RIVER WATERS

By D. W. W. HENDRY

During July 1956 there was announced in a Government Gazette conditions under which river water may be used industrially.

One of these conditions is that water so extracted must be returned to its source in a condition approaching to that prior to its abstraction from the river, or, of such a standard of purity as may be set by the competent authorities.

We in the Sugar Industry, and in particular the South Coast are very conscious of this, as most of our rivers run into the sea at holiday resorts, and woe betide the factory should the river be polluted, accidentally or otherwise.

In a sugar factory, the evaporation station is the greatest user of water for condensing purposes, and this water is returned to its source. A fair amount is used for washing down floors, etc. and this is kept separate from the condenser water, as it usually contains sugar.

As an introduction, we shall describe the method of use and disposal at the Renishaw Mill of Messrs. Crookes' Bros. Water is conserved in the m'Pambinyoni River by a wall of sand, from which the pan condensers are served. Arrangements are made for part of the condensate which returns to the river below the weir to be pumped if necessary to a spray pond, from whence it returns by gravity to the dam. Surplus water and condensate flow downstream, and at a point some two hundred yards below the dam, water is extracted through well points for the quadruple. The hot water from the quadruple returning to the river with the pan condensate. It will be appreciated that there is always a certain amount of recirculation. Arrangements are possible to extract water from the river about a mile below the factory, but this only becomes necessary in the case of a severe drought.

As the result of an investigation by Mr. H. Bayers, a Senior Inspector of The Union Health Department, samples of water were taken, and analysed by Messrs. A. Harding-Kloot and Martin, Durban, as follows:

Colour	all good
Sediment	all slight
Turbidity	all very slight

Results, expressed as parts per million

	1	2	3	4	5	6
Dissolved Solids	492	506	482	476	488	1822
Loss on Ignition... ...	48	98	96	50	102	206
Saline Ammonia... ...	.08	.02	.22	.14	.14	.14
Albuminoid	.07	.07	.09	.09	.16	.07
Nitrates	.005	.005	.005	.005	.005	.005
Nitrites	Nil	Nil	.18	.10	.006	.12
Sulphites	Nil	Nil	Nil	Nil	Nil	Nil
Oxygen Absorption ... (4 hours at 27°C.)	.6	.9	2.3	2.5	1.5	1.6
pH.	8.7	9.0	8.05	8.0	8.2	8.6

The points of sampling, were as follows:

1. About half a mile above factory.
2. Overflow at dam.
3. Sixty feet below outlet of condenser water to river.
4. Below well points.
5. Old wooden bridge leading to Scottburgh (washed away).
6. At top of lagoon, near National Road.

Rainfall for month 0.24 inches.

The explanation for the increased dissolved solids in sample No. 6, is the fact that the river at times is tidal to a point above the point of sampling. The mill washings are pumped to a dam, and from there pumped on to a sandy field, whence it must eventually seep back to the river.

There is, however, a fact which the chemical analysis does not disclose, and this is an algal growth which is observed growing for a distance of several hundred feet down stream from the point of discharge of the condenser water to the river. There is no doubt that the temperature of the water stimulates the growth. As a matter of interest we observed the following temperatures along the growth area:—

Above condenser water discharge	22°C.
Condenser water discharge	34°C.
25 yards below	28°C.
100 ,, ,, ...	26°C.
200 ,, ,, ...	25°C.

The nature of the river bed is sandy. Water flows over a large area and is very shallow. There is an absence of rapids and turbulence to increase oxidation. The growth consists of greyish white tufts, resembling cotton wool, and becomes attached to stones or other objects below the surface of the water. That it is a complex compound, there is little doubt. On exposure to the air it darkens, and if dried in an oven the residue is of a brown clay colour.

A. G. Southgate, in his excellent book on Industrial Waste Waters, quotes:

> "An important factor in the growth of fungus is the temperature of the water. The optimum temperature of a fungus called Sphaerotilus has been given by some workers as 20–25°C., and by others as 30°C. (*It would appear as if we confirm this*). It is quite evident that this fungus grows more rapidly in warm water than cold. This is an important point since under certain conditions growth of fungus in a polluted river may be stimulated by the discharge of comparatively clean but warm waste water, such as condenser water.
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> In spite of the fact that increase in temperature stimulates growth it is often found that the length of a belt of fungus in a river below the point of discharge of a polluting liquid is greater in winter than summer. This, however, is due to the fact that in winter the organic matter in which the organism depends is not rapidly decomposing, and is therefore available over a long distance."

Fortunately the pollution (if we may use the word) is of a minor nature. Young mullet have been observed from time to time, which is surely a good test of the pollution. However, we are concerned with a method of preventing the algal or bacterial growth (if in quantity) from being carried down stream. The most obvious method is to let the condensate run along a furrow of say 800 yards, when the limit of the growth will be exceeded due to the drop in temperature, and a reduction in the sulphur compounds, etc. effected. Long grass in the furrow would be an advantage to take up the products of activity.

The writer is indebted to Mr. Bayers, of The Union Health Department, for his assistance, and hopes that the bringing forward at this time of a paper such as this, will show that the Sugar Industry is fully aware of its responsibilities.