hopper, feeder, crusher, bucket elevator and belt conveyor unloaded and raised coal to the bunkers. In the new plant, complete new handling equipment is not being installed now. The existing hopper, crusher and elevator are used, and an additional cross-conveyor and belt conveyor installed to deliver coal to the new bunkers. Over the bunkers the conveyor is equipped with a self-propelled tripper.

When additional boilers are installed, a new hopper, crusher and elevator can be added to this coal-handling equipment and placed at the opposite end of the building. The old equipment will then be abandoned and the belt-conveyor drive changed to permit feeding it from the new elevator.

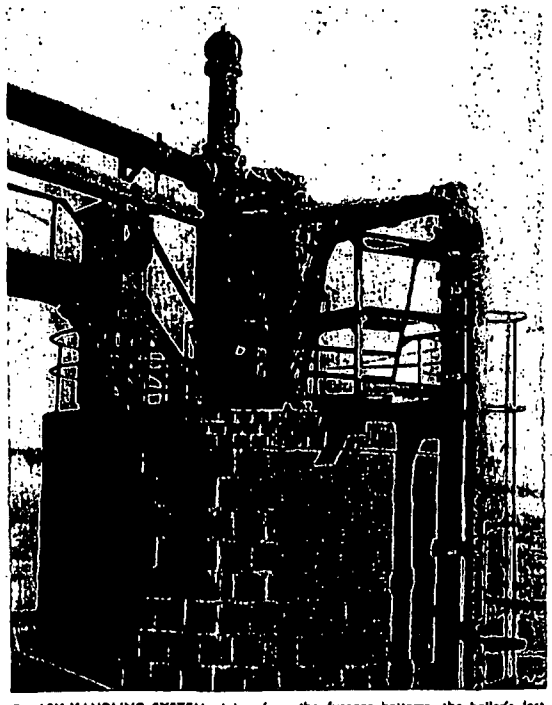
Bunkers of about 30-hr storage capacity are built with hopper bottoms and flat reinforced-concrete sides. Construction is somewhat more expensive than a suspended design, but it eliminates dead pockets. This advantage is important with high sulphur-content coal, which is apt to catch fire from spontaneous combustion if left in storage very long. From the bunker openings, coal discharges through automatic scales to the pulverizer feeders on the operating floor.

Ash Handling. Ashes, from furnace bottoms, boiler's last-pass hopper, and from dust-collector storage bins, are handled by a pneumatic conveyor system, discharging to a 100-ton tile storage tank. A steam ejector produces the vacuum. A mechanical blower was considered but the higher initial expense and maintenance costs would more than offset its lower operating cost.

Pushbutton stations, conveniently near the ash intakes, control a valve in the exhauster steam line of the conveyor system. Its operation is simple, clean and convenient.

Feed Pumps. Two high-pressure feed pumps, one turbine- and one motor-driven, have sufficient capacity each to supply both boilers. The turbine-driven unit normally operates when available on 170-psi steam and exhausts at 25 psi. The motor-driven pump operates to start the plant or when the turbine-driven unit is out for repairs.

Two low-pressure feed pumps in the new plant, both motor-driven, supply water to the old boilers. During low-pressure operation of the new boilers, the turbine-driven high-pressure pump was also used, operated at reduced speed. All feed pumps are in the basement directly under the deaerator. A story of the feedwater-treating system will be published in an early issue.



3 ASH-HANDLING SYSTEM. Ashes from the furnace bottoms, the boiler's last-pass hoppers and from the dust-collector storage bins are handled by a pneumatic conveyor system, which discharges to a 100-ton storage tank made of tile

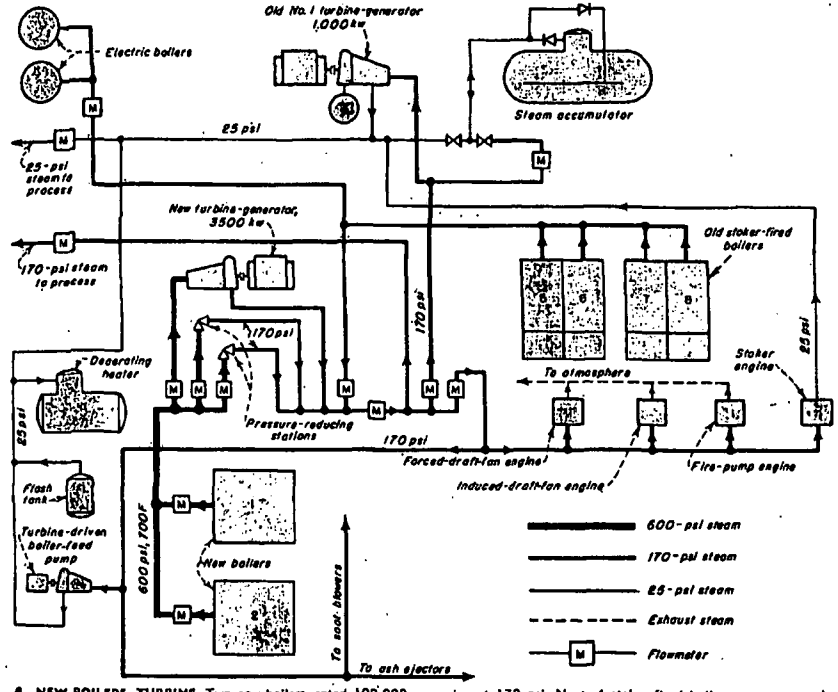
Turbine Generator. Built in Switzerland, the turbine-generator is an impulse-reaction backpressure unit, rated at 3500 kw at 600-psi 700-F inlet-steam conditions and 170-psi exhaust. Power is generated at 6600 v, 3-phase, 60 cycles.

The governing system is interesting. A pump geared to the turbine shaft and equipped with a spring-loaded relief valve supplies control and lubricating oil at constant pressure. A pressure connection, from the pump discharge through an adjustable orifice, goes to individual piston operators on the steam-inlet valves. A bleed valve, operated directly by the governor weights, controls pressure in this line. A drop in speed closes this bleed valve, thereby allowing pressure at the inlet valves to build up and open them. These double-seated, balanced valves are spring-loaded so they open in sequence as oil pressure rises. The entire system is simple and free of mechanical linkages.

The turbine shaft is sealed where it passes through the casing with labyrinth glands, through which an appreciable quantity of steam is permitted to pass. This steam is piped to a small surface condenser in the treated-water line where most of the heat is recovered. The generator has a closed air-cooling system in which raw water is used in the air cooler.

Meters and Controls. As the diagram on p 67 shows, a fairly complete system of steam-flow meters was installed. Consideration was given to this in making the piping layouts to provide suitable orifice locations. The boilers have automatic control.

As mentioned, the old plant included a steam accumulator, connected between the 170- and 25-psi mains. By absorbing temporary surpluses of 170-psi steam and making up deficiencies in the supply of 25-psi steam, the accumulator served to iron out fluctuations in the total process demand. This permitted operating the old stoker-fired boilers at fairly constant load, an important factor in their performance, but less so with the new installation. But the accumulator was useful enough to warrant continuing it in service, which required a slight departure from normal operation.



4 NEW BOILERS, TURBINE. Two new boilers, rated 100,000 lb per hr, 600 psi and 700 F, were installed and put in service at 170 psi. Next, 4 stoker-fired boilers were removed; 3500-kw 600-psi turbine-generator was put in their space

With the accumulator in service the boilers can operate at constant load. It is necessary, however, to set the load manually by adjustment of the master selector valve. Pressure in the 600-psi header is then controlled by the 600- and 170-psi reducing valves, which operate from a pressure controller connected to their inlet side. Pressure in the 170-psi system is under control of the accumulator, which automatically accepts steam from the 170-psi line or delivers it to the 25-psi line to maintain constant pressure.

When the accumulator is out of service provision is made for conventional operation—that is, with the 600-psi pressure controlled from a master pressure controller operating on the boiler firing rate. Reducing valves then control the 170-psi pressure through a pressure controller connected to their outlet side.

Electrical Equipment. All motors of 1-hp rating and over are operated on 550-v 3-phase current, smaller motors on 220-v 3-phase. All 550-v motor starters, except for the high-pressure feed pump, are combination fusible type, located in a single room. Besides providing convenient maintenance, combination magnetic contactors with fused disconnect switches proved economical since they serve to limit short-circuit currents to values that fuses can handle safely.

The starters are divided between two buses, each supplied by two feeders from the main bus. A fifth feeder supplies the motor on the high-pressure feed pump.

Motors for induced-draft fans, forced-draft fans, pulverizers and coal feeders are interlocked so they must start in the order named. Failure of one motor automatically stops those succeeding it in the sequence given.

Auxiliary equipment is divided between the two buses so a fault on one bus will not cause a complete plant shutdown.

An oil circuit breaker of 250,000-