

SOAP AND SOUP

The attention of Engineer Officers will have to be drawn by A.F.O. 5454/46 to a remarkable incident where a laundry soap solution found its way into the feed system, and the original report from H.M.S. Belfast is reproduced here in detail.

It has since been reported that a very similar thing happened to one ship's company's soup, and Engineer Officers are invited to consider whether any modifications to other steam supply arrangements for domestic services in their ship is desirable, in order to guard against these somewhat rare but disturbing misfortunes.

At 1400 on Monday, 7th January, 1946, while steaming auxiliary in harbour, the officer in charge of the boiler rooms was in the forward boiler room with a view to supervising the routine blow down of the steaming boiler—A1. He noticed that the pressure in the auxiliary saturated steam range was low, about 90 lb. per sq. in. instead of 150 lb. per sq. in. It was apparent to him that some trouble was being experienced with the reducing valve to the saturated range and he endeavoured to adjust it. While this adjustment was being carried out the pressure in the saturated range fluctuated and at one period dropped to 70 lb. per sq. in.

Within about fifteen minutes water started to come over from the steaming boiler, filled the auxiliary superheated steam range and caused a general slowing down of the auxiliary machinery, including the two steam dynamos. It soon became apparent that the boiler was priming heavily.

The load was taken off both steam dynamos and the two Diesel dynamos were started up and put on load. By this time the load on the boiler was greatly reduced and the priming considerably eased. The situation in the engine room was that all feed tanks, main and overflow, were showing heavy contamination. Both steam dynamos, both drain coolers and the after evaporators (the only set running) were immediately suspected. Tests were taken from all these but they proved to be almost clear, being only slightly contaminated and showing a slight discoloration due to the priming boiler. The evaporators were perfectly clear. This slight discoloration quickly disappeared as the boiler priming became less and less. The boiler was, during this period, frequently blown down. Both main feed tanks had been cross connected and as soon as the trouble commenced they were isolated. This action had an important bearing on subsequent events.

The conditions in the boiler room continued to improve and within one hour from the commencement of the trouble were back to normal. It was considered inadvisable to increase the output of the boiler, and therefore only one steam dynamo was kept running on very light load. The main feed tanks and overflow tanks were still contaminated, the after tank much more so than the forward one. The feed suction for the boiler was changed from main feed to reserve feed tanks. In the meantime B2 boiler was flashed up with a view to changing over boilers, it being considered undesirable to use A1 further until it had been opened for examination.

The assumption at this time was that the contamination of the feed tanks was due to a passage of boiler compound from the priming boiler, and it was decided to empty main and overflow tanks to bilge. While these tanks were

being so emptied it was found that the after main feed tank had a considerable quantity of soapy substance in it and soap froth on top of the water. The water proved to be alkaline. These conditions were most baffling and during the night every step was taken to try and solve the problem.

By 2100 B2 boiler was in use and A1 shut down. Both steam dynamos were back on load. The density in A1 at this time was 0.1. By 0800, Tuesday the eighth, the situation was as follows :—B2 boiler auxiliary and conditions normal. The main feed tanks and overflow tanks, having been refilled from reserve feed tanks by the time B2 was connected. At no time was trouble experienced with the evaporator. A1 boiler was run down to bilge and opened out for internal and external examination. This examination proved perfectly satisfactory, the boiler, which had steamed 900 hours, opening up in first class condition.

Up to this time no explanation could be found to account for this sudden and heavy priming of A1 boiler. The boiler had a normal density, alkalinity, and salinity, and there were no leaks in any turbo generator condensers or the drain coolers. It was then decided to examine every possible method whereby soap could have entered the after main feed tank as it was this tank which had been so heavily contaminated.

It was at this juncture that the suggestion was made that the soap might have come from the Ship's Laundry. Enquiries from the laundry staff elicited the fact that they had lost some sixteen gallons of soap solution from their mixing tank at about 1415 on Monday, the 7th, and that it had apparently disappeared into thin air. After careful consideration and in view of the fact that no more reasonable explanation is forthcoming it now seems certain that the following are the causes which led up to the priming in A1 boiler.

At approximately 1400 on Monday, 7th January, the soap mixing tank in the laundry had been filled with 16 gallons of soap solution. The tank has no outlet and has two pipes which supply :—

- (i) fresh water to make the mixture,
- (ii) steam to warm the mixture.

The mixture was in the process of being warmed by means of the steam pipe and the laundry staff were occupied with sorting clothes. At about 1415 the engineer officer in charge of the boiler rooms, as already stated, had trouble with the auxiliary saturated line and considerable fluctuations were experienced. The after evaporators were in use with coil drain led to after drain cooler and thence to after main feed tank.

It is considered that the fluctuations in pressure which took place in the saturated steam line, coupled with the demand for steam from the after evaporators, produced a situation which created a suction in the steam supply to laundry mixture (this pipe enters the saturated line in 'B' boiler room) which actually drew the soap mixture into the saturated line thence through the after evaporator coils, thence by after coil drain to after main feed tank. The feed tanks were cross connected and A1 boiler feeding from forward main feed tank. The mixture was drawn through the cross-connection pipe and fed into the boiler which then commenced to prime. As soon as the cross-connection on the feed tanks was closed the situation started to improve until as stated above A1 boiler ceased to prime.

It was noted that with the steam jet in operation there was no non-return valve between the mixing tank and the saturated line. A non-return has since been fitted in the line.