973) 553.