containing the capacitance pickup system. The tongue projects into the radial bore of the bluff body. Lateral port holes on the sides of the bluff body permit the vortex pressure pulses to reach the sensor. This design ensures protection of the sensor from massive flow shocks.

Two electrodes are mounted on one carrier rod and centered inside the oscillating tongue (*Fig. 8*). Two equal capacitors are formed between these electrodes and the inner wall of the tongue. Pressure differences acting on the tongue unbalance the capacitors causing a signal detected by a unique circuit. A compressive force (pressure pulsations) on the tongue has equal but symmetric effects on the two gap widths of the capacitor so that no signal is generated. As a result, "clean" vortex signals are obtained. This neutral behaviour is especially appropriate for liquids where signal quality depends on the insensitivity of the sensor to line pressure pulsations.

Similarly, pipe vibrations acting on the sensor are also cancelled out; the dual capacitance sensors move together no matter what axis the vibration is on. Even rotational vibration is compensated.

Steam Flow Measurement

Vortex flowmeters are ideal for steam and gas flow measurements.

It is necessary to compensate saturated steam flow for pressure and superheated steam flow for pressure and temperature to calculate the mass flow in kg/hr or tons/hr. Microprocessor-based steam flow calculators are available with programmed steam tables both for saturated and superheated steam flow.

Flowmeter Selection

Fig. 9 can be used for the selection of flowmeters for various applications. Manufacturer's recommendations should be followed for sizing of various flowmeters.

The outputs of all flowmeters are standard 4-20mA signal proportional to flow rate. This signal can be connected to flow indicators, recorders, controllers or datalogger/computers. Since in most cases total flow is required another output in the form of integrated pulses is also available.

(D.C. Sharma, Endress & Hauser GmbH & Co.)

DECANTER EVALUATION

EVALUATION OF DECANTER OPERATION - A QUANTITATIVE APPROACH

Introduction

Currently, there are many companies advertising decanters for the treatment of crude palm oil, in the undiluted or diluted state, all claiming advantages both capital cost-wise and on oil recovery efficiency over the present conventional system using settling tanks and nozzle separators.

The 3-phase decanter separates by centrifugal action the crude oil into 3 streams, namely, oil phase, heavy phase and solid phase.

The Ishikawajima Harima (IHI) decanter marketed by Salcon Engineering (M) Sdn Bhd was selected for the trial at Brooklands Palm Oil Mill (20 tonnes FFB/h) in Banting, Selangor. PORIM participated in the trial as an independent observer.

The objective of the decanter trial was to evaluate the performance of the Ishikawajima Harima (IHI) decanter on a quantitative basis.

System Configurations Evaluated

In the quantitative evaluation of the decanter performance the following configurations/modes of operation were studied:

- System A with 3-phase decanter operation (*Fig. 1*)

- System B with 3-phase decanter and 2-phase Alfa Laval PASX 410T nozzle separator/secondary clarifier operation (*Fig. 2*)

- System C with 3-phase decanter and 2 - or 3-phase Alfa Laval PASX-410T nozzle separator/oil recycle operation (*Fig. 3*)

- System D with static clarifier/3-phase decanter and 2 - or 3-phase Alfa Laval PASX 410T nozzle separator/oil recycle operation (*Fig. 4*)

- System E with static clarifier/3-phase decanter operation (*Fig. 5*)

Experimental Design

To study hourly performance of the decanter, the daily data collection required were as follows:

(i) Half-hourly collection of samples which are bulked for hourly composition analysis for the relevant flow streams.

FIGURE 1: SYSTEM WITH 3-PHASE DECANTER OPERATION

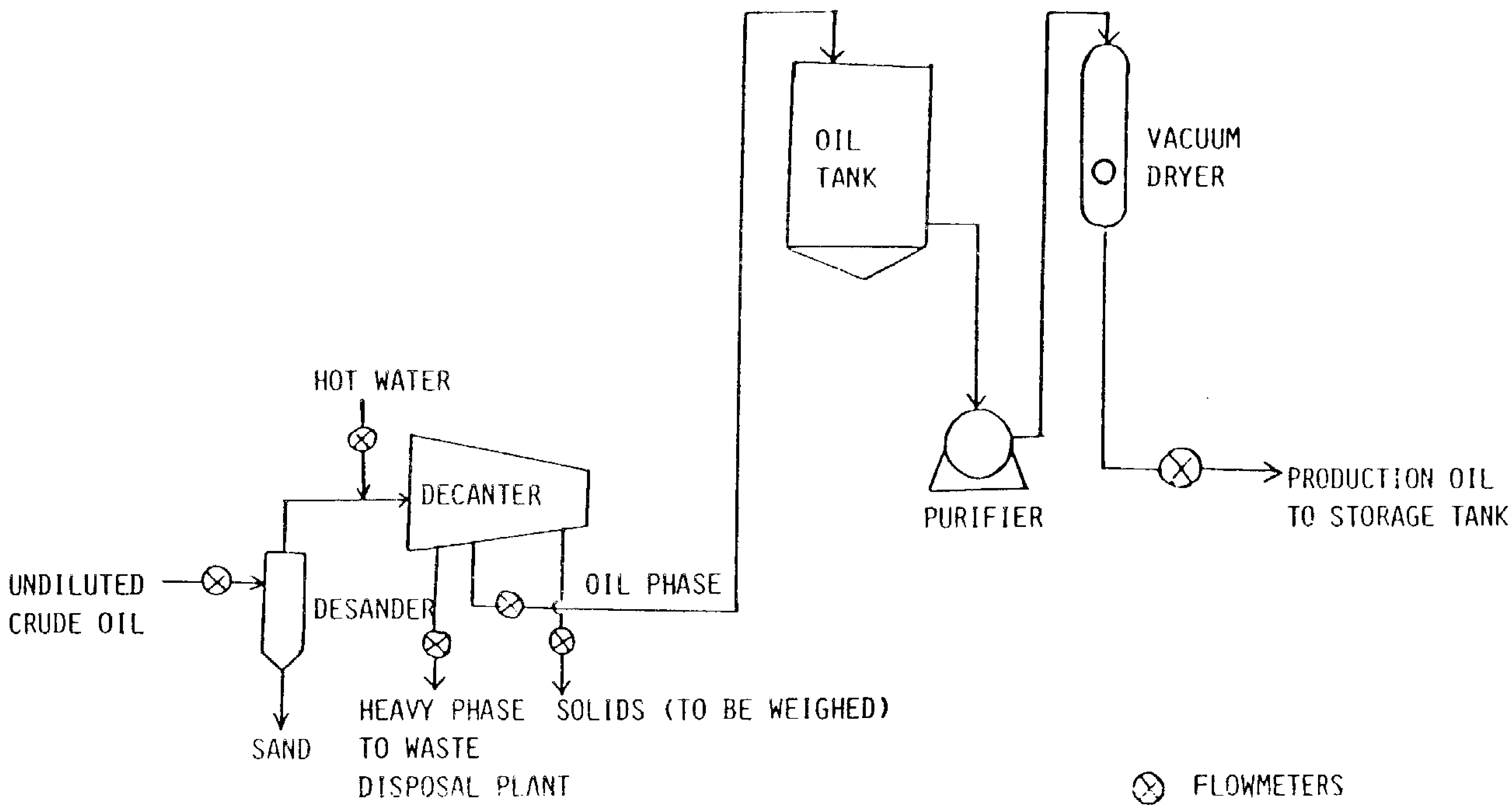

FIGURE 2: SYSTEM WITH 3-PHASE DECANTER AND 2-PHASE ALFA LAVAL 410T NOZZLE SEPARATOR/SECONDARY CLARIFIER OPERATION

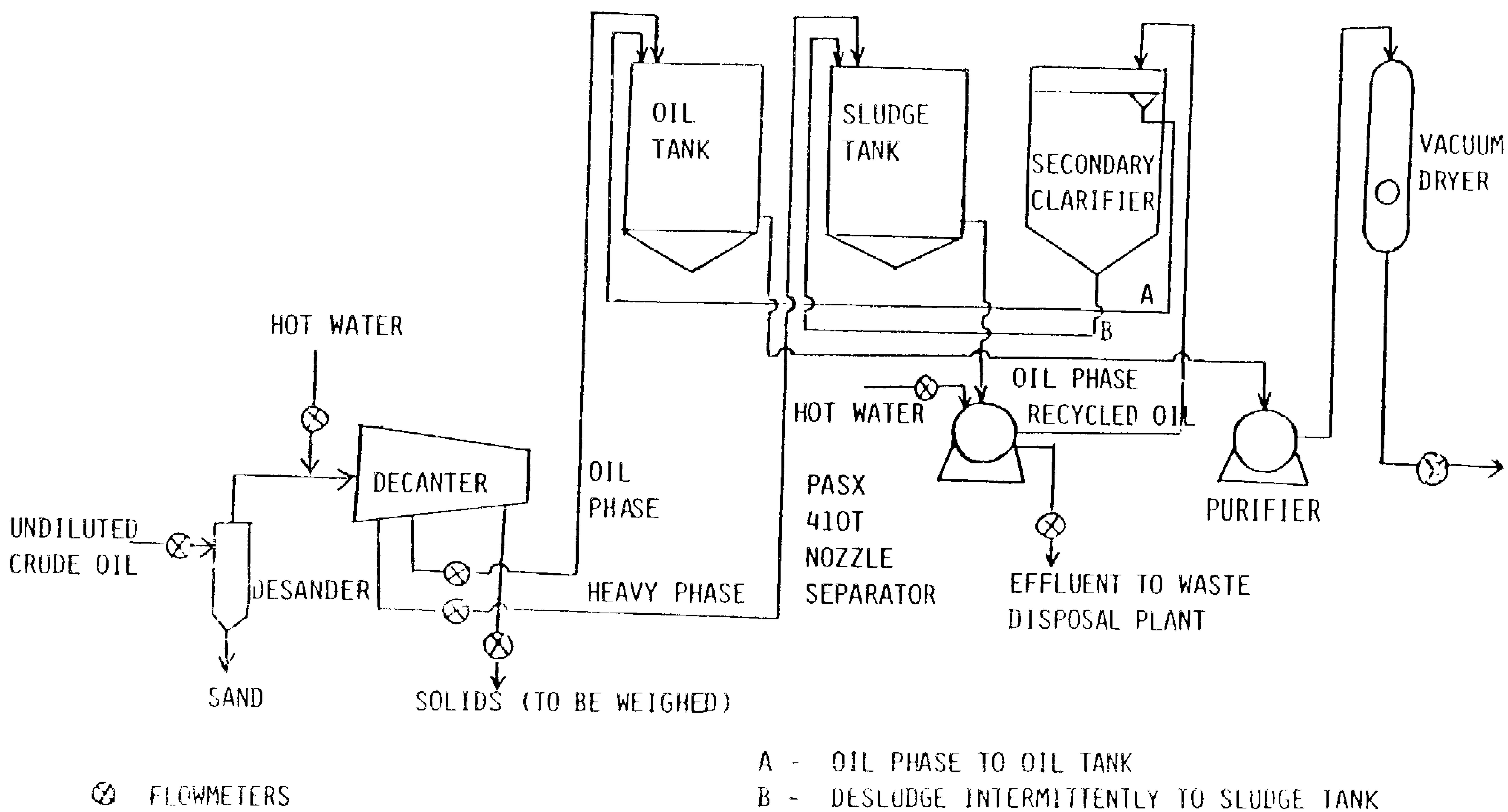

FIGURE 3: SYSTEM WITH 3-PHASE DECANTER AND 2- OR 3-PHASE ALFA LAVAL 410T NOZZLE SEPARATOR/OIL RECYCLE OPERATION

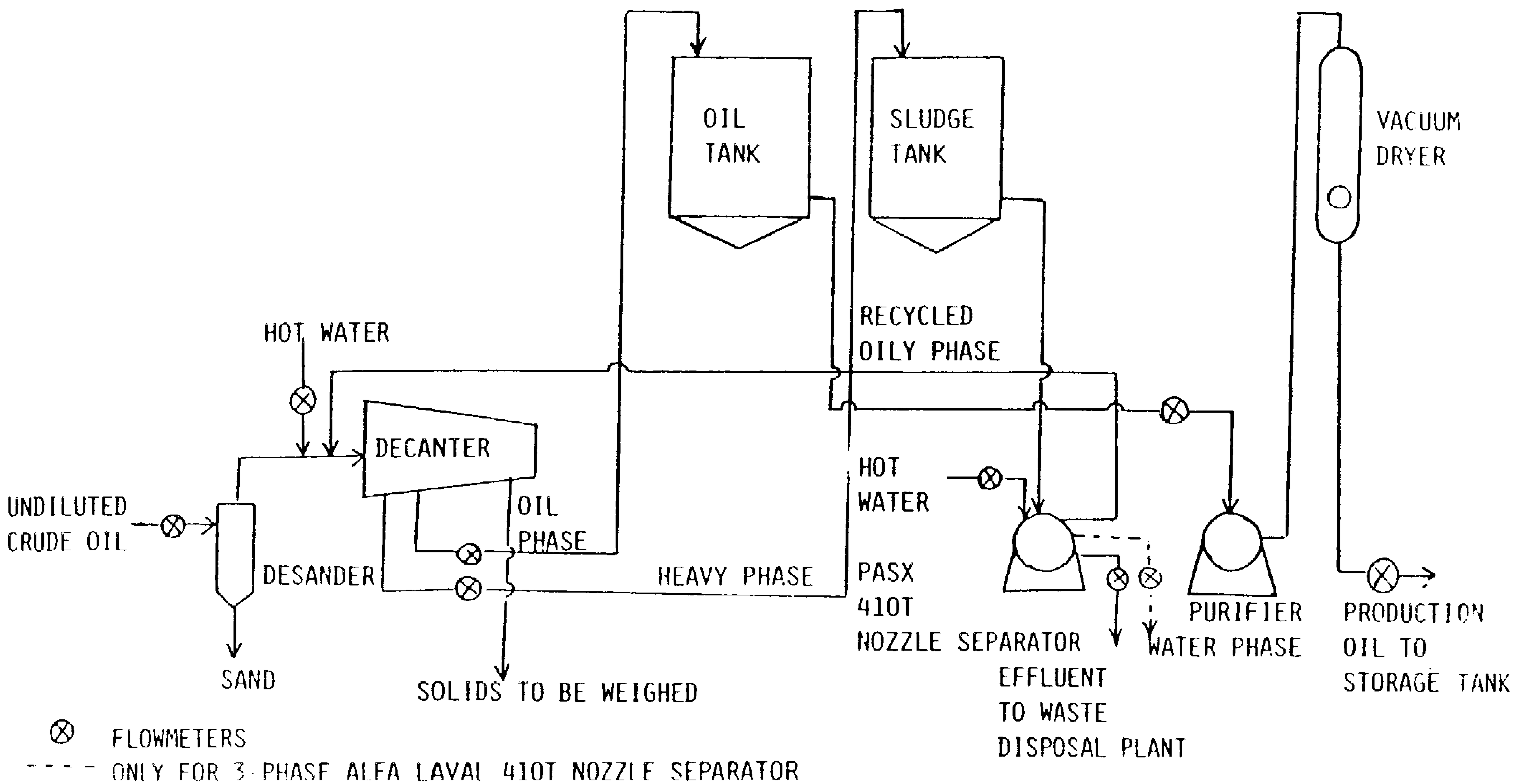

FIGURE 4: SYSTEM WITH STATIC CLARIFIER/3-PHASE DECANTER AND 2-OR 3-PHASE ALFA LAVAL 410T NOZZLE SEPARATOR/OIL RECYCLE OPERATION