

## H.M.S. 'BULWARK'— DISTILLING PLANTS

H.M.S. *Bulwark* is fitted with two Weir's distilling plants, one, a three-shell with a rated continuous output of 240 tons per day and the other, a two-shell, with a rated output of 200 tons per day. Both plants were converted, after installation, to give the designed continuous output using exhaust steam, but the exhaust range control system, which ensures that the pressure in the main is maintained constant under all conditions of steaming, has not yet been installed.

The following unofficial report on the operation of the plants was recently received in E.-in-C. Department. This sort of report is extremely useful to the section at Headquarters responsible for the design of plants. It is published in the hope that other ships may benefit from *Bulwark's* experience.

### REPORT

The evaporators are normally run under vacuum with 16 in to 18 in vacuum in the shell and 22 in to 24 in. in the distiller. Admiralty evaporator compound is drawn in by shell vacuum at a rate of 1 lb per 10 tons water made. Brine densities are maintained at 20°. Desuperheater sprays are never used.

#### Descaling Routine

##### (a) Daily Blow Down and Descale

If running continuously, the evaporators are blown down and descaled each forenoon, giving a running time of 21 or 22 hours. The blow down is carried out with the pumps stopped and sea water is sucked back through the blow down to sea valve (converted to normal S.D.V. from non-return valve). This is repeated twice and the loose scale is then removed through descaling door.

##### (b) Weekly Blow Down

Once a week, in addition to routine (a) above, the shell is blown down and, while still hot, the coils are hosed down, through the foam level sight glass, from the firemain.

##### (c) Monthly Descale

After about 4 weeks running, the large doors are removed and, after heating the coils with steam, they are hosed down from the firemain and the scale is then removed from between the coils. When the evaporators are not likely to be required for a week or more, the shells are filled with feed water and evaporator compound. The water is then boiled and the coils are allowed to soak until the evaporators are required.

#### Performance

##### Reading for Two-Shell Set

Readings showing effect of daily blow down immediately after a monthly blow down :—

<i>Hours since last blow down</i>	<i>Before Blow Down</i>		<i>After Blow Down</i>	
	<i>coil steam pressure in lb/sq in</i>	<i>output tons/hr</i>	<i>coil steam pressure in lb/sq in</i>	<i>output tons/hr</i>
22	9	6.5	7	6.5
21	8	6.2	7	6.2
24	9	6.7	7	6.3

Readings showing effect of daily blow down immediately before monthly descale :—

<i>Hours since last blow down</i>	<i>Before Blow Down</i>		<i>After Blow Down</i>	
	<i>coil steam pressure in lb/sq in</i>	<i>output tons/hr</i>	<i>coil steam pressure in lb/sq in</i>	<i>output tons/hr</i>
22	9	6.0	8	6.2
21	9	6.0	7	6.0
18	10	5.8	7	6.0
29	11	6.1	9	6.3

#### *Readings for Three-Shell Set*

Readings showing effect of daily blow down immediately after descale of one shell :—

<i>Hours since last blow down</i>	<i>Before Blow Down</i>		<i>After Blow Down</i>	
	<i>coil steam pressure in lb/sq in</i>	<i>output tons/hr</i>	<i>coil steam pressure in lb/sq in</i>	<i>output tons/hr</i>
29	9	9.3	8	9.1
20	9	9.0	8	9.1
22	9.2	9.5	9	9.5
21	12	10.1	11	11.1

Readings showing effect of daily blow down immediately before monthly descale :—

<i>Hours since last blow down</i>	<i>Before Blow Down</i>		<i>After Blow Down</i>	
	<i>coil steam pressure in lb/sq in</i>	<i>output tons/hr</i>	<i>coil steam pressure in lb/sq in</i>	<i>output tons/hr</i>
20	11	9.5	10	9.5
21	10	9.0	10	9.3
25	11	9.3	10	9.2
18	12	9.1	10	9.0

On the three-shell set, the monthly blow down is normally carried out on one shell at a time, so that the difference, shown in the above tables, is not as noticeable as when all three shells are descaled together.

All the above readings were taken after both sets had been running for about 2,000 hours 'since new'. No coils have yet been changed. Similar readings after about 800 hours running are :—

*For Two-Shell Set*

	<i>Hours since last blow down</i>	<i>Before Blow Down</i>		<i>After Blow Down</i>	
		<i>coil steam pressure in lb/sq in</i>	<i>output tons/hr</i>	<i>coil steam pressure in lb/sq in</i>	<i>output tons/hr</i>
24th Feb., 1955	21	7	6.7	6	6.5
2nd Mar., 1955	21	6.5	6.4	6	6.1

*For Three-Shell Set after about 700 Hours Running*

	<i>Hours since last blow down</i>	<i>Before Blow Down</i>		<i>After Blow Down</i>	
		<i>coil steam pressure in lb/sq in</i>	<i>output tons/hr</i>	<i>coil steam pressure in lb/sq in</i>	<i>output tons/hr</i>
24th Feb., 1955	20	6	9	6	11.0
28th Feb., 1955	31	8	10.5	7	11.7

The acceptance trials were carried out before the coils were modified, and no trials were subsequently performed. Trial outputs with old type coils under vacuum conditions were :—

- 2-shell set :—Coil steam 3 lb/sq in  
Shell vacuum, 20 in } 64 tons in 12 hours =  $5\frac{1}{3}$  tons/hr.
- 3-shell set :—Coil steam 5 lb/sq in  
Shell vacuum, 20 in } 73 tons in 12 hours =  $6\frac{1}{2}$  tons/hr.

**DEPARTMENTAL COMMENT**

It was feared that the greatly increased coil area, provided to give the required output when operated on exhaust steam, might make it difficult for the scale to fall away on shocking, because of the very close pitching of the coils. There is little doubt that the conscientious use of compound and strict blowing down routines have lessened the chances of this trouble occurring.

It is noted that the desuperheaters are not used. One of the main reasons for fitting them was to avoid the formation of calcium sulphate scale at the coil inlets. The scale is almost impossible to remove by shocking and, as it is acid insoluble, acid cleaning of the scale is partially ineffective. It may be that the steam temperature at the coil inlet is not as high as was anticipated.

The output from the two-shell plant appears to be low, but this is presumably because it is not being forced as hard as it might be. The output appears to correspond to the coil steam pressure.