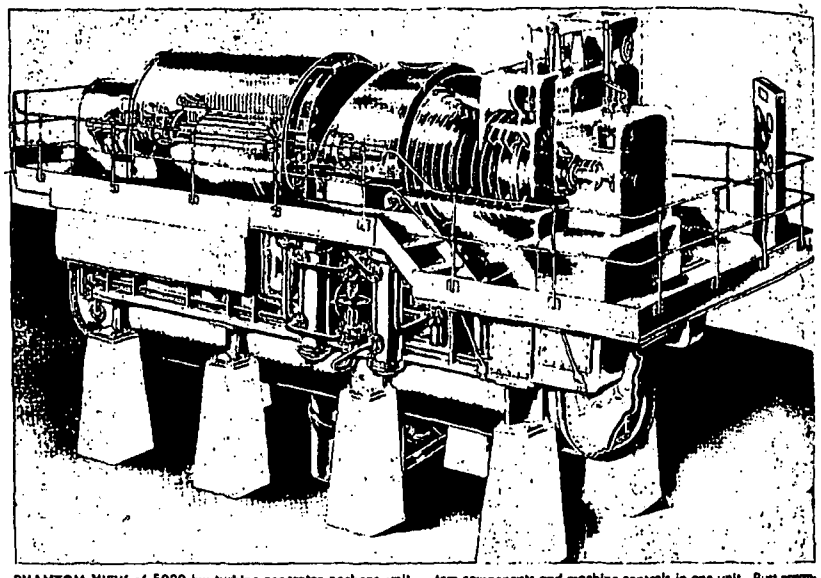


PHANTOM VIEW of 5000-kw turbine-generator package unit. Control simplified by locating steam condenser, lubricating-system components and machine controls in one unit. Rust preventives must be completely removed before adding first oil charge

preventive coatings applied by the manufacturer, and any dirt that may have found its way into the system, are completely removed before the regular lubricating oil is added. If not, these contaminants will reduce the normal life of the oil and may affect turbine operation. A new turbine lube system is properly prepared when turbine builder, operator and oil supplier pool their efforts.

General Inspection. After the turbine is in place and before any part of the cleaning job is started, the entire lubrication system should be thoroughly inspected. Carefully check for any peculiarities, such as air pockets or areas of poor drainage, which may cause trouble when the turbine is put in service.

This initial inspection will also tell the extent of the cleaning job required before oil or flushing fluid is introduced into the system. In addition to removing the thick rust-preventive film, wire brushing, blasting and sweeping are often necessary for removal of welding shot, chips, sand, etc. Throughout the cleaning process and in later steps of the work, use lintless wiping cloths. Lint accumulation from cleaning cloths has been known to cause plugged oilways after the unit is in operation.

Flushing the System. After the *preliminary cleaning the next step* is to send a charge of flushing oil through the lube system. Make provisions to prevent any of the flushing oil from entering bearings. This can be done best by installing closed flanges at bearing-oil inlets and connecting a bypass across each bearing. On small installations, or wherever this procedure cannot be justified, the bearing shells should be removed or rotated to prevent flow of oil through them. In rotating the bearing be careful that the flow of high-pressure flushing oil is not blocked.

It may be best to sectionalize piping and flush each section separately, depending on size and layout of the system and capacity of the pump used to circulate the flushing oil.

One of the reasons for flushing a system is to remove any rust preventive materials that may be present. If the manufacturer's rust preventive is not readily soluble in turbine oil, it should be removed before assembly. Choice of a solvent depends on the type of rust preventive. When it is oil soluble and can be flushed away, use a flushing oil with the same or lower viscosity *than the recommended* lubricating oil. For the latter method, it is best to select a flushing oil with the same type of rust inhibitor as the final oil charge. Use sufficient flushing oil so there will be continuous circulation with the auxiliary oil pump.

Heating the Oil. The circulating flushing oil should be heated to 125-180 F. Heating the oil above the maximum temperature to be expected when the unit is put in service is desirable because it expands the piping to a greater degree than is met with in service. This effectively loosens scale and other adhering material. For heating the flushing oil any of the following means may be used, with due precaution to prevent localized overheating of oil: (1) Pipe steam at a pressure of 3-5 psi to the water side of the main lubricating-oil cooler. (2) Install temporary heating coil *in the* lubricating-oil sump tank. (3) Install temporary heater in the piping system.

It is important that a filter or centrifuge be used continuously during the flushing operation. Where the system is not equipped with a purifier, install an auxiliary filter to remove suspended contaminants which would otherwise be carried through the system.

Circulation of hot flushing oil should be continued for a period varying from four hours for smaller units to 96 hours or longer for larger turbines. Following this flushing operation drain all oil from the system, taking particular care to drain all low points in the piping, coolers and governor mechanism. Remove any heavy solids that have been flushed into the oil reservoir. Inspect and clean the bearing pedestals and the governor hydraulic mechanism.

On small systems and those where no rust-preventive materials have been used the initial flushing charge may be the same type oil that will be used later as the lubricant. The procedure is similar to that already described.

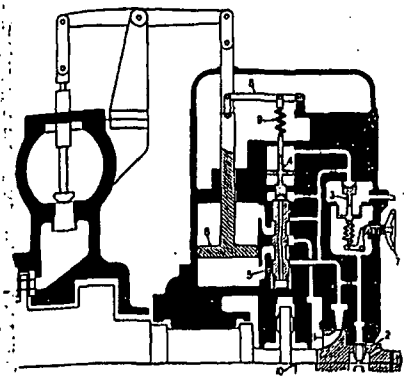
Displacement Oil Charge. To completely remove all flushing oil and any contaminants it may have carried into solution, it may be desirable to follow flushing with *a charge of displacement* oil. This decision should be left to the good judgment of the oil supplier and turbine engineer. Factors to consider include type and viscosity of flushing oil and general cleanliness of the system. Displacement oil should be the same type as the recommended lubricant. This oil is heated to 130-150 F and circulated for about two hours.

Since viscosity of the oil is often higher than the flushing oil, some contaminants that were not removed by the less viscous oil will be suspended and flushed out. Inspection of the centrifuge or filter at this time tells if the system is clean. If so, the blind flanges and jumpers that were initially installed may be removed and circulation continued through the bearings for an hour or two. During this circulating period, the governor mechanism should be operated to flush it completely.

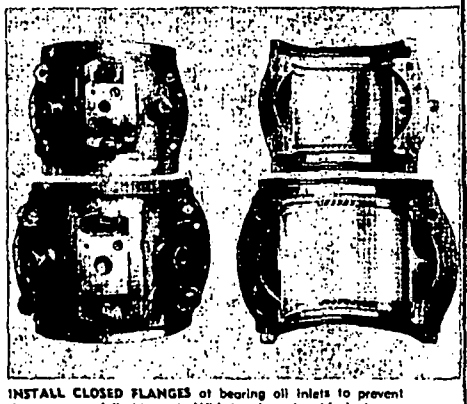
After this recirculation period, if practicable remove and inspect all accessible bearings; if they are in satisfactory condition, the system may be considered clean. During drainage, attention should once again be given to all low points in the system. Wipe out the oil reservoir with lintless cloths and remove any loose solids. Care at this point may save you time and trouble after the turbine is in service.

Experience has shown it is entirely satisfactory to operate a turbine for a period up to a few weeks on the displacement charge on systems where particular care has been taken during fabrication and erection. This procedure may be followed when laboratory tests indicate the displacement charge is in satisfactory condition with particular regard to viscosity and cleanliness.

Where operating requirements permit this schedule, the difficulties frequently encountered in operation of a new system can be worked out before the final lubricating oil is introduced.



STEAM GOVERNOR SHOWING: 1, 2: oil pumps; 3: pressure transformer; 4: relay piston pilot; 5, 6: servomotor relay & piston; 7: speed changer; 8, 9: lever and spring; 10: shaft



INSTALL CLOSED FLANGES at bearing oil inlets to prevent the entrance of flushing oil. With bearings thus blocked, connect a temporary jumper or bypass to allow lube-oil circulation

CORRECTION NOTICE

In the article, "Internal Conditions of Old Boilers Guide Water Treatment For New Units," Power, September 1948, pp 88-91, the following changes should be made:

On p 89, col 2, par 2, the last two sentences should read: "Aluminum silicate was also found in the analcite scale formed in Sept 1944. This indicated that the feedwater must have contained considerable suspended matter, as aluminum silicate in relatively small amounts would not normally remain as such very long in high-temperature, alkaline boiler water."

On p 90, col 2, second sentence of first complete paragraph as originally printed read: "But should silica removal prove necessary, this system of softening would provide therefor." This statement is in error and should be: "But should silica removal prove necessary, this system of *softening* would not provide therefor."