



Figure 2.
 Diagram of the downflow fixed film anaerobic reactor indicating the position of the temperature sensor (F) and the heating tape (G).

Temperature control

In the method, use is made of a solid state electronic unit with a temperature sensor probe combined with a heating tape of the type used to prevent the freezing of water pipes in winter. The unit, which can be constructed with little electronic expertise with parts available from most electronic component shops, is described here. The unit is based on the Philips/Mullard TDA 1024 IC design (1978), using a heating tape (L) to heat the digester. The heating tape, which is PVC coated, is available in different lengths, supplying 7W per 30 cm. The tape is coiled round the digester and secured with friction tape. To prevent excess heat loss the whole digester is insulated with shock-absorbent plastic material. Depending on the size of the digester one or more heating tapes can be used, coupled in parallel. In Figure 1 the circuit diagram is shown. The electrical supply at 220 V AC 2,5 A is via a standard 15' A socket. The TDA 1024 IC contains a differential comparator and a zero crossing point trigger. Temperature is measured with an insulated negative temperature coefficient thermistor (R2 = NTC 18 k Ω) placed on the outside of the digester (Fig. 2). A total temperature variation of less than 0,5°C is obtained. When the temperature rises, the resistance of the temperature probe will fall and thus also the voltage between R1 and the probe (R2).

When the voltage falls below that of the present value of the linear potentiometer (P1 = 10 k Ω) the comparator output changes state and the circuit will switch off the triac (TIC 226D) which in turn controls the heating tape (L). With the temperature below the preset value the voltage between R1 and R2 will be higher than the voltage set by P1 and the triac will be switched on resulting in an increase in digester temperature at the same time switching on the cycle light (N1 = 220 V AC neon in-

dicator). The unit has a standard on/off switch (SW1 = 220 V AC 3A) and front panel on/off indicator (N2 = 220 V AC neon indicator). A 220 V AC 2,5 A fuse (F1) has been built into the system and the unit placed in an insulated box. It is of the utmost importance that the live and neutral electrical supply wires are connected correctly.

Five such units have been constructed in this laboratory and have been operating satisfactorily for more than a year. A variation of less than 0,25°C above or below the preset value on the potentiometer has been observed. The downflow fixed film anaerobic reactors on which the controls units were used, consisted of one metre long glass columns with a working volume of 3,5 l. The operational temperature was 35°C.

Acknowledgement

This work is part of a project supported by a researched grant from the Central Research Fund of the University of the O.F.S.

References

- HAWKES, F.R. AND YOUNG B.V. (1980) Design and operation of laboratory-scale anaerobic digesters: Operating experience with poultry litter. *Agricultural Wastes* 2 119-133.
 PHILIPS/MULLARD application notes for TDA 1024. (1978) *Elektron*. 39/40, 7/65-7/66.
 SÁNCHEZ RIERA F., VALZ-GIANIRET S. CALLIERI D. and SIÑERIZ F. (1982) Use of a packed-bed reactor for anaerobic treatment of stillage of cane molasses. *Biotechnology Letters* 4 (2) 127-132.
 VAN VELSEN A.F.M. (1977) Anaerobic digestion of piggery waste. *Neth. J. Agric. Sci.* 25 151-169.

GUIDE TO AUTHORS

1. AIMS AND SCOPE

This journal aims at publishing original work in all branches of water science, technology and engineering, viz. water resources development; industrial and municipal water and effluent management; environmental pollution control; hydrology and geohydrology; agricultural water science; limnology; the hydrological cycle; etc.

2. GENERAL

- 2.1 Papers will be accepted in English or Afrikaans.
- 2.2 Papers should be accompanied by an abstract. In preparing abstracts, authors should be brief but not at the expense of intelligibility. Papers written in Afrikaans should carry an extended English summary to facilitate information retrieval by international abstracting agencies.
- 2.3 Specialist terms which may be unfamiliar to the wider readership should be explained freely in the body of the text and, if essential, in the abstract.
- 2.4 Review articles will normally be prepared by invitation, but authors may submit such papers or suggestions for consideration to the Editor. A review is an authoritative and critical account of recent and current research or technology in a specialized field.
- 2.5 The submission of a paper will be taken to indicate that it has not, and will not, without the consent of the Editor, be submitted for publication elsewhere.
- 2.6 One hundred free reprints of each paper will be provided. Any additional copies of reprints must be ordered from the printer. (address available on request).
- 2.7 Manuscripts should be submitted to: **The Editor, WATER SA, PO Box 824, PRETORIA 0001.**

3. SCRIPT REQUIREMENTS

- 3.1 An original typed script in double spacing and two copies should be submitted. The title should be concise and followed by the authors' names and complete addresses. One set of original line drawings on good quality drawing paper or glossy photoprints should be submitted. Photographs should be on glossy and not matt paper, enlarged sufficiently to permit clear reproduction in half-tone. Three sets of copies should accompany each submission. All illustrations (line-drawings and photographs) must be fully identified on the back and should be provided with descriptive legends typed on a separate sheet. Illustrations should be packed carefully, with cardboard backing, to avoid damage in the post. The appropriate positions of illustrations should be indicated in the text.
- 3.2 Tables are numbered in arabic numbers (Table 1) and should bear a short yet adequate descriptive caption. Their appropriate position in the text should be indicated.
- 3.3 The SI system (International System of units) should be used.
- 3.4 References to published literature should be quoted in the text as follows: Smith (1978) the date of publication, in parentheses, following the author's name. All references should also be listed together at the end of each paper and not given as footnotes. They should be arranged in alphabetical order (first author's surname) with the name of the periodical abbreviated in the style of the *World List of Scientific Periodicals* (4th edn, Butterworths, London, 1963-1965, with supplements) and appear as follows:

MATSON J.V. and CHARACKLIS W.G. (1976) Diffusion into microbial aggregates. *Water Research* 10(10) 877-885.

THRING M.W. (1975) *Air Pollution* p 132 Butterworths, London.
