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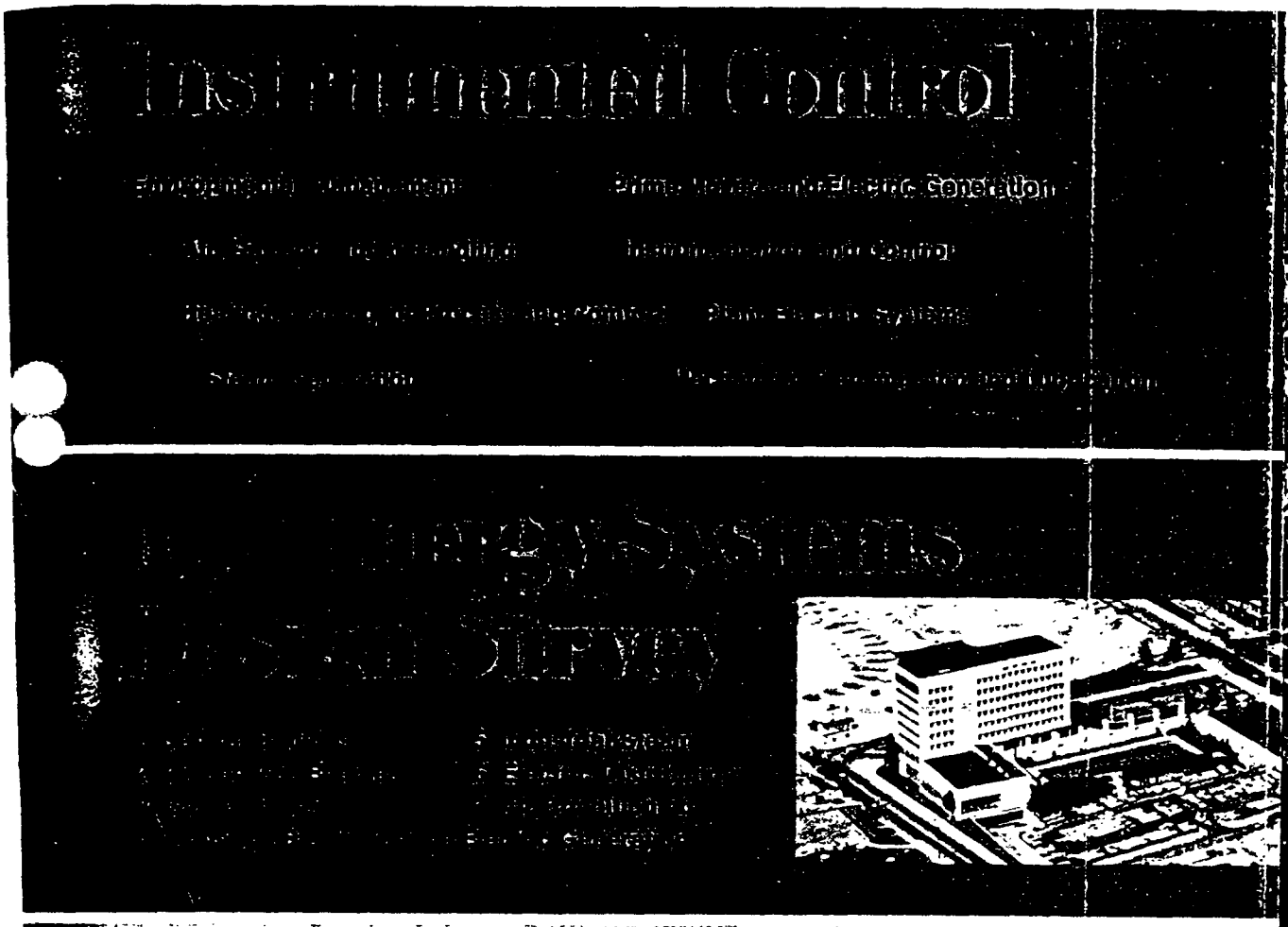
Power



Equipment and Design Aids Roundup

Presenting a condensation of one of the most useful and popular features the year-round. Equipment News items and Manufacturers' Data announcements appearing each month call for careful sifting through several hundred releases coming across our desks or collected during our visits to manufacturing facilities and engineering convention shows. Selection of announcements for each issue followed review by each editor of those items falling within his particular area of technical expertise, so that both departments—Equipment News and Manufacturers' Data—represented a balanced selection of material covering the entire spectrum of interest of our readers. Brief descriptions highlighted for you the significant features worth noting.

FOSSIL-FUELED CENTRAL STATIONS

Orders for new units gr

By **Robert G Schwieger**, Assistant Editor

In this age of burgeoning population, every large U.S. industry seems to have one major crisis each year. Electric utilities are no exception. If it is not tight money holding back new plant construction, or a shortage of trained personnel to design, construct or operate plants, it is some other problem that has yet to emerge.

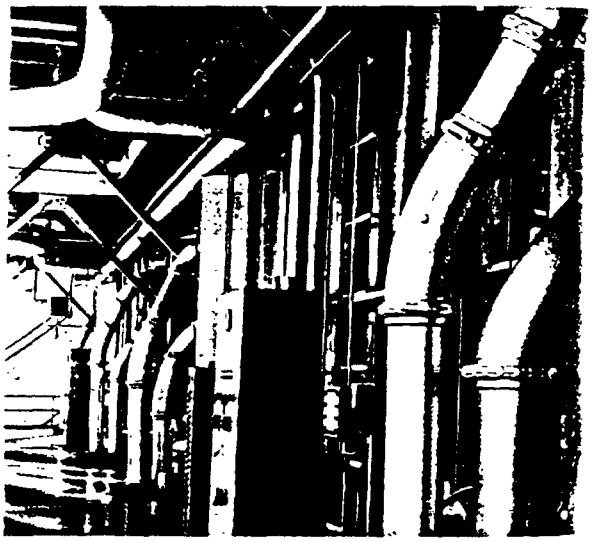
In recent years environmentalists have applied the pressure, clamoring for antipollution legislation. They hoped to curtail the number of new fossil-fueled plants and also reduce pollution from existing installations. Their intentions, sincere in most cases, attracted much public support and eventually the necessary legislation was enacted.

Unfortunately, however, the environmentalists' panacea appears to have contributed to two new crises: power shortages and, more serious, an energy shortage. Although selected U.S. projects in this year's survey of fossil-fueled central stations (next four pages) have a combined potential of 21,400 MW—an impressive figure in almost every other country—it is not enough to satisfy the ever-growing demand of American industry and the public.

Delays in plant construction resulting from public intervention will undoubtedly foster power shortages in major cities for years to come. This becomes obvious when you realize it takes 3.5 to 5 years to install a large plant.

Pressed by local authorities to reduce sulfur-oxide pollution, utilities and large industrial companies have been converting their coal-burning boilers to handle oil and/or gas (POWER, April 1970, pp 27-31). This has placed further pressure on oil and gas suppliers to increase production of low-sulfur fuel, already in short supply.

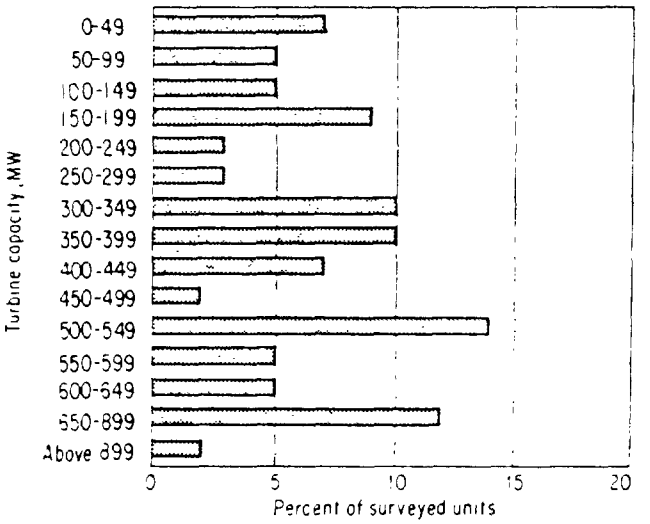
Just how long the oil crisis will last depends on several variables. Among them: (1) Time involved in proof-testing and modifying prototype stack-gas sulfur-removal syste These will permit burning of high-sulfur coal and without adding to pollution. (2) Availability of low-su oil from the large Mideast reserves. (3) Rapidity w which large-scale oil-desulfurization plants can be insta (4) Number of oil-fired stations that will be committed future years.



Burner level in a typical pulverized-coal-fired central sta shows some of the controls needed in most modern pl

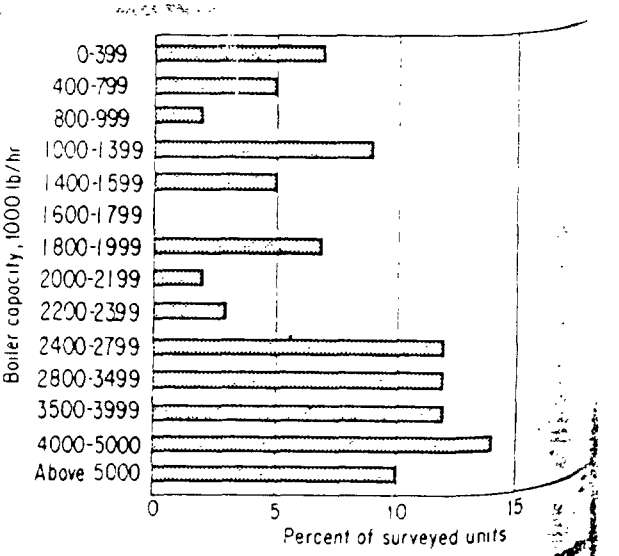
Gas shortages result from different problems. Stea shrinking gas reserves (known U.S. reserves will last o 12-14 yr) and availability only on an interruptible b eliminate gas as a base fuel for most utilities, which m design units for 30-yr life and project generation pote

Turbine size



Distribution of turbine sizes shows 40% of the units exceed 500 MW. All new installations have only one turbine/generator

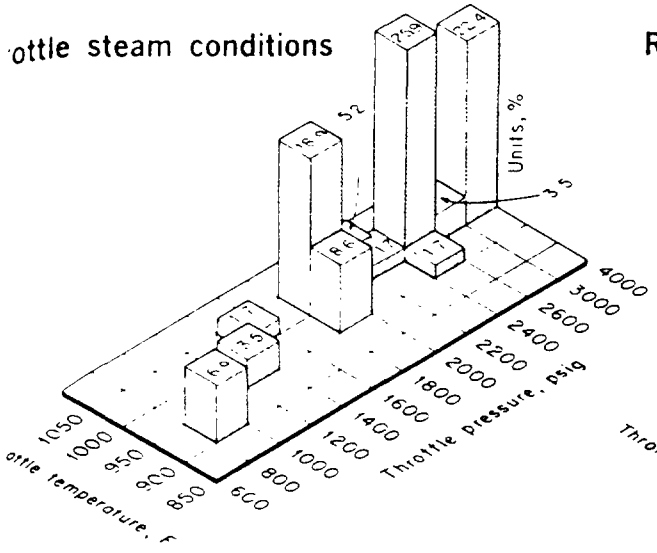
Capacity of boilers



Boiler ratings reflect the central station's turbine/generator capability. Larger steam generators loom on the horizon

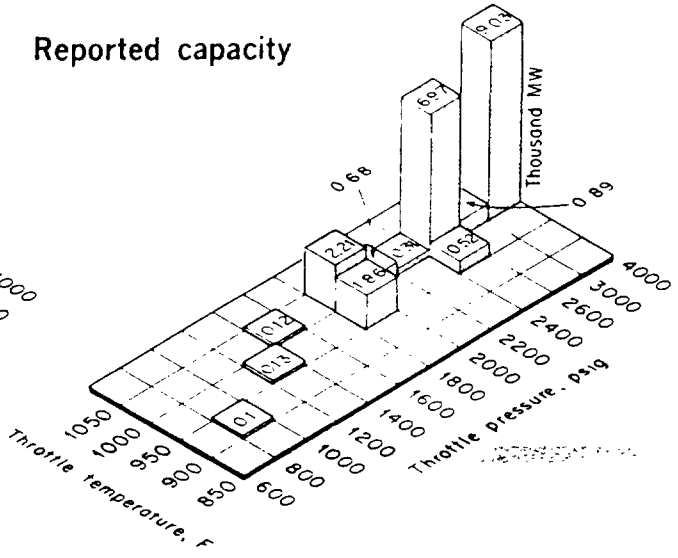
t where will the fuel come from?

ottle steam conditions



tral-station survey reveals many units currently on order be operating within the supercritical-pressure region

Reported capacity



Capacity tabulated this year amounts to nearly 23,000 MW. Municipal and cooperative plants account for 10% of total

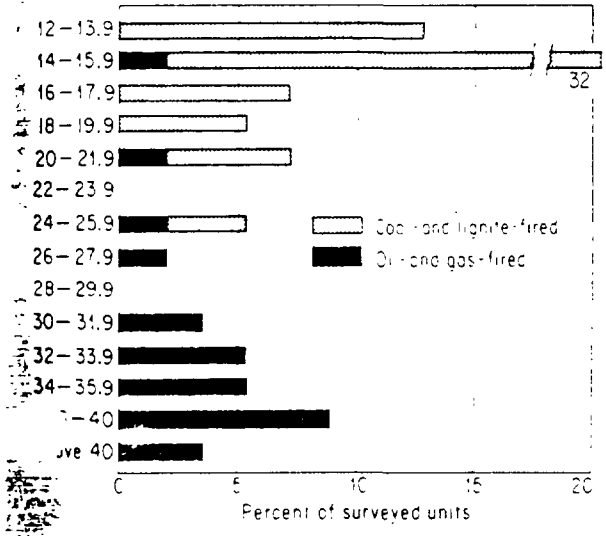
s in advance. Suppliers attribute this shortage to strin- rnment price controls.

uld coal supplies be taken for granted. Even if r coal could be burned in some areas, it would be cult to obtain. For example, Tennessee Valley Author- reported a two-week supply as of early August. Prob- stems from the recently enacted mine safety laws. As a ult, several companies have found it more economical close older mines than to equip them to meet new stan- ds. Further, mine openings are being delayed by tight ney and labor problems.

Should coal production fail to keep pace with demand in coming years, supply problems will get worse. Note the large number of coal- and lignite-fired units represented in the survey—36 in all, roughly 62% of the projects.

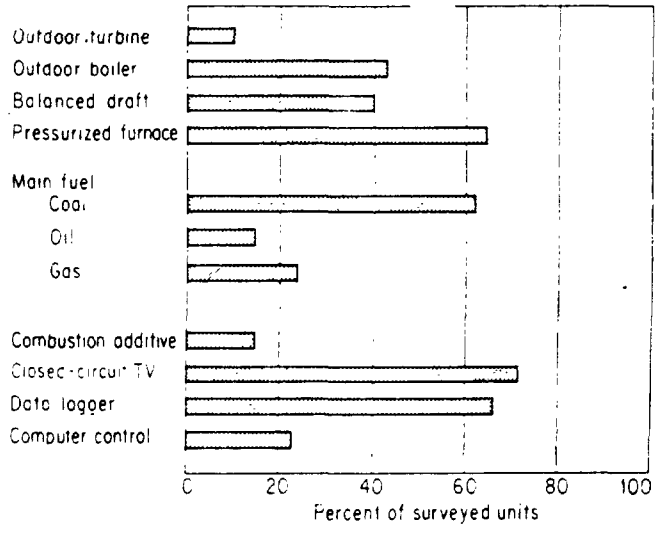
Data on instrumented control, theme of the 1970 survey, are accented with a gray tint (p S-6). Since final selection of control equipment is generally firmed up later in the design phase, manufacturers' names are not available in all cases. Note the trend to increased reliance on instruments and controls. Examples: Thirty-four of the 51 projects reported will employ data loggers, far above last year's 18%. And varying degrees of computer control will be employed in about 23% of the plants, a 7% increase over 1969.

rnace heat release



release rates show a wide spread between oil- and gas- units and those that use lignite or bituminous coal

Plant features



Design philosophy is reflected in the choice of equipment. In many cases, major plant controls are yet to be selected

FOSSIL-FUELED CENTRAL STATIONS

Materials limitations s

Each project listing covers four pages

PROJECT	COMPANY	PLANT NAME	LOCATION	CONSULTING ENGINEER	Unit number	Year first commercial operation	Unit capacity, MW	BOILERS			
								Capacity, 1000 lb/hr	Throttle pressure, psig	Throttle temp, F	Reheat temp, F
1	Duke Power Co	Belews Creek	Walnut Cove, N. C.		1,2[1]	74,75	1080	7298	3500	1000	1000
2	Kansas City Power & Light Co[58]	La Cygne	La Cygne, Kan.	Ebasco Services Inc	1	73	807	6503	2840	1010	1005
3	Cincinnati Gas & Electric Co[58]	Conesville	Conesville Ohio	Black & Veatch	4	73	770	5900	3500	1000	1000
4	Detroit Edison Co	Monroe	Monroe Mich.		1,4[1]	70,73	752	5717	3690	1000	1000
5	Southern California Edison Co	Ormond Beach	Ormond Beach, Calif	Bechtel Corp	1,2[1]	71,73	750	3600	3590	1005	1000
6	Alabama Power Co	Barry	Bucks Ala.	Southern Services Inc	5	71	700	4690	3500	1000	1000
7	Carolina Power & Light Co	Roxboro	Roxboro N. C	Brown & Root Inc	3	73	685	5159	3510	1000	1000
8	Allegheny Power System Inc	Harrison	Shinnston, W. Va.	Gibbs & Hill Inc	1,2,3[1]	72 73,75	650	4900	3540	1000	1000
9	Duke Power Co	Marshall	Terrell N C		4	70	647	4210	3590	1000	1000
10	Ohio Edison Co	W H Sammis	Stratton Ohio	Commonwealth Associates Inc	7	71	623	4630	3735[3]	.005[3]	1005[3]
11	The Dayton Power & Light Co	J M Stuart	Aberdeen Ohio	Ebasco Services Inc	4	74	600	4400	3500	1000	1000
12	Gulf States Utilities Co	Sabine	Bridge City Texas	Mid-Valley Inc	4	73	586	4021	3675	1000	1000
13	Union Electric Co	Labadie	Franklin County Mo.	Bechtel Corp	1,2,3,4[1]	70 71,72 73	573	4020	3500	1000	1000
14	Duke Power Co	Cliffside	Cliffside, N. C.	Bechtel Corp	5	72	572	4060	2400	1000	1000
15	Allegheny Power System Inc	Hatfield's Ferry	Masontown, Pa.	United Engineers & Constructors, Inc	2,3[1]	70,71	550	3325	3500	1000	1000
16	Texas Electric Service Co	Permian Basin	Monahans Texas	United Engineers & Constructors, Inc[11]	6	73	540	3800	2400	1000	1000
17	Northern Indiana Public Service Co	Michigan City	Michigan City, Ind	Sargent & Lundy	12	73	522	2220	3500	1000	1000
18	Dallas Power & Light Co	Lake Hubbard	Dallas, Texas	Bechtel Corp	2	73	515	3825	2400	950	950
19	Kentucky Utilities Co	Ghent	Ghent, Ky.	Sargent & Lundy	1	74	511	3800	2400	1000	1000
20	The Hydro-Electric Power Commission of Ontario	Nanticoke	Port Cover, Ont., Can		2	72	500	3600	2450	1000	1000
21	The Hydro-Electric Power Commission of Ontario	Lambton	Vic of Sarnia Ont Can.		1,2,3,4[1]	70,70,71	500	3600	2450	1000	1000
22	Mississippi Power Co	Jack Watson	Gulfport Miss.	Southern Services Inc	5	73	500	3620	2400	1000	1000
23	New England Power Co	Brayton Point	Somerset Mass	Charles T Main Inc	4	73	460	3250	3890	950	950
24	Carolina Power & Light Co	L V Sutton	Wilmington, N C	Brown & Root, Inc	3	72	446	3100	2520	1000	1000
25	Kentucky Utilities Co	E W Brown	Burgin, Ky	Sargent & Lundy	3	71	409	2025	2400	1000	1000
26	Long Island Lighting Co	Northport	Northport, N Y.	Ebasco Services Inc.	3	72	380	2550	3520	1000	1000
27	Baltimore Gas & Electric Co	Herbert A Wagner	Anne Arundel Cty., Md	Gilbert Associates Inc	4	72	378	2792	3390	950	950
28	Connecticut Light & Power Co	Montville	Uncasville, Conn.	Bechtel Corp	6		375	2806	3890	955	955
29	Texas Electric Service Co	Eagle Mountain	Ft. Worth, Texas	Gibbs & Hill Inc	3	71	356	2535	3800	950	950
30	Alabama Power Co	Barry	Bucks Ala.	Southern Services Inc	4	70	350	2569	2400	1000	1000
31	Public Service Co of Colorado	Comanche	Pueblo, Col.	Stearns-Roger Corp	1	73	350	2534	3400	1000	1000
32	Public Gas & Electric Co[58]	San Juan	Farmington, N M	Stearns-Roger Corp	2	73	345	1510	1965	1005	1005
33	Minnesota Power & Light Co.	Clay Boswell	Cohasset, Minn.	Ebasco Services Inc	2	73	324	2472	2400	1000	1000
34	Central Power & Light Co	Nueces Bay	Corpus Christi, Texas	Sargent & Lundy	7	72	324	2283	2000	1000	1000
35	Louisville Gas & Electric Co	Mill Creek	Kosmosdale, Ky.	Pioneer Service & Engineering Co	1,2	74	321	2325	2400	1000	1000
36	Calgary Power Ltd	Sundance	Lake Wabamun Alb. Can	Montreal Engineering Co Ltd	1,2[1]	70 74	308	1395	2250	1005[3]	1005[3]
37	Potomac Electric Power Co	Benning	Washington, D C	Bechtel Corp	6	72	289	1871	965	950	950
38	Southern Indiana Gas & Electric Co.	Culley	Newburgh Ind.	Brown & Root Inc	3	73	240	850	965	1005	1005
39	Empire District Electric Co	Asbury	Joplin, Mo.	Black & Veatch	1	70	210	1425	1800	1000	1000
40	Carolina Power & Light Co	Asheville	Skyland N C	Brown & Root, Inc	2	71	196	1400	1890	1000	1000
41	Delmarva Power & Light Co	Indian River	Millsboro Del	United Engineers & Constructors Inc	3	70	150	1061	1800	1000	1000
42	Newfoundland & Labrador Power Commission	Hardwood	Hardwood Mtns. Can.	Shawmont Resources Joint Venture	1,2[1]	70	150	750	1900[3]	1005[3]	1005[3]
43	Saskatchewan Power Corp	Boundary Dam	Estevan Sask. Can	Montreal Engineering Co Ltd	3	70	150	750	1900	1005	1005
44	Public Service Electric & Gas Co	Linden	Linden N J		4	72	86 5	1400	1000	1000	1000

MUNICIPAL AND COOPERATIVE INSTALLATIONS

45	San Antonio Public Service Board	Calaveras	San Antonio, Texas	Black & Veatch	1	72	436	3019	3620	1005	1005
46	San Antonio Public Service Board	Calaveras	San Antonio, Texas	Black & Veatch	2	74	436	3051	3620	1005	1005
47	Tennessee Valley Commission	Allen	Memphis, Tn	Black & Veatch	3	73	330	1755	1890	1000	1000
48	Owensboro Municipal Utilities	Elmer Smith	Owensboro, Ky	Black & Veatch	2	73	265	1300	2100	1000	1000
49	Austin Electric Department	Holly Street	Austin, Texas	Brown & Root, Inc.	4	74	132	1100	1965	1005	1005
50	Kansas City Board of Public Utilities	Quindaro	Kansas City, Kan	Burns & McDonnell	3	72	136	1125	1800	1000	1000
51	Brush Electric Power Corporation	Brush Beattie & Miller	Colson, Texas	Tegett & Lee	2	72	65	870	1515	1000	1000
52	Lafayette Utilities System	Doris Bonin	Lafayette, La	May Engineering	2		70	925	1800	1005	1005
53	John W Speaker Light & Power Dept	W H Dorman	San Marcos	Burns & McDonnell	2	72	60	630	1250	950	950
54	South Mississippi Electric Power Association	Moselle	Moselle, Miss	Burns & McDonnell	1,2,3[1]	70	59	704	1250	950	950
55	Austin Utilities	Northeast	Austin, Minn	Black & Veatch	1	70	58	370	870	900	900
56	City of Ames (Iowa)	Ames Light & Power	Ames, Iowa	Stearns-Roger Corp	6	71	55	370	850	900	900
57	Moorhead Public Service Department	Main Ave	Moorhead, Minn.	P.O. Thomas			45	250	820	905	905
58	Morgan City Municipal Electric Plant		Morgan City, La	Barnard & Burk	1	70	20	100	950	900	900

MANUFACTURERS

See page 5-5 for key

AC - Allis-Chalmers Mfg Co
AE - Babcock Power Inc
ABC - The Babcock & Wilcox Co
ACC - Automation Inc
AT - Atlas Industrial Manufacturing Co
BW - Bigelow-Liptak Corp
BF - Bolting Fabricators
BE - Bowen Engineering Inc
BM - Bowen Mechanical Inc
BW - Brown Boveri Corp
BP - Burnham Products

BPP - Bruce Peebles & Co Ltd
BU - Byron Engineering Co Inc
CW - Cannon & Wilson Co
CWL - Cockburn & Wilson Ltd
CAP - C-A Parsons Ltd
CE - Combustion Engineering Inc
CEC - Combustion Engineering-Superheater Ltd
CF - Connelly Containers Inc
CO - Continental Boiler Co
CGE - Canadian General Electric Co Ltd
CHM - Chemico Water Co
CR - Combustion Engineering Corp
CCC - Crane Co
CV - Cleaver-Brooks Div Aqua-Chem Inc
CWE - Canadian Westinghouse Co Ltd
DAV - Davis Engineering Ltd
DL - Detroit Stoker Co

DP - Diamond Power Specialty Corp
ED - Erie City Iron Works
EM - Electric Machinery Mfg Co
Sub of Worthington Corp
F - The Foxboro Co
FAA - The Fly Ash Arrester Corp
FS - Fischer & Porter Co
FD - Forney Engineering Co
FW - Foster Wheeler Corp
FWC - Foster Wheeler of Canada Ltd
GE - General Electric Co
GEE - The General Electric and English Electric Companies
General Electric Co Ltd, English Electric Co Ltd and Associated Electrical Industries Ltd

GF - Green Fuel Economizer Co Inc
GW - Graver Water Conditioning Co
H - Honeywell Inc
HAP - Hayden-Apico
HCC - Computer and Instrumentation Div of Hagan Electric Corp
HIC - Howell Instruments, Inc
HCP - Hayden Parsons
HT - Hungerford & Terry Inc
IBM - International Business Machines Corp
IN - Infilco Inc Div Gen Amer Trans Corp
IPE - Industrial Process Engineers
JR - Jorgenson Rand Co
K - Kimpro Water Treatment Co
KC - Koppers Co, Inc
LA - The Louis Allis Co, Inc

BOILERS					FURNACE							FORCED-DRAFT FANS						INDUCED-DRAFT FANS						PROJECT
Surface, 1000 sq ft																								
Boiler and waterwalls	Superheater	Reheater	Economizer	Air heater	Pressure, in. H_2O	Volume, 1000 cu ft	Heat release, 1000 Btu/cu ft hr	Type	Number of burners	Pulverizers per boiler	Pulverizer manufacturer	Number per boiler	Capacity of each, 1000 cfm	Manufacturer	Flow control	Drive hp, each	Drive manufacturer	Number per boiler	Capacity of each, 1000 cfm	Manufacturer	Flow control	Drive hp, each	Drive manufacturer	
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50	[illegible]	[illegible]	[illegible]	[illegible]	-[illegible]	[illegible]	[illegible]	Ba	[illegible]^12	6	RA	[illegible]	51[illegible]	HOP	[illegible]	[illegible]	CGE 16	[illegible]	[illegible]	HOP	V	[illegible]700	AE	[illegible]
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50 [illegible]	[illegible]	[illegible]	[illegible]	500?	-[illegible]	[illegible]	[illegible]	Ba DB	[illegible]^59	[illegible]	RS	[illegible]	[illegible]	AS	V	[illegible]	EM	[illegible]	79[illegible]	AS	V	3500	EM	24
50	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Prc	[illegible]	[illegible]	RA	[illegible]	59[illegible]	SW	HyC	4500	WE	N						25
27 4	60 8	58	48	29[illegible]	[illegible]	[illegible]	[illegible]	Ba	[illegible]^12	N		[illegible]	36[illegible]	WE	V,D	500	EM	[illegible]	54[illegible]	WE	V,D	3000	GE	[illegible]
46 8	6[illegible]	[illegible]	95 9	[illegible]	[illegible]	129[illegible]	[illegible]	Prc	2E^10	N		[illegible]	38[illegible]	SW	V	4000	WE	N						[illegible]
23 4	[illegible]	[illegible]	[illegible]	[illegible]	6[illegible]	[illegible]	[illegible]	Prc DS	1[illegible]	N		[illegible]	36[illegible]	WE	V	4000	AC	N						28
[illegible] 6	[illegible]	[illegible]	76 8	N	[illegible]	95	46	Prc	16	N		[illegible]	948	APC	V	5000	WE	N						29
[illegible]	110 9	[illegible]	[illegible]	391 8	28 8	[illegible]	[illegible]	Prc	[illegible]	[illegible]	RA	[illegible]	[illegible]	AC	V	3000	AC	N						30
72	96	30	[illegible]	[illegible]	80	138	14	Ba DB	[illegible]^39	[illegible]	RA	[illegible]	16	16	16	16	16	[illegible]	16	16	16	16	16	[illegible]
56 9	58 [illegible]	[illegible]	29	406	[illegible]	290	[illegible]	Pr	[illegible]^44	[illegible]	FW	[illegible]	[illegible]	WE	V	4000		N						[illegible]
35	[illegible]	[illegible]	[illegible]	[illegible]	-[illegible]	[illegible]	[illegible]	Ba	[illegible]	[illegible]	RA	[illegible]	[illegible]	CF	V	7000	EM	[illegible]	48[illegible]	CF	V	3000	EM	[illegible]
37	6[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Prc	[illegible]^42	N		[illegible]	[illegible]	APC	V	2000	LA	N						[illegible]
25 8	[illegible]	[illegible]	[illegible]	56 8	80	219	[illegible]	Ba DB	16	-	RA	[illegible]	48[illegible]	AS	V	1500	AC	[illegible]	690	AS	HyC	2500	AC	35
57 7	96	30	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Ba	48	6	CEC	[illegible]	[illegible]	HOP	V	900	MPL	[illegible]	[illegible]770	HOP	V	2200	MPL	36
31	[illegible]	[illegible]	[illegible]	364	[illegible]	6[illegible]	[illegible]	Prc	20^42	N		[illegible]	[illegible]	AC	V	2000	EM	N						[illegible]
32	[illegible]	[illegible]	[illegible]	364	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	BY	[illegible]	[illegible]		V	2000	LA	N						38
31	[illegible]	27 8	[illegible]	[illegible]	[illegible]	60	[illegible]	Prc ST	[illegible]^42	N		[illegible]	29[illegible]	GF	V	4000	WE							39
20 5	86	[illegible]	[illegible]	70 8	[illegible]	86	[illegible]	Prc DB	16^42	[illegible]	BW	[illegible]	[illegible]	WE	V	1500	GE	N						40
22 3	66	16.[illegible]	[illegible]	[illegible]	-[illegible]	9[illegible]	[illegible]	Bal DB	[illegible]^42	[illegible]	BW	[illegible]	180	AS	V,D	700	GE	[illegible]	[illegible]	AS	D	1750	GE	41
20 6	40	[illegible]	[illegible]	56 [illegible]	[illegible]	56[illegible]	[illegible]	Prc	[illegible]	N		[illegible]	[illegible]	HOP	V	900	CGE		[illegible]	HOP	D	200	CGE	42
22.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	128 [illegible]	[illegible]	Ba	[illegible]^55	[illegible]	CES RA	[illegible]	[illegible]	WE	V,D	450	GSE	[illegible]	350	HOP	V,D	1500	BRF	43
16.[illegible]	[illegible]	[illegible]	66 [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Prc DB	[illegible]^59			[illegible]	550	SW	V	4500	AC	N						44
21 9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pr	[illegible]	N		[illegible]	488	SW	HyC	3900	SW	N						45
19 6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pr	[illegible]	[illegible]		[illegible]	504	SW	V	4000	GE	N						46
16 [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Prc DB	[illegible]	N		[illegible]	[illegible]	NOR	V	3500	AC	N						47
34 [illegible]	78	[illegible]	[illegible]	[illegible]	[illegible]	80	[illegible]	Prc DB	[illegible]	[illegible]	RA	[illegible]	[illegible]	APC	HyC	2500	AC	N						48
17 8	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Prc	[illegible]	N		[illegible]	[illegible]	WE	V,D	1500	WE	N						49
7.5	[illegible]	[illegible]	[illegible]	[illegible]	-[illegible]	[illegible]	[illegible]	Ba DB	[illegible]^59	[illegible]	RC	[illegible]	[illegible]	CF	V	700	WE	[illegible]	[illegible]	CF	D	1250	WE	50
15.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Prc	[illegible]	N		[illegible]	[illegible]	BF	V	1000	AC	N						[illegible]
5.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Prc	[illegible]^12	N		[illegible]		WE				N						[illegible]
34.3	28 8	N	N	[illegible]	[illegible]	[illegible]	[illegible]	Prc [illegible]	[illegible]^43	N		[illegible]	[illegible]	SW	V,C	1500	16	N						[illegible]
6.7	[illegible]	N	N	[illegible]	[illegible]	[illegible]	[illegible]	Prc	[illegible]	N		[illegible]	[illegible]	SW	[illegible]	900	WE	N						54
16 8	[illegible]	N	N	[illegible]	-[illegible]	[illegible]	[illegible]	Ba DB	[illegible]^55	[illegible]	RC	[illegible]	[illegible]	CF	V	[illegible]	WE	[illegible]	[illegible]	CF	HyC,D	500	WE	55
15.7	[illegible]	N	N	[illegible]	[illegible]	[illegible]	[illegible]	Prc	[illegible]	N		[illegible]	9[illegible]	FAA	[illegible]	[illegible]	AC	N						56
20 8	[illegible]	N	[illegible]	[illegible]	80	[illegible]	[illegible]		N	N		[illegible]		WE	MCV	350	EM			WE	MCV	500	EM	[illegible]
12.2	[illegible]	N	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	N			65[illegible]	BF	[illegible]	350		N						58

[illegible] Water Conditioning [illegible]
[illegible] Controls, Inc
[illegible] & [illegible] Co
[illegible] Ltd
[illegible] Locomotive Works Ltd
[illegible] Co
[illegible] & [illegible] Ltd
[illegible] Co
[illegible] Shipbuilding & Drydock Co
[illegible] AB
[illegible] Co
[illegible] Co
[illegible], Inc, [illegible]
[illegible], Inc
[illegible] Div of CE
[illegible], Inc

[illegible] - Rochester Instrument Systems Inc
[illegible] - [illegible] Corp
[illegible] - Siemens AG
[illegible] - [illegible] Corp
[illegible] - Sturtevant Div, Westinghouse Elec Corp
[illegible] - SWECO Inc
[illegible] - Systems Engineering Laboratories Inc
UOP - Universal Oil Products Co, Air Correction Div
WE - Westinghouse Electric Corp
W - Westronics Inc
WO - Worthington Corp
WP - Western Precipitation Div, Joy Mfg Co
[illegible] - [illegible] Heat Transfer Corp

SYMBOLS

[illegible] - Admiralty brass
[illegible] - Admiralty [illegible]
A - Aluminum
A B - Aluminum brass
[illegible] - Analog computer
AsC - Arsenical copper
A - Attemperation
Ba - Balanced
BD - Balanced draft
[illegible] - Coal, bituminous
[illegible] - Cross-compound
[illegible] - Copper nickel
[illegible] - Damper
DB - Dry bottom
[illegible] - Dual drive
De - Demineralization
DiC - Digital computer
EA - Excess air
E - Electrostatic
Eva - Evaporator
FC - Fuel control
FF - Firing rate
F - Filtered filtration
FuB - Fuel at burner
G - Gas
GF - Flue-gas recirculation
[illegible] - Hydrogen
Hy - Hybrid
HyC - Hydraulic coupling
[illegible] - Steam [illegible]

FOSSIL-FUELED CENTRAL STATIONS

Selecting instrumentation [illegible]

Each project listing covers four pages

PROJECT	TURBINE: Type	Exhaust, in. Hg abs	Number of bleed points	Number of exhausts	Manufacturer	CONDENSER: Surface area, 1000 sq ft	Number of water passes	Tube material	Air removal equipment	Manufacturer	FEEDWATER: Makeup treatment	Condensate treatment	Makeup and condensate treatment system manufacturers	GENERATOR: Voltage, kV	Rating, MVA	Cooling, rotor/stator	CONTROLS: Combustion, mfr	Feedwater, mfr	Closed-circuit TV, mfr	Data logger, mfr	Manufacturer
[illegible]	CC	1.5	7	4	WE	540	2	SSt	J	BLH	De[31]	Pdx[32]	W OL	18	1033	H_2, H_2	....[16]	....[16]	OP[16]	....[16]	[illegible]
[illegible]	TC	[illegible]	....	....	WE	305	[illegible]	SSt	Ro	SWE	De	De[27]	BIE	20	970	H_2, H_2	BM	BM	....	....[16]	GE
[illegible]	TC	3.5	7	4	WE	415	[illegible]	Adl	Ro	IR	De	De[27]	IN	25	935	H_2, H_2O	BM	BM	OP	HIC	BM
4	TC	[illegible]	7	4	GE	300	1	Adl CuN	RP	FW	De	De	LAW	25	308	H_2, H_2O	BM	BM	OP	....	[illegible]
5	TC	3.5	8	4	GE	[illegible]	1	CuN	Ro J	SWE	Eva So	De, Pdx	LAW AQC IN	26	309	H_2, H_2O	HCC	HCC	OP	N	N
6	TC	3.5	7	4	GE	360	2	Adl	Ro	BLH	De	Pdx[13]	GW[16]	26	929	H_2, H_2O	LN[16]	LN[16]	MOT[16]	F[16]	....
[illegible]	TC[2]	3.5	8	4	GE	365[20]	1[35]	SSt	Ro	WE	So, Eva	....[13]		24	329	H_2, H_2, H_2O	....	....	....	....	....
8	TC	2[36]	7	4	WE	370[20]		SSt	Ro	FW	De	Pdx[27]	GW	20	760	H_2, H_2	BM	BM	OP	N	....
9	TC	[illegible]	7	4	GE	510	[35]	SSt	J	BLH	De	Pdx[32]	W GW	24	730	H_2, H_2O	HCC	HCC	OP	N	GE
10	TC	1.5	8	4	WE	211	1	Adl	Ro	WO	De	De[27]	W N	20	300	H_2, H_2	BM	BM	N	GE	GE
11	TC	1.5	3	2	GE	325	2	AsC	Ro	IR	De	De Pdx[27]	W GW	24	578	H_2, H_2O	BM[16]	BM[16]	OP[16]	GE[16]	GE
12	TC	3.5	5	2	GE	295		CuN	Ro	WE	De	De Ft[27]	PM, W	24	530		....	....	....	....	....
[illegible]	TC		5	4	WE	253	[35]	Ad	Ro	WE	De	....[32, 27]	BIE	20	730	H_2, H_2	CE	BM	N	FIS, LCI	N
[illegible]	TC		5	4	GE	216	[35]	Acl	J	WE	De	....	W	24	590	H_2, H_2O	BM	BM	OP	N	GE
[illegible]	TC	[29]	7	4	WE	250	[35]	SSt	Ro	BLH	De	Pdx[27]	GW	13	540	H_2, H_2	BM	BM	OP	N	F
[illegible]	[illegible][2]	[illegible]	14	4	WE	298		Adl	Ro	SWE	De	....[13]	....[16]	18	595	H_2, H_2	BM[16]	BM[16]	Y[16]	....[16]	HCC
[illegible]	[illegible]	[illegible]			GE	250[16]		SSt, Adl	Ro	WE[16]	De	Pdx[32]	PM	22	500	H_2, H_2O	....[16]	....[16]	....[16]	....[16]	....
[illegible]	[illegible][2]	[illegible]	5		GE			SSt	Ro		De	....[16]	[16]	22	590	H_2, H_2O	....[16]	....[16]	....	....[16]	....
[illegible]	[illegible]				WE	355	2	AsC	Ro	WE	De		[16]	13	6.3 8	H_2, H_2	....	....	OP	....	N
[illegible]	TC	1.5		4	CAP	163		Ad	Ro	MLW	De	De[8]	N	22	338	H_2, H_2O	BM	BM	OP	IBM	IBM
[illegible]	TC	3.5	7	4	CGE	150		Ad	Ro	FWC	De	De[13]	N	24	555	H_2, H_2O	BM[16]	BM[16]	OP[16]	IBM	IBM
[illegible]	TC	3.5			GE	220	2	CuN	Ro	FW	De	De[13]	GW[16]	24	580	H_2, H_2O	....	....	....	....	....
[illegible]	TC		3	4	GE	135		AIB CuN	Ro J	FW	De	....[32]		22	528	H_2, H_2O	HCC[16]	HCC[16]	OP[16]	....[16]	F
[illegible]	TC[2]	1.5			WE	225		CuN	Ro	R	So, Eva	....[13]	YU	24	136 2	H_2, H_2	....	....	....	....	....
[illegible]	TC	[illegible]	7	2	WE	220	2	SSt	RP	IR	De	DH	IW	24	196	H_2, H_2	BM	BM	OP	FIS	FIS
26	TC	[illegible]		4	GE	[illegible]	1	CuN	RP	IR	De	....[13]	IW	22	[illegible]	H_2, H_2O	GE	GE	....[16]	N	N
[illegible]	TC				WE	[illegible]		AIB CuN	Ro	FW	De	De[27]	PM	24	[illegible]	H_2, H_2	BM	BM	N	IBM	IBM
[illegible]	TC	3.5			GE	[illegible]		AIB	J Ro	IR	De	De[27]	PM	22	461	H_2O, H_2	F	F	OP	H	H
[illegible]	TC[2]		10		GE	58		Adl	Ro	SWE	De So	....[13]	W	20	[illegible]	H_2, H_2	GE	GE	N	WI	N
[illegible]	TC		5	2	GE	[illegible]		Adl	Ro	FW	De	Pdx[13]	GW	22	475	H_2, H_2O	LN	LN	MOT	N	N
[illegible]	TC	3.5		2	WE	[illegible]		Adl	J	....[16]	De	De[32]	[16]	24	450	H_2, H_2	....[16]	....[16]	....[16]	....[16]	....
[illegible]	TC		5		WE	130	2	Adl	J	DL	De	De	....	24	410	H_2, H_2	....	....	....	....	....
[illegible]	TC	1.5			GE	147	2	SSt Adl	Ro	DL	De	....		22	405	H_2, H_2O	....	....	....	WE	WE
[illegible]	TC		5		GE	194		AIB	Ro	WE	De	De[27, 32]	W[16]	22	390	H_2, H_2, H_2O	F[16]	F[16]	N[16]	N	N
35	TC	1.5	7	2	GE	170	2	Adl	....[16]	WE	De	....	....	22	395	H_2, H_2O	....	....	....	N	GE
36	TC	1.5	7	4	CEE	135		SSt	J	FWC	Eva, So	De[27]	GW	18.5	333.3	H_2, H_2O	HCC	HCC	OP, PH	CWE	CWE
37	TC	3.5			GE	156	2	Adl CuN	RP	WE	De	De[27]	PM	22	[illegible]	H_2, H_2, H_2O	BM[16]	BM[16]	OP[16]	N[16]	N
38	TC	3.5	5	2	GE	154		SSt, Al	Ro	....	De	De[32]	W	22	234.7	H_2, H_2O	....	....	....	....	....
39	TC	1.5	5	2	WE	90	2	SSt	Ro	WE	Eva, De	....[13]	WE PM	20	[illegible]	H_2, H_2	BM	BM	OP	HIC	N
40	TC	3.5	5	2	GE	110	2	SSt	Ro	FW	So Eva	....	YU	20	220	H_2, H_2, H_2O	WE	WE	OP	BM	....
41	TC	3.5	5		GE	70		CuN[7]	J	DL	De	....[32]	MR	20	308	H_2, H_2	BM	BM	N	N	N
[illegible]	TC	[illegible]	5	2	CGE	57.7		....	Ro	FWC	De	....[8]	GW	16	175.5	H_2, H_2	BM	BM	OP	CGE	CGE
[illegible]	TC	[illegible]	5	2	CGE	36.3		Ad		FW	So Eva	Pdx[27]	GW	5	[illegible]	H_2, H_2	HCC	HCC	OP	CGE	CGE
[illegible]	SC[2]	55[44]	N		GE	N	....	....	....	....	De	[27]	CCC	[illegible]	[illegible]	H_2, H_2	LN	LN	....[16]	LN	N
[illegible]	TC	[illegible]		2	GE	[illegible]		SSt, Adl	Ro	WE	De	....[27, 32]	N	22	496	H_2, H_2O	HCC[16]	HCC[16]	OP[16]	....[16]	SYE
46	TC			2	WE	[illegible]		SSt, Adl	Ro	LWE	De	....[27, 32]	N[16]	[illegible]	[illegible]	H_2, H_2	....[16]	....[16]	....[16]	....[16]	SYE
47	TC		5	2	GE	[illegible]		CuN	Ro	DL	De	....[32]	[16]	[illegible]	183	H_2, H_2O	....[16]	....[16]	....[16]	....[16]	....
48	TC		10		GE	[illegible]	2	CuN, AsC	Ro	DL	Eva	....		[illegible]	[illegible]	H_2, H_2O	....	....	N	N	N
49	TC	[illegible]	5		GE	[illegible]	2	....	Ro	DL	De	....		20	234	H_2, H_2	GE	GE	....	....	....
50	TC		5	2	GE	[illegible]	2	SSt	J	CWE	De	DH	HT	13.8	275	H_2, H_2	F	F, BM	....	F	F
[illegible]	TC	[illegible]			EB	[illegible]		Ad	Ro	DL	De		N	13	[illegible]	H_2, H_2	BMN	BMN	N	N	N
[illegible]	TC				GE	55		Adl	Ro		De	Pdx	[illegible]	13	36	H_2, H_2	BM	BM	N	LCI	....
[illegible]	TC				WE	50		SSt Adl		MS	Eva	....	GW	13	35	H_2, H_2	HCC	HCC	N	N	N
[illegible]	C				GE	[illegible]		SSt Ad	Ro	DL	Eva	DH	AQC	13		H_2, H_2	F	F	N	HIC, [illegible]	....
[illegible]	C	1.5			GE	[illegible]		Adl	Ro	DL	De	[17]	W	3	[illegible]	H_2, H_2	HCC	HCC	N	N	N
56	CC				CE			SSt		DL	Eva So		GW	13	[illegible]	H_2, H_2	BMN	BMN	OP		....
57	CC				PB	....		Al		WO	De	N	W			H_2, H_2	HCC	HCC	N	N	N
58	CC				WE	5		Ad		WC	De	De DH	WO	13	[illegible]	H_2O, H_2O	FO	BMN	N	N	N

[illegible] - Lignite
M - Motor
MAn - Monitoring and analysis
MAP - Monitoring, analysis and partial control
MC - Magnetic coupling
Me - Mainframe
MgO - Magnesium oxide
Mon - Monitoring only
MP - Monitoring and partial control
MTS - Main turbine shaft
N - None
Pdx - Powdered resin exchange
[illegible] - [illegible]
P[illegible] - Pressurized
Reg - Regulation control

Rer - Retractable
Ro - Rotary pump or blower
rotating pot blower
RP - Reciprocating pump
[illegible] - Speed control
[illegible] - Single cylinder
So - Softener
SSt - Stainless steel
[illegible] - Standard
St - Steam
[illegible] - Turbine
TB - Tilting burners
[illegible] - Tandem compound
V - Vane control
WS - Water softener
WO - Water rotor

FOOTNOTES
See page S-5 for manufacturers and symbols

1 - Data refer to each unit
2 - Outdoor
3 - At superheater outlet
4 - Steam atomization
5 - Gas recirculation on
6 - On coal
7 - 40% A B, 60% CuN
8 - pH control with morpholine
9 - On natural gas
10 - Mechanical atomization
11 - Based on natural gas firing
12 - Tilting tangential burners
13 - pH control with amine
14 - Higher heating value
15 - At boiler efficiency of [illegible]
16 - Data not yet available [illegible]
17 - pH control with [illegible]
18 - Bituminous coal/[illegible]
19 - Jointly owned with [illegible] of NY, Inc and [illegible]
20 - Twin condenser [illegible]
21 - Calorific value of [illegible] 15,750 and [illegible]
22 - One main pump with [illegible] startup pump with [illegible]
23 - Main pump data
24 - [illegible] standby [illegible]
25 - Equipment not [illegible]
26 - Exhaust to second [illegible]

lows latest thinking for control systems

BOILER FEED PUMPS						HEATERS			FUEL AND EXHAUST												PROJECT
									Fuel						Sootblower			Dust			
Discharge pressure, psig	Manufacturer	Flow control	Drive type	Drive hp, each	Drive manufacturer	Number	Final feedwater temp, F	Max deaerating pressure, psig	Manufacturers	Type	Calorific value, 1000 Btu lb or Btu cu ft	Design heat rate, Btu kWh	Max sulfur content, %	Combustion additive	Additive introduction	Type of unit and working fluid	Manufacturer	Stack height, ft above ground	Collector type	Manufacturer	
4815					AE	2	535	33	WE,SWE	C	10	7485[34]	2.0	N	...	Rc,Ret,S	DP	600	El	RC	1
								[16]		C	10		6.5	[16]	...	Ret,S	[16]	700	WtS	...	2
4650					AE		535	177	FW,STW,CHH	C	10.5	8745	6	N	...	Rc,Ret,Air	DP	800	El	RC	3
4980					AE		535	2054	FW	C	10.5	8710	5	N	...	Ret,Air	DP	800	El	RC	4
4100	BU				GE	1	545	99	SWE,FW,CHH	C,O	.8 10[8][9]	9655[11]	0.5	N	...	Ret,S	DP	236	N	...	5
5045	BU				GE	1	495	47[16]	YU,SWE	C	10	9200	3.7	N	...	Ret,S	DP	600	El	BU	6
2660	WE	Recip	T		GE	1	540	125	YU	C	10	9,00	3.6	N	...	Ret,Air	DP	890	El	UOP	7
4660	WE		T			1	550	[33]	WE,GW	C	10	7870	3	N	...	Ret,Air	CV	1000[28]	El	AS	8
4550			T			1	550		BLH,WE	C	10	8,15	3.1	N	...	Rc,Ret,S	CV	280	El	RC	9
4630	WE		T		GE	1	542	1,01	WO,CHH,FW	C	10.2	8600	4.0	N	...	Ret,Air	DP	1000	El	WP	10
4[15][23]	WE	[23]	[23]	5,000	GE[23]	1	550	60	STW,FW,CHH	C	10	8940	3.5	N	...	Ret,Air	DP	800	El	BU	11
3050	BE	[23]	[23]			1	550	[33]	WE,CHH	G	1060	9386	N	N	...	N		190	N	...	12
4[15]	BE	Recip	T	1,000	WE	1	485	[33]	GW,WE	C	11.5	9030	2.9	N	...	Ret,Air	CV	700	El	RC	13
3016	WE		T	4,000	GE	1	495	[33]	WE	C	11.5	7855[34]	3.5	N	...	Rc,Ret,St	CV	500	El	RC	14
4630	WE		T	1,000	WE	1	500	70	SWE,GW	C	11.5	7566	3.5	N	...	Ret,Air	CV	700[28]	El	RC	15
2975	BE		T	4,000	WE	2	495	...	WE	C	1065	...[16]	N[16]	N	...	N	...	186	N	...	16
4570	BE		T	5,000	GE	2	495	354	STW,CHH	C,G	11.4[10][35][18]	9350	[16]	N[16]	...[16]	Ro,Ret,Air	CV	500	El[25]	KC[7]	17
2900[23]	[16]	[23]	[23]	20,000[23]		1	480	570	...[16]	C	10.1[10][45][9]	8022		...	...	...	DP	199	...	...	18
4[15][23]	BE	[23]	[23]	4,000	GE	1	466	181	YU,GW	C	11.4	9306	3.7	N	...	Ret,Air	DP	660	El	WP	19
4[15][23]	[16][23]	[23]	[23]	6,600[23]	GE[23]	1	495	42	FW	C	10.5	-	3.5	N	...	Ro,Ret,St	CV	650	El	WP	20
3100	GE	T	T	4,000	GE	1	465	159	FW,GW,MLW	C	10.3	9000	2.5	N	...	Ret,S	CV	550	El	WP	22
2940	BE	T	T	9900	GE	1	550	154	STW,BLH,GW	C	11	9218	3.9	N	...	Rc,Ret,St	DP	400	El	WP	23
2300	WE	T	T	11,600	GE	1	400	33	WE	C	10.6	10,400	3.5	MgO	Fub	Ret,Air	DP	500	El	RC	23
3025	GE	T	T	7700	GE	1	488	...[16]	IPE	C,O	10.3[10][6]	9300[9][10][6]	3.1[6]	MgO	Fub	Ret,Air	DP	552	Me	UOP	24
2939	WE	T	T	3600	WE	1	488	...	YU,CHH	C	11.6	9400	6	N	...	Rc,Ret,Air	DP	565	El	RC	25
2815	WE	Recip	MTS	10,000		1	467	...[16]	YU,WE	O	10.2[14]	9005[15]	3	Yes	Fub	Ret,Air	CV	600	El	BU	26
2220[23]	BE[23]	[23]	[23]	10,500[23]	WE[23]	1	550	527	GW,STW	O	10.4	10,400	...[37]	MgO	Fub	Ret,Air	DP	348	Me	WP	27
2440	BE	T	T	10,000	GE	1	535	104	COC,BLH	O	10.4	10,650	2.4	MgO	Fub	Ret,Air	CV	400	...	...	28
2467	BE	T	T	10,000	GE	1	505	1	YU	O	10.9	10,000	N	N	...	N	...	215	N	...	29
3544	BE	T	T	7350	GE	2	485	162	YU	C	11	9400	3.7	N	...	Ret,St	DP	600	El	AS	30
3066	WE	Recip	W	7500	...[16]	1	467	43	...[16]	C	11	9068	0.7	N	...	Rc,Ret,Air	DP	...[16]	El	...[16]	31
2446	GE	Recip	W	...	...	2	475	470	SWE	C	10	...	N	N	...	Ret,Air	DP	...	El	...	32
2775	WE	Recip	W	10,000	GE	1	465	146	BLH	C	10.6	...[16]	2.4	N	...	Rc,Ret,Air	DP	400	WtS	...[16]	33
4[15][23]	BE[23]	[23]	[23]	6,000[23]	GE[23]	2	465	166	YU,GW	C	1040	9655	N	N	...	N	...	177	N	...[16]	34
9	AC	T	W	6500	AC	1	485	145	WE	C	10.5	9300	...	N	...	Ret,S	CV	600	El	...	35
700	BE	Recip	W	5000	WP	1	467	67	FW	C[34]	11[14]	9525	0.2	N	...	Ro,Ret,St	DP	510	Me,El	CES	36
30	GE	Recip	W	2500	EM	1	285	49	COC	O	10.6	11,245	1	MgO	...	...	...	258	N	...	37
6500	BE	Recip	T	6700	GE	2	545	167	YU,GW	C	...	8391	4.5	N	...	Ret	DP	500	El	COD	38
7640	IR	Recip	W	2500	WE	1	535	201	WE,SWE,CHH	C	10.5	8376[34]	1	N	...	Ro,Ret,St	DP	400	El	UOP	39
2465	IR	Recip	W	3000	GE	1	466	...[16]	YU	C	12.4	9450	1	N	...	Ret,Air	DP	397	El	RC	40
2400	AC	Recip	W	2250	AC	1	454	89	CHH,YU	C	10.6	9150	2.7	N	...	St	DP	385	Me,El	UOP	41
2450	BE	Recip	W	2500	BPP	1	467	88	FW,GW	O	10.6	9000	2.9	MgO	Fub	Rc,Ret,St	CV	300	...	...	42
2330	MPL	Recip	W	2500	GE	1	448	62	FW	C	10.5	9720	0.3	N	...	Ret,St	DP	300	Me	WP	43
2530	BE	Recip	W	3500	AC	1	364	169	COC	C	10.3	...[16]	0.2	N	...	Ret,Air	CV	225	...	...	44
2800	BE	T	T	8,000	GE	1	575	1203	GW,YU	C,G	10.6 10.4[9]	7545[34]	0.3	N	...	N	...	175	N	...	45
2800	BE	T	T	10,000	WE	1	480	176	CHH,YU	C,G	10.6 10.2[9]	7535[34]	0.3	N	...	N	...	175	N	...	46
2500[23]	[16][23]	[23]	[23]	20,000[23]	GE[23]	2	467	145	SWE,CHH	C,O[32]	10.5 10.0[9]	8165[34]	1	MgO	Fub	Ret,Air	CV	300	N	...[16]	47
2610	AC	Recip	W	2400	AC	1	466	108	SWE,CHH,STW	C	11.1	9350	0.5	N	...	Ret,Air	DP	650	El	...[16]	48
2526	AC	T	T	8000	GE	2	555	9	CHH,SWE	C	10.37	-	...	N	...	N	...	186	N	...	49
2335	BE	Recip	W	2250	AC	1	515	96	STW,GW	C,G	10.5 9.4[10]	8180	3.5	N	...	Ro,Ret,Air	DP	350	El	UOP	50
1680	BE	Recip	W	1500	AC	1	468	88	SWE,COC	C,G	10.6	9890[45]	N	N	...	N	...	1745	N	...	51
2350	AC	T	T	8000	...	1	550	93	W	C	10.5	10,000	N	N	...	N	N	56	N	...	52
1600	BE	Recip	W	1500	AC	1[16]	550	8	SWE,COC	C	10.6	10,067	4	N	...	Ret,St	DP	300	E	AS	53
2200	AC	Recip	W	4000	AC	1	450	...	STW,GW	C	10.5	8565	N	N	...	N	...	100	N	...	54
1460	BE	Recip	W	1500	AC	1	389	65	CHH,DAv	C,O	10.6 10.0[10][18]	10,000 10,750[18]	1.0	N	...	Ret,St	DP	150	El	UOP	55
1180	BE[23]	Recip	W	1500	AC	1	467	177	AC,CHH	C,O	10.2[40]	10,500[44]	N	N	...	N	...	70	N	...	56
1500	WE	Recip	W	1500	EM	1	467	78	CHH	C	10.5	9200	0.6	N	...	Rc,Ret,St	DP	250	Me	UOP	57
1400	BE	Recip	W	1500	AC	1	36[illegible]	62	CHH	C,O	1050	98[illegible]	N	N	...	Rc,Air	APC	50	N	...	58

[illegible] with ammonia
[illegible] semi-outdoor
[illegible] electric
[illegible] cent guinea
[illegible] tilter
[illegible] with incinerator
[illegible] condenser con
[illegible] turbine net 3600
[illegible] un
[illegible] with 10% spare
[illegible] City, 88 psig
[illegible] Public
[illegible] ive a

[16] - [illegible] duct burners for secondary
[illegible]
[illegible]
[illegible]
[illegible] burner
[illegible]
[illegible] tangential burners
[illegible]
[illegible] steam, 850,000
[illegible]

[illegible] - Includes a partial-capacity, 8-burner rated 3500 gpm at 3800 psig. Manufacturer of the unit's 6000-hp motor-drive is AC.
[illegible] - Jointly owned with Columbus & Southern Ohio Electric Co. and The Dayton Power & Light Co.
[illegible] - Two burners are low-capacity standby units.
[illegible] - Jointly owned with Public Service Co. of New Mexico.
[illegible] - Includes a 250-hp auxiliary turbine rated 2000 rpm at 250 psig. Manufacturer of the 25,000-hp main drive is GE.
[illegible] - Natural gas is the primary fuel.
[illegible] - The burners are set for the same heat input, but 10% less air is supplied by the manufacturer's rating.
Ref - Refractory.
[illegible] - Sub-bituminous coal.

[illegible] - Coal nozzles also. 12 burners for natural gas. One burner for which the data are provided was rated at 100% capacity. Two motor-driven units provide 35% capacity; manufacturer's 6-by-burner 2240 gpm at 2750 psig. GE is supplying the 5300-hp motors.
[illegible] - Opposed firing: 24 burners in front, 18 in rear.
[illegible] - Jointly owned with Kansas Gas & Electric Co.
[illegible] - Horizontal, flare type burner.

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llows latest thinking for control systems

Capacity of each, gpm	BOILER FEED PUMPS: Discharge pressure, psig	Manufacturer	Flow control	Drive type	Drive hp, each	Drive manufacturer	HEATERS: Number	Final feedwater temp, F	Max deaerating pressure, psia	Manufacturers	FUEL AND EXHAUST — Fuel: Type	Calorific value, 1000 Btu/lb or Btu/cu ft	Design heat rate, Btu/kWh	Max sulfur content, %	Combustion additive	Additive introduction	Sootblower: Type of unit and working fluid	Manufacturer	Stack height, ft above ground	Dust: Collector type	Manufacturer	PROJECT
	4315	IR	S	T	[illegible]	WE	14	502	...[33]	WE,SWE	C	[illegible]	7485[34]	2.3	N	...	Ro,Ret,St	DP	600	EI	RC	1
		PP		MTS	[illegible]	WE	6	506	55	...[16]	C	10.1	....	6.5	....[16]	....	Ret,St	...[16]	700	WtS	....[16]	2
	4654	DL	S	T	[illegible]	WE	[illegible]	[illegible]	77	FW,STW,CHH	C	[illegible]	6744	8	N	...	Ro,Ret,Air	DP	800	E	RC	3
	4985	IF	S	T	[illegible]	GE		[illegible]	214	FW	C	[illegible]	8710	5	N	...	Ret,Air	DP	800	EI	RC	4
	4120	BJ	S	T	[illegible]	DL	6	542	95	SWE,FW,CHH	C,O	18 1095[9]	9057[11]	0.5	N	....	Ret,St	DP	236	N	....	5
	5245	BJ	S	T	21,600	GE	[illegible]	492	147[16]	YU,SWE	C	[illegible]	9200	3.7	N	...	Ret,St	DP	600	EI	BU	6
	2860	IF	Reg C	T	[illegible]	GE	6	[illegible]		YU	C	[illegible]	9100	1.8	N	..	Ret,Air	DP	800	E	UOP	7
	4680	DL	S	T	[illegible]	[illegible]		500	125[33]	WE,GW	C	[illegible]	[illegible]	4	N	...	Ret,Air	CV	1000[28]	EI	AS	8
	4520	BJ		T	16,500	GE		545		BLH,WE	C	[illegible]	[illegible]	2.2	N	...	Ro,Ret	CV	260	EI	RC	9
	4600	WC	S	T	15,300	DL	8	544	[illegible]	WD,CHH,FW	C	[illegible]	8800	4.7	N	....	Ret,Air	DP	1000	EI	WP	10
	4550	WC	S	DC	15,000	GE	8	554	62	STW,FW,CHH	C	11	8940	3.5	N	..	Ret,Air	DP	800	EI	BU	11
	4400[23]	DE[23]	S[23]	T[23]		GE[23]		503	173	WE,CHH	G	1065	9386	N	N	...	N		190	N	....	12
	3050	PP	HyC	T	[illegible]	WE	6	485	[illegible][33]	GW,WE	C	[illegible]	[illegible]	2.9	N	....	Ret,Air	CV	700	EI	RC	13
	3016	WC	S	T	9500	GE	6	493		WE	C	[illegible]	[illegible][34]	2.3	N	....	Ro,Ret,St	CV	500[28]	EI	RC	14
	4632	DL	S	T	5300	WC		500	70	SWE,GW	C	[illegible]	7566	3.5	N	....	Ret,Air	CV	700[28]	EI	RC	15
	2975	PP	S	T	18,300	WE	8	464		WE	C	1065	...[16]	N[16]	N	....	N	...	186	N	....	16
	4570	BJ[16]	S	T	[illegible]	DL[16]		485	154	STW,CHH	C,G	[illegible] 1035[18]	9350	...	N	...[16]	Ro,Ret,Air[25]	CV	504	EI[25]	KC	17
	2900[23]		S[23]	T[23]	20,000[23]			483	173	...[16]	C,G[24]	18.2 1045[9]	8217	2	...[16]	...			196	....	....	18
	3120	SJ	S	T	12,000	GE		466	183	YU,GW	C	[illegible]	9306	3.7	N	...	Ret,Air	DP	660	EI	WP	19
	2743[23]	CIP[23]	S[23]	T[23]	16,800[23]	CAP[23]		495	147	FW	C	12.3	....	3.5	N	...	Ro,Ret,St	CV	650	EI	WF	20
	3190	CIR	S	T	16,265	GE		482	159	FW,GW,MLW	C	[illegible]	[illegible]	2.3	N	....	Ret,St	CV	550	EI	WP	21
	2840	BJ	S	T	9900	GE		460	154[33]	STW,BLH,GW	C	[illegible]	[illegible]	2.9	N	....	Ro,Ret,St	DP	400	EI	WP	22
	2300	IR	S	T	11,600	GE	5	400	...	WE	C	15.6	10,400	2.2	MgO	Fut	Ret,Air	DP	500	EI	RC	23
	3025	GL	S	T	7200	GE		488	...[16]	IPE	O,C	18.3/12[6]	9300/9100[6]	1.8[6]	MgO	Fut	Ret,Air	DP	552	Me	UOP	24
	2929	IF	S	T	9600	WE		488	...	YU,CHH	C	11.8	9400	6	N	....	Ro,Ret,Air	DP	565	EI	RC	25
	2815	IR	HyC	MTS	12,090	...		467	...[16]	YU,WE	O	18.3[14]	9008[15]	3	Yes	Fut	Ret,Air	CV	600	EI	BU	26
	2220[23]	BJ[23]	S[23]	T[23]	10,500[23]	WE[23]		350	127	GW,STW	O	18.4	10,400	....[37]	MgO	Fut	Ret,Air	DP	348	Me	WP	27
	2440	PP	S	T	[illegible]	GE		230	104	COC,BLH	O	18.4	10,650	2.4	MgO	Fut	Ret,Air	CV	400	....	...	28
	2462	DL	S	T	10,000	DL		335	....	YU	G	1019	12,000	N	N	....	N	....	215	N	....	29
	3544	PP	S	T	[illegible]	GE	6	485	167	YU	C	12	9400	[illegible]	N	....	Ret,St	DP	600	EI	AS	30
	3066	WG	HyC	M	[illegible]	....[16]	7	487	[illegible]	....[16]	C	[illegible]	9068	0.7	N	....	Ro,Ret,Air	DP	....[16]	EI	....[16]	31
	[illegible]	DL	HyC	M			6	476	173	SWE	C	10		1	N	....	Ret,Air	DP	....	EI		32
		DL		T	[illegible]	DL		485	149	BLH	C[54]	8.8	...[16]	1.4	N	....	Ro,Ret,Air	DP	400	WtS	....[16]	33
	[illegible][23]	PP[23]	S[23]	T[23]	9,550[23]	GE[23]	6	465	166	YU,GW	G	1040	[illegible]	N	N		N	...	[illegible]	N	....	34
	[illegible]	AC	S	M	6500	AC		485	145	WE	C	[illegible]	9300	....	N	....	Ret,St	CV	600	EI	...[16]	35
	[illegible]	BJ	Reg	M	5000	MPL		461	57	FW	C[54]	[illegible][14]	9525	0.2	N	....	Ro,Ret,St	DP	510	Me,EI	CES	36
	2200	BJ	Reg	M	2500	EM		285	45	COC	C	16.6	[illegible]	1	MgO	....			258	N	....	37
	2500	PP	Reg	T	6700	GE	6	465	167	YU,GW	C	[illegible]	[illegible]	4.5	N	....	Ret	DP	500	EI	LOD	38
	2640	IR	Reg	M	3500	WE	5	445	105[16]	WE,SWE,CHH	C	10.5	[illegible][34]	[illegible]	N	...	Ro,Ret,St	DP	400	EI	UOP	39
	2465	IP	Reg	M	3000	GE	6	466	....	YU	C	12.4	9450	1	N	...	Ret,Air	DP	353	E	RC	40
	2400	AC	HyC	M	2250	AS	6	454	89	CHH,YU	C	12.8	9150	2.7	N	..	St	DP	385	Me,EI	UOP	41
	2450	EJ	Reg	M	2500	BPP	6	462	86	FWC,GW	C	18.6	9000	[illegible]	MgO	Fut	Ro,Ret,St	CV	300	....	....	42
	2330	MPL	Reg	M	2000	GEE	6	448	62	FW	L	6.5	9720[16]	0.3	N	....	Ret,St	DP	300	Me	WP	43
	2530	EJ	Reg	M	2500	AC		366	165	COC	C	19.2		0.3	N	....	Ret,Air	CV	225	....	...	44
	2800	SJ	S	T	[illegible]	GE		[illegible]	172	GW,YU	C,G	19.6/1044[9]	[illegible][34]	[illegible]	N	..	N		[illegible]	N	....	45
	2800	AC		T	[illegible]	WE	7	480	178	CHH,YU	C,G	19.6/1044[9]	7530[34]	[illegible]	N	....	N		[illegible]	N	....	46
	2505[23]	E[23]	S[23]	T[23]	[illegible][23]	GE[23]	6	460	[illegible]	SWE,CHH	C,G[53]	16.5/1029[9]	[illegible][34]		MgO	Fut	Ret,Air	CV	300	N	....[16]	47
	2610	AC	HyC	M	[illegible]	AC		468	105	SWE,CHH,STW	C	..	9490	3.5	N	....	Ret,Air	DP	650	EI		48
	2526	AC	S	T	[illegible]	GE	6	455	[illegible]	CHH,SWE	G	1037	..	....	N	....	N		166	N	....	49
	2335	PP	Reg	M	2250	AC		455	[illegible]	STW,GW	C,G	12.6/940[18]	8180	3.5	N	..	Ro,Ret,Air	DP	250	EI	UOP	50
	1680	E	HyC	M	[illegible]	AC		466	88	SWE,COC	G	1050	9900[41]	N	N	...	N		[illegible]	N	...	51
	2250	FC			[illegible]	AC		455	79	YU	C	[illegible]	10,000	N	N	...	N		[illegible]	N	..	52
	1600	PP	Reg	M	[illegible]	[illegible]		440	61	SWE,COC	C	10.6	[illegible]	4	N	...	Ret,St	DP	300	EI	AS	53
	2200	AC	Reg	M	[illegible]	AC		450	...	STW,GW	G	[illegible]	[illegible]	N	N	...	N		300	N	...	54
	1460	BJ	Reg	M	[illegible]	WE	4	389	50	CHH,DAV	C,G	12.6/1000[18]	[illegible]	[illegible]	N	..	Ret,St	DP	[illegible]	EI	UOP	55
	1180	BPC	Reg	M	300	WE	4	[illegible]	[illegible]	ACC,CHH	C,G	1020[40]	[illegible][40]	N	N	..	N		70	N	...	56
	1500	WC		M	[illegible]	EM	4	[illegible]	[illegible]	CHH			[illegible]	0.6	N	...	Ro,Ret,St	DP	250	Me	UOP	57
	1400	PP	Reg	M	[illegible]	[illegible]	4	365	60	CHH	C,G	1060	[illegible]	N	N	...	Ro,Air	APC	50	N	...	58

...with ammonia
...stacks serving three units
...to second ...
...cell burner
...litters
...with ...
... condenser only
...turbine net output
... in 100% capacity ...
... was equivalent ...
... drive at ...
... is.

38 Includes a partial-capacity pump rated ... gpm at ... psig. Manufacturer of its ... motor drive is AC.
39 Full coal firing ... burners for secondary ...
40 Date of ...
41 ...
42 ...
43 Cyclone burners
44 Horizontal ... burners
45 ...
46 ... stream ...

47 Includes a partial-capacity IR pump rated 3300 gpm at 3600 psig. Manufacturer of the unit's 8000-hp motor drive is AC.
48 Jointly owned with Columbus & Southern Ohio Electric Co and The Dayton Power & Light Co.
49 Two pumps are 25%-capacity standby units.
50 Jointly owned with Public Service ... New Mexico.
51 Includes a partial-capacity pump rated 2500 gpm at 1500 psig. Manufacturer of its 2500-hp motor drive is GE.
52 Natural gas is the primary fuel.
53 Two pumps for which the data are provided are 50% capacity. One manufactured by BPC has 25% capacity.
54 Sub-bituminous coal.
55 Coal nozzles ... 12 burners for natural gas.
56 One pump, for which the data are provided, is rated at 100% capacity. Two motor-driven units (each provides 25% capacity) manufactured by ... pump 2240 gpm at 1750 psig. GE is supplying the 3000-hp motors.
57 Opposed firing: 24 burners in front, 16 in rear.
58 Jointly owned with Kansas Gas & Electric Co.
59 Horizontal flare type burner.

3 GAS TURBINES

Popularity of gas turbines continues to climb

By Robert G Schwieger, Assistant Editor

The large number of gas turbines sold to industrial and utility companies during the past year indicates the continuing popularity of these prime movers. This trend, according to McGraw-Hill's DMS Aircraft Studies Group, is certain to continue throughout the 1970-74 period.

POWER's survey of recent orders supports the DMS projection with design data on specific projects (pp S-14-15). Installations surveyed highlight the primary uses of gas turbines, including base-load, intermittent or peaking, and standby or emergency power generation, natural gas and oil pumping, compressor drives for petrochemical process plants, and total-energy systems.

Outside the aircraft industry, today's biggest single market for gas turbines (on a horsepower basis) is in electric generation. Reasons: Gas turbine offers fast response to load changes, it operates on a variety of fuels, can be equipped with controls for remote operation, and has both low initial cost and short delivery time.

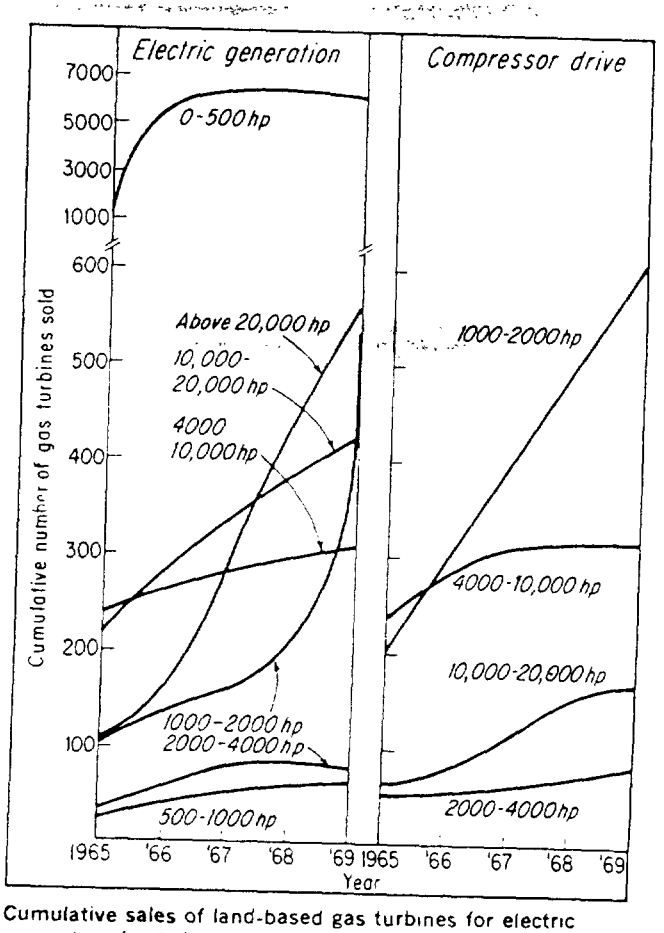
Gas turbine drives were also selected for more than half new gas-pipeline compressors; the trend is expected to continue. They now account for roughly 2.2-million hp (installed) in this industry alone.

In contrast, oil-pipeline owners have installed only about 8% as much gas-turbine power as the gas-pipeline industry. Main reasons: Few oil lines are large enough to utilize the bigger industrial turbines. Further, experience thus far with crude-oil fuel (supplied directly from the pipeline) in modified aircraft units has not been satisfactory. Remember, turbines are of two basic types: those designed for land use (so-called industrial units) and those modified from an existing aircraft design. Until larger pipelines predominate or aircraft engines can accommodate crude, the market is estimated at 30-60,000 hp annually.

Water flooding, a method of extracting crude oil, offers vast potential for turbines as pump drives. Note that about one-quarter of 1968 U.S. production was accomplished using this increasingly popular technique. Offshore, the expanding search for new oil and gas reserves is ideal for gas turbines in another area. They can be used to generate power while providing high-temperature exhaust gas for purifying salt water and satisfying heating and air conditioning demands. According to experts, 25% of the oil consumed in the mid-70s will come from offshore drilling.

Production of gas turbines for land-based and marine use will increase during the 1970-74 period. Sales of 2-4000-hp units may exceed 700 units, compared to 110 in 1965-69, despite sluggishness in the industrial area (curves). While industrial production of 4-10,000-hp machines is not expected to increase appreciably, orders in the 10-20,000-hp range are expected to exceed 1000 units in 1970-74—80% higher than the previous five-year period. Annual production of turbines in excess of 20,000 hp, now at 200 units per year, should remain relatively constant.

Satellite Control Facility relies on twelve 750-kW gas turbines to provide all its energy requirements (Project 18, next page). Two electrical systems are supplied—one handles plant services, the other computers and related equipment



Cumulative sales of land-based gas turbines for electric generation (including portable units) and compressor drives indicate popularity of 1-2000-hp machines in 1965-69 period

Single-shaft gas turbine

PROJECT	COMPANY	LOCATION	Manufacturer	Units ordered between 6/69 & 6/70	Year(s) of initial operation	Main application	Black plant installation?	Method of remote operation	RATING AND CONDITIONS: Normal power, MW	Normal power, 1000 hp	Standard elevation, ft	Ambient temp, F	Maximum power, MW	Maximum power, 1000 hp	Ambient temp for max power at std elevation, F	Time to reach normal power, minutes: Normal startup	Fast startup	Emergency startup	Gas temp at turbine inlet, F	Power/temp index
UNITED STATES AND CANADIAN UTILITIES AND INDUSTRIAL PLANTS																				
1	Baltimore Gas & Electric Co	Bush River, Md.	WE	2[13]	....	PP	No	Dw	58[9]	...	1000	90	81	.	32	20	20	10	1650[10]	
2	Florida Power & Light Co	Ft. Lauderdale, Fla.	WO	5[14]	70	PP	Yes	Dw	68.0	...	1000	80	42.7	.	80	5.6	2.75	0.75	1760	
3	Canadian Utilities, Ltd.[3]	Rainbow Lake, Alb., Can.	GE[4]	1	72	PP	Yes	Dw	35.9	...	1579	20	39.6	.	.	5	3	3	1456	
4	Public Service Electric & Gas Co	Newark, N.J.	WE	5[8]	....	PP	No	Dw	35[9]	...	1000	90	35	.	32	10	5	5	1650[10]	
5	Consolidated Edison Co. of N.Y., Inc.	New York, N.Y.	PW	3[23]	70	PP	Yes	Sov	19.7	...	1000	80	22.1	.	80	5	2	2	....	
6	Lubbock Light & Power Dept.	Lubbock, Texas	WO	1[18]	71	PP	Yes	Dw	18.8	.	1000	80	21.4	.	80	5.6	2.75	2.75	1760	
7	Consolidated Edison Co. of N.Y., Inc.	New York, N.Y.	WE	4	.	PP	Yes	W	....	.	1000	90	19.5	.	90	5	5	5	1450[5]	
8	Burlington Electric Light Dept.	Burlington, Vt.	WO	1[17]	.	PP	Yes	Dw	16.8	.	1000	90	24.0	.	80	5.6	2.75	2.75	1700	
9	Alberta Natural Gas Co.	Elko, B.C., Can.	GBC	1[40]	70	Gh	No	Dw	.	12.5	1000	90	.	.6	90	.	.	.	1450	
10	*Natural Gas Pipeline Co. of America*	Muscatine, Iowa	GBC	1	70	Gh	No	Dw	.	12.5	1000	90	.	.6	90	.	.	.	....	
11	Northern Natural Gas Co.	Bushton, Kan.	DRI	1[21]	.	Gh	Yes	Sov	.	2.5	1000	90	.	.	.	15	3	.	1400	
12	Trans-Canada Pipe Lines Ltd.	Burstall, Sask., Can.	GBC	1[39]	70	Gh	No	Dw	.	2.5	1000	90	.	.6	90	.	.	.	1450	
13	Natural Gas Pipeline Co. of America	Chicago, Ill.[20]	DRI	2[21,23]	.	Gh	Yes	Sov	.	10	1000	90	.	.	.	15	3	.	1400	
14	Humble Oil & Refining Co.	Santa Texas,	MM	1[31]	.	P,[30]	No	W	.	5.0	1000	90	.	6.65	90	2.5	.	.	1545	
15	Atlantic Richfield Co.	Bakersfield, Calif.	MM	3	....	....[25]	....	W	....	4.65	1000	90	.....	5.8	20	2.5	.	.	1545	
16	New York Telephone Co.	New York, N.Y.	ALY	1[19]	70	SP	Yes	Dw	2.5	.	1500	90	2.5	.	.	1	.	.	1875	
17	Consumers Power Co.	Mt. of St. Clair, Mich.	GBC	.	70	Gh	No	Sov	.	3	1000	90	.	1	4	.	.	.	1700[25]	
18	United States Air Force[1]	Sunnyvale, Calif.	SO	1[2]	.	TE	Yes	W	0.75	1.0	0	60	.	.1	.	.	.	.	1450	
FOREIGN UTILITIES AND INDUSTRIAL PLANTS																				
19	Swedish State Power Board	Kimstad, Sweden	STA	1[49]	71	PP	Yes	W	50.5	...	0	59	70	.	20	0	5	.	1472	
20	Swedish State Power Board	Stockholm, Sweden	EE	1[54]	70-72	PP	Yes	Sov	58	.	0	60	65.5	.	40	2.5	.	.	1652	
21	Sehindgaerket	Kingsov, Denmark	BBS	1	72	PP	Yes	Dw	66.8	.	0	60	80[29]	.	.	3	.	10	1500[25]	
22	Tokyo Electric Power Co.	Yokosuka, Japan	MHI	1	71	PP	No	Dw	20	.	0	68	23	.	37	20	20	.	1500	
23	Hokkaido Electric Power Co.	Kushiro, Japan	MHI	1[70]	70	PP	Yes	Sov	20	...	0	32	20	.	39	20	15	10	1500	
24	Chubu Electric Power Co., Inc.	Nagoya, Japan	HT	1[50]	70-71	PP	Yes	Dw	38.5	.	.	59	20	.	32	20	5	.	1750	
25	Servicios Electricos del Gran Buenos Aires SA (SEGBA)	Buenos Aires, Argentina	BBS	1[65]	70	BI	No	W	73.3[66]	...	0	60	109.5	.	80[35]	15	.	8	1355[25]	
26	CA Venezolana de Cementos[67]	Portugarete, Venezuela	BBS	1[68]	71	BI	No	Dw	17.5[66]	...	0	60	19.5	.	35	15	.	8	1356[25]	
27	Esterlom SA	Brussels, Belgium[20]	STA	1[41]	71	PP	Yes	Dw	27	.	0	59	19.4	.	59	.	.	.	1550	
28	Comision Federal de Electricidad	Acapulco, Mexico	BBS	1[62]	70	BI	Yes	Dw	16.3[66]	...	0	60	19.5	.	35	15	.	8	1355[25]	
29	B P Chemicals Ltd.	Hull, England	BBS	1	71	P,[60]	No	W	.	19.5	0	60	.	.	.	20	.	10	1345[58]	
30	London Transport Board	London, England	STA	8[45]	70-72	PP	Yes	W	20.6	.	0	59	14	.	32	.	.	.	1560	
31	The Gas Council	London, England	EE	1[55]	71	Gh	No	Sov	.	12.3	1000	90	.	16.4	0	5	.	.	1652	
32	Etela-Pohjanmaan Voima Oy	Seinajoki, Finland	STA	1[44]	70	PP	Yes	Dw	9.4	.	0	59	11.7	.	59	5	.	.	1500	
33	Varmans kraft AB	Varberg, Sweden	STA	1[40]	70	PP	Yes	Dw	9.4	.	.	59	11.4	.	59	5	.	.	1382	
34	Mitsubishi Coal Mine Co.	Oyubari Mine, Hokkaido, Jpn.	MHI	1	71	BI	No	Dw	9.0	....	500	60	9.5	.	25	20	.	....	1450	
35	Iraq Petroleum Co. Ltd.	Iraq and U.A.R.	EE	1[52]	71	[53]	No	N	.	9.7	000	90	.	9.5	20	10	.	....	1482	
36	Sonatrach	Arzew, Algeria	BBS	1[59]	71	P.	No	N	.	5.0	0	60	.	.	.	1	.	3	1455[25]	
37	Saudi Cement Co.[56]	El Hasa, Saudi Arabia	BBS	1[57]	70	BI	No	Dw	5.6[66]	.	0	60	....	.	....	1	.	3	1455[25]	

MANUFACTURERS

ALY — Allison Div. of General Motors Corp.
BBS — Brown Boveri-Sulzer Turbomaschinen A.G.
GBC — General Electric Co.
[illegible]
HT — Hitachi, Ltd.
MHI — Mitsubishi Heavy Industries, Ltd.
MM — Solar Div. of International Harvester Co.
[illegible]
PW — Pratt & Whitney Div. of United Aircraft Corp.
[illegible]
WE — Westinghouse Electric Corp.
WO — Worthington Corp.

SYMBOLS

A — Annular
B — Bypass
C — Centrifugal
CC — Combustion chamber
D — Dual
E — Exhaust
F — Fuel
FC — Fuel control
G — Gear
H — Horizontal
HC — Horizontal combustor
Hy — Hydraulic
IC — Inlet chamber
[illegible]
M — Multiple
Mg — Magnetic
N — None
OC — Open cycle
P — Pneumatic
PP — Power plant
R — Recuperator
RC — Regenerative cycle
Rx — Reactor
S — Single
SC — Split compressor
SP — Simple cycle
T — Turbine
TE — Test engine
V — Variable
W — Water
X — Cross

FOOTNOTES

[illegible]

5 At peak load, 500 F
6 [illegible] pressure
7 Also in turbine exhaust and stack
8 Variations of this machine ordered by Public Service Electric & Gas Co., Newark, N.J.; Baltimore Gas & Electric Co., Baltimore, Md.; Florida Power & Light Co., Miami; Philadelphia Electric Co., Philadelphia, Pa.; 3 units; Consolidated Edison Co. of N.Y., Inc., New York, N.Y.; 10 units; Carolina Power & Light Co., Goldsboro, N.C.; 3 units; Duke Power Co., Charlotte, N.C.; 3 units; South Carolina Electric & Gas Co., Charleston, S.C.; 2 units; Tucson Gas & Electric Co., Tucson, Ariz.; 2 units; and Lincoln Electric System, Lincoln, Neb.
9 Peak
10 At peak load, 1725 F
11 On gas-generator turbine
12 Also 3 duct-burner temperature
13 Variations of this machine ordered by Baltimore Gas & Electric Co., Baltimore, Md.; Florida Power & Light Co., Miami; Public Service Electric & Gas Co., Newark, N.J.; Southern Natural Gas & Electric Co., Commerce, Ga.; Public Service Co. of Oklahoma, Tulsa, Okla.; and Jersey Central Power & Light Co., South Amboy, N.J.; Jersey Shore Power Project Authority, Brandon Improvement & Power District, Progress Area, Jamestown, and McPherson Rural Electric Dept., McPherson, Kan. (3 units)
14 Variations of this machine ordered by Carolina Light & Power Co., Columbia, S.C.; Consolidated Edison Co. of N.Y., Inc., New York, N.Y.; Florida Power Corp., Clearwater, Fla.; Philadelphia Electric Co., Philadelphia, Pa.; Atlantic City Electric Co., Atlantic City, N.J.; and Orange & Rockland Utilities, Inc., Hillburn, N.Y.
15 [illegible]
16 Shown [illegible]
17 Variation of this machine ordered by Virgin Islands Water & Power Authority, St. Thomas, V.I.
18 Variation of this machine ordered by Allegheny Corp., Kansas City, Mo.
19 Variations of this unit ordered in 1970 by Illinois Bell Telephone Co., Chicago, Ill.; San Diego Gas and Electric Co., San Diego, Calif.; Southern Bell Telephone Co., Birmingham, Ala.; and Chesapeake & Potomac Telephone Co., Baltimore, Md.

range in size from 750 kW to 58 MW

Type of byste	Speed of driven equipment, rpm	GAS GENERATOR: Number per unit	GAS GENERATOR: Manufacturer	GAS GENERATOR: Number of shafts per generator	GAS GENERATOR: Number of stages in compressor	GAS GENERATOR: Number of turbine stages	GAS GENERATOR: Turbine speed, rpm	POWER TURBINE: Number of shafts	POWER TURBINE: Number of rotors	POWER TURBINE: Number of stages per rotor	COMBUSTORS: Type	COMBUSTORS: Number	FUEL: Type	FUEL: Switch fuel automatically under load?	Type of soundproofing	INSTRUMENTATION AND CONTROL: Type of control system: logic/analog	INSTRUMENTATION AND CONTROL: Method of measuring turbine speed	INSTRUMENTATION AND CONTROL: Location of cycle temperature monitor	INSTRUMENTATION AND CONTROL: Setpoint power control?	INSTRUMENTATION AND CONTROL: Method of controlling turbine surge	INSTRUMENTATION AND CONTROL: Method of controlling turbine acceleration	INSTRUMENTATION AND CONTROL: Method of measuring turbine vibration	INSTRUMENTATION AND CONTROL: Exhaust temp control?	INSTRUMENTATION AND CONTROL: Turbine and generator controls	PROJECT
	3600	1	AE	1-32	17	5	3600	N	N	N	HoC	16	G	No	IS[75]	Sol/Cmb	EM	Ti[7]	Yes	Cv,Vig	SpT[12]	Ts	Yes	ltg	1
	3600	1	PA	1-32	8 1-33	5 1-71	15	1	1	2[16]	CoC	8	DF	Yes	IS[75]	Ry/E	Mag	Ti,Te	Yes	TwS	SpT	Bc	Yes[11]	ltg	2
	3600		BBC		16		3600	N	N	N	VeC	1	C-G	Yes	IS[75]	Ry/Hy	ECo	Ti[7]	Yes	Cv	SpT[12]	Bc	No	ltg	3
	3600	1	KE	1	16	5	4894	N	N	N	CaC	8	DF	Yes	IS[75]	Sol/Cmb	EM	Ti[37]	Yes	Cv,Vig	SpT[12]	Bc	Yes	ltg	4
	3600	1	PA	1	8 1-33	5 1-71	42	1	1	2	CaC	8	DF	Yes	IS[75]	Ry/E	Mag	Te[37]	No	Cv	BpT	....[20]	Yes	ltg	5
	3600	1	PA	1-32	8 1-33	5 1-71	15	1	1	2	CaC	8	G		IS[75]	Ry/E	Mag[6]	Ti,Te	Yes	TwS	SpT	Bc	Yes[11]	ltg	6
	900	1	AE	1	6	5	85	N	N	N	CaC	16	DsC	No	IS[75]	Ry/Pn	....	Ti[7]	No	Cv	BpT	Bc	Yes	ltg	7
	3600	1	PA	1	9	5	7900	1	1	2	CaC	8	DsC		IS[75]	Ry/E	Mag	Ti,Te	Yes	Cv,Vig	SpT	Bc	Yes[11]	ltg	8
	5000	1	RR	1	9	5	7500	1	1	2	CaC	8	G	No	IS[75]	Ry/E	ECo	Te	Yes	Cv,Vig	SpT	Ref	Yes	....	9
	5000	1	PA	1-32	9 1-72	5 1-71	34	1	1	2	CaC	8	G	No	IS[75]	Ry/E	ECo	Te	Yes	Cv,Vig	SpT	Ref	Yes	....	10
	5300	1	GE	1	16	5	7200	1	1	1	CaC	8	G	No	IS[74]	Ry/....	ECo	....	No	Vig	SpT	Ref	Yes	ltg	11
	5000	1	RR	1	17	5	7600	1	1	2	CaC	8	G	No	IS[75]	Ry/E	....	Te	Yes	Cv,Vig	....	Ts[38]	Yes	....	12
	5300	1	PA	1-32	9 1-72	5 1-71	9200[22]	1	1	2	CaC	8	G	No	IS[74]	Ry/....	ECo[27]	....	....	TwS	SpT	Ref	Yes	ltg	13
	7700	1	NW	1	9	5	11 700	1	1	2	VeC	2	G	No	IS[	Sol/....	....[27]	Ti	Yes	Cv	SpT	....[28]	No[29]	ltg	14
	7100	1	NW	1	9	5	11 700	1	1	2	VeC[26]	2	G	No	IS[	Sol/....	....[27]	Ti	Yes	Cv	SpT	....[28]	No[29]	ltg	15
	1200	1	ALN[36]	1	14	5	13 640	1	1	2	CaC	6	DsC	Yes	IS[74]	Ry/E	Sol	Ti[37]	Yes	Cv	BpT	Acc	No	ltg	16
	15 500	1	AE	1	14	5	11 400	1	1	2	AC	1	C	No	IS[75]	Ry/E	ECo	....[37]	Yes	Cv	SpT	Ts[38]	No	ltg	17
	1200	1	SC	1	9	3	22,350	N	N	N	AC	1	DsO,G	Yes	IS[76]	Ry/....	....	Ti,Sk	Yes	Cv	....[3]	....	Yes	ltg	18
	3000	1	STA	1-32	10/10	2/2	[24]	1	1	2[16]	VeC	2[17]	DsO		IS[74]	Sol/Eh	....	Ti	Yes	Cv,Vig	SpT	Bc	No	ltg	19
	3000	4	RR	1	17	5	7900	1	2	2	CaC	8	DsC		IS[74]	Ry/E	ECo	Ti	No	Cv,Vig	SpT	....	Yes	ltg	20
	3000	1	BBC	1	17	5	3000	N	N	N	VeC	1	DsO	No	IS[75]	Sol/Hy	ECo[51]	Ti	Yes	Cv	SpT	Bc	No	ltg	21
	3000				15		3600	....	1	4	CaC	12	DsO	No	IS[75]	Cmb	....[51]	Ti,Sk	Yes	Cv	SpT	Rel	Yes	Sep	22
	3000				15		4850	....	1	5	CaC	6	DsO	No	IS[75]	Cmb	....[51]	Ti,Sk	Yes	Cv	SpT	Rel	Yes	Sep	23
	3600	1		1	15	5		N	N	N	CaC	10	DsO	..	IS[74]	...../Hy,Pn	ECo	Sk	Yes	Cv	BpT	Bc	Yes	Sep	24
	3000	1	BBS	1	15	7	3677	....	1	2	HoC	1	DF	Yes	IS[75]	Ry/Hy	ECo	Ti	Yes	Cv	SpT	Bc	No	ltg	25
	3600	1	BBC	1-32	16	2	3600	N	N	N	HoC	1	DF	Yes	IS[75]	Ry/Hy	ECo	Ti	Yes	Cv	SpT[43]	Bc	No	ltg	26
	3000	1	PA	1-32	8 1-33	2 1-71	42	1	1	2	CaC	8	DsC	No	IS[75]	Sol/Eh	....	Ti	Yes	....	SpT[43]	Bc	No	ltg	27
	3600	1	BBC	1	15	2	3600	N	N	N	HoC	1	DsC	..	IS[75]	..../Hy,E	ECo	Ti	Yes	Cv	SpT	Bc	No	ltg	28
	....[41]	1	BBS	1	16	6	3850	N	N	N	VeC	1	DsO,G	No	IS[	Ry/Hy[50]	Hy	Ti	Yes	Byp	SpT	Bc	No	....	29
	3000	1	RR	1	17	5	7900	1	1	2	CaC	8	DsC	No	IS[75]	Ry/Eh	....	Ti	Yes	Cv,Vig	SpT	Bc	No	ltg	30
	6000	1	RR	1	17	5	7500	1	1	1	CaC	8	C	..	IS[74]	Ry/E	....	Ti	Yes	Cv,Vig	SpT	Bc	Yes	....	31
	3000	1	PA	1-32	9 1-72	2 1-71	42	1	1	2	CaC	6	DsC	No	IS[75]	Sol/Eh	....	Ti	Yes	Cv	SpT[43]	Bc	No	ltg	32
	....	1	STA	1-32	10/10	2/2	48	1	1	2	CaC	7	DsO	.	....	Sol/Eh	....	Ti	Yes	....	SpT	Bc	No	ltg	33
	1000	..			15		6067	....	1	5	CaC	6	DF	Yes	IS[75]	Cmb	....[51]	Ti,Sk	Yes	Cv	SpT	Rel	Yes	Sep	34
	4500	1	EE	1	12	2	6700	1	1	2	VeC	1	G	....	IS[74]	Ry/Pn	ECo	Te	No	N	....	Bc	Yes	....	35
	8800	1	BBS	1	10	2	7200	1	1	1	VeC	2	G	No	IS[	Sol/Cmb	Hy	Ti	No	....	SpT	....	No	....	36
	1500	1	BBS	1	10	3	7300	N	N	N	VeC	2	G	.	IS[74]	Ry/Hy[50]	Hy	Ti	Yes	N	SpT	....	No	ltg	37

(2 units), Norfolk, Va. (1 unit) and Phoenix Telephone & Telegraph Co., Los Angeles, Calif. (2 units). A total of six units were installed in 1969 (two in 1968, three in 1967, one in 1965 and one in 1961.

- Base office
- Ordered prior to June 1969
- B-g compressor drive
- Similar unit ordered by Columbia Gulf Transmission Co., a subsidiary of the Columbia Gas System, Inc., New York, N.Y.
- 3000-rpm i-p, 3600-rpm n-p
- Base flooding
- "Pino" configuration
- Inductive pickup with transducer
- Kinetic sensors on turbine casing
- Turbine inlet-air-temperature control
- Main gas handling
- Variations of this machine ordered by Hudson Engineering Corp.
- Port Sulphur, La. (1 unit); Northern Natural Gas Co., Eagle Grove (1 unit) and Avoca (1 unit); BOC Cryogenic Plants Corp., Harsford, Conn. (3 units).
- Concentric n-p and i-p shafts
- Eight stages in i-p compressor; seven in n-p compressor
- 3000-rpm i-p, 9000-rpm n-p
- Approximate figure
- Cooper-Bessemer Co./Rolls-Royce Ltd.
- Gas generator outlet
- Axial relative motion between bearing cap and shaft
- Variations of this machine ordered by Trans-Canada Pipe Lines Ltd., Cavon, Sask., Can. (1 unit); Ile de Chenes, Man., Can. (2 units) and Alberta Gas Trunk Line Co. Ltd., Long Pine, Alta., Can. (2 units). Basic package was also ordered by utility and industrial companies in the Netherlands (5 units); Germany (4 units), Venezuela (3 units), and Great Britain (1 unit) for gas-handling purposes:
- Variations of this machine ordered by Alberta Natural Gas Co. and West. B.C., Can. (1 unit); Moyie, B.C., Can. (1 unit).
- Gas Transmission Co., Kent, Ohio; Bens Run, W. Va.; Florestville, N.Y.; Gerber, Calif.; Chemung, Ont., Can.; Athens, Texas; Stanfield, Ore.; Wallula, Wash. (1 unit each); Location undisclosed; United Fuel Gas Co., Charleston, W. Va. (1 unit); Columbia Gulf Transmission Co., Ravenna, Ky. (2 units); Chevron Oil Co.'s Kevsor, Alta., Can. (1 units) and Consumers Gas Co. of Canada, Ltd., London West, Ont., Can. (1 units).

Basic package was also ordered by industrial companies in Germany (1 units); Venezuela (2 units) and Qatar (2 units).

41 - Variations of this machine will be installed in Finland (2 units) and Belgium (1 unit).
42 - 6000-rpm i-p, 9000-rpm n-p.
43 - Also surge.
44 - Variations of this machine will be installed in Sweden (2 units) and Finland (1 unit).
45 - Variation of this machine will be installed in Argentina.
46 - Variations of this machine will be installed in Algeria (2 units) for base-load generation.
47 - At peak load, 1472 F.
48 - 5500-rpm i-p, 7000-rpm n-p.
49 - Variations of this machine will be installed by two other companies in Sweden (1 unit each).
50 - The same machine will also be installed in Argentina (2 units) and Honduras (1 unit).
51 - Compressor-pressure purge counter.
52 - The same machine will be installed in Iran for gas-pipeline pumping (5 units); in Algeria for petrochemical compressor drive (1 unit) and in the United Kingdom for gas-pipeline pumping (2 units).
53 - On pumping.
54 - This machine is a scaled-up version of EE's 30-MW turbine-generator. Latter was ordered by two Finnish utilities (2 units each) for peaking power.
55 - Variations of this machine ordered by Great Lakes Gas Transmission Co., Detroit, Mich. (2 units), and Trans-Canada Pipe Lines Ltd., Calgary, Alta., Can. (3 units). Others will be installed in Qatar for base-load generation (5 units); in Zambia for emergency generation (2 units) and in Canada for peaking power (1 unit). Another two machines were purchased by a major foreign petrochemical company for driving compressors.
56 - Consulting engineer: Henry Pooley.
57 - Variations of this machine will be installed in Iran (2 units) and Italy (2 units) for base-load generation.
58 - Axial pneumatic.
59 - Variations of this machine will be installed in Algeria for gas handling (2 units) and process (1 unit) and in Tripoli for pump drive (1 unit).
60 - Partial flow from gas-turbine compressor is drawn off and compressed further for use in a chemical process. Compressors for this operation are driven by the gas turbine.
61 - 13,450 rpm/18,370 rpm.
62 - Variations of this machine will be installed in Mexico (5 units) and Bahama is (1 unit) for base-load generation.
63 - Consulting engineer: Winkelaar Howard Assoc., Ltd.
64 - Under license from BBC. Variations of this machine will be installed (by BBS) in Mexico (1 unit) and Venezuela (2 units) for base-load generation. Foreign installations have higher turbine temperature (1560 F) and can attain 40-MW maximum power.
65 - Variations of this machine will be installed in Bahrain (1 unit) and Nigeria (2 units) for base-load generation.
66 - At coupling.
67 - Consulting engineer: Brown Boveri de Venezuela, SA.
68 - Variations of this machine will be installed in the Philippines (1 unit) for peaking power in a commercial building in Liberia (1 unit) for base-load generation and in Bermuda (1 unit) for base-load generation.
69 - Cannot be attained at base-load turbine-inlet temperature because of Mach number influence.
70 - The same machine will be installed in Mexico (2 units). A variation of this machine will be installed in Japan.
71 - Two stages in i-p turbine, one in n-p turbine.
72 - Nine stages in i-p compressor; seven in n-p compressor.
73 - Variations of this machine ordered by Philadelphia Electric Co., Philadelphia, Pa. (2 units); New England Gas & Electric Assn., Cambridge, Mass. (1 unit); Montaup Electric Co., Somerset, Mass. (1 unit); Public Service Electric & Gas Co., Newark, N.J. (2 units); Public Service Co. of New Hampshire, Manchester, N.H. (1 unit) and Peabody Municipal Light Plant, Peabody, Mass. (1 unit). Two units were ordered by Oil & Gas Corp., Houston, Tex., for gas-pipeline pumping service in Venezuela. Variable units of the basic machine (each of these units is rated at 35 [illegible] normal and 44.2-MW maximum) ordered by Long Island Lighting, Minneola, N.Y. (4 units); Northeast Utilities, Wethersfield, Conn. [illegible]; Public Service Electric & Gas Co., Newark, N.J. (6 units); Georgia Power Co., Atlanta, Ga. (5 units); Columbus & Southern Ohio Electric Co., Columbus, Ohio (4 units); Detroit Edison Co., Detroit, Mich. (2 units) and Wisconsin Power & Light Co., Madison, Wis. (2 units).
74 - Axial exhaust silencer.
75 - Axial exhaust silencer and soundproofed building.
76 - Building soundproofed.

Only U.S. installation

PROJECT	COMPANY	LOCATION	CONSULTING ENGINEER	Year of initial operation	New or existing plant	Principal steam use	BOILERS: No. and type of new units	Manufacturer	Capacity each, 1000 lb/hr or MBtu/hr	Operating pressure, psig	Operating temp, F	FUEL: Type	Ash fusion temp, F	FURNACE: Furnace type	Salagaard type
	UNITED STATES AND CANADIAN INDUSTRIAL STEAM SYSTEMS														
1	Brunswick Pulp & Paper Co	Brunswick, Ga.	Charles T Main Co, Inc			Pr,Po	1 Fl	BW	550	1450	825	BL	N	BD	Uv
2	Weyerhaeuser Co	Valliant, Okla.	Rust Engineering Co	71	New	Pr,Po	1 Fl	CE	700	1300	925	G	N	BD	Uv
3	Weyerhaeuser Co	Valliant, Okla.	Rust Engineering Co	71	New	Pr,Po	1 Fl	CE	700	1300	925	BL,G	N	BD	Uv
4	Great Northern Paper Co	Millinocket, Me.	Stone & Webster Engineering Corp	72	Ex	Pr,SH,Po	1 Fl	UR	600	1300	975	O		BD	...
5	Weyerhaeuser Co	Valliant, Okla.	Rust Engineering Co	71	New	Pr,Po	1 Fl	CE	450	1300	925	Bk	N	BD	Uv
6	Southwest Forest Industries Inc	Snowflake, Ariz.	Charles T Main, Inc	71	Ex	Pr,Po	1 Fl	BW	223	1225	850	BL,G		BD	Uv
7	Union Carbide Corp	San Francisco, Calif.	Bechtel Corp	71	New	Pr	3 Fl	CE	275	1100	750	O,Pr,R		BD	Uv
8	Texaco Inc	Ventura, Calif.	S & Q Construction Co	70	New	Pr	1 Pk	CE	150	1000	Sat	Cr,G	N	Prd	Ir
9	The Procter & Gamble Co	Cincinnati, Ohio	Bechtel Corp	71	Ex	Pr	1 Pk	CE	235	900	825	O,G		Prd	Uv
10	Western Electric Co, Inc	Cicero, Ill.	United Engineers & Constructors, Inc	70	Ex	Pr	1 Pk	UR	150	380	800	G	N	Prd	Uv
11	International Paper Co	Ticonderoga, N.Y.	H A Simons Ltd	70	New	Pr,Po	1 Fl	EC	600	875	825	O,Bk	N	BD	Uv
12	The Mead Corp	Chillicothe, Ohio		71	Ex	Pr,Po	1 Fl	CE	300	875[4]	850	C,O	2000	BD	Uv
13	Puna Sugar Co	Keeau, Hawaii	Amfac, Inc	70	New	Pr,Po	1 Fl	CE	220	875	760	O,Bg	N	BD	Uv
14	International Paper Co	Ticonderoga, N.Y.	H A Simons Ltd	70	New	Pr,Po	1 Fl	BW	208	875	825	O,BL		BD	Uv
15	The Mead Corp	Otsego, Mich.		70	Ex	Pr,Po	1 Pk	CE	125	875	750	O,G	N	Prd	Uv
16	Alston Corp	Cleveland, Ohio	J F Pritchard	70		Pr	2 Pk	BW	155	350	300	G	N	Prd	Ir
17	The Procter & Gamble Co	Cincinnati, Ohio	Bechtel Corp	70	Ex	Pr	1 Pk	CE	130	350	750	G	N	Prd	Uv
18	Wabash Power Equipment Co	Chicago, Ill.				S	2 Pk	UR	125	300	750	O,G		Prd	Uv
19	Wabash Power Equipment Co	Chicago, Ill.				S	2 Pk	CE	125	300	750	O,G	N	Prd	Uv
20	Getty Oil Co	Los Angeles, Calif.	S & Q Construction Co	70	New	SH	1 Pk	CE	225	750	Sat	O	N	Prd	Uv
21	Hammermill Paper Co	Erie, Pa.	Rust Engineering Co.	71	Ex	Pr,Po	1 Fl	BW	306	700	775	BL		BD	...
22	Abitibi Corp	Roaring River, N.C.	Tood-Hedeen International, Inc	69	New	Pr	2 Pk	CE	25	700	Sat	Bk,BL,O,G	N	Prd	Ir
23	Wabash Power Equipment Co	Chicago, Ill.				S	1 Pk	CE	75	650	750	O,G	N	Prd	Uv
24	Westvaco Corp	Luke, Md.		71	Ex	Pr	1 Fl	CE	150	625	720	O,BL	N	BD	Uv
25	Westvaco Corp.	Mickliffe, Ky.		70	New	Pr	1 Fl	CE	300	625	720	O,BL	N	BD	Uv
26	Westvaco Corp.	Luke, Md.		70	Ex	Pr	1 Pk	CE	240	625	720	O,G	N	Prd	Uv
27	Westvaco Corp	Mickliffe, Ky.		70	New	Pr	2 Pk	CE	240	625	720	G	N	Prd	Uv
28	Oscar Mayer & Co, Inc	Davenport, Iowa	Herrick & Lutz Co	70	Ex	Pr,Po	1 Fl	CE	90	625	675	O,G	2175	BD	Uv
29	Thermal Systems, Inc	Oklahoma City, Okla.	M A Niskian Co	71	New	Pr,SH	2 Pk	MW	30	625	750	G	N	Prd	Uv
30	The Standard Oil Co (Ohio)	Toledo, Ohio		69	Ex	Pr	1 Pk	UR	225	600	750	RG	N	Prd	Uv
31	Stauffer Chemical Co	New Orleans, La.	Barnard & Burk, Inc	70	Ex	Pr	1 Pk	CE	50	500	680	G	N	Prd	Uv
32	Sun Oil Co	Houston, Texas	Fluor Western, Inc	71	New	Pr	3 Pk	CE	105	475	Sat	O,RG	N	Prd	Uv
33	Gates Rubber Co	Denver, Col.		70	New	Pr,SH	2 Pk	CE	60	450	Sat	O,G	N	Prd	Uv
34	Clinton Corn Processing Co	Clinton, Iowa	Stanley Consultants	71	Ex	Pr	1 Pk	CE	225	420	765	G	N	Prd	Uv
35	Crown Zellerbach Corp	Camas, Wash.		71	Ex	Pr	1 Fl	BW	263	415	525	O,G,BL	N	BD	Uv
36	FMC Corp	Philadelphia, Pa.					1 Pk	CE	225	415	700	O	N	Prd	Uv
37	Southeast Missouri State College	Cape Girardeau, Mo.	Rogers-Schmidt Co	71	Ex	Po	1 Fl	KEE	125	415	750	O,G	2100	BD	Uv
38	St Regis Paper Co	York, Pa.		71	Ex	Pr	1 Pk	CE	130	410	750	O	N	Prd	Uv
39	GAF Corp, Dyestuffs & Chemical Div	Texas City, Texas					1 Pk	MW	100	400	Sat	G	N	Prd	Uv
40	Melamine Chemicals Inc	Donaldsonville, La.		70	New	Pr	1 Pk	UR	60	380	Sat	G	N	Prd	Uv
41	Gates Rubber Co	Littleton, Col.	Rust Engineering Co.	70	New	Pr,SH	1 Pk	CE	60	350	Sat	O,G	N	Prd	Uv
42	Jonroal Inc	Ardmore, Okla.	Rust Engine, Inc Co.	70	New	Pr,SH	1 Pk	KEE	50	350[11]	336	G	N	Prd	Uv
43	Bethlehem Steel Corp	Sparrows Point, Md.	United Engineers & Constructors Inc	71	New	Pr	1 Fl	UR	450	320	650	O,BF	N	BD	Uv
44	Quincy Foods Inc	Burley, Ida.	William H Kahl & Associates	70	Ex	Pr,SH	1 Pk	MW	75	300	Sat	O,G	N	Prd	Uv
45	Wabash Power Equipment Co	Chicago, Ill.				S	1 Pk	MW	75	300	Sat	O,G	N	Prd	Uv
46	U S Steel Corp	Bivtown, Texas		70	New	Pr	1 Pk	BW	50	300	Sat	G	N	Prd	Uv
47	Hercules Inc	Conora, Pa.		69	Ex	Pr	1 Pk	MW	40	290	Sat	G	N	Prd	Uv
48	Penny Tar & Chemical Corp	Yaphankapaws, Ind.		70	Ex	Pr	1 Pk	MW	70	275	Sat	O,G	N	Prd	Uv
49	Virginia Polytechnic Institute	Blacksburg, Va.	Wiley & Wilson	70	Ex	SH	2 Fl	KEE	30	265	Sat	O,G	N	Prd	Uv
50	Western Electric Co Inc	Baltimore, Md.		69	Ex	Pr,SH	3 Pk	UR	200	260	309	O,G	N	Prd	Uv
51	GAF Corp	Joliet, Ill.	Johnson & Johnson Engrs & Arch, Inc	70	Ex	Pr,SH	2 Pk	MW	77	250	Sat	O,G	N	Prd	Uv
52	Dawson Mills Inc	Jasper, Texas				Pr	1 Fl	UR	80	250	Sat	Bk,G	N	BD	Uv
53	The Kendall Company Inc	Fayetteville, N.C.		69	New	Pr,SH	2 Pk	UR	60	250	Sat	O,G	N	Prd	Uv
54	A R Dale & Co, Dawson Chemical Div	Baltimore, Md.		69	Ex	Pr	1 Fl	UR	50	250	Sat	G	N	Prd	Uv
55	Mohasco Finishing Co	Bunker, N.C.	John D Latimer & Associates	70	Ex	Pr	1 Pk	BW	40	235	Sat	O,G	N	Prd	Uv
56	Southwest Forest Industries Inc	Flagstaff, Ariz.	Power Teams	70	Ex	Pr	1 Pk	BW	75	225	Sat	G	N	Prd	Uv
57	Monsanto Co	Burlington, N.J.		70	Ex	Pr	1 Pk	MW	60	225	Sat	O,G	N	Prd	Uv
58	B F Goodrich Chemical Co	Henry, Ill.			Ex	Pr,SH	1 Pk	CE	100	220	Sat	O,G	N	Prd	Uv
59	B F Goodrich Chemical Co	Pottsville, N.C.		69	New	Pr	2 Pk	UR	75	220	Sat	O,G	N	Prd	Uv
60	Bonner Fiberboard Co	Newberg, Ore.		70	Ex	Pr	1 Pk	BW	40	210	Sat	O	N	Prd	Uv
61	Consolidated Packaging Corp	Ft Madison, Iowa		70	Ex	Pr	1 Pk	MW	125	200	Sat	O,G	N	BD	Uv
62	The Nestle Co Inc	Freehold, N.J.	A M Kinney, Inc	70	New	Pr	2 Pk	BW	115	200	Sat	O	N	Prd	Uv
63	B F Goodrich Chemical Co	Louisville, Ky.		70	Ex	Pr	1 Pk	CE	100	200	475	O,H2	N	Prd	Uv
64	Fibre Container Corp	Monroe, Mich.		70	Ex	Pr,SH	1 Pk	KEE	70	200	Sat	O,G	N	Prd	Uv
65	Empresa Industrial A	Laredo, Texas		70	New	Pr	1 Pk	CE	45	200	Sat	O	N	Prd	Uv
66	Government Hospital	Richland, Ore.		70	New	SH	2 Pk	BW	26.5	200	Sat	O,G	N		

MANUFACTURERS

AAF	American Air Filter Co Inc
...	...
ABB	American Blower & Sirocco Sys Div
...	...
AC	Allis-Chalmers Mfg Co
AMB	American Blower Corp
AMP	American-Marsh Pumps Inc
...	...
APD	Aurora Pump Div, New York Air Brake Co
ASI	American Standard Industrial Div
BF	Buffalo Forge Co
BP	Byron Jackson Pumps Inc
BW	Babcock & Wilcox Co
BFP	Buffalo Pumps Div, Buffalo Forge Co
CBP	Chapman Pump Co Div of Gary Aviation Co
...	...
CE	Combustion Engineering Co Inc
CG	Coen Company Inc
CW	Cleaver-Brooks Div, Aqua-Chem Inc
...	...
DC	Detroit Controls Inc
DF	Dravo Fan Co
DHB	Chicago Blower Corp, Chicago Conveyor Corp
DOC	Dorchane Div, Crane Co
DOE	Doen Co
DHP	Dean Brothers Pumps Inc
DP	Pacific Pumps Div, Dresser Inds Inc
DT	De Laval Turbine Inc
DP	Diamond Power Specialty Corp
DOC	Detroit Stoker Co
EC	Erie City Iron Works
EEA	Electronics Corp of America
EL	Elliott Co, Carrier Corp
ENG	Engineer Co
F	The Foxboro Co
FAA	The Fly Ash Arrester Co
FAB	Fisher Engineering Co, Inc
FIS	Fischer & Porter Co
FLA	Flame Tech
FMP	Fly Gunes Morse Pump Div
FO	Forney Engineering Co
GE	General Electric Co
GP	Gaulds Pumps Inc
H	Honeywell Inc
HAY	The Hays Corp

igure in this year's boiler survey

EQUIPMENT		AIR HEATER			F.D FANS			I.D FANS			BOILER FEED SYSTEM				COMBUSTION CONTROL		POLLUTION CONTROL					PROJECT
	Burner																					
Manufacturer	Type and number per boiler	Manufacturer	Type	Manufacturer	Number per boiler	Manufacturer	Drive type and power, required?®	Number per boiler	Manufacturer	Drive type and power, required?®	Number of pumps	Manufacturer	Drive type and power, required?®	Feedwater treatment	Type	Control manufacturer	Max. sulfur in fuel, %	Fuel additive introduction point	Dust collector type	Dust collector manufacturer	Chimney height, ft?	
	10 SA	BW	Ro			FAA	M 350-600		FAA	T 3000	4	IR	T 1750	MuD In	E	F	N	N	EI	KC	269	
	6	CE	N	N		CF	T 225C	N	N	N	2?	BPC	T	Ca MuD In	E	TIC	N	N	N	N	300	
	6 Ya	CE	N	CE		CF	T 5PC		CF	T 120E	2?	BPC	T	Ca MuD In	E	TIC	N	N	EI	FAA	300	
	6 Me	PEC	SC	APC		WE	T 220		WE	T 130C		PP	T 166E	Ca MuE	Pa	BM	2.2	Bar	N	N	170	4
	4	CE	Ke	APC		CF	T 36C		CF	T 140	2?	BPC	T	Ca MuD In	E	TIC	N	N	Me	FAA	300	5
	2?	BW	Ro	BW		FAA	T		FAA	T	2		T	MuD In	Co	BM	....	Bar	EI	KC	....	6
	10 SA	CE	Ke	APC		CF	M T 35C		CF	M T 80C		BPC	M T 80C	MuC In	Pa	F	N	N	N	160	7
	10 SA	CE	N	N		CF	M T 35C 45C	N	N	N	2-4	PP	M T 90C	Z	Co	BM	2.5	....	....	....	30	8
	8 SA	CE	Ke	APC		CF	M T 35C 45C	N	N	N		BPC	T 70C	MuD In	E	F	....	....	....	....	200	9
		COE					M 40C	N	N	N	2	IR	M T 200	MuD	Co	BM	N	N	N	N	250	10
OSC	6 SA	SC	Ro	EC		WE	M 60C	2	WE	T 1420	2?®	KSE	CM 150C CT 140C	MuD, In	E	FIS	0.4	N	Me	BU	200	11
	2 AP	CE	Sc Ke	APC		WE	M 40C	2	WE	T 80C	2	BJ	T 75e	Ex	Pa	....	5	N	Me	WP	475	12
CE	4 Tc	CE	Sc Ke	AF CE		APC	M T	2	APC	M T	2	EJ	M T 60C	In	E	GE	2	N	Me	WP	170	13
	2 SA	BW	N	N		WE	M 30C	2	WE	T 48C	2			MuD In	E	FIS	N	N	EI	RC	200	14
	2 SA	COE	Ke	APC		CF	M 35C	N	N	N	2	BPC	T 24C	Fl Z So In	Co	....	....	Fs	N	N	75	15
	2		BW	TC	BW		CF	M T 300	N	N	N	2		M T	MuD In	Pa	....	N	N	N	N	50	16
			CCE	Ke	APC		CHE	M 20C	N	N	N				MuD In	E	F	N	N	N	N	....	17
	2 SA		COE	N	N		CF	M 35C	N	N	N	N	N	N	N	Pa	BM	....	N	N	N	....	18
	2 SA		COE	N	N		CF	M 45C	N	N	N	N	N	N	N	Pn	BM	N	N	N	N	40	19
	2 SA		CE	N	N		CF	M T 52C	N	N	N	2		M T 50C	Z	Pn	BM	1.5	N	N	N	60	20
	14		BW	SC	AC		FAA	M 50C	2®	FAA	T 90C	2	IR	M T 80C	Z So In	Pa	F	N	N	EI	RC	210	21
ACB	4 CA		CE	N	N		RV	M CE	2	FAA	M 12S	2	AC	M 20C	M D In	Pn	DM	....	N	Me	FAA	40,50	22
	2 SA		COE	N	N		CF	M 75C	N	N	N	N	N	N	N	E	COE	N	N	N	N	40	23
	8 HA		CE	SC	AC			M 20C	2		T 90C	2?2		M T 100D	MuD In	....	....	N	N	EI	KC	275	24
	16 E		CE	SC	AC		SW	T 20C	2	SW	T 80C	2?	IR	M T 100D	MuD, In	E	....	N	N	EI	RC	....	25
	2 SA		CE	N	N			M 90C	N	N	N	2?2		M T 100C	MuD In	....	....	N	N	N	N	250	26
			CE	N	N		SW	T 80C	N	N	N	2	IR	M T 100D	MuC In	E	....	N	N	N	N	20	27
PSC	4 Ta		COE	N	N		SW	M 4C	2	SW	M 15C	2	IR	M T 20C	Z So In	Pn	BM	2.4	Fur	Me	WP	140	28
	2 SA						CE	M T 40 C 13?	N	N			PP	M T 12S	Z Ir	Co	BM	N	N	N	N	....	29
	4		UP	N	N		BF	M 40C	N	N	N	2	PP	M T 50C	Ca Fl Z In	Pn	BM	N	N	N	N	120	30
			CE	N	N		CHE	M 4C	N	N	N	2	IR	M 10C	Da In	Pn	CE	N	N	N	N	40	31
			CE	N	N		BF	M T 13C	N	N	N				So Fl Z	E	....	0.5	N	N	N	350	32
	A		CE	N	N			M	N	N	N		PE	M	Z Da In	E	HAY	N	N	N	N	40	33
			CE	N	N		CF	M 50C	N	N	N	2?®	IR	M 90C	Ca, Fl, Z, Ir	Pn	F	N	N	N	N	200	34
	SA		BW	S	CF		CF	M 30C	2	CF	T 180C	2	BJ	M 70C	Z So MuD In	Pn	BM	N	N	Me	FAA	152	35
	2 SA		CE	N	N		BF	T 40C	N	N	N	Ex	IR	M T 25C	Ca Fl Z In	Pn	BM	2.5	N	N	N	75	36
MC			CCE	N	N			M 6C			M 30C	2		M T 20C	Z Ir	Pn	BM	2	N	Me	RC	140	37
			PEC	N	N			M T 36C	N	N	N			M 20C	Z	Pn	....	2.5	Bar	N	N	150	38
	2 AP		COE	N	N		COE	M 12S	N	N	N	2?4	BPC	M 15C	MuD MuD In	Pn	F	N	N	N	N	50	39
			UP	N	N		CF	T 4C	N	N	N	2?4	IR	M T 75	Z Ir	Pn	BM	N	N	N	N	50	40
	2 SA		CE	N	N		CHE	M 10C	N	N	N	2	PE	M	Z Da In	E	HAY	N	N	N	N	40	41
			CE	N	N		CF	M 6C	N	N	N	2?4	WC	M 10C	Ir	Pn	BM	N	N	N	N	40	42
	4 SA		PEC	N	UP		WE	T 63E		WE	T 66E	2	WD	T 42D	Z Ir	Pn	BM	1	N	N	N	175	43
	2 AA		COE	N	N		CF		N	N	N		WC	M	Z In	Pn	....	N	N	N	N	40	44
	2 SA		COE	N	N		COE	M 5C	N	N	N	....				E	COE	N	N	N	N	....	45
				N	N			M	N	N	N	2	WS	M	Fl Z In	Pn	BM	N	N	N	N	....	46
	2 SA		CCE	N	N		AC	M 12C	N	N	N	Ex			Ir	E	H	N	N	N	N	40	47
				N	N		CF	M 4D	N	N	N	2	WE	M T 20	Z Sc	Pn	....	N	N	N	N	30	48
	2 AA		COE	N	N		COE	M 10C	N	N	N			M 15C	MuD In	E	COE	1	N	N	N	185	49
	2 SA		PEC	N	UP		CF	M 15C	N	N	N	2	IR	T 14C	Z Ir	Pn	FIS	1	N	N	N	126	50
	2 SA		COE	N	N		AC	M 5C	N	N	N	2?4	CCC	M 5C	Sc Fl Z Ir	Pn	HCC	N	N	N	N	75	51
	2		AP	N	N		CF	M 8C	2	CF	M 15C	2	CF	M T 25	Z	Pn	BM	N	N	Me	....	75	52
	2 SA		COE	N	N		COE	M 4C	N	N	N		UF	M T 10C	Z Ir	Co	HCC	N	N	N	N	50	53
	2 SA		PEC	N	N		CF	M 4C	N	N	N		GE	M 2C	Z In	Co	CCI	N	N	N	N	....	54
	2 SA		BW	N	N			M 2C	N	N	N	2	WP	M 5C	Z In	Pn	....	N	Fs	N	N	40	55
	2 AA		BW	N	N		CF	M 6C	N	N	N		PP IR	M 75 12S	Ir	Pn	BM	N	N	N	N	60	56
			COE	N	N		COE	M T 15C	N	N	N		IR	T 6C	Ca Fl Z Ir	E	COE	N	N	N	N	40	57
	2 SA		CE	Ke	APC		CF	M T 20C	N	N	N			M T 10C	Da Sc MuD In	Co	F,RD	N	N	N	N	....	58
			PEC	Ke	APC		CHE	M T 5C	N	N	N		PE	M T 5C	MuC MuD In	Pn	F	1	N	N	N	50	59
	2 SA		BW	N	N			M 2C	N	N	N				Z Ir	....	....	N	N	N	N	45	60
			CCE	N	N		CF	M 12C	N	N	N	2		T 8C	Sc	E	COE	N	N	N	N	225	61
	2 SA		BW	Ke	APC		CF	M 20C 20C	N	N	N		DC	M 10C	Fl Z Da In	Pn	BM	N	N	N	N	76	62
			COE	Ke	APC		BF	M T 20C	N	N	N	2	PE	T 10C	Da Z Da In	Pn	F	N	N	N	N	50	63
	2 SA		FW	N	N		CF	M 8C	N	N	N		APC	T 6C	Z In	....	....	N	N	N	N	40	64
	2 SA		CCE	N	N		AC	M 5C	N	N	N	2?4	UF	M 4C	Z Sc In	Pn	BM	N	N	N	N	40	65
	2 SA		BW	N	N		CF	M 12C	N	N	N		SnA	M 5C	Ir	Pn	BM	N	N	N	N	80	66

- Combustion Engineering Inc
- Combustion Equipment Co
- Detroit Stoker Co
- Erie City Iron Works
- Foster Wheeler Corp
- Foxboro Co
- Gilbert Associates Inc
- Peabody Engineering Corp
- Riley Stoker Corp
- Zurn Industries Inc

- Babcock & Wilcox Co
- Bailey Meter Co
- Bartlett-Hayward Co
- Bethlehem Steel Corp
- Bituminous Fuel Eng Corp
- Buffalo Forge Co
- Buffalo Pumps Inc
- Chemical Construction Corp
- Cleaver-Brooks Co
- Combustion Engineering Inc
- Connelly Boiler Co
- Copes-Vulcan Div
- Detroit Stoker Co
- Diamond Power Specialty Corp
- Dravo Corp
- Duriron Co Inc
- Elliott Co
- Erie City Iron Works
- Fairbanks Morse & Co
- Fisher Governor Co
- Foster Wheeler Corp
- Foxboro Co
- Gilbert Associates Inc
- Green Fuel Economizer Co
- Hagan Corp
- Heat Exchangers Inc
- Hoffman Specialty Div
- Ingersoll-Rand Co
- Integrated Equipment Inc
- International Combustion Ltd
- Jeffrey Mfg Co
- Johnston Pump Co
- Keystone Valve Div
- Kobe Inc
- Lear Siegler Inc
- Leslie Co
- Lewis Foundry & Machine Div
- Link-Belt Co
- Lone Star Steel Co
- Marley Co
- Master Boiler Co
- Metropolitan Wheelabrator Corp
- Midland-Ross Corp
- Nebraska Boiler Co
- Nooter Corp
- Pacific Pumps Inc
- Peabody Engineering Corp
- Penberthy Injector Co
- Permutit Co
- Pitometer Log Corp
- Power Specialty Co
- Precipitair Inc
- Pressure Blast Mfg Co Inc
- Proportioning Controls Inc
- Ray Burner Co
- Research-Cottrell Inc
- Republic Div Aerojet Mfg Co
- Reliance Electric Engrg Co
- Riley Stoker Corp
- Roots-Connersville Blower Corp
- Sarco Co Inc
- Schutte & Koerting Co
- Southern Boiler & Tank Works Inc
- Spence Engineering Co Inc
- Struthers Wells Corp
- Sturtevant Div Westinghouse Elec Corp
- Taylor Instrument Co
- Todd Shipyards Corp Products Div
- Union Iron Works Riley Stoker Corp
- Unit Rig & Equipment Co
- Vapor Corp
- Vogt Machine Co Inc
- Wallace & Tiernan Inc
- Walworth Co
- Warren Steam Pump Co Inc
- Wellman Engineering Co
- Westinghouse Electric Corp
- Wheelabrator-Frye Inc
- Williamson Heater Co
- Yarnall-Waring Co
- Zurn Industries Inc

PROJECT	COMPANY	LOCATION	CONSULTING ENGINEER	Year of initial operation	New or existing plant	Principal steam use	BOILERS					FUEL		
							No. and type of new units	Manufacturer	Capacity each, 1000 lb/hr or MBtu/hr	Operating pressure, psig	Operating temp, F	Type	Ash fusion temp, F	Furnace type
67	Wallace Silversmiths	Wallingford, Conn	Westcott & Mapes				1 Pk	KEE	50	195	500	O	N	Pd
68	Southdown, Inc	New Orleans La.		70	Ex	Pr	1 Pk	CE	180	175	Sat		N	Pd
69	Carolina Paper Board Corp	Charlotte, N. C.		70	Ex	Pr Po, SH	1 Pk	BW	50	175	Sat	O G	N	Pd
70	Central Park Ave Pumping Station	Chicago, Ill.	Laramore Douglas & Popham	70	Ex	Pp[15]	5 Pk		40	175	577	O G	N	Pd
71	Dorringway Co	Springfield Mo.		70	Ex	Pr	1 Pk	KEE	45	166	Sat	O G	N	Pd
72	University of Texas	Arlington, Texas	Cowan Love & Jackson, Inc	69	Ex	SH	1 Fl	CE	45	165	Sat	O G	N	Pd
73	Armstrong Cork Co	Kankakee, Ill		70	Ex	Pr SH	1 Pk	KEE	40	165	Sat	O G	N	Pd
74	Indiana University	Bloomington, Ind.	Brown Engineering Co.	70	Ex	SH	1 Fl	UR	150	160	Sat			BO
75	Seattle Steam Corp	Seattle, Wash		70	Ex	SH	1 Pk	CE	120	160	Sat	O G	N	Pd
76	Stauffer Chemical Co	Garfield, Utah		70	Ex	Pr	1 Pk	MW	80	160	Sat	O G	N	Pd
77	Lithium Corp of America, Inc	Bessemer City N. C.				Pr	1 Pk	BW	45	160	Sat	O G	N	Pd
78	Rock Island Refinery Corp	Indianapolis Ind.		70	Ex	Pr	1 Fl	VO	40	160	479	O RG		BO
79	Great Meadows Institute	Comstock, N. Y.		70	New	Pr SH	4 Pk	CE	25	160		O	N	BO
80	General Motors Corp, Fisher Body Div	Grand Rapids Mich		70	New	SH	2 Pk	BW	35	157	Sat	O	N	Pd
81	General Motors Corp, Harrison Radiator Div	Lockport, N. Y	GMC, Argonaut Realty Div	70	New	SH	2 Pk	BW	30	155	Sat	O G	N	Pd
82	Dow Chemical Co	Freeport, Texas			New	Pr	3 Fl	KEE	67	150	Sat	O G	N	Pd
83	University of Texas Medical Center	Galveston, Texas	Saynor & Simen Inc		Ex	SH	2 Pk	MW	100	150	Sat		N	Pd
84	S C Johnson & Son Inc	Waxdale, Wis.		70	Ex	Pr SH	2 Pk	BW	80	150	Sat	O G	N	Pd
85	Scott Paper Co	Philadelphia, Pa.		70	Ex	Pr	4 Pk	CE	80	150[14]	590	O G[15]		Pd
86	Bassett-Walker Knitting Co	Martinsville, Va.	J E Sirrine Co	70	New	Pr	1 Pk	BW	75	150	Sat	O G	N	Pd
87	The Quaker Oats Co	Rockford Ill					1 Pk	BW	50	150	Sat	O G	N	Pd
88	Weyerhaeuser Co	Frederick, Mass.	Jackson & Moreland	70	New	Pr	1 Pk	BW	50	150	Sat	O G	N	Pd
89	Detroit House of Correction	Detroit, Mich	Snyder & McLean Inc	70	Ex	Pr SH	1 Pk	CE	36 5	150	Sat	O G	N	Pd
90	Brighton Sanford Inc	Summerville Ga		69	New	Pr	2 Fl	CE	43	150	758	O G		BO
91	Sacred Heart Medical Center	Spokane, Wash	Valentine Fisher & Tomlinson	68	New	Pr SH	1 Pk	BW	40	150	Sat	O G	N	Pd
92	Sunmount State School	Tupper Lake, N. Y.	Paul L Geringer & Associates.	70	Ex	SH	2 Pk	KEE	30	150	366	O	N	Pd
93	Wilson Pharm & Chem Corp Wilson Labs Div	Chicago, Ill.		69	Ex	Pr	1 Pk	BW	20	150	Sat	O G	N	Pd
94	Edgewater Hospital	Chicago, Ill.	Ganze, Karookin & Associates	71	New	Pr SH	3 Pk	BW	24	150	Sat	O G	N	Pd
95	Koppers Co Inc	Florence, N. C.					1 Pk	MW	24	150	Sat	O G	N	Pd
96	Providence Hospital	Mobile, Ala.	Evans & Young	70	Ex	Pr SH	2 Pk	MW	20	150	766	O G	N	Pd
97	Witco Chemical Corp	Petrolia Pa		69	Ex	Pr	1 Pk	BW	50	140	Sat	O G	N	Pd
98	W R Grace & Co Dewey & Almy Chem Div	Owensboro, Ky		70	Ex	Pr SH	1 Pk	MW	50	130	Sat	O G	N	Pd
99	Townsends, Inc	Millsboro, Del		70	Ex	Pr	1 Pk	BW	40	140	Sat	O	N	Pd
100	Thomberg-Carlson Corp	Rochester, N. Y		69	Ex	Pr SH	2 Fl	KEE	30	140	Sat	O G	N	Pd
101	Dole Co	Honolulu, Hawaii		71	Ex	Pr	1 Pk	BW	150	125	Sat	O	N	Pd
102	Chemetron Corp Tube Turns Div	Louisville, Ky.		70	Ex	Pr	1 Pk	CE	90	135	Sat	O G	N	Pd
103	Medical Center Development Corp	Detroit, Mich.	Albert Kahn Associates	70	New	Pr	2 Pk	BW	70	125	Sat	O G	N	Pd
104	General Motors Corp Diesel Equ Div	Grand Rapids Mich	GMC Argonaut Realty Div	66	Ex	Pr SH	1 Pk	BW	90	125	Sat	O G	N	Pd
105	Chevron Chemical Co	San Francisco Calif.		70	Ex	Pr	1 Pk	CE	100	150	Sat	O G	N	Pd
106	The Babcock & Wilcox Co, Tubular Prods Div	Beaver Falls, Pa		70	Ex	Pr, SH	1 Pk	BW	105	125	Sat	O G	N	Pd
107	Monsanto Co	Nitro, W. Va	Black & Veatch	70	Ex	Pr SH	1 Fl	EC	125	125	Sat			BO
108	General Dynamics Corp	Groton, Conn		69	New	SH	1 Pk	BW	100	125	Sat	O G	N	Pd
109	Central State Hospital	Anchorage, Ky	E R Ronald & Associates	70	Ex	SH	2 Pk	MW	50 20	125	Sat	O G	N	Pd
110	Koppers Co Inc	Susquehanna, Pa		71	New	Pr	1 Pk	MW	50	125	Sat	O G	N	Pd
111	Lake Superior State College	Sault Ste. Marie, Mich.	Commonwealth Associates Inc		New	SH	2 Pk	OB	50	125	583	O G	N	Pd
112	Owatonna Canning Co	Owatonna, Minn		70	Ex	P	2 Pk	MW	50	125	Sat	O G	N	Pd
113	International Paper Co	Ticonderoga, N. Y	R A Simons Ltd	69	New	SH	1 Pk	EC	40	125	Sat	O G	N	Pd
114	Oscar Mayer & Co Inc	Perry, Iowa	Helmick & Lutz Co	70	Ex	Pr	1 Pk	CE	40	125	Sat	O G	N	BO
115	Sacramento State College	Sacramento, Calif.		70	Ex	SH	1 Pk	MW	40	125	Sat	O G	N	Pd
116	Swiftec International Corp	Chattanooga, Tenn					1 Pk	CE	40	125	Sat	O G	N	Pd
117	Ellis Hospital	Schenectady, N. Y	Harold H. Friedman Associates	71	New	Pr, SH	2 Pk	MW	35	125	Sat	O G	N	Pd
118	University of Colorado	Boulder, Colo			New	SH	1 Pk	BW	40	125	Sat	O G	N	Pd
119	University of South Carolina	Columbia, S. C.		69	New	Pr SH	2 Pk	BW	35	125	441	O G	N	BO
120	Palm Springs State Hospital	Palm Springs, Mont	P L Pruyning		New	SH	2 Pk	BW	25	125	Sat	O G	N	Pd
121	E & B Carpet Mills Inc	Trenton, Ga	J E Sirrine Co	69	New	Pr	1 Fl	CB	20	125	Sat	O G	N	Pd
122	Industrial Chemicals Co	Morganza, Pa		70	Ex	Pr	1 Pk	BW	20	125	Sat	O G	N	Pd
123	Kimberly Farms	Fresno, Calif.		70	Ex	SH	1 Pk	BW	60	125	Sat	O G	N	Pd
124	Eastern Washington State College	Cheney, Wash	Hyjack Reeves	70	New	SH	1 Pk	BW	35	125	Sat	O G	N	BO
125	Borden Inc Dairy Products Div	Wayne, Pa		70	Ex	Pr SH	2 Pk	MW	35	125	Sat	O G	N	Pd
126	Ford Dealers & Owners Home	Dearborn, Mich	Cummins Associates	69	Ex	Pr SH	1 Pk	UR	30	125	Sat	O	N	BO
127	Portland Steam Co	Portland, Me		70	Ex	SH	1 Pk	UR	40	125	Sat	O	N	Pd
	HIGH TEMPERATURE WATER SYSTEMS													
128	Lakeland University	Fond du Lac, Wisc	Commonwealth Associates Inc	71	New	SH	2	HW	20	240	35	O G		Pd
129	Alfred State School	Alfred, N. Y.	Crawley & Associates		New	SH	2	HW	38 2	250	400	O G	N	Pd
130	Lincoln Hall	Lincoln, Neb.	Mayer, Strong & Jones		New	SH	2	HW	60	250	420	O G		BO
131	Ozark Junior Development Co	Poplar Bluff, Mo	Black & Veatch		New	SH	2	HW	39	250	395	O G		Pd
132	Northeastern College	Sterling		69	New	SH	2		21	5	420	O G		Pd

SYMBOLS

Fuels: O = Oil and C = Coal; manufacturers

AA = Air atomizing
BO = Boiler only
BP = Back pressure
Ba = Bagasse
C = Coal
Ch = Chemical
D = Deaerator
E = Electric
Ex = Existing
F = Fuel oil
G = Gas
H = Hydrogen
In = Industrial
Ir = Iron
LNG = Liquefied natural gas
M = Motor
Me = Mechanical
MnO = Manganese oxide
MoO = Molybdic oxide
N = None
New = New
O = Oil
Pa = Pulp and paper industry
Pk = Package
Pp = Process
Pr = Process
PrG = Process gas
PrR = Process recovery
Re = Refinery
RO = Reverse osmosis
SA = Steam atomizing
Sat = Saturated
Sd = Sodium

Combined pneumatic and mechanical
Stoker
Steam drum
Electrostatic precipitator
Electric steam
Engine
Fuel oil
Gas
Hydrogen
Internal water treatment
Iron
Liquefied natural gas
Motor
Mechanical
Manganese oxide
Molybdic oxide
None
New
Oil
Pulp and paper industry

nvironment dominate users' thinking

	AIR HEATER		F-D FANS			I-D FANS			BOILER FEED SYSTEM				COMBUSTION CONTROL		POLLUTION CONTROL					PROJECT
	Burner Type and number per boiler	Manufacturer	Type	Manufacturer	Number per boiler	Manufacturer	Drive type and power required[20]	Number per boiler	Manufacturer	Drive type and power required[20]	Number of pumps	Manufacturer	Drive type and power required[20]	Feedwater treatment	Type	Control manufacturer	Max. sulfur in fuel, %	Fuel additive introduction point	Dust collector type	Dust collector manufacturer	Chimney height, ft[17]	
	[22] SA	FAB	N	N		CE	M [illegible]	N	N	N		WC	T [illegible]	Ft Z In	E	RE	N	N	N	N	45	67
		CE	N	N		FAA	M T [illegible]	N	N	N			M T 100	Sc Ft Z In	Pn	CE	N	N	N	N	40	68
		BW	N	N			M [illegible]	N	N	N		WC	M 40	Z In	Co	BM	N	Fs	N	N	50	69
	SA		N	N			M [illegible]	N	N	N			M T 50	In	Pn	....	N	N	N	N	215	70
	SA		N	N			M 40	N	N	N		IP	T 30	Z Da In	Co	CDE	N	N	N	N	35	71
		CDE	N	N																		
	Me	CDE	N	N		CDE	M [illegible]	N	N	N		PP	M 40	Z In	Co	CDE	N	N	N	N	....	72
	SA	BW	N	N			M [illegible]	N	N	N			M T	Z In	Co	CDE	N	N	N	N	....	73
	SA		N	N			M 50		CE	M 350	Ea			Ea	E	HAY	....	N	Me, El	UOP, AS	Ea	74
			N	N				N	N	N				Z In	Pn	BM	....	Fs	N	N	150[17]	75
	SA	CDE	N	N			M T 100	N	N	N		PE	M 60	Z In	Co	BM	1	Fs	N	N	54	76
	SA	CDE	N	N																		
	SA	PDE	N	N		CE	M [illegible]	N	N	N	[illegible]	GP	T 50	In	Pn	BM	....	N	N	N	40	77
			N	N							[13]	IR	M T 60	Z In	Co	....	N	N	N	N	....	78
			N	N								WPM	M	Ir	Co	HAY	0.9	Fs	N	N	....	79
	SA	BW	N	N			M 40	N	N	N	[12]	WC	M T 100	Z Da In	Co	BM	N	N	N	N	60	80
	SA	BW	N	N			M [illegible]	N	N	N	[12]	WD	M T 60	Z Da In	Co	BM	N	N	N	N	45	81
		FAB	N	N		BF	M [illegible]50	N	N	N	[12]	BF	M [illegible]25	Z In	Co	F,HAY	N	N	N	N	30	82
		CDE	N	N		CDE AL	M [illegible]	N	N	N		GP	M 50	Da	E	....	N	N	N	N	50	83
	AA	BW	N	N			M [illegible]	N	N	N		IR	M 50	Z In	Co	....	N	N	N	N	45	84
	SA	[illegible]	[illegible]	CE		[illegible]	M [illegible]	N	N	N		PE	M	Ft Z So In	Co	BM	N	N	N	N	30	85
	SA	BW	N	N		CE	M 50	N	N	N		WD	M T 75	Z In	Pn	BM	N	N	N	N	70	86
	SA	BW	N	N		CE	M 40	N	N	N	[12]	WD	M 40	Z In	Pn	BM	N	N	N	N	95	87
		CDE	N	N			M 30	N	N	N		GP	M 30	Z	E	CDE	3	Fs	N	N	50	88
	SA	CDE	N	N		AL	M [illegible]	N	N	N				Z In	E	CDE	N	N	N	N	....	89
		N	N	N		FAA	M		FAA	M			M T	Z In	Co	HAY	3.12	N	Me	FAA	40	90
	SA	BW	N	N			M 40	N	N	N		WD	M T 30	Z In	Pn	BM	....	N	N	N	....	91
	SA	[illegible]	N	N		CE	M 30	N	N	N	1	IR	M 30	In	Co	TS	N	N	N	N	150[17]	92
		[illegible]	N	N		[illegible]	M [illegible]	N	N	N	1	IR UP	M 30	Z In	E	....	N	N	N	N	60	93
	SA	BW	N	N		[illegible]	M 30	N	N	N	2	SHA	M 20	Z In	Co	BM	N	N	N	N	....	94
		Z	N	N		[illegible]	M [illegible]	N	N	N	2	DHP	M 30	Ft In	E	CCI	3	N	N	N	40	95
	SA	EI	N	N		MIN	M	N	N	N	1	IF	M 25	In	Co	HAY	N	N	N	N	100[17]	96
		BW	N	N		CE	M 40	N	N	N	2	APD	M T 50	Z In	Pn	BM	N	N	N	N	70	97
	FA	CDE	N	N		CE	M [illegible]	N	N	N	1	GF	M 30	Ft Z In	E	CDE	N	N	N	N	35	98
		BW	N	N		[illegible]	M [illegible]	N	N	N	1	FMP	M 30	In	Pn	BM	3[16]	Fs	N	N	35	99
		PDE	N	N			M [illegible]	N	N	N	4	GP BP AMP	M T 30	Z In	Pn	BM	N	N	N	N	175[17]	100
		BW	N	N			M 200	N	N	N	[24]	....	M 100	Ea	Pn	....	.43	N	Me	BRL	110[17]	101
		CDE	Fa	APD		AL	M 75	N	N	N	2	GP	M 40	Z In	E	CDE	2.1	N	N	N	30	102
		BW	N	N		[illegible]		N	N	N	2	COC	M T	Z In	Pn	BM	N	N	N	N	45	103
	SA	SA	N	N		WE	M 60	N	N	N	4	WD	M T	Z Da In	....	BM	N	Fs	N	N	12	104
	SA	CE	N	N		FAA	M T 100	N	N	N	1		M T 30	Ca Z In	Pn	BM	N	N	N	N	50	105
	SA	BW	N	N		CE	M 125	N	N	N	1	DL	M 50	Z Ir	Pn	BM	N	N	N	N	75	106
		[illegible]	N	N		CE	M 40	1	CE	T 300	Ea	IR	T 125	Z In	Pn	BM	N	N	Me	FAA	90	107
	SA	BW	N	N		CE	M 40	N	N	N	32	IR	M 40	Ir	Co	BM	1.9	Fs	N	N	135[17]	108
			N	N				N	N	N	32	DHP	M T 25	Z In	Pn	....	N	N	N	N	55	109
	SA	[illegible]	N	N		[illegible]	M [illegible]	N	N	N	1	GF	M 50	Z In	E	CCI	2	N	N	N	40	110
	Me	CE	N	N		CE	M 30	N	N	N	1	GP	M 30	Z	E	HAY	....	N	N	N	50	111
		CDE	N	N		AL	M 30	N	N	N	2	GF	M 40	Z In	E	CCI	N	N	N	N	80	112
	SA	[illegible]	N	N		BF	M 40	N	N	N	2	APD	M 25	Ir	E	CCI	N	N	N	N	36	113
	SA	[illegible]	N	N				N	N	N				Z	Pn	....	N	N	N	N	....	114
	SA	[illegible]	N	N		AL	M [illegible]	N	N	N					E	HAY	N	N	N	N	28	115
		[illegible]	N	N		CE	M 30	N	N	N	1	WC	M T 40	Z In	E	CE	N	N	N	N	....	116
	SA	[illegible]	N	N		CE	M [illegible]	N	N	N	3	JF	M 25	Z Da	Pn	HCC	N	N	N	N	160[17]	117
		BW	N	N			M [illegible]	N	N	N				In	Pn	BM	N	N	N	N	34	118
		[illegible]	[illegible]	[illegible]		[illegible]	M [illegible]	N	N	N		GF	M 30	N	Co	CDE	N	N	N	N	60	119
	SA	BW	N	N		[illegible]	M [illegible]	N	N	N				Z Da In	Pn	BM	N	N	N	N	35	120
	AA	[illegible]	N	N		[illegible]	M 30	N	N	N	2	IF	M 20	Z In	E	....	N	N	N	N	15	121
	SA	BW	N	N		[illegible]	M [illegible]	N	N	N	2	APD	M 20	Z In	E	RE	N	N	N	N	38	122
		FA	N	N		[illegible]	M [illegible]	N	N	N		PE	M 30	Z In	E	BM	N	N	N	N	25	123
		[illegible]	N	N		W [illegible]	M [illegible]	N	N	N		WC	M [illegible]	Z Da In	Co	HCC	N	N	N	N	126[17]	124
	SA	[illegible]	N	N		[illegible]	M [illegible]	N	N	N					Pn	HCC	N	N	N	N	40	125
	AA	[illegible]	N	N		[illegible]	M [illegible]	N	N	N		EL	T 20	Z In	Pn	HCC	N	N	N	N	60	126
	SA	[illegible]	N	N		[illegible]	M [illegible]	N	N	N		WC	T [illegible]	Z Ir	E	CE	2	Fs	N	N	150[17]	127
		[illegible]	N	N		CHE	M 60	N	N	N		GF	M 75	N	E	HAY	N	N	N	N	45	128
		[illegible]	N	N		[illegible]	M [illegible]	N	N	N		DHP	M [illegible]30	Ir	Co	....	....	N	N	N	18.5	129
		[illegible]	N	N		[illegible]	M [illegible]	N	N	N		WC	M 100	Z Ir	Pn	TS	0.5	N	Me	UOP	26	130
		[illegible]	N	N		AL	M [illegible]	N	N	N		WC	M 40	M C	Pn	BM	N	N	N	N	150	131
		[illegible]	N	N		AL	M	N	N	N				Sc In	E	CE	N	N	N	N	....	132

[illegible]
[illegible] stoker
[illegible]
[illegible] tangential

VC - Vibrating-plate stoker
WC - Wedge
WE - Wedge with endless
WP - Wet scrubber
Z - Zeolite

FOOTNOTES

[illegible] pumps for [illegible] boilers
[illegible] Drive to 3 pumps to plant
[illegible] Auxiliary for turbine

[illegible]
[illegible]-arch: Tu
[illegible] stoker
[illegible] routine
[illegible]

1 pump as standby
- Boiler for rental service
- Will operate late at 1475 psig 950 F
- Radial turbine
POWER, April 1970, p 59
- Separate-fired power only
- Gas recovery power only
- 2 pumps for 6 boilers
- Will operate later at 425 psig
- One main, one auxiliary
- 2 pumps to 3 boilers

- Will operate later at 265 psig 550F
- Will use black liquor later
- Sulfur content will be 1% later
- Heights 100 ft and above are measured from ground level
- 3 pumps for 2 boilers
- Plus 4 for startup
- Approximate hp rs for each motor or turbine
- Ft. Fie Koniroid Div Boiler Engrg & Supply Co, Inc

provides a fast, reliable nection for applications su dockside hoses, loading b manifolds and stationary fi It is available in six sta sizes to fit 4- through 16-ir flanges. No tools are requir installation and it can be fit any 150-lb flange.—Hydra Co, Inc

23 Three-cylinder h-p pump h pacity up to 4 gpm at pre to 1000 psi. Three-cylinc sign produces smooth flow out the use of surge da Applicable to chemical pr ing, water treatment and r osmosis systems, Model 2 tures valve and piston c which permit material sel compatible with the pump uids. Pump is light and co has outside dimensions 6 8⅞ in.—Triline, Inc

Air, Gas and Liquid Han design aids

285 Compressed-air and gas nine models are review dimensions and capac Wright-Austin Co

286 Tank, pipe and tube valves, spigots and pur among 7,000 items inc 112-p catalog on plast ucts.—U.S. Plastics

287 Low-noise gas pumps a ers are described in this and categorized accor frame size, rpm, press capacity.—Dresser Indus

288 Pulsation-free compres single-stage, two-stage, cial booster units— with emphasis on cor and design features.— mers Mfg Co

289 Pumps for industrial ar applications are descrit page color brochure. Pumps, Inc

290 Lightweight hoses and moving air, dust, fumes terials by pressure, s gravity are the topic of illustrated catalog. It a nical data on coating sories and end finis plings and connections losses, pressure, and

selecting clutches are incl in the text, with suggestions installation, maintenance and brication.—Formsprag Co

502 Right-angle worm-gears and allel-shaft speed reducers described in 48-p technical bu tin, with illustrations and se tion tables on 36 models. right-angle types are said to available in single and c bination reduction; and para shaft types in single, double triple reduction.—Dodge Ma facturing Corp

503 Technical journal on bear has 266 pp on selection, rat and specifications for ball roller bearings. Drawings, gra and charts accompany ball-b ing, roller-bearing and bear mount information.—FMC C Link-Belt Divs

504 Rolling bearings and how to lect and maintain them are topics of this 44-p booklet. C tains practical informat photos and charts to pro ready reference for users.— Industries, Inc

505 New V-belt is described as ing five times longer life and to twice the horsepower capa of standard V-belts. Horsepo ratings are given for e sheave diameter for A, B an sections. Tables list approxi outside length and pitch le for the 107 "Torque-Flex" numbers available.—T B Wo Sons Co

506 Ajusto-Gear drives, avail from 1 hp through 20 hp maximum output speeds 410 through 7 rpm. Applicat and dimensional data are cluded in 12-p booklet.—E Yale & Towne, Inc

507 Bearings constructed of var materials are reviewed in the p color brochure. Selection bearing for specific use is phasized.—Clevite Bearing sion, Gould Inc

508 Single and some double-re tion shaft-mounted speed re cers, ranging from fractiona 60 hp, are depicted in this booklet (No. 3318). Discus compact Type C screw-conve drive and the direct-mount principle that assures posi and permanent alignment of