

Multi-Tray Continuous Settlers *Versus* Intermittent Settlers in the Clarification of Cane Juices.

By M. VIGER.

The man who makes two blades of grass to grow where only one grew formerly is admittedly a benefactor of the human race.

So also should be regarded he who enables, or even assists, one man to do the work of two or more.

The equipment of Sugar Factories, which, in the days of the past, occupied the energies of many men, has now, in these days of highly-organised effort and economics, been replaced by more modern units where only one man is used.

This has only been made possible through the facilities which modern inventions and improvements have placed at our disposal.

In the juice settling department of Sugar Factories Multi-Tray clarifiers have been known and used for almost twenty years. During this period a large number of designs have been proposed:— the Dorr, Seip and Bach Continuous Subsiders are well known to every one of us. Some apparatus are of the counter flow type, others use the parallel flow principle.

Each maker naturally claims some specific advantage as to his design.

Last year (1939), a trial Bach was installed at Darnall on account of shortage of settling capacity at that mill. The settler started to operate from the 17th July to the end of the season. The Bach is 20 feet in diameter and 19 feet 3 inches high, with five trays, its capacity is of 24,000 gallons, and can cope with 70 tons of juice per hour.

The apparatus is heavily insulated against heat losses, a layer of oil of about $\frac{1}{4}$ inch in thickness seals the surface of the juice. The juice from the heaters was split equally between the Bach and the ordinary intermittent settling tanks, so that the time of settling in both types of subsiding tanks, was, as much as possible, the same, and could be compared against one another.

The following tests were carried, averages are shown hereunder:—

BACH				
Purity	Reducing Sugar Ratio	pH.	Clarity	Temperature of Juice at Outlet°F
88.3	2.14	7.7	37	210°F.

INTERMITTENT SUBSIDERS.

88.3	2.15	7.7	35	185°F.
------	------	-----	----	--------

These figures show that the Purity, Reducing Sugar Ratio, and pH. are the same in both cases, there is a slight advantage in the Clarity of the Juice from the Bach, it is two degrees higher than the intermittent subsiders.

The temperature of the juice from the Multi-Tray Settler is 210°F., whereas the juice from the intermittent settling tanks shows a loss of 25°F. through radiation.

After a week-end stop of twenty-four hours, the temperature of the juice from the Bach is between 185° to 190°F., and 133° to 135°F. from the intermittent settling tanks. It is generally admitted that juices do not deteriorate readily if they are held at a temperature of 180° to 185°F.

When this point was examined, it was found that the degree of deterioration was the same in both types of subsiders, the drop in Purity being about 1.° after a week-end stop. Although, strange to say, the pH. loss was far greater in the intermittent tanks.

The mud from the Bach can be concentrated to a porridge-like consistency with 15% to 20% of solids, this is not attained with the ordinary type of intermittent settlers.

Unfortunately, if the sludge is allowed to thicken to this extent, it decomposes, Hydrogen Sulphide is evolved, this is a sure sign of deterioration. To obviate this decomposition, the mud is only allowed to thicken in the neighbourhood of 7% to 10% solids at the most. It is the writer's experience that Sulphitation Muds decompose more readily than simple defecation sludge.

It is advisable to empty out the apparatus every fortnight or every three weeks at the most, and wash it thoroughly with boiling hot water. To obtain good results cleanliness is essential, a spare unit is therefore necessary.

The advantages of this type of subsider as against the intermittent settling tanks are as follows:—

1. The space occupied is reduced considerably as compared with the ordinary type of subsider.
2. It is very simple to operate, and the process of settling is continuous, resulting in a saving of labour.
3. The juices dealt with by means of this process are more uniform and lend themselves to better clarification.
4. The Subsider is a sealed unit, there is no steam evaporation from the juice, thereby keeping the entire station cool and reducing maintenance costs on the steel structure and roof.
5. A considerable saving in steam is effected.

An endeavour to express the savings monetarily is as follows:—

LABOUR SAVING

One unit with wages and rations=£2/15/0 per month.

Saving on 8 hour shift 15 units=£41/5/0 per month.

Saving per season of eight months=£330.

SAVING IN STEAM.

Tons of mixed juice per hour comprising filter press juice and dilution at the filter presses=110.3 tons per hour.

$110.3 \times 2,000 = 220,600$ lbs. per hour.

Temperature drop in intermittent settling tanks 25°F.

$220,600 \text{ lbs.} \times 25 = 5,515,000$ B.T.U.s per hour (specific heat being neglected).

Calorific value of Coal=13,500 B.T.U.s/lb.

Coal per hour lbs.= $\frac{5,515,000}{13,500} = 408$ lbs.

Coal effectively used lbs. hour (say 70%)
 $\frac{408 \times 100}{70} = 583$ lbs.

Mill crushed for season, 5,013 hours.

Coal saved per season=5,013 x 583
 =2,922,579 lbs., or 1461.2 tons.

The price of coal delivered at the mill costs 15s. 10d. per ton. Therefore 1461.2 tons coal cost £1156 15s. 8d.

TOTAL SAVINGS.

Labour	£330 0 0
Steam	1156 0 0
	£1486 0 0
Total	£1486 0 0

The above calculated savings only apply to a complete installation of Multi-Tray Clarifiers.

Darnell,
9th March, 1940.

—❧—

The PRESIDENT said that a lot of experience had to be gained with continuous settlers, and the latest advances gave much promise. Mr. Viger mentioned three types, but there was another type invented by Mr. McIntyre of Natal Estates, which would work exactly the same in the sulphitation factories. The President thought continuous settlers should be installed in every factory.

Mr. RISHWORTH remarked on the interesting comparison between two types of subsiders. If juices at 210°F instead of 185°F were received by the evaporator, much advantage would thereby be gained, particularly in factories with a small evaporator capacity. More uniform juices and better classification referred to by Mr. Viger would of course reduce the amount of scale in the evaporator, with consequently more efficient heat transference over the weeks' run.

Mr. BOOTH asked if Mr. McIntyre's defecator could be demonstrated? If it was successful it should be given every support.