NOTES FROM SEA

Readers are invited to discuss either the extracts or the comments in the Correspondence section of the Journal.

Improvisation during Repairs to Distilling Plant Combined Pump Motors

On passage to Hong Kong in a Type 12 A/S frigate of the RNZN, the combined acquair and fresh water pump motor on the after evaporating and distilling plant burnt out and disabled that plant. The motor was found to have 5 windings burnt out and since it was realized that it would be some time before a replacement motor could reach the ship, repairs were attempted. Fortunately the burnt area was at the end of the motor and it was possible to splay out the wires, join them, re-varnish and set in epoxy resin. A satisfactory resistance balance and insulation reading was obtained and the motor ran successfully.

About ten days later, a small-bore cooling water pipe on the circulating water/brine pump failed and unfortunately in doing so directed a stream of water into the air cooling cowl of the fresh water/acquair pump motor. Consequently this motor burnt out again, this time beyond repair.

On arrival in Hong Kong it was decided that, since the spare fresh water/acquair pump was unlikely to catch up with the ship before our departure, an alternative method of running the after evaporator and distilling plant should be attempted.

With H.M.S. *Tamar* providing assistance in making up adaptors the following jury rig was made up:

(*a*) A one inch Admiralty No. 1 armoured hose with female connections at each end was led from the test connection on the side of the distiller condenser to the water hose connection for condenser testing on 'K' TA. Approximately 31 feet of hose was required for this.

(*b*) A specially made flanged adaptor to 2-inch Admiralty No. 2 size armoured hose connection was bolted to the fresh water pump suction from the fresh water cooler and 18 feet of 2-inch armoured hose was led to the hose connection on the reciprocating auxiliary feed pump suction chest, a double male connection 6 inches long being employed to join the two lengths of hose together.

(*c*) Fresh water pumped from the fresh water cooler by the reciprocating auxiliary feed pump was discharged to the boiler washing connection on the auxiliary feed line to the auxiliary feed check, until proved clear by silver nitrate. Once the distillate was clear it was intended to change over the auxiliary feed pump discharge direct to the feed tank filling line.

(*d*) To minimize the effect of any contaminated water being pulled over into the TA condenser, the extraction pump discharge line was broken between the discharge valve to the starboard reserve feed tank and the bulkhead valve.

(*e*) 'K' TA was taken off load while the evaporator was being started up and vacuum in the distiller condenser was regulated by the opening of the screw-down screw-lift valve on the TA water hose connection for condenser testing.

The evaporator was started up and vacuum applied to the distiller condenser shell maintaining a minimum of 20 inches of vacuum in the TA condenser; this produced a vacuum of about 5 inches in the distiller condenser. After about 8 minutes the reciprocating auxiliary feed pump was started up and the vacuum in the distiller increased to approximately 20 inches, with 23 inches in the TA condenser. At this time a slight cloud developed in the TA extraction pump discharge but this cleared after about 6 minutes. The distillate was also contaminated and was discharged to bilge through the boiler washing connection as in (*c*) above.

After about 10 minutes' running the TA condenser was confirmed clear and the distillate had a very slight cloud. It was decided to give the plant 30 minutes' running to settle down and, if the distillate was still clear, discharge it to a reserve feed tank and obtain a measure of the output under this jury rig.

Unfortunately, before this could be done, the circulating water/brine pump motor burnt out and the experiment came to an abrupt end. However, at this time the distillate was clear.

Conclusions

It has been shown that the failure of the fresh water/acquair pump will not necessarily put a set of evaporators completely out of action and at this later stage it is also considered that it may be feasible to replace the circulating water pump with a jury rig from the firemain and the brine pump with a jury rig to the megator bilge pump. This experiment could well be carried out at a later date, but should only be attempted when alongside with machine shop facilities available to make the necessary adaptors.

A number of adaptors had to be made which ships staff would normally have difficulty in producing, but these were quickly made by H.M.S. *Tamar*'s workshop staff. The 1-inch armoured hose is not normally carried in Type 12 frigates and would not normally be available.

The value of having a means of putting the TA extractor pump discharge direct to bilge was amply demonstrated since breaking the TA extractor pump line is a cumbersome method of getting rid of contaminated condensate, and good water is lost between the time that the condensate is proved clear and when the line is re-made.

The circulating water/brine pump motor is believed to have been damaged by salt water at the same time as the fresh water/acquair pump motor in the first instance, but to a lesser degree. Consequently the damage was not revealed until much later.

Although during the experiment 'K' TA was taken off load, it is believed that after conditions had settled, it would have been quite capable of handling 50 per cent load.

This incident in no way reduces the value of the modification carried out on the air trunkings to the evaporator combined motors since until this occasion it had proved successful, and it was entirely fortuitous that when the cooling water pipe fractured it did so in such a way as to direct a stream of water into the motor's air inlet. Of course, the final solution is to install totally enclosed water-tight motors.

It must be stated that the basic idea for this jury rig was suggested by the Base Technical Officer on the staff of the Commodore, Hong Kong.

Familiarity Breeds Contempt

During a recent post-refit full power trial of a single screw ship trials observers noticed heavy vibration of the plummer block forward of the stern gland.

Although the watchkeepers had paid regular visits to the compartment they had not thought this worthy of investigation or reporting, as the level of noise and vibration in the stern of the ship at high powers was high and vibration of this plummer block had been experienced since Contractors sea trials.

Closer inspection, however, revealed the holding down bolts to be slack. This failure again emphasizes the dangers inherent in the acceptance of a defect because 'it has always been like it'.

Fuel Dilution of Main Lubricating Oil Drain Tank

Investigations of excessive vibration in a G6 gas turbine in a COSAG frigate revealed a main oil drain tank fuel dilution of 17½ per cent. The source of this contamination was eventually traced to the gas generator overspeed governor, where an observant maker's representative noticed that the oil and fuel connections were reversed.

The hazard to the propulsion plant of contaminated lubricating oil is obvious. In this case suspicions were not aroused until the main oil pressure began to fall. While current instructions are explicit about testing steam turbine and Diesel engine lubricating oil for contamination, they do not call for tests on other equipments, nor do they call for a fuel dilution check with steam or gas turbine systems. A suitable amendment is now being prepared, but in the meantime it is important to realize that any lub. oil system with an oil cooler may be subject to water contamination and that fuel/oil interfaces do exist in other equipment than Diesel engines. Regular use of the lubricating oil test kit on all lub. oil systems is the only solution. In this case it would have revealed the dilution much earlier and reduced if not eliminated the stripping work necessary to examine the machinery for possible damage.

We Never Learn

In a paper 'Process Plant Hazards' reprinted in the *Chartered Mechanica Engineer* of January, 1969, G. A. J. Begg discussed a number of accidents which occurred many years ago. The following is one the lesson of which has not been completely learnt.

'A boiler accident occurred in one of ten Sterling type water-tube boilers where the blowdown connections are fed into a common main. As is customary the blowdown valves from each boiler were so arranged that they could be opened by one common removable valve handle which was fitted with a lug. This lug prevented the valve handle from being withdrawn from the valve in the open position. Thus, only one blowdown valve could be opened in the range of boilers at one time, and it would be impossible for steam and hot water to enter a standing boiler in which men might be working.

However the boiler plant attendants found it a nuisance not to be able to remove the handle and so they filed off the lug, thus destroying the efficiency of a safety measure. This was not discovered by the management until, as the inevitable happened one fine day, there was a different attendant on duty.

This man having opened the drain valve of a boiler which was open for cleaning then removed the valve handle and proceeded to blow down one of the working boilers. Steam and hot water were blown back into the standing boiler with the inevitable serious result'.

How many of your ship's blowdown spanners still have their lugs on?

How many of your ship's blowdown valves actually work in the correct sequence?

From pre- and post-refit inspections carried out by the Western Fleet Technical Staff, the answers to the above would, in many ships, be NONE.

Some Fuelling Problems Solved

(*i*) *Transfer of Dieso to Avcat System*—Leanders

A *Leander* Class Marine Engineer Officer considering the problem of using dieso in Wasp helicopters asked his Chief M(E) how to transfer dieso to the Avcat system. He was assured there would never be any need. The 'Airy Fairy' would never allow dieso near his 'Petrol Pigeon'.

On investigation it transpired this requirement had not been foreseen and could not be done in practice with the existing arrangement. It was solved by an adaptor, made by the Local Fleet Maintenance Unit, joining the aircraft and the motor boat fuelling hoses together. This enabled dieso, pumped up to the motor boat fuelling connection, to be delivered under the control of the Zwicky nozzle to the Avcat fuelling point on the flight deck.

Six months later the ship was on a NATO exercise when 21 tons of fuel were used by the helicopter in 2½ weeks. Only 10 tons of Avcat is carried in *Leanders*. Further supplies could not be safely embarked from the American tanker supplying the Task Group at sea, due to the incompatibility of hoses and adaptors. Dieso, however, was easily pumped over from ship's tanks and cleaned in 12 hours recirculating. During this time the helicopter operated on the Avcat remaining in the service tank.

(ii) Fuelling at U.S. Navy Fuel Depots

Before a *Leander* visited an American port it had been decided there was no need to fuel and that dollars should be saved. Due to Diesel generator problems the ship had to remain auxiliary during the visit and burnt extra F.F.O. In addition the helicopter flying programme began to gel and it became obvious that it would be wise to top up with Avcat.

The local U.S. Navy Fuel Depot was approached and were only too pleased to help out with 100 tons of F.F.O. and 5 tons of Avcat. Prudently the ship liaised beforehand and knew that both could only be supplied from 6-inch hoses with an 8-bolt flange connection. (These are apparently the American equivalent of our 6-inch RAS hoses). N.A.T.O. swingbolt connections were not held at the depot.

The problem of embarking the F.F.O. was overcome fairly simply. It was discovered that the P.C.D. of the flange connection between a NATO breakable spool and the adaptor for connecting it to an R.N. ship's gooseneck deck fitting was the same as the flange on the American hoses. Thus by removing the breakable spool the American hose was simply bolted to the ship's standard fuelling equipment.

Embarking the Avcat under control required a little more thought and ingenuity. It was achieved by using a square piece of $\frac{1}{8}$ in. mild steel plate as an adaptor to connect the aircraft fuelling hose to the American 6 in. hose. Firstly the plate was drilled with four holes on a P.C.D. similar to the American hoses flange. Next the centre was bored out on the lathe so that the male screw connection on the outboard end of the aircraft fuelling hose would just pass through, where it was secured in position by a back nut manufactured on board. Again full control of the Avcat coming aboard was easily achieved due to the use of the Zwicky nozzle on the aircraft fuelling hose.

The Hazards of the Plastic Age

Choking of condensers and heat exchangers in harbour is a familiar hazard which is particularly prevalent in some Far East ports where plastic bags are a major source of such chokage.

A side effect that is sometimes forgotten was recently highlighted by the need to replace both main feed pumps in a Type 15 frigate following the failure of main bearings attributed to loss of circulating water through chokage.

Boiler Feed Water Contamination

On first raising steam for a basin trial at the end of a docking period, the steaming boiler salinity rose to 330 ppm in half an hour, requiring the boiler to be internally cleaned.

Although all feed tanks had been proved clear prior to feeding the boiler, a slight cloud had initially been detected at the extraction pump discharge. Though a salinometer reading of 0·5 grains/gallon had been observed at the same time it was dismissed as a compound cloud and the salinometer switched off. The system was not checked again until the high salinity was found in the boiler.

Despite a subsequent exhaustive search no source of contamination was discovered, but it is significant to note that the condenser sump water had not been tested.

Note

This example highlights the requirement for vigilance when raising steam, particularly after a docking period. Suspected compound clouds must always be confirmed by the method shown in BR 3000, Article 1228. Passive acceptance of a cloud when raising steam will sooner or later lead to heavy boiler contamination.

Don't Forget the Drawing

In these days of handbooks, drawings tend to fall into disuse. When available, careful use during assembly, particularly of static devices, can save much subsequent work.

Following a recent repair of an evaporator baffle the plant was completely unstable during trials. The baffle looked alright and the individuals who had done the work were convinced that it was correctly assembled.

Subsequent meticulous checking of the baffle against the drawings held, however, revealed several apparently minor deviations in construction. As may be imagined there was much argument about their possible importance but when they were corrected, full stability was achieved at all outputs. Had the initial repairs been carried out to the requirements of the drawings much effort could have been saved.

Creative Thinking v Mental Inertia

The following extract from 'Engineering Abstracts' published in the Transactions of the Institute of Marine Engineers, *Vol. 80, No. 9, is reproduced by permission of the Institution.*

The following example illustrates that because of mental inertia, many people do not realize that there are several approaches to the solution of any problem.

The wooden upper section of an oil tanker's mainmast was loosened and slid down into the hollow metal tube that made up the lower half of the mast. The lower metal tube was 65 ft high and the wooden upper section was 45 ft by 2 ft at the lower diameter where it fastened into the iron mast. The bottom end of the steel tube was solidly welded to the tanker's deck.

The chief engineer, who was responsible for the repair and maintenance of deck machinery, tried to retrieve the mast by means of conventional lifting machinery and failed. He searched his text books for a possible solution and found none. On arrival at Bahrain, a local ship repair yard quoted £1800 for repairing the fallen mast. As it was not possible to use a crane to withdraw the fallen mainmast, the lower metal half of the mast would first have to be cut away from the deck, then lifted off the tanker to facilitate the removal of the inner wooden mast. The repairers advised that the complete repair would take at least four days, possibly five. As the tanker was employed on a strict time charter which imposed a penalty of £200 for each 24-hour delay, the cost of repair, excluding crew's wages, harbour dues, etc., would amount to £2800.

The captain was hesitant to commit his company to this delay and expenditure without first consulting the ship's owners. He cabled them and, while waiting for a reply, he and the chief engineer, an officer of 25 years' experience, re-examined the damaged mast to determine whether a cheaper, speedier method of removing the inner wood mast could be found. After discussing the problem for two hours they agreed that the ship repair company's proposal, regardless of the cost, seemed to be the only means of achieving a satisfactory repair.

Meanwhile, the ship's radio officer who had recently returned from a spell of duty in the U.S.A., during which time he had become keenly interested in Practical Ideation Techniques, examined the problem creatively. He carefully defined the problem, then applied various creative techniques to produce a series of ideas for solving the problem. Out of the numerous ideas conceived one stood out as the obvious solution to the problem.

When the radio officer explained his idea to the captain and chief engineer, both senior officers exchanged glances of amazement. The idea was too obvious. Drill a hole in the deck under the mainmast, tap it, screw in a hose coupling and then, by means of a length of hose connect the coupling to the nearest high-pressure water pipe, start up the appropriate pump in the engine room and use the pressure of water to raise the fallen mast.

Using this method, it took exactly 65 minutes to restore the wooden upper section of the mainmast to its former working position, and at no extra cost to the ship owner.