Anaerobic Ponding for POM Effluent Treatment — *A.N. Ma (PORIM)*

Testing and Sampling Procedures for POM Effluent — *M.C. Chow (PORIM)*

Effluent Problems Being Faced by the Northern Millers — *T.S. Lim*

Effluent Problems Being Faced by the Southern/Central Millers — *B.E. Low*

Air Pollution Control — *W.L. Leong (PORIM)*

Combustion and Boiler Control — *S.M. Poh (Vickers Hoskins)*

Air Pollution Problems Being Faced by POMA — *S.T. Chuah*

The Workshop ended with a lively and useful discussion on problems being faced by POMA members in meeting the DOE regulations and proposals were made for further studies and research projects.

• BOILER OPERATIONS

BOILER EXPLOSIONS AND ACCIDENTS

We would like to carry on the series on boiler operations by commenting on boiler explosions and accidents.

It is rather strange that quite a large majority of people who are concerned with steam boilers refuse to accept the simple fact that boilers can and do explode, so it is as well to consider one or two cases where this has happened.

Figure 1 shows the devastation resulting from the explosion of a water-tube boiler. Here the primary cause was an inherent constructional feature outside the control of a boiler operator but it does show that when an explosion comes about there is always disastrous damage. Don't forget explosions occur simply because certain parts of a boiler are not strong enough to withstand the pressure generated. Figure 2 shows the aftermath following the explosion of a simple economic boiler. In this case there were obvious faults in the operation, insofar as the safety valves had been screwed down for a hydraulic test and not put in working order afterwards, with the result that when steam was raised overpresure came about and "pop", the boiler exploded, killing, of course, some of the people in the vicinity. These are steam explosions.

Another type of explosion which is very often due to maloperation is a flue gas explosion, and if one comes about the normal explosion doors do not prevent extensive damage. Figure 3 shows what did happen when there was a flue gas explosion on a Lancashire boiler plant as it removed the top half of the chimney.

Economic and Packaged Boilers

These so called packaged boilers came into more general use from 1945 and these days most of the shell boilers installed are of this type. These boilers have not been entirely trouble-free but the troubles have been confined : (a) to tube troubles, and (b) to shortness of water.

The original design with welded attachment of tubes to end plates has been modified in the light of experience, but there is one fundamental factor which is, with the high back end temperatures which are sometimes obtained on this type of boiler, it is absolutely essential that the water-side surface be maintained clear of deposit and scale, sludge *etc.* at all times. If it is not then you can expect trouble from the tubes

Dealing now with shortage of water, such events are becoming far too frequent for anyones liking and it should be borne in mind that there have been cases in Europe over the last few years where shortness of water has killed boiler attendants. The mains cause of boilers being short of water is mulfunctioning of the automatic controls and in the majority of such cases it is entirely due to maloperation and bad maintenance; *i.e.* float chambers when opened up are found to be full of sludge and scale, by this preventing the float mechanism from operating. This sort of trouble can be eliminated providing the feed water is properly treated and conditioned and, consequently and most important, that the float chambers are blown down at regular intervals and the controls are tested and checked. Figure 4 shows an economic boiler which has been short of water and Figure 5 indicates the extensive deformation which occurs when a Lancashire boiler is short of water. Don't forget these types of troubles should not happen with proper maintenance and operation.

Still speaking in general terms about troubles, watertube units are not free from them but in most cases with this type of boiler the troubles are confined to tube failures. It is, of course, absolutely essential that the feed water for watertube boilers be properly treated and conditioned. Incidentally, the same is still applicable for shell boilers but any shortcomigns in feed

Figure 1. Devastation from the explosion of a water tube boiler

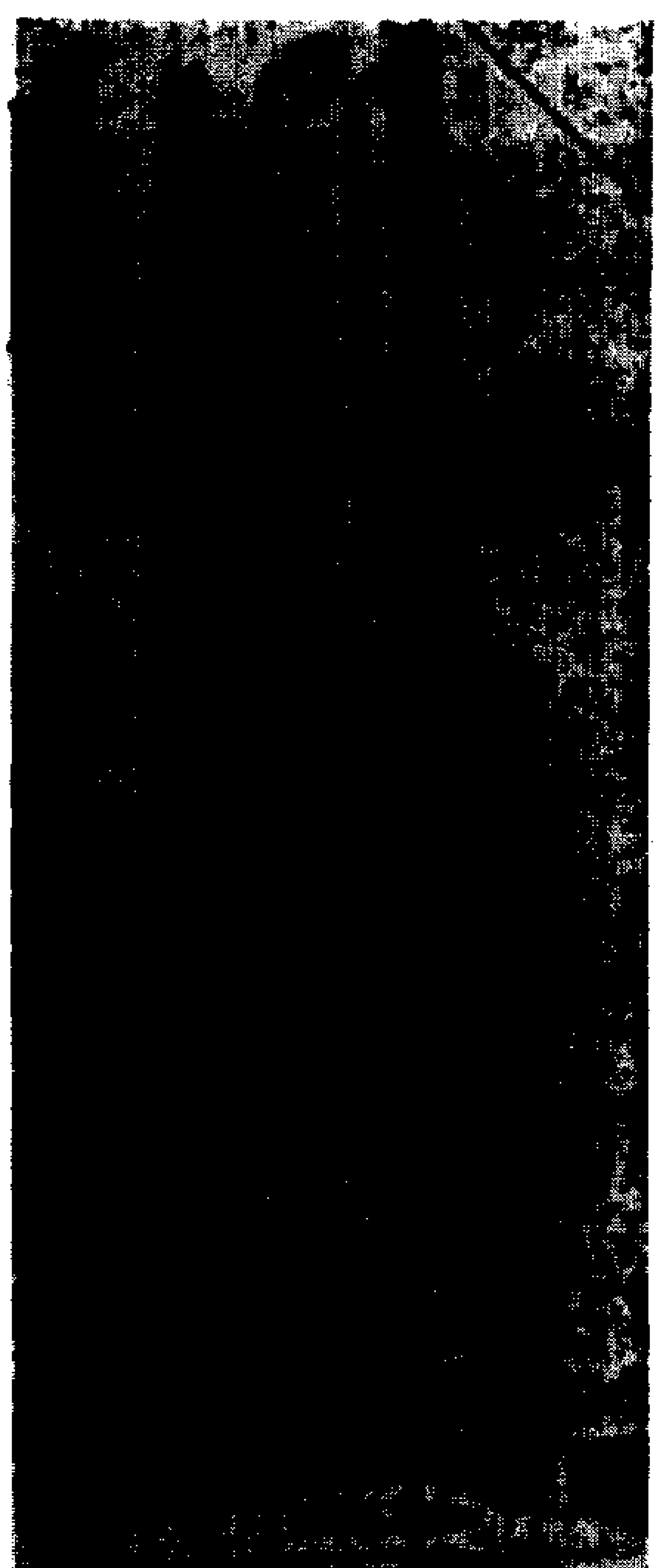

Figure 2. After the explosion of an economic boiler

Figure 3. The outcome of a flue gas explosion

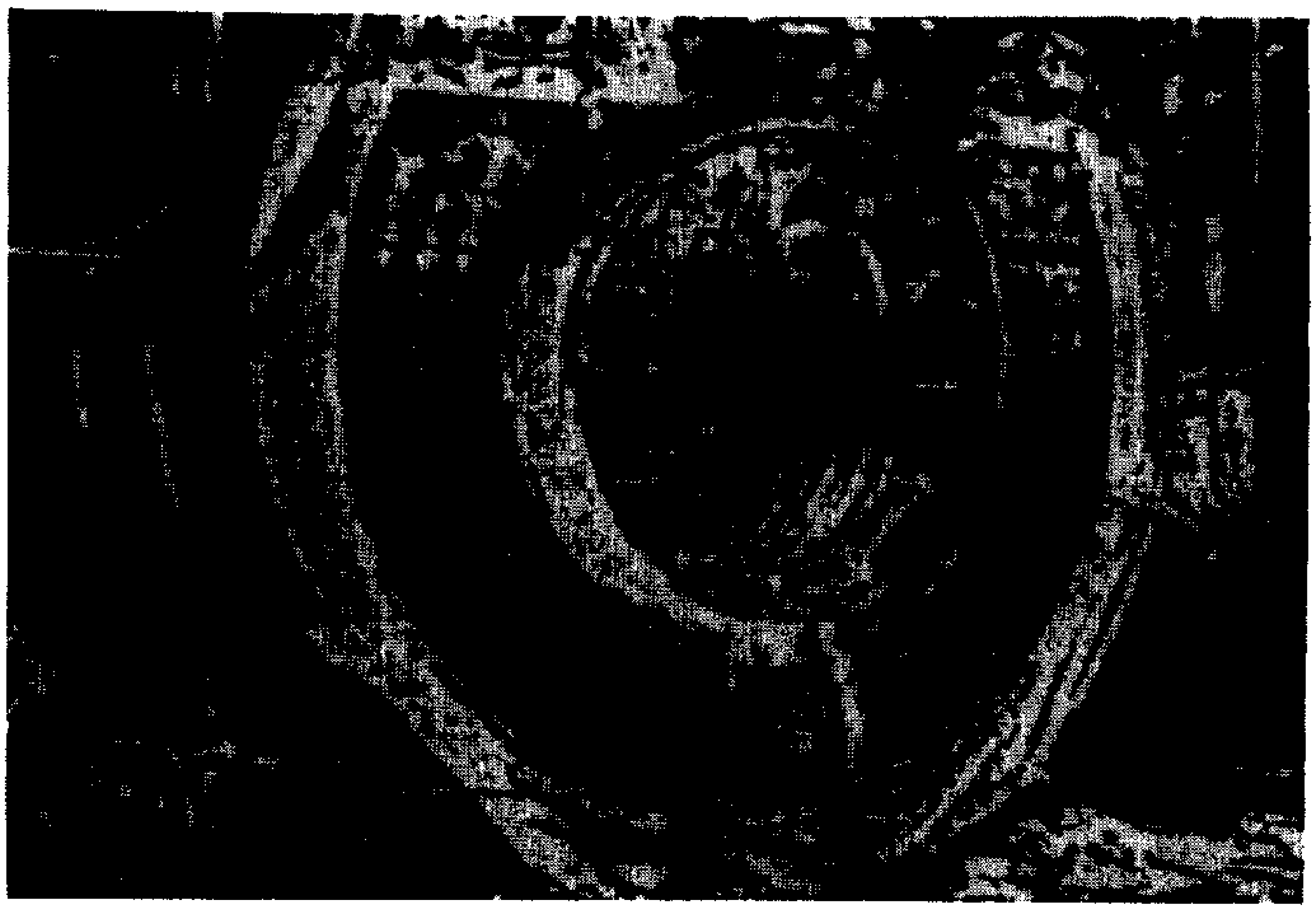

Figure 4. An economic boiler which had been short of water

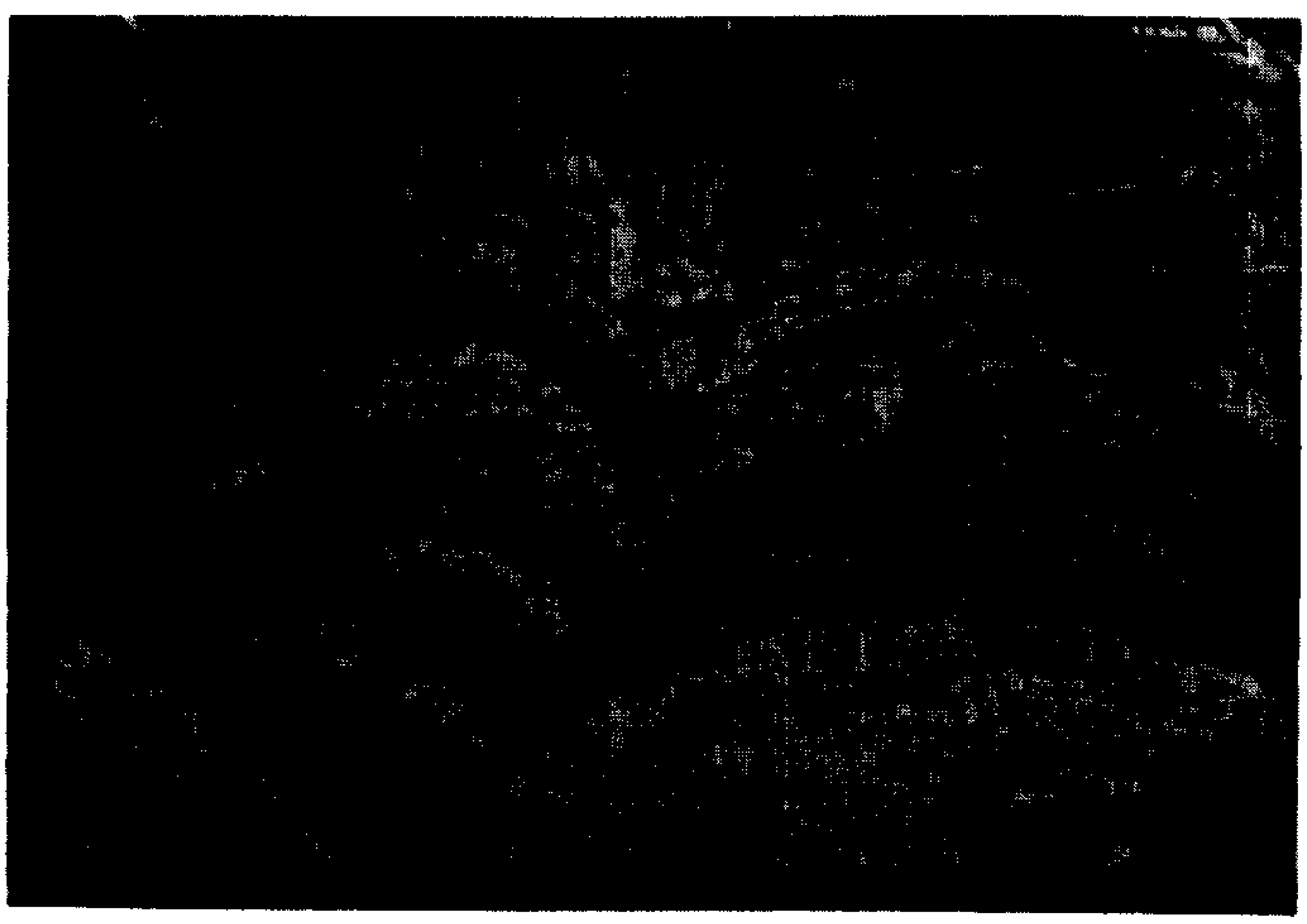

Figure 5. A Lancashire boiler which was short of water

water treatment standards can be expected to show themselves quite rapidly by tube failures, which can be disastrous in many cases and certainly may be expensive to rectify.

In the next issue of Engineering News we will give a copy of a report on actual failure of a water-tube boiler at a Cooling Plant near Sheffield, U.K.

(J.H. Maycock)

• POLLUTION CONTROL

LEGISLATION IN THE CONTROL OF PALM OIL INDUSTRIAL EFFLUENT DISCHARGE (WATERCOURSE)

The Environment Quality (Prescribed Premises) (Crude Palm Oil) Regulations 1977 containing the enabling provisions for the stipulation of acceptable conditions of effluent discharge in licences was gazetted on 3 November 1977 and came into force on 1 July 1978. These acceptable conditions were in the form of a four-generation set of effluent standards. Since then, the standards have been revised and the existing palm oil mill effluent (POME) standards for watercourse discharge are shown in Table 1.

A monitoring exercise carried out recently indicated that most POME treatment plants adopted by the industry could comply with the Department of Environment (DOE) standards on BOD, SS, TN and AN most of the time. However most mills had difficulties in meeting the standards during peak crop periods. This is attributed to overloading of the treatment plants during these peak periods. The quality of the final discharge from three mills monitored is shown in Figure 1. The treatment technology for POME will be discussed in later issues.

The proposed standards for palm oil refinery effluent (PORE) are also shown in Table 1. These standards were accepted by the DOE at a meeting of the Tripartite Committee consisting of PORIM/PORAM/DOE in February 1986. It was also agreed that all refineries should build or be in the process of building their effluent treatment plants as soon as possible. A treatment system developed by PORIM for PORE will be discussed in later issues.

TABLE 1 : EXISTING PALM OIL INDUSTRIAL EFFLUENT STANDARDS FOR WATERCOURSE DISCHARGE

PARAMETER	POME	PORE
BIOCHEMICAL OXYGEN DEMAND (BOD) (3 days at 30°C)	100 (50)*	50
CHEMICAL OXYGEN DEMAND (COD)	—	250**
SUSPENDED SOLIDS (SS)	400	100
TOTAL NITROGEN (TN)	200++	—
AMMONIACAL NITROGEN (AN)	100++	—
OIL & GREASE (O & G)	50	10
pH	5.0 — 9.0	5.5 — 9.0
TEMPERATURE	45	40

* All values in mg/l except pH and temperature

+ This additional limit is the arithmetic mean value determined on the basis of a minimum of four samples taken at least once a week for four weeks consecutively.

++ Values on filtered samples

** A maximum of 250 mg/l is acceptable until further notice.

• REFINING

REFINING AND FRACTIONATION OF PALM OIL : PART FOUR

This part, the final in the four part series, outlines the detergent and solvent fractionation processes and concludes with an examination of the exports from the Malaysian refining industry.

Detergent Fractionation (Figure 1)

Before the introduction of membrane filters, detergent fractionation enjoyed the distinct ad-