



Textile industry has always used considerable steam for process, and in the latest plants a large power source is needed for modern drives

► THE NEW BLEACHERY DIVISION of the Springs Cotton Mills at Grace, S. C. represents one of the largest and most modern plants of its kind. Characteristic of the progressive thinking is a large-scale, fully equipped power plant, whose entire installation was engineered for an ample supply of steam and water.

Steam supply comes from two 650-psig 750-F steam generators of 150,000-lb-per-hr capacity. Furnace volume is 9000 cu ft, total heating surface is 10,673 sq ft, and heat release, at normal load, 21,600 Btu per cu ft per hr. An economizer of 2618 sq ft and a tubular air heater of 24,100 sq ft are provided. A system of pulverized-coal firing is used with oil as a second fuel choice.

A main header receives the 650-psig 750-F steam for distribution within the power plant. Coming off this header

are a 15,000-kw turbine-generator, a turbine-driven boiler-feed pump, and a series of six pressure-reducing stations.

Process steam goes out at two pressure levels, 170 and 50 psi. All steam for the 170-psi service comes through two of the six pressure-reducing stations and from a bleed point on the turbine-generator unit.

A second bleed point on the turbine unit provides steam at 50 psi and, coupled with output from three pressure-reducing stations, operating off the 650-psi header, handles process-steam requirements at this level.

The 50-psi header acts as a steam source for the sixth pressure-reducing station to deliver steam at 5 psi. This 5-psi steam along with the 5-psi exhaust from the boiler-feed-pump turbine acts as a heating source for general plant service and for raising the temperature of the deaerator within the power house.

Bleachery Connections. An underground tunnel about 250 ft long connects the power plant with the bleachery. In this tunnel are (1) 12-in. line for condensate returns (2) 24-in. line delivering the 50-psi process steam (3) 10-in. line for the 170-psi process steam (4) 20-in. cold-water process line. This tunnel extends under the bleachery, and rises from the steam lines

and cold-water process go up at various points within the bleachery.

In addition to the large steaming requirements an even larger need for process water must be met. A raw water pumping station, on the Catawba river, pumps water $\frac{3}{4}$ of a mile to a reservoir that contains 20,000,000 gallons of raw water.

Water for the power plant flows from this raw-water reservoir through a 22,500-sq-ft condenser as circulating water. After its service, as a condensing medium the raw water discharges to a sluice. A second pumping station takes water from the sluice and directs it to the filter plant.

After filtering, water enters a 5,000,000-gallon reservoir that acts as a supply source for process water and for a 150,000-gallon tank assigned for protection.

All filtered water for power plant service continues to a double unit of bonaccours-zolite water softener. After here it goes to a makeup and storage tank. This last-named tank supplies required water to the 450,000-lb-per-tray-type deaerator.

The deaerator, in turn, ties into the suction line of two 4-stage boiler pumps, capable of delivering water 875 psi to the boiler drum.

Electrical Load. Most of the process

ing machines use dc motors. The electrical energy generated by the power-plant turbine at 13,800 v, 60 cycles, is stepped down for plant distribution to

600 v, 60 cycles. Off this plant distribution bus three motor-generator rooms, spotted at convenient load centers throughout the bleachery, convert the

available ac to dc through m-g sets and necessary switchgear.

Following table lists the principal bleachery power-plant equipment.

Springs Cotton Mills, Grace, S. C.

STEAM GENERATORS AND AUXILIARIES:

Hall's, 2,500,000 lb per hr, 650 psi, 750 P.	
Superheaters, 2, loops tube, 150,000 lb	
per hr	
Burner, a combination oil and pulver coal,	
Burner elements, 4, steam burners, steam	
accommodating	Babcock & Wilcox Co.
Reboilers, 2, tube type, 34,100 sq ft,	
Economizers, 2, continuous loop, 2018	
sq ft	
Generators, 4, direct firing, 2215A,	
size all	
Heat blowers, 18; 14 rotary units,	
and 4; 4 retrievable units, 650	
gal	
Water columns, 2, reflecting, high	Diamond Power Specialty Corp.

and low alarms
Safety valves, 8
Steam water
Ash-disposal system
Coal-handling system
Cooling
Dust collectors, mechanical, 630,000 cfm.
Hazardous waste
Heat transfer fluids, 2
Horizontal, double windup, double inlet, outlet damper control
Inlet, 100 hp, 1700 rpm, constant speed
Induced draft fans, 2
Inlet, 100 hp, 1700 rpm, constant speed
Inlet motors, 2
Inlet, 100 hp, 800 rpm, constant speed
Inlet, 20 ft high, 100 hp, 1700 rpm, constant speed

Cumulated Safety Valve Division
Yarn-Waring
Hydro-Ash Corp.
Limb-Belt Co.
Richardson-Riley Co.
Western Precipitation Corp.
B F Sturtevant Co.
Washinghouse Elevator
B F Sturtevant Co.
Westinghouse Electric Corp.
Seaboard & Wilcox Co.

ELECTRIC GENERATORS AND AUXILIARIES.

Vertical-generators, 1, 18,750 kw, 3600 rpm.	Westinghouse	Elec Corp
Oil pit, condensing automatic and nonautomatic extraction		
coolers, 2	Westinghouse	Elec Corp
15,000 sq ft cooling surf for 35,000 cu ft per min, parallel flow		
Oil cooler, 1 pair, twin units	Westinghouse	Elec Corp
Shell and		
Condenser, tube type	Westinghouse	Elec Corp
12,000 sq ft, 2-pass, Admiralty brass tubes		

WATER-TREATMENT SYSTEM AND AUXILIARIES

Water softeners, carbonaceous zeolite, double unit.....	Cochrane Corp
Chemical pumps, 3.....	Milton Roy Co
75% phosphate; sodium sulphate for internal treatment.....	
Deaerator, 1, tray type, 450,000 lb per hr.....	Cochrane Corp
Stage feedwater heater, 1.....	Lummus Co
Continuous blowoff heat exchanger.....	Cochrane Corp

PRESSURE REDUCERS, CONTROLS, INSTRUMENTS

Pressure reducers, 6	Balley Meter Co
1, 121,000 lb per hr, 450-50 psi; 1, 50,000 lb per hr, 450-170 psi; 1, 518,000 lb per hr, 450-170 psi; 1, 50,000 lb per hr, 50-3 psi	Balley Meter Co
Deaerating stations, 2	
1, 3-unit, 170 psi; 1, 3-unit, 50 psi, spray type	
Combustion controls, feedwater controls	
Overseers, boiler temp, steam and water temp	Balley Meter Co
Flow levels, steam and water pressures	
Indicators, flow	
Indicators, level	Varnell-Waring Co

PUMPS AND COMPRESSORS:

Miller feed, 3-4 stage, 3600 rpm, 875 psi..... De Laval Steam Turb Co
 Richard-Jones motor, 1,600 hp, 3600 rpm..... Westinghouse Electric Co
 1,600 hp, 3600 rpm..... De Laval Steam Turbine Co
 Vertical pumps, 2, H-J Hytor..... Nash Engineering Co
 1110 gpm at 10 min at 20-in. vacuum, 15 hp, 1150 rpm.....
 1110 rpm motors, 2..... Westinghouse Elec Corp
 Vertical pumps, 2, constant speed
 1100 gpm, 1600 rpm, 875 psi, 1800 pumps..... De Laval Steam Turbines Co
 1100 gpm motors, 2, 1600 rpm..... Westinghouse Elec Corp
 Vertical condenser pumps, 4..... De Laval Steam Turbine Co
 1175 gpm, 180-ft head, 1750 rpm

Process condensate pump motors, 4.....Westinghouse Elec Corp
15 hp, 1750 rpm
Ash pump motor, 1, 1000 rpm, 880 rpm, 109-11 head.....Morris Machine Works
Ash-pump motor, 1.....Westinghouse Elec Corp
Boiler feed pump motor, 1, 1000 rpm, 1750 rpm.....Ingersoll-Rand Co
Sludge pump, 1, 1000 rpm, 253 ft, 1780 rpm.....Ingersoll-Rand Co
B motor, 1, 100 hp, 1780 rpm, const speed.....Westinghouse Elec Corp
Booster fire pump, 1, 1000 rpm.....Peerless Pump Div, Food Machinery Corp
Boiler feed pump motor, 1, 1000 rpm, 40-42 psi head.....Ingersoll-Rand Co
Booster fire-pump turbine, 1, 4000 rpm, 1000 rpm, 100 psi.....Turbine Div, Worthington Corp
B motor, 1, 1750 rpm, 530 psi, noncondensing
Air compressors, 2, 85-1, 747, 40 rpm, 100 psi.....Ingersoll-Rand Co
Air compressor motors, 2.....Crosby Wheeler Elec Mfg Co
20, 1250 rpm
Hotwell pumps, 2, 370 gpm, 2-stage, 1150 rpm
Hotwell-pump motors, 2, 40 hp, 1160 rpm.....Westinghouse Elec Corp
Vacuum-cleaning system pump, 1.....U. S. Hoffman Machinery Corp

THE
STANDARD
TIME.

TANKS:	
Storage tanks, 3: 1, 19 ft dia. 18 ft high, surge & makeup, 38,200 gal; 2, 10 ft dia, 28 ft & in. long, fuel oil, 13,200 gal; 2, 8 ft, 6 in. dia, 20 ft long, condensate storage, 8,650 gal.....	R D Cals Mfg Co
Vacuum tank, 1, 4 ft dia, 6 ft high.....	
Blowoff tank, 1, 8 ft dia, 16 ft long, 2,960 gal.....	
Compressed-air receiver, 2, 3 ft, 6 in. dia, 10 ft high.....	
	Ingersoll Rand Co

STATION ELECTRICAL EQUIPMENT.

12,000-v switchgear and control.....	Westinghouse Elec Corp
600-v switchgear and control.....	R E Upcraft Mfg Co, Inc
Transformers, 1.....	
1, 75-kva lighting; 1, 50-kva lighting	
Transformers, 4.....	General Elec Co
2, 1500-kva station service; 2, 7500-10,000 kva	
Control, storage battery.....	Electric Storage Battery Co
1, 60 cell, 12 v, RC, 60 P; 1, 50. Exide charge control with	
copper oxide cathode.....	
Potheads.....	Q&W Electric Specialty Co
350-v motor controls and.....	Westinghouse Elec Corp
350-v motor controls and.....	
Cable, synthetic and oil base.....	General Electric Co & Obentis Co
Wire and cable, varnished-cambril insulated.....	General Electric Co
Wire.....	General Electric Co & American Steel & Wire Co
Interphone system.....	Bromberg-Carlson Co

PIPING, VALVES AND ACCESSORIES:

Piping.....	Orlanel Co, Inc
Piping, condenser water.....	American Locomotive Co
..... hot steam, wetted steel.....	
Couplings for condenser-water piping.....	Dresser Mfg Div
Valves.....	Lunkenheimer Co
150-psi boiler nonreturn valves; feed-line stop and check valves;	
hot water valves; 1500, 600, 150 and 150 psi miscellaneous	
Valves, check.....	Williams Gauge Co
Ballar-feed pump-discharge; makeup-water	
Valves, motor operated.....	Chapman Valve Mfg Co
Condenser-water and steam	
Valves.....	Atwood & Merrill Co
Nonreturn on automatic and nonautomatic extraction lines	
Pressure-relief valves.....	Manning, Maxwell & Moore, Inc
Liquid-level control valve.....	Cochrane Corp
Valves.....	
Expansion joints, copper, corrugated.....	E B Badger & Sons Co
Traps, 1500 psi.....	Varnell-Waring Co
Traps, low-pressure.....	Armstrong Machine Works
Traps, steam.....	Cochrane Corp
Strainers, fuel oil.....	Cochrane Corp
Press gauges, industrial thermometers, Manning, Maxwell & Moore Inc	

BUILDING:

Ventilators, roof.....	Swartwout Co
Unit heaters.....	Grinnell Co, Inc
Conveyors.....	Trans Co
Turbine room crane.....	Whiting Co

CONSULTING ENGINEERS..... Robert A. C