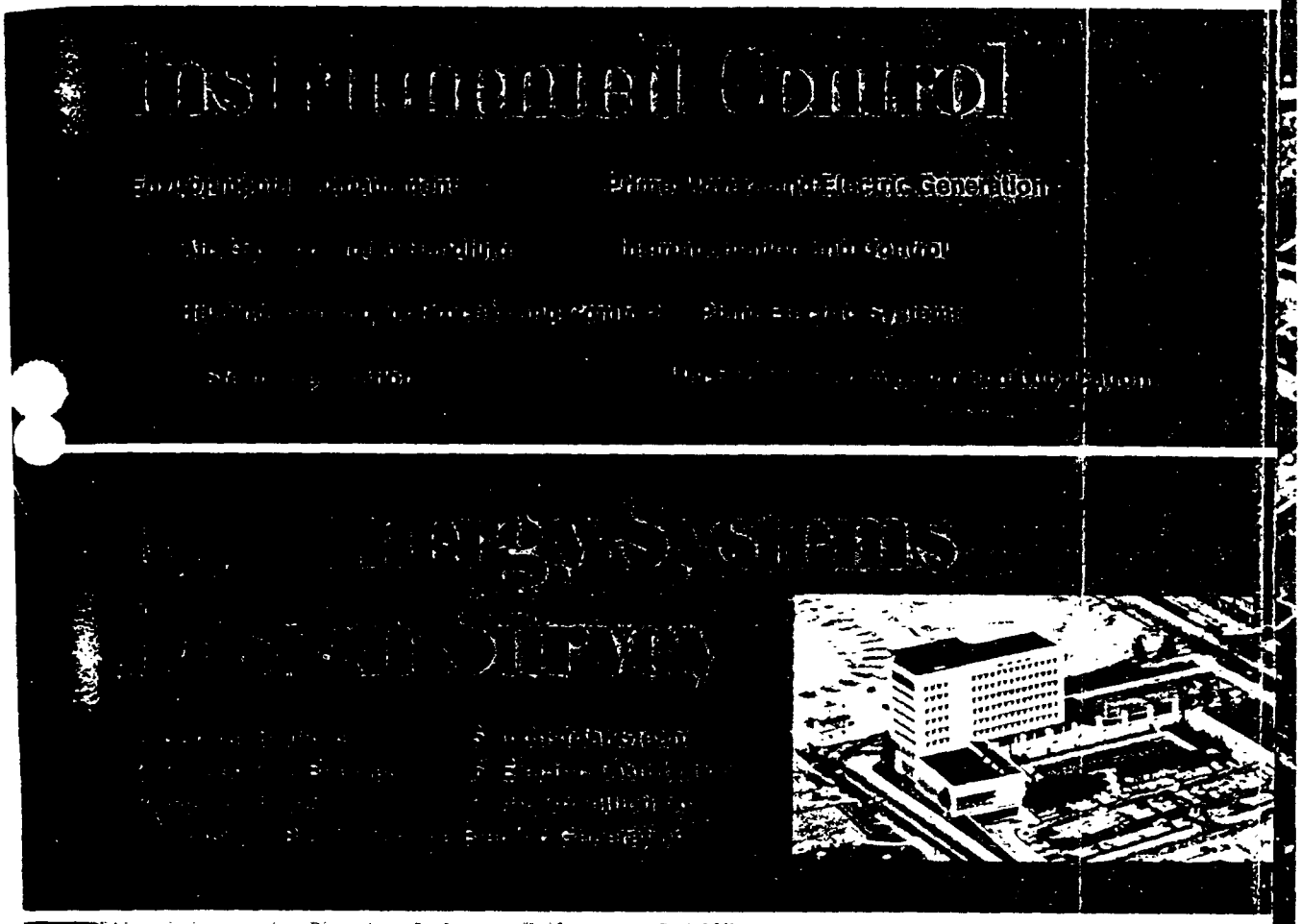
A McGraw-Hill Publication Three Dollars October 1970

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.

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.

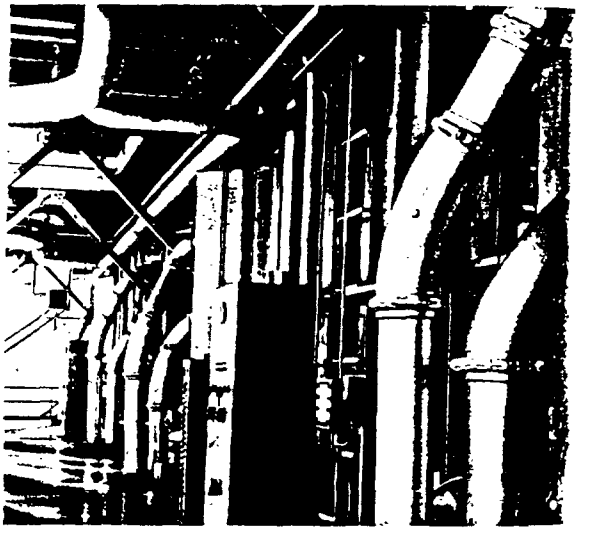
In recent years environmentalists have applied the pressure, clamoring for antipollution legislation. They hoped to curtail the number of new fossil-fueled plants and also reduce pollution from existing installations. Their intentions, sincere in most cases, attracted much public support and eventually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

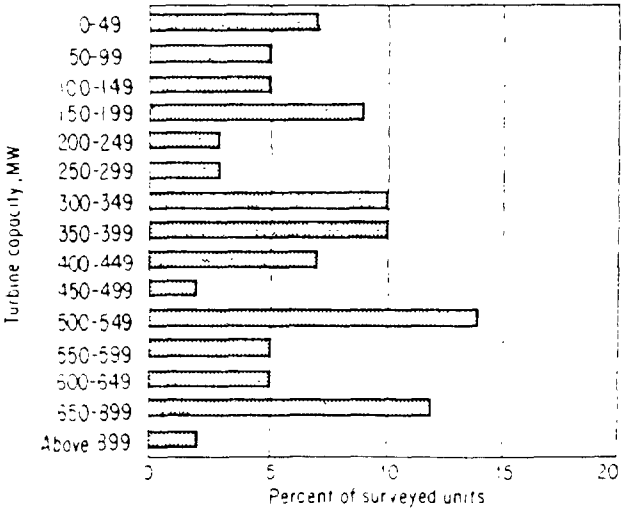
Just how long the oil crisis will last depends on several variables. Among them: (1) Time involved in proof-testing and modifying prototype stack-gas sulfur-removal syste These will permit burning of high-sulfur coal and without adding to pollution. (2) Availability of low-su oil from the large Mideast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



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

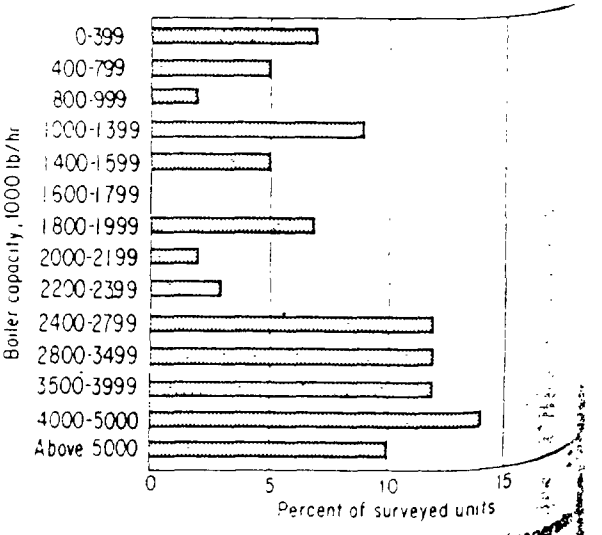
Gas shortages result from different problems. Stea shrinking gas reserves (known U.S. reserves will last a 12-14 yr) and availability only on an interruptible b eliminate gas as a base fuel for most utilities, which m design units for 30-yr life and project generation pote

Turbine size



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

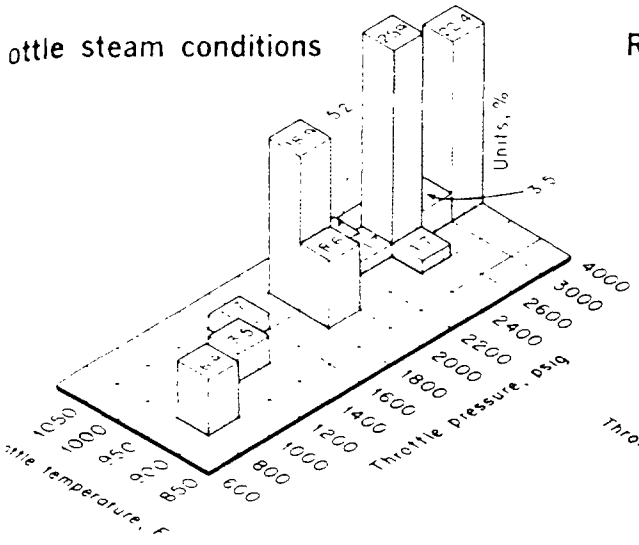
Capacity of boilers



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

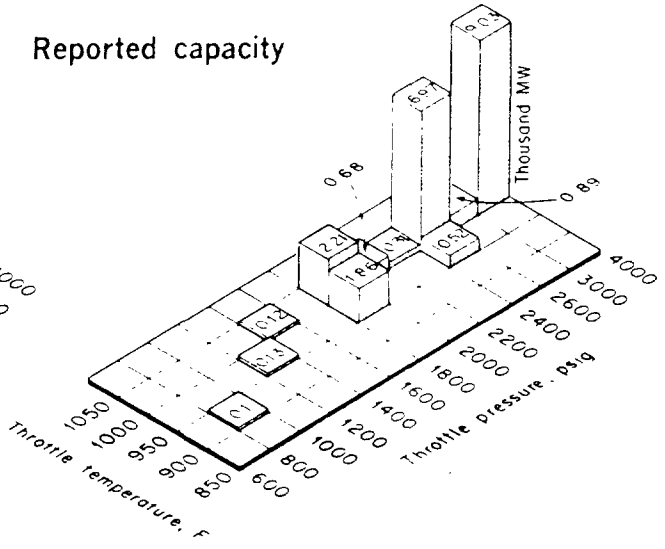
t where will the fuel come from?

ottle steam conditions



ral-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

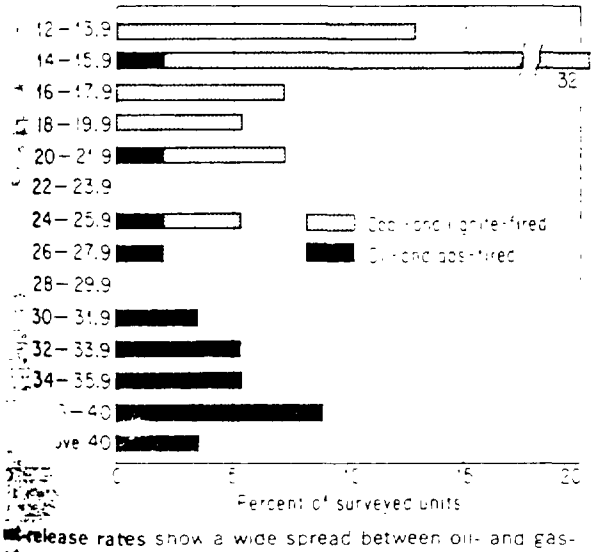
s in advance. Suppliers attribute this shortage to strin- rnment price controls

uld coal supplies be taken for granted. Even if r coal could be burned in some areas, it would be cu.. 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 lt, several companies have found it more economical lose older mines than to equip them to meet new stan- ds. Further, mine openings are being delayed by tight ey 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.

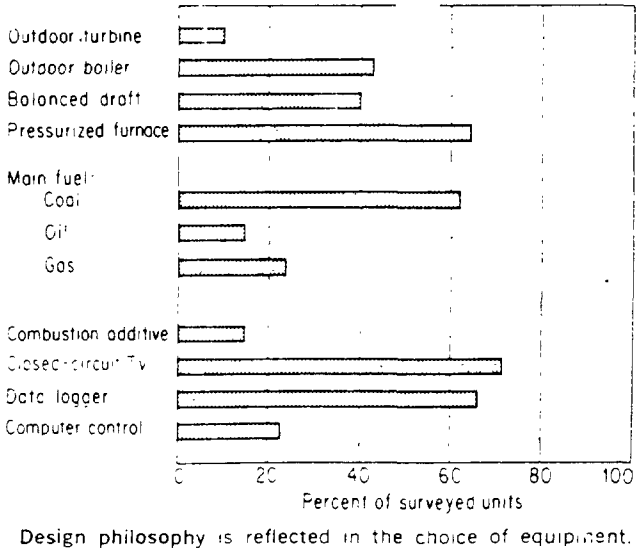
Data on instrumented control, theme of the 1970 survey, are accented with a gray tint (p S 61). Since final selection of control equipment is generally firmed up later in the design phase, manufacturers' names are not available in all cases. Note the trend to increased reliance on instruments and controls. 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

Materials limitations s[illegible]

Each project listing covers four pages

[illegible]JECT	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[3a]	▲	La Cygne	La Cygne, Kan.	Ebasco Services Inc	1	73	807	5503	3840	1010	1005
3	Cincinnati Gas & Electric Co[4a]	▲	Conesville	Conesville, Ohio	Black & Veatch	4	73	770	5900	3500	1000	1000
4	Detroit Edison Co		Monroe	Monroe, Mich.		3,4[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	5600	3590	1005	1000
[illegible]	Alabama Power Co		Barry	Bucks, Ala	Southern Services Inc	5	71	700	4690	3500	1000	1000
[illegible]	Carolina Power & Light Co		Roxboro	Roxboro, N. C.	Brown & Root Inc	3	73	685	5159	3500	1000	1000
8	Allegheny Power System, Inc	●	Harrison	Johnston, W. Va	Gibbs & Hill Inc	1,2,3[1]	72,73,75	650	4300	3500	1000	1000
[illegible]	Duke Power Co		Marshall	Terrell, N. C.		4	70	647	4210	3500	1000	1000
10	Ohio Edison Co	●	W H Sammis	Stratton, Ohio	Commonwealth Associates Inc	7	71	623	4630	3735[3]	1005[3]	1005[3]
	The Dayton Power & Light Co		J M Stuart	Aberdeen, Ohio	Ebasco Services Inc	1	74	600	4400	3500	1000	1000
[illegible]	Gulf States Utilities Co		Sabine	Bridge City, Texas	Mid-Valley Inc	4	72	586	[illegible]	3675	1000	1000
[illegible]	Union Electric Co	●	Labadie	Franklin County, Mo	Bechtel Corp	1,2,3,4[1]	70,71,72,73	[illegible]	4020	2400	1000	1000
[illegible]	Duke Power Co		Cliffside	Cliffside, N. C.	Bechtel Corp	5	72	570	4080	2400	1000	1000
[illegible]	Allegheny Power System, Inc	●	Hatfield's Ferry	Masontown, Pa	United Engineers & Constructors, Inc	2,3[1]	70,71	540	3325	2500	1000	1000
[illegible]	Texas Electric Service Co	●	Permian Basin	Monahans, Texas	United Engineers & Constructors Inc	6	73	540	3600	2400	1000	1000
[illegible]	Northern Indiana Public Service Co		Michigan City	Michigan City, Ind	Sargent & Lundy	12	73	[illegible]	[illegible]	3500	1000	1000
8	Dallas Power & Light Co		Lake Hubbard	Dallas, Texas	Bechtel Corp	2	73	[illegible]	3825	2400	950	950
9	Kentucky Utilities Co	●	Ghent	Ghent, Ky	Sargent & Lundy	1	74	[illegible]	3800	2400	1000	1000
[illegible]	The Hydro-Electric Power Commission of Ontario		Nanticoke	Port Dover, Ont., Can		2	72	500	3600	2450	1000	1000
	The Hydro-Electric Power Commission of Ontario		Lambton	Moore Township (Sarnia), Ont., Can.		1,2,3,4[1]	70,70,71	500	3600	2450	1000	1000
[illegible]	Mississippi Power Co		Jack Watson	Gulfport, Miss	Southern Services Inc	5	73	500	3600	2400	1000	1000
[illegible]	New England Power Co		Brayton Point	Somerset, Mass	Charles T Main Inc	4	73	460	3050	2390	950	950
[illegible]	Carolina Power & Light Co	●	L V Sutton	Wilmington, N. C.	Brown & Root Inc	3	72	436	3120	2520	1000	1000
15	Kentucky Utilities Co	●	E W Brown	Burgin, Ky	Sargent & Lundy	3	71	409	3025	2400	1000	1000
16	Long Island Lighting Co		Northport	Northport, N. Y.	Ebasco Services Inc	2	72	380	2550	2500	1000	1000
[illegible]	Baltimore Gas & Electric Co	●	Herbert A Wagner	Anne Arundel Cty, Md	Gilbert Associates Inc	4	72	378	2233	3500	1050	1000
8	Connecticut Light & Power Co.		Montville	Uncasville, Conn.	Bechtel Corp	6		375	2806	3500	955	955
19	Texas Electric Service Co		Eagle Mountain	Ft. Worth, Texas	Gibbs & Hill Inc	3	71	356	2535	3500	950	950
[illegible]	Alabama Power Co		Barry	Bucks, Ala	Southern Services Inc	4	70	350	2568	2400	1000	1000
	Public Service Co of Colorado	●	Comanche	Pueblo, Col	Stearns-Roger Corp	[illegible]	73	350	[illegible]	2400	1000	1000
[illegible]	Tucson Gas & Electric Co[30]	▲	San Juan	Fruitland, N. M.	Stearns-Roger Corp	1	72	345	[illegible]	3565	1005	1005
13	Minnesota Power & Light Co.		Clay Boswell	Cohasset, Minn	Ebasco Services Inc	3	73	334	[illegible]	2400	1000	1000
[illegible]	Central Power & Light Co		Nueces Bay	Corpus Christi, Texas	Sargent & Lundy	7	72	[illegible]	[illegible]	2000	1000	1000
[illegible]	Louisville Gas & Electric Co		Mill Creek	Kosmosdale, Ky	Pioneer Service & Engineering Co	2	74	[illegible]	[illegible]	2400	1000	1000
[illegible]	Calgary Power Ltd		Sundance	Lake Wabamun, Alb., Can	Montreal Engineering Co Ltd	[illegible]	70,71	308	1995	2050	1005[3]	1005[3]
[illegible]	Potomac Electric Power Co		Benning	Washington, D. C.	Bechtel Corp	16	72	289	[illegible]	3565	950	950
[illegible]	Southern Indiana Gas & Electric Co		Culley	Newburgh, Ind	Brown & Root Inc	3	73	240	1650	3565	1005	1005
[illegible]	Empire District Electric Co	●	Asbury	Joplin, Mo	Black & Veatch	1	70	[illegible]	[illegible]	2400	1000	1000
[illegible]	Carolina Power & Light Co		Asheville	Skyland, N. C.	Brown & Root Inc	2	[illegible]	195	1300	2390	1000	1000
[illegible]	Delmarva Power & Light Co		Indian River	Millsboro, Del	United Engineers & Constructors Inc	2	70	150	[illegible]	2400	1000	1000
[illegible]	Newfoundland & Labrador Power Commission		Holyrood	Holyrood, Nfld., Can	Shawmont Resources Joint Venture	1,2[1]	[illegible]	150	[illegible]	[illegible]	1005[3]	1005[3]
[illegible]	Saskatchewan Power Corp		Boundary Dam	Estevan, Sask., Can	Montreal Engineering Co Ltd	1	70	[illegible]	[illegible]	[illegible]	1005	1005
[illegible]	Public Service Electric & Gas Co		Linden	Linden, N. J.		2	72	56.5	400	1000	900	[illegible]

MUNICIPAL AND COOPERATIVE INSTALLATIONS

	COMPANY		PLANT NAME	LOCATION	CONSULTING ENGINEER	Unit number	Year first commercial operation	Unit capacity, MW	Capacity, 1000 lb/hr	Throttle pressure, psig	Throttle temp, F	Reheat temp, F
[illegible]	City of San Antonio, City Public Service Board		Calaveras	San Antonio, Texas	Black & Veatch	1	73	[illegible]	[illegible]	3500	1005	1005
[illegible]	City of San Antonio, City Public Service Board	●	Calaveras	San Antonio, Texas	Black & Veatch	2	74	436	[illegible]	3500	1005	1005
[illegible]	[illegible] Commission		Indian River	[illegible], Fla	Black & Veatch	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1000	1000
[illegible]	[illegible]		Elmer Smith	Owensboro, Ky	Black & Veatch	2	73	[illegible]	[illegible]	[illegible]	1000	1000
[illegible]	Austin Electric Department		Holly Street	Austin, Texas	Brown & Root, Inc	4	74	[illegible]	[illegible]	[illegible]	1005	1005
	Kansas City, Kan., Board of Public Utilities		Quindaro	Kansas City, Kan	Burns & McDonnell	2	72	[illegible]	[illegible]	1300	1000	1000
	[illegible]		Randle A Miller	[illegible], Texas	[illegible] & Lee	[illegible]	72	[illegible]	[illegible]	[illegible]	1000	1000
	[illegible]		Louis Bonin	Lafayette, La	May Engineering	[illegible]		70	[illegible]	[illegible]	1005	1005
	[illegible] Water, Light & Power Dept	●	[illegible]	[illegible]	Burns & McDonnell	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	950	[illegible]
[illegible]	[illegible] Electric Power Association		[illegible]	Moselle, Miss	Burns & McDonnell	[illegible]	70	[illegible]	[illegible]	[illegible]	950	[illegible]
[illegible]	[illegible]		[illegible]	Austin, Minn	Black & Veatch		70	[illegible]	[illegible]	[illegible]	900	[illegible]
[illegible]	[illegible]		[illegible] Light & Power	[illegible]	[illegible] Power Co	5		[illegible]	[illegible]	[illegible]	900	[illegible]
	[illegible] Public Utilities Department		[illegible]	[illegible], Minn	R D Thomas			[illegible]	[illegible]	[illegible]	905	[illegible]
[illegible]	[illegible] Municipal Utility Plant	●		Morgan City, La	Barnard & Burk		73	[illegible]	[illegible]	850	900	[illegible]

MANUFACTURERS [illegible]

[illegible]

AC [illegible] Mfg Co
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
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[illegible]
[illegible]
[illegible]
BM [illegible]
BAN [illegible]
[illegible]

BPP [illegible]
[illegible]
BW Babcock & Wilcox Co
BWL Babcock & Wilcox Ltd
[illegible]
CE Combustion Engineering Inc
CED Combustion Engineering-Superheater Ltd
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

DP Diamond Power Specialty Corp
[illegible]
EM Electric Machinery Mfg Co
[illegible] Worthington Corp
F The Foxboro Co
FAA The Fly Ash Arrestor Corp
FP Fischer & Porter Co
FE 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 Ltd
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 Howden-Appo
HCC Computer and Instrumentation Div of [illegible] Corp
HIC Howell Instruments Inc
HCP Howden Parsons
HT Hungerford & Terry Inc
IBM International Business Machines Corp
[illegible] Inc Div Gen Amer Trans Corp
PE Industrial Process Engineers
IR Ingersoll-Rand Co
[illegible] Illinois Water Treatment Co
KC Koppers Co Inc
LA The Louis Allis Co Inc

...ld throttle and reheat steam near 1000 F

Reheat control	BOILERS: Surface, 1000 sq ft: Boiler and waterwalls	Superheater	Reheater	Economizer	Air heater	FURNACE: Pressure, in. H_2O	Volume, 1000 cu ft	Heat release, 1000 Btu/cu ft-hr	Type	Number of burners	Pulverizers per boiler	Pulverizer manufacturer	FORCED-DRAFT FANS: Number per boiler	Capacity of each, 1000 cfm	Manufacturer	Flow control	Drive hp, each	Drive manufacturer	INDUCED-DRAFT FANS: Number per boiler	Capacity of each, 1000 cfm	Manufacturer	Flow control	Drive hp, each	Drive manufacturer	PROJECT
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EA, TB	[illegible]	[illegible]	[illegible]	[illegible]					F DE	[illegible]		RA		900	WE	V	9000	EM	N						[illegible]
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TB	[illegible]			[illegible]		[illegible]	[illegible]		Sa	[illegible]	[illegible]	RA		[illegible]	SA	V	[illegible]	WE	[illegible]	[illegible]	SW	V	5000	WE	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]			Pu	[illegible] 30	[illegible]	BW		600	APC	D	4000	GE	N						[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Sa	[illegible]	[illegible]	RA		[illegible]	CF	V	[illegible]	EM	[illegible]	[illegible]	AFC	HyC	4500	16	[illegible]
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TB	50	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	6	[illegible]	[illegible]	RA	[illegible]	[illegible]	HOF	V	[illegible]	GE 16		[illegible]	HOF	V	[illegible]	AE	[illegible]
[illegible]	35 E	[illegible]			[illegible]	[illegible]	[illegible]		Pu	[illegible] 44	[illegible]	FW	[illegible]	[illegible]	AC	V	6000		N						[illegible]
[illegible]	[illegible]	16	16	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	F		N		[illegible]	600	CW	V	7500	GE	N						[illegible]
[illegible]	50		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		Sa DB	[illegible] 59		RV			AC	V	[illegible]	EM		[illegible]	AC		3500	EM	[illegible]
[illegible]	50		[illegible]	[illegible]			[illegible]		Pu	[illegible]		RA		[illegible]	EV	HyC	4500	WE	N						[illegible]
TB	[illegible]	60 E	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	Sa	[illegible]	N		[illegible]	46	WE	VC	1500	EM	[illegible]	[illegible]	WE	VC	3000	GE	[illegible]
EA	[illegible]	[illegible]		[illegible]			[illegible]	[illegible]	Pu	[illegible] 10	N		[illegible]	75	CW	V	4000	WE	N						
[illegible]	[illegible]	[illegible]				[illegible]	[illegible]		Pu DB	[illegible]	N		[illegible]	85	WE	V	4000	AC	N						[illegible]
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	Pu	[illegible]	N			348	APC	V	5000	WE	N						[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pu	[illegible]		RA		401	A	V	3000	AC	N						30
[illegible]	[illegible]	96	[illegible]	[illegible]	[illegible]	80	[illegible]	[illegible]	Sa DB	[illegible] 39		RA	[illegible]	16	16	16	16	16	[illegible]	16	16	16	16	16	
[illegible]	56.5	[illegible]		[illegible]	[illegible]		[illegible]		Pu	[illegible] 44	[illegible]	FW	[illegible]	[illegible]	WE	[illegible]	[illegible]		N						[illegible]
	35			[illegible]		[illegible]	[illegible]	[illegible]	B	[illegible]		RA	[illegible]	[illegible]	CF	[illegible]	[illegible]	EM	[illegible]	[illegible]	CF	V	2000	EM	[illegible]
	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pu	[illegible] 42	N		[illegible]	[illegible]	APC	V	[illegible]	LA	N						[illegible]
	25 E	[illegible]	[illegible]		[illegible]	80	[illegible]	[illegible]	Sa DE	[illegible]		RA	[illegible]	480	AC	[illegible]	2500	AC	[illegible]	680	AC	HyC	2500	AC	[illegible]
	57.0	46	[illegible]	[illegible]		[illegible]	[illegible]		Sa	[illegible]	[illegible]	DEC		[illegible]	HOF		900	MPL	[illegible]	[illegible]	HOF		2200	MPL	[illegible]
	31	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pu	[illegible] 4	N		[illegible]	[illegible]	AC	V	2000	EM	N						[illegible]
[illegible]	32		[illegible]	[illegible]	[illegible]		[illegible]			[illegible]		BW	[illegible]	[illegible]		V	3000	EA	N						[illegible]
[illegible]	31	[illegible]	[illegible]	[illegible]			50	[illegible]	Pu ST	[illegible] 40	N		[illegible]	[illegible]	CF	V	4000	WE							[illegible]
[illegible]	20 E	56	[illegible]	[illegible]	[illegible]	[illegible]	50	[illegible]	Pu DB	[illegible] 42	[illegible]	BW	[illegible]	[illegible]	WE	V	1500	GE	N						[illegible]
[illegible]	22.2	50	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	Sa DE	[illegible] 42	[illegible]	BW	[illegible]	[illegible]	AC	VC	700	GE	[illegible]	[illegible]	AC	[illegible]	1250	GE	[illegible]
[illegible]	20.6	40	[illegible]	[illegible]	56	[illegible]	56	[illegible]	Pu	[illegible] 4	N		[illegible]	[illegible]	HOF	V	900	GGE		[illegible]	HOF	[illegible]	200	GGE	[illegible]
TB	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	128 E	[illegible]	Sa	[illegible] 35	[illegible]	GEC RA	[illegible]	[illegible]	WE	VC	450	GEE	[illegible]	360	HOF	VC	1500	SRF	[illegible]
[illegible]	18.2		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pu DE	[illegible] 59			[illegible]	[illegible]	SA	V	4500	AC	N						[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] 9	F	[illegible]	N		[illegible]	486	SA	HyC	[illegible]	CW	N						[illegible]
[illegible]	35 E	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible] 9	F	[illegible]				[illegible]	SA	V	[illegible]	GE	N						[illegible]
[illegible]	35	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]		F DE	[illegible]	N			[illegible]	HOF	V	[illegible]	AC	N						[illegible]
[illegible]	34	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		Pu DE	[illegible]		RA	[illegible]	[illegible]	APC	HyC	[illegible]	AC	N						48
[illegible]	17 E	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	F		N		[illegible]	220	WE	VC	1500	WE	N						49
[illegible]	7.5	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Sa De	[illegible] 59	[illegible]	RC	[illegible]	[illegible]	CF	V	700	WE	[illegible]	[illegible]	CF	D	1250	WE	50
[illegible]	15.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	Pu	[illegible]	N		[illegible]		EF	[illegible]	1000	AC	N						
[illegible]	5.5				[illegible]		[illegible]		F	[illegible]	N				WE				N						[illegible]
[illegible]	34	[illegible]	[illegible]		[illegible]				Pu	[illegible] 43	N				CW	[illegible]	700	[illegible]	N						[illegible]
[illegible]	6.7	[illegible]	[illegible]		[illegible]		[illegible]		[illegible]		N			[illegible]	CW		400	WE	N						[illegible]
[illegible]	16 E	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Sa DB	[illegible]	[illegible]	RC		[illegible]	CF	[illegible]	[illegible]	WE		[illegible]	[illegible]	HyC D	500	WE	[illegible]
[illegible]	15	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]		Pu		N			46	FAL	[illegible]	[illegible]	WE	N						[illegible]
[illegible]	20 E		[illegible]		[illegible]	80	[illegible]			[illegible]	N				WE	VC	[illegible]	EM			[illegible]	VC	[illegible]	EM	
[illegible]	12.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	N			90	EF	[illegible]	[illegible]		N						[illegible]

...Water Cond[illegible]
...Co
... & [illegible] Co
...-Cottrell Ltd
... Locomotive Works Ltd
... Co
... & Platt Ltd
... Co
... Shipbuilding & [illegible] Co
...ator AB
...Co
... Co
..., Inc
...
... Div of CE
...-Cottrell Inc

[illegible]

SYMBOLS

[illegible]

Selecting instrumentation

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]	[illegible]	[illegible]	7	4	WE	540	[illegible]	SSt	[illegible]	BLH	De[31]	Pdx[12]	W DL	[illegible]	1033	H_2, H_2	...[16]	...[16]	DP[16]	...[16]	[illegible]
[illegible]	[illegible]				WE	105	[illegible]	SSt	Ro	CWE	De	De	BIE	[illegible]	970	H_2, H_2	BM	BM	...	...[16]	GE
[illegible]	[illegible]	[illegible]		4	WE	[illegible]	[illegible]	Adl	Ro	FR	De	De[27]	IN	[illegible]	305	H_2, H_2O	BM	BM	DP	HIC	BM
[illegible]	[illegible]			4	GE	100	[illegible]	Adl CuN	RP	FW	De	De	LAW	[illegible]	308	H_2, H_2O	BM	BM	DP	...	[illegible]
[illegible]	[illegible]	3.5	3	4	GE	[illegible]	[illegible]	CuN	Ro J	SWE	Eva So	De Pdx	LAW AQC IN	[illegible]	309	H_2, H_2O	HCC	HCC	DP	N	N
[illegible]	[illegible]	3.5		4	GE	360	2	Adl	Ro	BLH	De	Pdx[13]	CW[16]	[illegible]	329	H_2, H_2O	LN[16]	LN[16]	MOT[16]	F[16]	...
[illegible]	[illegible]	3.5	3	4	GE	365	1.35	SSt	Ro	WE	So Eva	...[13]		[illegible]	329	H_2, H_2, H_2O	...	...		...	...
[illegible]	[illegible]	[26]		4	WE	370[20]		SSt	Ro	FW	De	Pdx[27]	CW	[illegible]	50	H_2, H_2	BM	BM	DP	N	...
[illegible]	[illegible]			4	GE	510	1.35	SSt		BLH	De	Pdx[32]	IW CW	[illegible]	130	H_2, H_2O	HCC	HCC	DP	N	GE
[illegible]	[illegible]	3	3	4	WE	[illegible]	[illegible]	Adl	Ro	WO	De	De[27]	IW N	[illegible]	300	H_2, H_2	BM	BM	N	GE	GE
[illegible]	[illegible]	[illegible]	3	[illegible]	GE	[illegible]	[illegible]	AsC	Ro	R	De	De Pdx[27]	W CW	[illegible]	373	H_2, H_2O	BM[16]	BM[16]	DP[16]	GE[16]	GE
[illegible]	[illegible]	[illegible]	5	[illegible]	GE	[illegible]		CuN	Ro	WE	De	De Fr[27]	PM IW	[illegible]	330				...		...
[illegible]	[illegible]		[illegible]	4	WE	[illegible]	1.35	Ad	Ro	WE	De		BIE	[illegible]	100	H_2, H_2	CE	BM	N	FIS,LCI	N
[illegible]	[illegible]		5	4	GE	[illegible]	1.35	Adl	J	WE	De	[32, 27]	W	[illegible]	590	H_2, H_2O	BM	BM	DP	Y	GE
[illegible]	[illegible]	[29]		4	WE	150	1.35	SSt	Ro	BLH	De	Pdx[27]	CW	[illegible]	540	H_2, H_2	BM	BM	DP	N	F
[illegible]	[illegible]		[illegible]	[illegible]	WE	[illegible]	[illegible]	Adl	Ro	SWE	De	[13]	[16]	[illegible]	595	H_2, H_2	BM[16]	BM[16]	N[16]	...[16]	HCC[16]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	GE	[illegible][16]		SSt Adl	Ro	WE[16]	De	Pdx[32]	PM	[illegible]	500	[illegible]	...[16]	...[16]	...[16]	...[16]	...
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	GE			SSt	Ro		De	[16]	[6]	[illegible]	190	[illegible]	...[16]	...[16]	...[16]	...[16]	...
[illegible]	[illegible]		[illegible]	[illegible]	WE	155	2	AsC	Ro	WE	De	[16]	[16]	[illegible]	[illegible]	H_2, H_2	...[16]	...[16]	DP	...[16]	N
[illegible]	[illegible]	[illegible]		[illegible]	CAP	53		Ad	Ro	MLW	De	De[8]	N	[illegible]	58	H_2, H_2O	BM	BM	DP	IBM	IBM
[illegible]	[illegible]	[illegible]		4	CGE	[illegible]		Ad	Ro	FWC	De	De[13]	N	[illegible]	555	H_2, H_2O	BM[16]	BM[16]	DP[16]	IBM	IBM
[illegible]	[illegible]	[illegible]		[illegible]	GE	[illegible]	2	CuN	Ro	FW	De	De[13]	CW[16]	[illegible]	530	H_2, H_2O					
[illegible]	[illegible]	[illegible]		[illegible]	GE	105		A/B CuN	Ro J	FW	De	[32]		[illegible]	[illegible]	H_2, H_2O	HCC[16]	HCC[16]	DP[16]	...[16]	F
[illegible]	[illegible]	[illegible]		[illegible]	WE	105		CuN	Ro	R	So Eva	[3]	[illegible]	[illegible]	[illegible]	H_2, H_2					
[illegible]	[illegible]			[illegible]	WE	100	2	SSt	RP	R	De	CH	W	[illegible]	196	H_2, H_2	BM	BM	DP	FIS	FIS
[illegible]	TC			4	GE	[illegible]		CuN	RP	R	De	[13]	W	[illegible]	[illegible]	H_2, H_2O	GE	GE	[16]	N	N
[illegible]	TC	[illegible]		[illegible]	WE	[illegible]		A/B CuN	Ro	FW	De	De[27]	PM	[illegible]	[illegible]	H_2, H_2	BM	BM	N	IBM	IBM
[illegible]	TC	[illegible]		[illegible]	GE	[illegible]		A/B	Ro	R	De	De[27]	PM	[illegible]	[illegible]	H_2O, H_2	F	F	DP	H	H
[illegible]	TC[2]	[illegible]	3	[illegible]	GE	68	[illegible]	Adl	Ro	SWE	De So	[13]	W	[illegible]	[illegible]	H_2, H_2O	GE	GE	N	WI	N
[illegible]	TC	[illegible]	5	[illegible]	GE	[illegible]	[illegible]	Adl	Ro	FW	De	Pdx[13]	CW	[illegible]	375	H_2, H_2O	LN	LN	MOT	N	N
[illegible]	[illegible]	[illegible]		[illegible]	WE	[illegible]		Adl	[illegible]	[6]	De	De[32]	[16]	[illegible]	[illegible]	[illegible]	...[16]	...[16]	...[16]	...[16]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	WE	130	[illegible]	Adl		DL	De	De		[illegible]	[illegible]	[illegible]	...	...		...	
[illegible]	[illegible]			[illegible]	GE	[illegible]	[illegible]	SSt Adl	Ro	DL	De			[illegible]	[illegible]	H_2, H_2O	...	...	...	WE	WE
[illegible]	[illegible]		5	[illegible]	GE	93	[illegible]	A/B	Ro[16]	WE	De	De [27, 32]	W[16]	[illegible]	190	H_2, H_2, H_2O	F[16]	F[16]	N[16]	Y	N
[illegible]	[illegible]	[illegible]	7	2	GE	170	2	Adl		WE	De			[illegible]	395	H_2, H_2O	...	...	...	N	GE
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	CGE	[illegible]		SSt		FWC	Eva So	De[27]	IW	[illegible]	[illegible]	H_2, H_2	HCC	HCC	DP, PH	CWE	CWE
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	GE	[illegible]	[illegible]	Adl CuN	Ro	WE	De	De[27]	PM	[illegible]	[illegible]	H_2, H_2, H_2O	BM[16]	BM[16]	DP[16]	N[16]	N
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	GE	[illegible]	[illegible]	SSt Ad	Ro		De	De[32]	W	[illegible]	[illegible]	H_2, H_2O	...			...	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	WE	80	[illegible]	SSt	Ro	WE	Eva De	[13]	WE PM	[illegible]	[illegible]	H_2, H_2	BM	BM	DP	HIC	N
[illegible]	TC	[illegible]	5	[illegible]	GE	[illegible]	[illegible]	SSt	Ro	FW	So Eva		[illegible]	[illegible]	[illegible]	H_2, H_2, H_2O	WE	WE	DP	BM	
[illegible]	TC	[illegible]	5	[illegible]	GE	[illegible]	[illegible]	CuN[7]		DL	De	[32]	MR	[illegible]	[illegible]	H_2, H_2	BM	BM	N	N	N
[illegible]	TC		5	[illegible]	CGE	[illegible]	[illegible]		Ro	FWC	De	[9]	IW	[illegible]	[illegible]	H_2, H_2	BM	BM	DP	CGE	CGE
[illegible]	[illegible]		5	[illegible]	CGE	[illegible]	[illegible]	Ad		FW	So Eva	Pdx[27]	CW	[illegible]	[illegible]	[illegible]	HCC	HCC	DP	CGE	CGE
[illegible]	TC[2]	[46]	N		GE	N					De	[27]	[illegible]	[illegible]	[illegible]	[illegible]	LN	LN	[16]	LN	N
[illegible]	[illegible]	[illegible]		[illegible]	GE	[illegible]		SSt Adl	Ro	WE	De	[27, 32]	N	[illegible]	[illegible]	H_2, H_2O	HCC[16]	HCC[16]	DP[16]	...[16]	SYE
[illegible]	[illegible]	[illegible]		[illegible]	WE	[illegible]		SSt Adl	Ro	CWE	De	[27, 32]	N	[illegible]	[illegible]	[illegible]	...[16]	...[16]	[16]	...[16]	SYE
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	GE	[illegible]		CuN	Ro	DL	De	[32]	[6]	[illegible]	[illegible]	[illegible]	...[16]	...[16]			[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		CuN AsC	Ro	DL	[illegible]	[32]	[6]	[illegible]	[illegible]	[illegible]			N	Y	[illegible]
[illegible]	[illegible]				GE	[illegible]		[illegible]	[illegible]	DL	De			[illegible]	134	H_2, H_2	GE	GE			[illegible]
[illegible]	[illegible]	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	SSt	J	WE	De	CH	HT	[illegible]	[illegible]	[illegible]	F	F, BM		F	[illegible]
[illegible]	[illegible]	[illegible]			BB	[illegible]		[illegible]	[illegible]	DL	[illegible]		N	[illegible]	[illegible]	[illegible]	BMN	BMN	N	N	[illegible]
[illegible]	[illegible]	[illegible]			[illegible]			[illegible]	[illegible]		[illegible]	Pdx	[illegible]	[illegible]	[illegible]	[illegible]	BM	BM	N	LCI	[illegible]
[illegible]	[illegible]	[illegible]			WE			[illegible] Adl		MS	Eva		TW	[illegible]	[illegible]	[illegible]	HCC	HCC	N	Y	[illegible]
[illegible]	[illegible]	[illegible]			GE			[illegible]	[illegible]	DL	[illegible]	CH	AQC	[illegible]	[illegible]	[illegible]	F	F	N	HIC, RI	[illegible]
[illegible]	[illegible]	[illegible]			[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	De	[7]	W	[illegible]	[illegible]	[illegible]	HCC	HCC	N	N	[illegible]
[illegible]	[illegible]	[illegible]			[illegible]			[illegible]		[illegible]	[illegible]		TW	[illegible]	[illegible]	[illegible]	BMN	BMN	DP		[illegible]
[illegible]	[illegible]	[illegible]			BB			[illegible]		WC	[illegible]	Y	N	[illegible]		H_2, H_2	HCC	HCC	N	Y	[illegible]
[illegible]	[illegible]	[illegible]			WE	[illegible]		[illegible]		[illegible]	[illegible]	De CH	[illegible]	[illegible]		[illegible]	FO	BMN	N	Y	[illegible]

FOOTNOTES

[illegible]

- Higher heating value
- At boiler efficiency of [illegible]
- Data not yet available
- Unit control with [illegible]
- Bituminous coal
- Jointly owned with [illegible]
- Twin condenser
- Calorific value [illegible]
- One main pump [illegible]
- Main pump data
- Standby [illegible]
- Equipment not [illegible]
- Exhaust to second [illegible]

lows latest thinking for control systems

Capacity of each	BOILER FEED PUMPS						HEATERS			FUEL AND EXHAUST								DUST		PROJECT
										Fuel					Sootblower					
	Discharge pressure, psig	Manufacturer	Flow control	Drive type	Drive hp each	Drive manufacturer	Number	Final feedwater temp, F	Max deaerating pressure psia	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	
									33	AE,SWE											
										FW,STM,CHH											
										FW											
										SWE,FW,CHH											
										YU,SWE											
										YU											
										AE,GA											
										BLH,AC											
										AC,CHH,FW											
										FW,FW,CHH											
										AE,CHH											
										GA,WE											
										AC											
										SWE,GA											
										AE											
										STM,CHH											
										GA,STM											
										WE											
										YU,GA											
										FW											
										FW,GA,MUN											
										STM,BLH,GA											
										WE											
										YU,FE											
										YU,CHH											
										YU,WE											
										GA,STM											
										COC,BLH											
										YU											
										YU											
										FW											
										COC											
										GA,YU											
										AE,SWE,CHH											
										YU											
										CHH,YU											
										FW,GA											
										FW											
										COC											
										GA,YU											
										SWE,CHH,STM											
										CHH,SWE											
										STM,GA											
										SWE,COC											
										SWE,COC											
										STM,GA											
										CHH,GA											
										FW,CHH											
										FW											
										COC											

Notes:

- 16 Spare pump is turbine-driven. Pumps are 2200 gpm at 1450 psig. Manufacturer is Ingersoll-Rand Co.
- 23 Two pumps are motor-driven. Pumps are 2200 gpm at 1450 psig. Manufacturer is Ingersoll-Rand Co.
- 24 Two pumps are motor-driven. Pumps are 2200 gpm at 1450 psig. Manufacturer is Worthington Corp.
- 28 Two pumps are motor-driven standby units. Pumps are 2200 gpm at 1450 psig. Manufacturer is Pacific Pumps, Inc.
- 33 Two pumps are motor-driven. Pumps are 2200 gpm at 1450 psig. Manufacturer is Byron Jackson Pumps, Inc.
- 34 Two pumps are motor-driven standby units. Pumps are 2200 gpm at 1450 psig. Manufacturer is Ingersoll-Rand Co.
- 37 Two pumps are motor-driven. Pumps are 2200 gpm at 1450 psig. Manufacturer is Worthington Corp.
- 41 Two pumps are motor-driven. Pumps are 2200 gpm at 1450 psig. Manufacturer is Pacific Pumps, Inc.
- 42 Two pumps are motor-driven standby units. Pumps are 2200 gpm at 1450 psig. Manufacturer is Byron Jackson Pumps, Inc.
- 46 Two pumps are motor-driven. Pumps are 2200 gpm at 1450 psig. Manufacturer is Ingersoll-Rand Co.
- 47 Two pumps are motor-driven standby units. Pumps are 2200 gpm at 1450 psig. Manufacturer is Worthington Corp.
- 49 Two pumps are motor-driven. Pumps are 2200 gpm at 1450 psig. Manufacturer is Pacific Pumps, Inc.
- 50 Two pumps are motor-driven standby units. Pumps are 2200 gpm at 1450 psig. Manufacturer is Byron Jackson Pumps, Inc.
- 54 Two pumps are motor-driven. Pumps are 2200 gpm at 1450 psig. Manufacturer is Ingersoll-Rand Co.
- 56 Two pumps are motor-driven standby units. Pumps are 2200 gpm at 1450 psig. Manufacturer is Worthington Corp.
- 58 Two pumps are motor-driven. Pumps are 2200 gpm at 1450 psig. Manufacturer is Pacific Pumps, Inc.
- 59 Two pumps are motor-driven standby units. Pumps are 2200 gpm at 1450 psig. Manufacturer is Byron Jackson Pumps, Inc.
- 64 Coal nozzle arrangement is for burners for natural gas
- 66 One pump set with gate are provided. His rated at 100% capacity. Two motor-driven units each provide 25% capacity manufactured by Byron Jackson at 2240 gpm at 2750 psig. GE is supplying the 6000-hp motors
- 67 Designed for 24 burners in front, 16 in rear
- 70 Unit is owned with Kansas Gas & Electric Co
- 99 Manufacturer's name type burner

lows latest thinking for control systems

BOILER FEED PUMPS						HEATERS				FUEL AND EXHAUST											PROJECT
										Fuel					Sootblower			Dust			
Capacity of each, lbs	Discharge pressure, psig	Manufacturer	Flow control	Drive type	Drive hp each	Drive manufacturer	Number	Final feedwater temp, F	Max operating 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	
435									33	WE,SWE			14pr[34]		N				E	RC	
4654										FW STM CHH					N		Rc Rel A	DF	80C	E	RC	
4985									24	FW					N		Rel A	DF	80C	E	RC	
4120										SWE FW CHH		.8 108[9]	9025[33]				Rel S	DF	236	N		
5745										YU SWE			9100		N		Rel S	DF	600	EI	BU	
5961										YU			9,00		N		Rel A	DF	890	E	UOP	
4681										WE GW			7470		N		Rel A	CV	1000[28]	E	AS	
4520									33	BLH WF			8555		N		Rc Rel	CV	350	EI	RC	
4630										AC CHH FW			9850		N		Rel A	DF	2000	EI	WP	
4[23]		[23]	[23]	[23]		[23]				STM FW CHH			8940		N		Rel A	DF	800	E	BL	
44										WE CHH		.0[30]	9,86		N		N		390	N		
3050										GW WE			9[3]		N		Rel A	CV	700	EI	RC	
3026									32	WE			9[34]		N		Rc Rel S	CV	500	EI	RC	
4600										SWE GW			9[6]		N		Rel A	CV	700[28]	EI	RC	
5979										WE		10[3]	[16]		N		N		186	N		
47		[16]	[23]	[23]						STM CHH		.1[3]	9350		N		Rc Rel A	CV	500	EI	KC	
1900[23]										WE		.6[24]	8[3]		N		N		190	N		
3[23]		[23]	[23]	[23]		[23]				YU GW			9300		N		Rel A	DF	660	EI	WP	
274[23]		[23]	[23]	[23]		[23]				FW					N		Rc Rel S	CV	650	E	WP	
5[3]										FW GW MLH			9000		N		Rel S	CV	550	EI	WP	
2840										STM BLH GW			9[3]		N		Rc Rel S	DF	400	EI	WP	
2306									33	WE			C 400		MgO	Fut	Rel A	DF	500	E	RC	
3021									16	PE			9500/9100[6]		MgC	Fut	Re, Al	DF	553	Me	UOP	
2529										YU CHH			9400		N		Rc Rel A	DF	566	E	RC	
2815									16	YU WE			9008[35]		Yes	Fut	Rel Al	CV	600	EI	BU	
2220[23]		[23]	[23]	[23]		[23]				GW STM			10 400		MgO	Fut	Rel A	DF	348	Me	WP	
2440										COC BLH			10 450		MgO	Fut	Rel Al	CV	400			
2462										YU			10 000		N		N		200	N		
3544										YS			9400		N		Rel S	DF	600	E	AS	
3066									16				9068		N		Rc Re A	DF	[16]	EI	[16]	
96										SWE					N		Rel Al	DF		EI		
										BLH			[16]		N		Rc,Rel,Air	DF	400	WtS	[16]	
[3]		[23]	[23]	[23]		[23]				YU GW		1040	9850		N		N		200	N		
47										WE			9300		N		Rel S	CV	600	E	[16]	
60										FW		[34]	9[3]		N		Rc Rel S	DF	520	Me,E	CES	
2200										COC		10 E	[34]		MgC				258	N		
2500										YU GW			8[3]		N		RP	DF	560	E	COC	
3640										WE SWE CHH		.0[4]	8[3][34]		N		Rc Rel S	DF	400	E	UOP	
2465									16	YU			9365		N		Rel Al	DF	353	E	RC	
2400										CHH YU			9,50		N		S	DF	388	Me,E	UOP	
2450										FW GW			9[3]		MgC	Fut	Rc Rel S	CV	360			
2230										FW			9[3]		N		Rel S	DF	360	Me	WP	
2530										COC					N		Rel Al	CV	225			
7800										GW YU		9.6 10[29]	7[3][34]		N		N		[20]	N		
3800										CHH YU		9.6 10[29]	7[3][34]		N		N		[20]	N		
2500[23]		[23]	[23]	[23]		[23]				SWE CHH		8.0 10[29]	8 E[34]		MgC	Fut	Rel A	CV	300	N		
26.0										SWE CHH STM			9[39]		N		Rel Al	DF	650	Er	[16]	
2526										CHH SWE		10[27]			N		N		166	N		
2335										STM GA		.0 E 9[40]	8.8		N		Rc Rel A	DF	250	E	UOP	
1660										SWE COC		[36]	9[3][41]		N		N		[20]	N		
2250										YU		[36]	[3] 900		N		N		[20]	N		
1600										SWE COC		[36]	[3] E		N		Rel S	DF	100	E	AS	
2200										STM GW		[36]	8[3]		N				200	N		
1460										CHH SAS		.0 E 1000[18]	[3] E		N		Rel S	DF	250	EI	UOP	
1180										ACC CHH		[36][42]	[3] E[42]		N		N		[20]	N		
1500										YU		[36]	9[3]		N		Rc Rel S	DF	250	Me	UOP	
1400										CHH		[36]	8[3]		N		Rc,Al	APC	50	N		

[16] ...
[23] ...
[24] ...
[27] ...
[29] ...
[30] ...
[33] ...
[34] ...
[35] ...
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[42] ...

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.

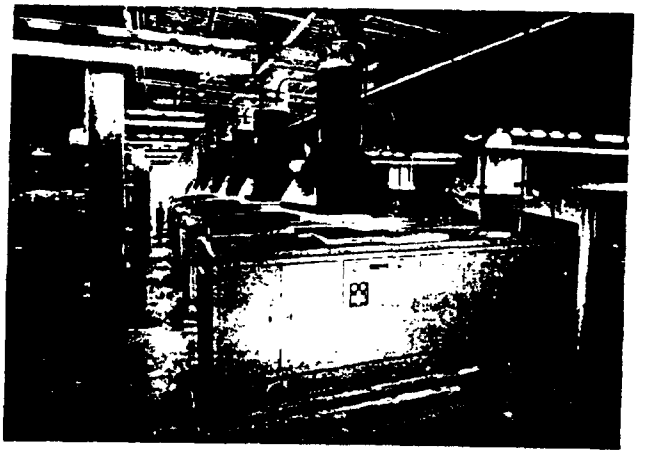
Outside the aircraft industry, today's biggest single market for gas turbines (on a horsepower basis) is in electric generation. Reasons: Gas turbine offers fast response to load changes, it operates on a variety of fuels, can be equipped with controls for remote operation, and has both low initial cost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

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

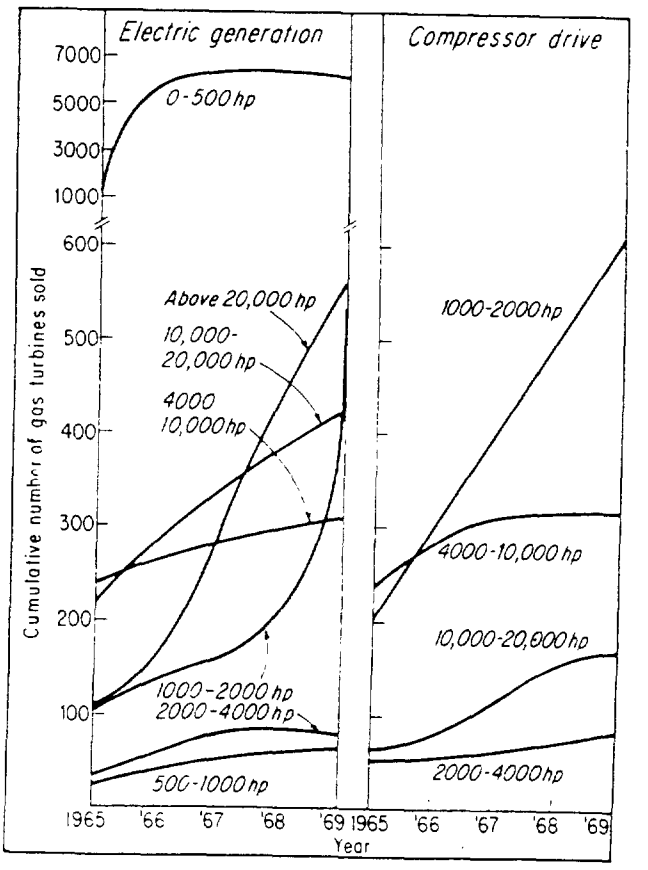
In contrast, oil-pipeline owners have installed only about 8% as much gas-turbine power as the gas-pipeline industry. Main reasons: Few oil lines are large enough to utilize the bigger industrial turbines. Further, experience thus far with crude-oil fuel (supplied directly from the pipeline) in modified 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 total 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

No.	Company	Location	Manufacturer	Units ordered between 6/69–6/70	Year(s) of initial operation	Main application	Black plant installation?	Method of remote operation	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	[illegible]
	UNITED STATES AND CANADIAN UTILITIES AND INDUSTRIAL PLANTS																			
[illegible]	Baltimore Gas & Electric Co	Bush River, Md.	WE	[illegible][13]	...	PP	No	Dw	18[4]		1,000	80	31		32	30	20	10	1650[16]	[illegible]
[illegible]	Florida Power & Light Co	Ft. Lauderdale, Fla.	WO	5[14]	70	PP	Yes	Dw	28.0		1000	80	32.7		80	5.6	2.75	2.75	1760	[illegible]
[illegible]	Canadian Utilities Ltd[a]	Rainbow Lake, Alb., Can.	CI[44]	1	71	PP	Yes	Dw	25.3		1579	70	29.5			5	3	3	1456	[illegible]
[illegible]	Public Service Electric & Gas Co	Newark, N.J.	WE	25[8]		PP	No	Dw	15[9]		1,000	80	25		22	10	5	5	1650[16]	[illegible]
[illegible]	Consolidated Edison Co of N.Y. Inc	New York, N.Y.	PW	[illegible][73]	70	PP	Yes	Gov	[illegible]		1,000	80	[illegible]		80	5	3	3	....	[illegible]
5	Lubbock Light & Power Dept	Lubbock, Texas	WO	[illegible][8]	71	PP	Yes	Dw	18.9		1000	60	21.4		80	5.6	2.75	2.75	1760	[illegible]
[illegible]	Consolidated Edison Co of N.Y. Inc	New York, N.Y.	WE	[illegible][4]		PP	Yes	N	[illegible]		1000	80	19.5		22	15	15	15	1450[5]	[illegible]
[illegible]	Burlington Electric Light Dept	Burlington, Vt.	WO	[illegible][17]		PP	Yes	Dw	6.3		1,000	80	24.0		80	5.6	2.75	2.75	1700	[illegible]
[illegible]	Alberta Natural Gas Co	Elko, B.C., Can.	CBC	[40]	70	Gh	No	Dw		12.5	1000	80	...	16	22	...		...	1450	[illegible]
[illegible]	Natural Gas Pipeline Co of America	Muscatine, Iowa	CBC		70	Gh	No	Dw		12.5	1000	80	...	16	[illegible]				....	[illegible]
[illegible]	Northern Natural Gas Co	Bushton, Kan.	CRI	[21]		Gh	Yes	Gov		[illegible]	1,000	80				15	[illegible]	...	1400	[illegible]
[illegible]	Trans-Canada Pipe Lines Ltd	Burstall, Sask., Can.	CBC	[39]	70	Gh	No	Dw		12.5	1,000	80		6	33			...	1450	[illegible]
[illegible]	Natural Gas Pipeline Co of America	Chicago, Ill.[20]	CRI	[21, 23]		Gh	Yes	Gov		12	1000	80	...			5	3		1400	[illegible]
[illegible]	Humble Oil & Refining Co	[illegible], Texas	NM	[31]		[illegible][30]	No	N		5.3	1000	80	...	6.65	30	[illegible]			1545	[illegible]
[illegible]	Atlantic Richfield Co	Bakersfield, Calif.	NM	[illegible]		[25]	...	N		4.65	1,000	80		5.8	20	3.5			1545	[illegible]
[illegible]	New York Telephone Co	New York, N.Y.	ALN	[19]	70	[illegible]	Yes	Dw	[illegible]		1500	90	[illegible]			[illegible]	...		1825	[illegible]
[illegible]	Consumers Power Co	[illegible] of St. Clair, Mich.	CBC		70	Gh	No	Gov		[illegible]	[illegible]	80	...	[illegible]	[illegible]				1100[35]	[illegible]
[illegible]	United States Air Force[1]	Sunnyvale, Calif.	[illegible]	[2]		TE	Yes	N	[illegible]	[illegible]	0	80		[illegible]	...	[illegible]			1450	[illegible]
	FOREIGN UTILITIES AND INDUSTRIAL PLANTS																			
[illegible]	Swedish State Power Board	Kimstad, Sweden	STA	[49]	[illegible]	PP	Yes	N	[illegible]		0	59	70		33	10	5		1472	[illegible]
[illegible]	Swedish State Power Board	Stockholm, Sweden	EE	[54]	[illegible]	PP	Yes	Gov	[illegible]		0	50	63.5	..	40	[illegible]			1652	[illegible]
[illegible]	[illegible]verket	[illegible], Denmark	BBS	[illegible]	[illegible]	PP	Yes	Dw	6.8		0	50	30[49]	..		5		10	1500[35]	[illegible]
[illegible]	Tokyo Electric Power Co	Yokosuka, Japan	MHI		[illegible]	PP	No	Dw	[illegible]		0	68	33		47	10	10		1500	[illegible]
[illegible]	Hokkaido Electric Power Co	Kushiro, Japan	MHI	[70]	70	PP	Yes	Gov	20		0	32	20		39	20	15	10	1500	[illegible]
[illegible]	Chubu Electric Power Co Inc	Nagoya, Japan	HIT	[30]	70-71	PP	Yes	Dw	[illegible]			59	20		[illegible]	10	5		1750	[illegible]
[illegible]	Servicios Electricos del Gran Buenos Aires (SEGBA)	Buenos Aires, Argentina	BBS	[65]	70	BI	No	N	[illegible][66]		0	50	19.5	..	50[35]	[illegible]		3	1355[35]	[illegible]
35	CA Venezolana de Cementos[67]	Pertigalete, Venezuela	BBS	[68]	[illegible]	BI	No	Dw	[illegible][66]		0	50	[illegible]		[illegible][35]	[illegible]		3	1355[35]	[illegible]
[illegible]	Intercom SA	Brussels, Belgium[20]	STA	[illegible]	[illegible]	PP	Yes	Dw	17		0	59	19.4		59	[illegible]			1550	[illegible]
[illegible]	Comision Federal de Electricidad	Acapulco, Mexico	BBS	[62]	70	BI	Yes	Dw	15.3[66]		0	50	[illegible]		[illegible][35]	[illegible]		3	1355[35]	[illegible]
[illegible]	P.P. Chemicals Ltd	Hull, England	BBS	[illegible]		[illegible][60]	No	N		9.5	0	50				[illegible]		10	1345[35]	[illegible]
[illegible]	London Transport Board	London, England	STA	[45]	70-72	PP	Yes	N	[illegible]		0	59	[illegible]		[illegible]	[illegible]			1560	[illegible]
[illegible]	The Gas Council	London, England	EE	[55]	[illegible]	Gh	No	Gov		[illegible]	900	90		[illegible]	0	[illegible]			1652	[illegible]
[illegible]	Etelä-Pohjanmaan Voima Oy	[illegible], Finland	STA	[44]	[illegible]	PP	Yes	Dw	[illegible]		0	59	[illegible]		59	[illegible]		...	1500	[illegible]
[illegible]	[illegible] Kraft AB	[illegible], Sweden	STA	[46]	[illegible]	PP	Yes	Dw	[illegible]			59	....		59	[illegible]			1382	[illegible]
[illegible]	Mitsubishi Coal Mine Co	Yubari Mine, Hokkaido, Jap.	MHI		[illegible]	BI [53]	No	Dw	3.0		500	50	9.5		[illegible]	10			1450	[illegible]
[illegible]	[illegible] Petroleum Co Ltd	[illegible], U.A.R.	EE	[52]	[illegible]		No	N		3.0	[illegible]	[illegible]		[illegible]	[illegible]	0			[illegible]	[illegible]
6	[illegible]	[illegible], Algeria	BBS	[59]	[illegible]	[illegible]	No	N		[illegible]	0	50				[illegible]		[illegible]	1455[35]	[illegible]
[illegible]	[illegible] Cement Co[56]	[illegible], Algeria	BBS	[57]	70	BI	No	Dw	[illegible][56]		0	50						[illegible]	1455[35]	[illegible]

MANUFACTURER

[illegible]

HoC Horizontal combustor

[illegible]

At peak load, [illegible]00 F

[illegible] pressure

[illegible] turbine exhaust and [illegible]

Variations of this machine ordered by Public Service Electric & Gas Co, Newark, N.J. [illegible] Baltimore Gas & Electric Co, Baltimore, Md. [illegible] Electric & Power Co [illegible] Electric Co [illegible] Philadelphia Electric Co, Philadelphia, Pa. [illegible] Consolidated Edison Co [illegible] New York, N.Y. [illegible] Power & Light Co [illegible] South Carolina Electric & Power Co [illegible] Tucson Gas & Electric Co [illegible] Lincoln Electric Syst. [illegible]

[illegible]

At peak load [illegible] F

[illegible] temperature

Variations of this machine ordered by Baltimore Gas & Electric Co, Baltimore, Md. [illegible] Service Electric & Gas Co, Newark, N.J. [illegible] Gas & Electric Co [illegible] Gas & Electric Co [illegible] Public Service Co of Oklahoma, Tulsa, Okla. [illegible] Jersey Central Power & Light Co, South Amboy, N.J. [illegible] Power Project Agricultural Improvement & Power District, Phoenix, Ariz. [illegible] McPherson Board of [illegible] Electric Dept, McPherson, Kan. [illegible]

Variations of this machine ordered by Carolina Light & Power Co, Lumberton, N.C.; Consolidated Edison Co of N.Y., Inc., New York, N.Y.; Florida Power Corp, Tampa, Fla.; Philadelphia Electric Co, Philadelphia, Pa.; Atlantic City Electric Co, Atlantic City [illegible]; and Orange & Rockland Utilities Inc [illegible]

[illegible] to [illegible]

[illegible]

[illegible] this machine [illegible] by Virgin Islands [illegible] Power Authority, St. Thomas, V.I.

[illegible] this machine sold to [illegible] Energy Corp [illegible]

[illegible] this unit being installed in 1970 by Illinois Bell Telephone Co, Chicago [illegible] San Diego Gas and Electric [illegible] Southern Bell Telephone Co [illegible] Chesapeake & Potomac Telephone Co [illegible]

range in size from 750 kW to 58 MW

Type of cycle	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		AE				16000	N	N	N	HoC	1	G	No	IS[75]	Sol/Cmb	EM	Ti[7]	Yes	Cv,Vig	SpT[12]	Ts	Yes	Itg		
	3600		PW		32	6	33	7	1	16	CoC	8	DF	Yes	IS[75]	Ry/E	Mag	Ti,Te	Yes	TwS	SpT	Bc	Yes[11]	Itg		2
	3600		GE								VeC	1	C,G		IS[75]	Ry/Hy	ECo	Ti	Yes	Cv	SpT	Bc	No	Itg		3
	3600		AE			6	33	7	N	N	CoC	8	DF	Yes	IS[75]	Sol/Cmb	EM	Ti[7]	Yes	Cv,Vig	SpT[12]	Bc	Yes	Itg		4
	3600		PW			6	33	7		2	CoC	8	DF	Yes	IS[75]	Ry/E	Mag	Te[37]	No	Cv	BpT	....[28]	Yes	Itg		5
	3600		PW		32	6	33	7		2	CoC	8	G		IS[75]	Ry/E	Mag[6]	Ti,Te	Yes	TwS	SpT	Bc	Yes[11]	Itg		6
	900		AE						N	N	CoC	8	DsC	No	IS[75]	Ry/Pn	...	Ti[7]	No	Cv	BpT	Bc	Yes	Itg		7
	3600		GE				7900			1	CoC	8	DsC		IS[75]	Ry/E	Mag	Ti,Te	Yes	Cv,Vig	SpT	Bc	Yes[11]	Itg		8
	5000		PW				11700				CoC	8	G	No	IS[75]	Ry/E	ECo	Te	Yes	Cv,Vig	SpT	Rel	Yes	....		9
	5000		PW		32	6	33	7		2	CoC	8	G	No	IS[75]	Ry/E	ECo	Te	Yes	Cv,Vig	SpT	Rel	Yes	....		10
	5300		GE			6					CoC	8	C	No	IC[74]	Ry/....	ECo	....	No	Vig	SpT	Rel	Yes	Itg		11
	5200		GE			6					CoC	8	C	No	IS[75]	Ry/E	....	Te	Yes	Cv,Vig	....	Ts[38]	Yes	....		12
	5300		PW		32	6	33	7		2	CoC	8	G	No	IS[74]	Ry/....	ECo[27]	....	.	TwS	SpT	Rel[28]	Yes	Itg		13
	7700		AE				11700				VeC	1	G	No	IS[75]	Sol/....	....[27]	Ti	Yes	Cv	SpT	....[28]	No[29]	Itg		14
	7700		AE				11700				VeC[26]	1	G	No	IS[75]	Sol/....	....[27]	Ti	Yes	Cv	SpT	....[28]	No[29]	Itg		15
	1200		AiResearch			4		1		1	CoC	8	DsC	Yes	IS[74]	Ry/E	Sol	Ti[37]	Yes	Cv	BpT	Acc	No	Itg		16
	15,500					12		1		1	AC	1	C	No	IC[75]	Ry/E	ECo	....[37]	Yes	Cv	SpT[3]	Ts[38]	No	Itg		17
	1200		GE			8		1	N	N	AC		DsO,G	Yes	[76]	Ry/....	....	Ti,Sk	Yes	Cv	....[3]	..	Yes	Itg		18
	3000		GTA		32	10	10				16	VeC	2	DsO		IS[74]	Sol/Eh	....	Ti	Yes	Cv,Vig	SpT	Bc	No	Itg		19
	3000		PE									CoC	8	DsC		IS[74]	Ry/E	ECo	Ti	No	Cv,Vig	SpT	....	Yes	Itg		20
	3000		BBC			6			N	N	N	VeC	1	DsO	Nc	IS[75]	Sol/Hy	ECo[51]	Ti	Yes	Cv	SpT	Bc	No	Itg		21
	3000				16		3600			4	CaC	12	DsO	No	IS[75]	Cmb	....[51]	Ti,Sk	Yes	Cv	SpT	Rel	Yes	Sep		22
	3000				16		4850			5	CaC	6	DsC	No	IS[75]	Cmb	....[51]	Ti,Sk	Yes	Cv	SpT	Rel	Yes	Sep		23
	3600				16				N	N	N	CaC	10	DsO		IS[74]	...../Hy,Pn	ECo	Sk	Yes	Cv	BpT	Bc	Yes	Sep		24
	3000		BBC		16		3677					HoC	1	DF	Yes	IS[75]	Ry/Hy	ECo	Ti	Yes	Cv	SpT	Bc	No	Itg		25
	3600		BBC			6			N	N	N	HoC	1	DF	Yes	IS[75]	Ry/Hy	ECo	Ti	Yes	Cv	SpT[43]	Bc	No	Itg		26
	3000		PW		32	6	33	7		2	CaC	8	DsC	No	IS[75]	Sol/Eh	....	Ti	Yes	....	SpT[43]	Bc	No	Itg		27
	3600		BBC			16			N	N	N	HoC	1	DsC		IS[75]	..../Hy,E	ECo	Ti	Yes	Cv	SpT	Bc	No	Itg		28
	....[41]		BBC			16		6	N	N	N	VeC	1	DsO,G	No	IS[75]	Ry/Hy[58]	Hy	Ti	Yes	Byp	SpT	Bc	No	....		29
	3000		PE									CoC	8	DsC	Yes	IS[75]	Ry/Eh	....	Ti	Yes	Cv,Vig	SpT	Bc	No	Itg		30
	6000		AE				3500					CaC	8	C		IS[74]	Ry/E	....	Ti	Yes	Cv,Vig	SpT[43]	Bc	Yes	....		31
	3000		PW		32	6	33	7		2		CoC	8	DsC	No	IS[75]	Sol/Eh	....	Ti	Yes	Cv	SpT[43]	Bc	No	Itg		32
	.....		STA		32	10	10					CaC	7	DsO			Sol/Eh	....	Ti	Yes	....	SpT	Bc	No	Itg		33
	1000					6		6367			1	CaC	6	DF	Yes	IS[75]	Cmb	....[51]	Ti,Sk	Yes	Cv	SpT	Rel	Yes	Sep		34
	4900		EE					6700				VeC	1	C		IS[74]	Ry/Pn	ECo	Te	No	N	....	Bc	Yes	....		35
	8800		BBC			12		7200				VeC	1	C	No	IS	Sol/Cmb	Hy	Ti	No	....	SpT	....	No	....		36
	1500		BBC			10		7200	N	N	N	VeC	2	G		IS[74]	Ry/Hy[58]	Hy	Ti	Yes	N	SpT	....	No	Itg		37

(2 units) Nortel • Variable unit and Pacific Telephone & Telegraph Co. Los Angeles, Calif. • Initial order for 3 units with installation in 1969 • One in 1968, three in 1969, one in 1970, and one in 1971. • Base office • Ordered prior to June 1969 • Big compressor drive • Similar unit ordered by Columbia Gulf Transmission Co., a subsidiary of the Columbia Gas System, Inc., New York, N.Y. • 3000-rpm hp, 3600-rpm hp • Base flooding • "Free" configuration • Inductive pickup with transducer • Seismic sensors on turbine casing • Turbine inlet-air-temperature control • Also gas handling • Versions of this machine ordered by Hudson Engineering Corp. • Port Sulphur, La. (2 units). No. 2 in National Gas Co. of Baton Rouge • Texas (1 unit) and Arizona Public Service Company Plants, Cholla, Ariz. • Cogen. (3 units). • Concentric hp and lp shafts • Eight stages in hp compressor, seven in hp compressor • 7000-rpm hp, 9000-rpm hp • Approximate figure • Cooper-Bessemer Co., Mount Vernon, Ohio • Gas generator outlet • Also, relative motion between bearing cap and shell • Versions of this machine ordered by Trans-Canada Pipe Lines Ltd., Calgary, Alta. Can. (2 units). Others will be installed in Quebec for base-load generation (5 units) in Zambia for emergency generation (2 units) and in Canada for peaking power (1 unit). Initial machine was purchased by a major foreign petrochemical company for driving compressors. • Consulting engineer: Henry Pfohl Co. • Variations of this machine will be installed in Iran (2 units) and Libya (2 units) for base-load generation. • Also surge. • Variations of this machine will be installed in Algeria (2 units) for base-load generation. • Gas Transmission Co., Northwest Div., Portland, Ore. • Chevron Oil Co., Kapolei, Hawaii (1 unit) and Gas Co. of Canada, Ltd., London, West, Ont., Can. (1 unit). Basic package was also ordered by industrial companies in Germany (1 units), Venezuela (1 units) and Qatar (2 units). • Variations of this machine will be installed in Finland (2 units) and Belgium (1 unit). • 6000-rpm hp, 9000-rpm hp. • Also surge. • Variations of this machine will be installed in Sweden (2 units) and Finland (1 unit). • Variation of this machine will be installed in Argentina. • Variations of this machine will be installed in Algeria (2 units) for base-load generation. At peak load, 1470 F. • 5500-rpm hp, 7000-rpm hp. • Variations of this machine will be installed by two other companies in Sweden (1 unit each). • The same machine will also be installed in Argentina (2 units) and Honduras (1 unit). • Compressor-pressure purge counter. • 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 (1 unit) for pumping. • This machine is a scaled-up version of EE's 30-MW turbine-generator. Latter was ordered by two Finnish utilities (1 unit each) for peaking power. • Variations of this machine ordered by Great Lakes Gas Transmission Co., Detroit, Mich. (2 units), and Trans-Canada Pipe Lines Ltd., Calgary, Alta., Can. (2 units). Others will be installed in Quebec for base-load generation (5 units), in Zambia for emergency generation (2 units), and in Canada for peaking power (1 unit). Initial machine was purchased by a major foreign petrochemical company for driving compressors. • Consulting engineer: Henry Pfohl. • Variations of this machine will be installed in Iran (2 units) and Libya (2 units) for base-load generation. • Also emergency. • Variations of this machine will be installed in Algeria for gas handling (1 unit) and process (1 unit) and in Libya for gas drive (1 unit). • Precise flow from gas turbine compressor is blown off and compressed air for use in chemical process. Compressors of this operation are driven by the gas turbine. • 13,450 rpm/18,370 rpm. • Variations of this machine will be installed in Mexico (5 units) and Bahamas (1 unit) for base-load generation. • Consulting engineer: Winkelaar Howard Assoc., Ltd. • Under license from BBC. Variations of this machine will be installed (by BBC) 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. • Variations of this machine will be installed in Bahrain (1 unit) and Nigeria (2 units) for base-load generation. • At coupling. • Consulting engineer: Brown Boveri de Venezuela, SA. • Variations of this machine will be installed in the Philippines (1 unit) for peaking power in a commercial building, in Algeria (1 unit) for base-load generation and in Bermuda (2 units) for base-load generation. • Cannot be attained at base-load turbine-inlet temperature because of Mach number influence. • The same machine will be installed in Mexico (2 units). A variation of this machine will be installed in Japan. • Two stages in hp turbine, one in hp turbine. • Nine stages in hp compressor, seven in hp compressor. • 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. Flexible units of the basic machine (each of these units is rated at 35 normal and 44.2-MW maximum) ordered by Long Island Lighting Co., Mineola, N.Y. (4 units); Northeast Utilities, Wethersfield, Conn. (3 units); 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). • Also exhaust silencer. • Also exhaust silencer and soundproofed building. • 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	BOILERS: Manufacturer	BOILERS: Capacity each, 1000 lb/hr or MBtu/hr	BOILERS: Operating pressure, psig	BOILERS: Operating temp, F	FUEL: Type	FUEL: Ash fusion temp, F	FURN.: Furnace type	FURN.: Subsequent type
UNITED STATES AND CANADIAN INDUSTRIAL STEAM SYSTEMS															
1	Brunswick Pulp & Paper Co	Brunswick, Ga	Charles T Main Co, Inc			P, Po	1 Fl	BW	550	1450	825	BL	N	BD	
2	Weyerhaeuser Co	Valliant, Okla	Rust Engineering Co	71	New	P, Po	1 Fl	CE	740	1300	825	G	N	BD	
3	Weyerhaeuser Co	Valliant, Okla	Rust Engineering Co	71	New	P, Po	1 Fl	CE	700	1200	825	BL, G	N	BD	
4	Weyerhaeuser Co	Valliant, Okla	Stone & Webster Engineering Corp.	72	Ex	P, SH, Po	1 Fl	UR	600	1300	875	O		BD	
5	Great Northern Paper Co	Millinocket, Me	Rust Engineering Co	71	New	P, Po	1 Fl	CE	450	1300	925	Bk	N	BD	SF
6	Weyerhaeuser Co	Valliant, Okla	Rust Engineering Co												
7	Ashcraft Forest Industries Inc	Snowflake, Ariz	Charles T Main Inc	71	Ex	P, Po	1 Fl	BW	223	1225	850	BL, G	N	BD	SF
8	Union Carbide Corp	San Francisco, Calif	Bechtel Corp	71	New	P	1 Fl	CE	275	1300	750	O, P, R		BD	SF
9	Peabody Inc	Ventura, Calif	S & Q Construction Co	70	New	P	1 Pk	CE	150	1000	Sat	O, G	N	Prd	SF
10	Procter & Gamble Co	Cincinnati, Ohio	Bechtel Corp	71	Ex	Po	1 Pk	CE	235	900	825	O, G		Prd	SF
11	Western Electric Co, Inc	Cicero, Ill	United Engineers & Constructors Inc	70	Ex	Po	1 Pk	UR	150	680	800	G	N	Prd	SF
12	International Paper Co	Ticonderoga, N Y	H A Simons Ltd	70	New	P, Po	1 Fl	EC	600	875	825	O, Bk	N	BD	SF
13	The Mead Corp	Dairybothe, Ohio		71	Ex	P, Po	1 Fl	CE	400	875[4]	850	O, G	2000	BD	SF
14	Pioneer Sugar Co	Keeau, Hawaii	Amtec, Inc	70	New	P, Po	1 Fl	CE	220	875	750	O, Bg	N	BD	SF
15	International Paper Co	Ticonderoga, N Y	H A Simons Ltd	70	New	P, Po	1 Fl	BW	208	875	825	O, BL		BD	SF
16	The Mead Corp	Otsego, Mich		70	Ex	P, Po	1 Pk	CE	125	975	750	O, G	N	Prd	SF
17	Union Corp	Cleveland, Ohio	J F Pritchard	70		P	2 Pk	BW	155	350	300	O	N	Prd	SF
18	The Procter & Gamble Co	Cincinnati, Ohio	Bechtel Corp	70	Ex	P, S	1 Pk	CE	130	350	750	O	N	Prd	SF
19	Wisconsin Power Equipment Co	Chicago, Ill				S	2 Pk	UR	125	800	750	O, G		Prd	SF
20	Wisconsin Power Equipment Co	Chicago, Ill				S	2 Pk	CE	125	800	750	O, G	N	Prd	SF
21	Getty Oil Co	Los Angeles, Calif	S & Q Construction Co	70	New	SH	1 Pk	CE	225	750	Sat	O	N	Prd	SF
22	Hammermill Paper Co	Erie, Pa	Rust Engineering Co	71	Ex	P, Po	1 Fl	BW	406	700	775	BL		BD	
23	Aprinol Corp	Pasquotank River, N C	Todd-Hedeen International, Inc	69	New	P, S	2 Pk	CE	55	200	Sat	Bk, BL, O, G	N	Prd	SF
24	Wisconsin Power Equipment Co	Chicago, Ill					1 Pk	CE	75	650	750	O, G	N	Prd	SF
25	Westvaco Corp	Luke, Md		71	Ex	P	1 Fl	CE	450	625	720	G, BL	N	BD	SF
26	Westvaco Corp	Wickliffe, Ky		70	New	P	1 Fl	CE	300	625	720	G, BL	N	BD[4]	SF
27	Westvaco Corp	Luke, Md		70	Ex	P	1 Pk	CE	240	625	720	O, G	N	Prd	SF
28	Westvaco Corp	Wickliffe, Ky		70	New	P	2 Pk	CE	240	625	720	O	N	Prd	SF
29	Oscar Mayer & Co, Inc	Davenport, Iowa	Fehrnick & Lutz Co	70	Ex	P, Po	1 Fl	CE	80	625	675	O, G	2075	BD	SF
30	Thermo Systems Inc	Oklahoma City, Okla	M A Nisikian Co	71	New	P, SH	2 Pk	MW	80	625	750	O	N	Prd	SF
31	The Standard Oil Co (Ohio)	Toledo, Ohio		69	Ex	P	1 Pk	UR	225	600	750	PC	N	Prd	SF
32	Dow Chemical Co	New Orleans, La	Barnard & Burk, Inc	70	Ex	P	1 Pk	CE	90	600	680	G	N	Prd	SF
33	Union Oil Co	Houston, Texas	Fluor Western, Inc	71	New	P	3 Pk	CE	105	475	Sat	O, RG	N	Prd	SF
34	Gates Rubber Co	Denver, Col		70	New	P, SH	2 Pk	CE	60	450	Sat	O, G	N	Prd	SF
35	Clinton Corn Processing Co	Clinton, Iowa	Stanley Consultants	71	Ex	P	1 Pk	CE	235	420	365	S	N	Prd	SF
36	Crown Zellerbach Corp	Camas, Wash		71	Ex	P	1 Fl	BW	363	415	525	O, G, BL	N	BD	SF
37	FMC Corp	Philadelphia, Pa					1 Pk	CE	225	415	720	O	N	Prd	SF
38	Southeast Missouri State College	Cape Girardeau, Mo	Rogers-Schmidt Co	71	Ex	P, S	1 Fl	KEE	125	315	750	O, G	2100	BD	SF
39	St Regis Paper Co	York, Pa		72	Ex	P	1 Pk	CE	120	410	750	O	N	Prd	SF
40	DAP Corp, Synstuffs & Chemical Div	Texas City, Texas					1 Pk	MW	100	300	Sat	G	N	Prd	SF
41	Melamine Chemicals Inc	Donaldsonville, La		70	New	P	1 Pk	UR	60	280	Sat	S	N	Prd	SF
42	Dixie Rubber Co	Littleton, Col	Rust Engineering Co	70	New	P, SH	1 Pk	CE	60	350	Sat	O, G	N	Prd	SF
43	Celanese	Ardmore, Okla	Rust Engineering Co	70	New	P, SH	1 Pk	KEE	50	350[4]	486	S	N	Prd	SF
44	Bethlehem Steel Corp	Sparrows Point, Md	United Engineers & Constructors Inc	71	New	P	1 Fl	UR	450	650	850	O, BF	N	BD	SF
45	Lehigh Foods Inc	Burley, Ida	William H Kahl & Associates	70	Ex	P, SH, S	1 Pk	MW	25	200	Sat	O, G	N	Prd	SF
46	Wisconsin Power Equipment Co	Chicago, Ill					1 Pk	MW	75	300	Sat	O, G	N	Prd	SF
47	U S Steel Corp	Baytown, Texas		70	New	P	1 Pk	BW	60	300	Sat	G	N	Prd	SF
48	Fabulose Inc	Denton, Tex		69	Ex	P	1 Pk	MW	40	290	Sat	S	N	Prd	SF
49	Farm Fish & Chemical Corp	Indianapolis, Ind		70	Ex	P	1 Pk	MW	70	275	Sat	O, G	N	Prd	SF
50	Louisiana Pacific Paper Ltd	Blackstone, Va	Wiley & Wilson	70	Ex	SH	2 Fl	KEE	80	265	Sat	O, G	N	Prd	SF
51	Anderson Electric Co Inc	Bainbridge, Md		69	Ex	P, SH	3 Pk	UR	200	260	409	O, G	N	Prd	SF
52	GAF Corp	Calvert	Johnson & Johnson Engrs & Archs, Inc	70	Ex	P, SH	2 Pk	MW	17	250	Sat	O, G	N	Prd	SF
53	Chemplex Co	Lecanto, Texas				P	2 Fl	UR	40	250	Sat	Bk, G	N	BD	SF
54	Pioneer Sugar Mill Co	Puunene, Maui, Hawaii		69	New	P, SH	2 Pk	UR	60	220	Sat	O, G	N	Prd	SF
55	A E Staley Mfg Co Div of Staley Continental Inc	Decatur, Ill		69	Ex	P	1 Fl	UR	50	250	Sat	S	N	Prd	SF
56	Monsanto Co	Buffalo, N Y	Gerald Latimer & Associates	70	Ex	P	1 Pk	SW	30	225	Sat	O, G	N	Prd	SF
57	Southwest Forest Industries Inc	Flagstaff, Ariz	Power Systems	70	Ex	P	1 Pk	BW	25	225	Sat	S	N	Prd	SF
58	Monsanto Co	Chocolate Bayou, Tex		70	Ex	P	1 Pk	MW	60	225	Sat	O, G	N	BD	SF
59	E I du Pont de Nemours & Co	Orange, Tex			Ex	P, SH	2 Pk	CE	100	220	Sat	O, G	N	Prd	SF
60	E I du Pont de Nemours & Co	Port Arthur, Tex		69	New	P	2 Pk	UR	75	220	Sat	O, G	N	Prd	SF
61	Rayonier Inc Woodlands Div	Fernandina Beach, Fla		70	Ex	P	1 Pk	BW	40	210	Sat	O	N	Prd	SF
62	Southwest Forest Industries Inc	Flagstaff, Ariz		70	Ex	P	1 Pk	BW	25	225	Sat	S	N	BD	SF
63	Monsanto Co	Chocolate Bayou, Tex		70	Ex	P	1 Pk	MW	60	225	Sat	O, G	N	Prd	SF
64	E I du Pont de Nemours & Co	Orange, Tex			Ex	P, SH	2 Pk	CE	100	220	Sat	O, G	N	Prd	SF
65	E I du Pont de Nemours & Co	Port Arthur, Tex		69	New	P	2 Pk	UR	75	220	Sat	O, G	N	Prd	SF
66	Rayonier Inc Woodlands Div	Fernandina Beach, Fla		70	Ex	P	1 Pk	BW	40	210	Sat	O	N	Prd	SF
67	Southwest Forest Industries Inc	Flagstaff, Ariz		70	Ex	P	1 Pk	MW	125	200	Sat	O, G	N	BD	SF
68	Monsanto Co	Chocolate Bayou, Tex	A M Kinney Inc	70	New	P	2 Pk	BW	115	200	Sat	S	N	Prd	SF
69	E I du Pont de Nemours & Co	Orange, Tex		70	Ex	P	2 Pk	CE	100	200	475	O, H2	N	Prd	SF
70	E I du Pont de Nemours & Co	Port Arthur, Tex		70	Ex	P, SH	1 Pk	KEE	70	200	Sat	O, G	N	Prd	SF
71	Champion Paper Co	Manistee, Mich		70	New	P	1 Pk	CE	45	200	Sat	O	N	Prd	SF
72	Empresa Industrial S A	Monterrey, Mexico		0	New	P	1 Pk	BW	26.5	200	Sat	O, G	N	Prd	SF

igure in this year's boiler survey

IPMENT	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^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	
	1 VSE	BA				FAA	M T 600		FAA	T 3000	3	IR	T 1550	MuD,In	E	F	N	N	EI	KC	269	
			N	N				N	N			BPC	T	Ca MuD,In	E	TIC	N	N	N	N	300	
						CF	T 700		CF	T 700	2	BPC	T	Ca MuD,In	E	TIC	N	N	EI	FAA	300	
	M			AF			T 130		PF	T 1667		PF	T 1667	Ca MuD	Pa	BM	2.2	Bur	N	N	170	4
						CF	T 740		CF	T 740	2	BPC		Ca MuD,In	E	TIC	N	N	Me	FAA	300	
		BA		BA		FAA			FAA				T	MuD,In	Co	BM	.....	Bur	EI	KC		E
							M T 450		CF	M T 800		BPC	M T 800	MuD,In	Pa	F	.....	N	N	W	160	
			N				M T 1250	N	N		4	PF	M T 900	?	Co	BM	2.5	.....	.....	.....	30	E
						CF	M T 1250	N	N			BPC	T 700	MuD,In	E	F	.....	.....	.....	.....	200	
							M 400	N	N	N		IR	M T 1000	MuD	Co	BM	N	N	N	N	250	
	E EA					NE	M 600		NE	T 420	1 NE	KCE	CM 2500 T 2400	MuD,In	E	FIS	0.4	N	Me	BU	200	
	EAA			AP		NE	M 400		NE	T 850		BU	T 750	Ex	Pn	.....	5	N	Me	WP	475	
				AP	DE	APC	M		APC	M		EL	M T 600	Ir	E	GE	2	N	Me	WP	170	
		BA	N	N		NE	M 300		NE	T 480				MuD,In	E	FIS	N	N	EI	RC	200	
	SA	COE	PC	APC		CF	M 250	N	N	N		BPC	T 240	Fl,Z,Sc,Ir	Co	.....	.....	Fs	N	N	75	
		BA		BA		CF	M T 300	N	N	N			M T	MuD,In	Pn	.....	N	N	N	N	50	
		COE		APC		CHE	M 200	N	N	N				MuD,In	E	F	N	N	N	N	.....	
						CF	M 150	N	N	N		N	N	N	Pn	BM	.....	N	N	N	.....	
	SA	COE				CF	M 150	N	N	N	1	N	N	N	Pn	BM	N	N	N	N	40	
		BA				CF	M T 250	N	N	N			M T 500	Z	Pn	BM	1.5	N	N	N	60	
		BA				FAA	M 500		FAA	T 900		IR	M T 800	Z,Sc,Ir	Pn	F	N	N	EI	RC	210	
						PA	M	?	FAA	M 125		AC	M 200	MuD,Ir	Pn	BM	.....	N	Me	FAA	40,50	
						CF	M	N	N			N	N	N	E	COE	N	N	N	N	40	
							M 700			T 900	2			MuD,In	.....	.....	N	N	EI	KC	275	
	EE					SW	T 200		SW	T 600	2	IR	M T 1000	MuD,In	E	.....	N	N	EI	RC	.....	
	SA		N	N			M 450	N	N	N	2		M T 1000	MuD,In	.....	.....	N	N	N	N	250	
			N	N		SA	T 500	N	N	N	2	IR	M T 1000	MuD,In	E	.....	N	N	N	N	20	
			N	N		SW	M E		SW	M 450		IR	M T 700	Z,Sc,In	Pn	BM	2.4	Fur	Me	WP	140	
	SA		N	N		CF	M 250	N	N	N		PF	M T 450	Z,Ir	Co	BM	N	N	N	N		
						BF	M 400	N	N	N		PF	M T 850	Ca,F,Z,In	Pn	BM	N	N	N	N	120	
			N	N		CHE	M	N	N	N		IR	M 400	Ca,Ir	Pn	CE	N	N	N	N	40	
			N	N		BF	M T 1200	N	N	N				Sc,F,Z	E	.....	0.5	N	N	N	350	
			N	N			M	N	N	N		PF	M	Z,Ca,In	E	HAY	N	N	N	N	40	
			N	N		CF	M 500	N	N	N	1	IR	M 800	Ca,F,Z,Ir	Pn	F	N	N	N	N	200	
	SA	BA				CF	M 900		CF	T 1800	2	EL	M T 700	Z,Sc,MuD,In	Pn	BM	N	N	Me	FAA	152	
	SA		N	N		BF	T 400	N	N	N	1	IR	M T 1250	Ca,F,Z,In	Pn	BM	2.5	N	N	N	75	
			N	N			M 650			M 300			M T 700	Z,Ir	Pn	BM	2	N	Me	RC	140	
			N	N			M T 1350	N	N	N			M 700	Z	Pn	.....	2.5	Bur	N	N	150	
	AA		N	N		COE	M	N	N	N	2	BPC	M 150	MuD,MuD,In	Pn	F	N	N	N	N	50	
			N	N		CF	T 450	N	N	N	2	IR	M T 1250	Z,Ir	Pn	BM	N	N	N	N	50	
	EA		N	N		CHE	M 1700	N	N	N	2	PE	M	Z,Ca,Ir	E	HAY	N	N	N	N	40	
						BF	M 850				2	BC	M 300	Ir	Pn	BM	N	N	N	N	40	
	SA	PEC				NE	T 650		NE	T 666		NC	T 420	Z,Ir	Pn	BM	1	N	N	N	175	
	AA							N	N	N		NC	M	Z,Ir	Pn	.....	N	N	N	N	40	
		EA				COE	M 50	N	N	N					E	COE	N	N	N	N	.....	
			N	N			M	N	N	N		AF	M	Fl,Ir	Pn	BM	N	N	N	N		
		BA	N	N		AL	M 700	N	N	N	1				E	H	N	N	N	N	40	
			N	N		CHE	M 400	N	N	N		NC	M T 700	Z,Sc	Pn	.....	N	N	N	N	30	
	AA		N	N		CHE	M 400	N	N	N			M 150	MuD,Ir	E	COE	1	N	N	N	185	
			N	N			M 150	N	N	N		IR	T 440	Z,Ir	Pn	FIS	1	N	N	N	126	
	SA	COE	N	N		AL	M 150	N	N	N	4		M 150	Sc,F,Z,Ir	Pn	HCC	N	N	N	N	75	
									CF	M 250		DE	M T		Pn	BM	N	N	Me		75	
							M						M T 700		Co	HCC	N	N	N	N	50	
							M 450	N	N	N			M T		Co	CCI	N	N	N	N		
		BA					M	N	N	N		AF	M	Fl,Ir	Pn	.....	N	Fs	N	N	40	
	AA	BA	N	N		CF	M T	N	N	N		PE F	M T		Pn	BM	N	N	N	N	60	
						CHE	M	N	N	N			F	T,Sc,Ca,Fl,Ir	E	COE	N	N	N	N	40	
		EA	N				M T 1200	N	N	N			M T 1000	Ca,Sc,MuD,Ir	Co	F,RD	N	N	N	N		
						CHE	M T	N	N	N		PE	M T	MuD,MuD,Ir	Pn	F	1	N	N	N	50	
		BA	N	N				N	N	N				Z,Ir	.....	.....	N	N	N	N	45	
			N	N		CF	M T	N	N	N			T 85	Sc	E	COE	N	N	N	N	225	
	GA	BA	N	N		CF	M T 1250	N	N	N			M 700	F,Z,Ca,Ir	Pn	BM	N	N	N	N	76	
		EA	N			CF	M T 1200	N	N	N		PE	T 450	Ca,Z,Ca,Ir	Pn	F	N	N	N	N	50	
	SA	EA	N	N			M T	N	N	N		AFE	T 90	Z,Ir	.....	.....	N	N	N	N	40	
	SA	COE	N	N		AL	M T	N	N	N	4	F	M 90	Z,Sc,Ir	Pn	BM	N	N	N	N	40	
	SA	BA	N	N		CF	M	N	N	N		InA	M T	Ir	Pn	BM	N	N	N	N	40	

[illegible] Co
[illegible] Combustion Engineering Inc
[illegible] Foster Wheeler Corp
MAC Mitsubishi Heavy Industries Ltd
MA Murray Manufacturing Corp
NYB The New York Blower Co
PEC Peerless Equipment Corp
PE Pennsylvania Engineering Corp
PF Pacific Fabricators Inc
[illegible] Riley Stoker Corp
[illegible] Struthers Wells Corp
RE Research Cottrell Inc
RD Rodney Hunt Machine Co
RE Ruggles-Klingemann Mfg Co
[illegible] Southwestern Engineering Co
SW Swartwout Co
[illegible] Union Iron Works
[illegible] United States Steel Corp
[illegible] Vulcan Iron Works
WC Wheelabrator Corp
WE Western Precipitation Div Joy Mfg Co
WP Wheeler Pump & Tank Co
WPM Worthington Pump Mfg Co
WW Wellman Engineering Co
YC Yuba Consolidated Industries Inc
ZC Zurn Industries Inc
[illegible] Aerotherm Corp
[illegible] Air Preheater Inc
[illegible] American Air Filter Co Inc
[illegible] American Blower Corp
[illegible] American Coal Enterprises Inc
[illegible] American Standard Inc
[illegible] Babcock & Wilcox Co
[illegible] Bahnson Co
[illegible] Basic Refractories Inc
[illegible] Bell & Gossett Co
[illegible] Bethlehem Steel Corp
[illegible] Blaw-Knox Co
[illegible] Buffalo Forge Co
[illegible] Carborundum Co
[illegible] Chemical Construction Corp
[illegible] Chicago Bridge & Iron Co
[illegible] Clarage Fan Co
[illegible] Clark Bros Co Inc
[illegible] Clayton Manufacturing Co
[illegible] Cleaver-Brooks Co
[illegible] Combustion Equipment Associates Inc
[illegible] Connelly Boiler Co
[illegible] Continental Boiler Works Inc
[illegible] Copes-Vulcan Inc
[illegible] Cottrell Environmental Inc
[illegible] Crane Co
[illegible] Dampney Co of America
[illegible] Detroit Stoker Co
[illegible] Dravo Corp
[illegible] Duriron Co Inc
[illegible] Edwards Engineering Corp
[illegible] Environeering Inc
[illegible] Erie City Iron Works
[illegible] Fairbanks Morse & Co
[illegible] Fisher Governor Co
[illegible] Foster Wheeler Corp
[illegible] Fuller Co
[illegible] Gas Machinery Co
[illegible] General Filter Co
[illegible] General Kinetics Inc
[illegible] Graver Water Conditioning Co
[illegible] Green Fuel Economizer Co
[illegible] Hagan Corp
[illegible] Hays Corp
[illegible] Heat Exchangers Inc
[illegible] Hoffman Air & Filter Inc
[illegible] Ingersoll-Rand Co
[illegible] Ionics Inc
[illegible] Jeffrey Manufacturing Co
[illegible] Kennedy Van Saun Mfg & Engineering Corp
[illegible] Keystone Consolidated Industries Inc
[illegible] Lear Siegler Inc
[illegible] Lone Star Steel Co
[illegible] Marley Co
[illegible] Mikro Pulverizer Co
[illegible] Nalco Chemical Co
[illegible] National Airoil Burner Co Inc
[illegible] National Tank Co
[illegible] Neptune Water Treatment Equipment Corp
[illegible] Nooter Corp
[illegible] Northern Blower Co
[illegible] Pacific Pumps Inc
[illegible] Peabody Engineering Corp
[illegible] Penberthy Injectors Div Houdaille Industries Inc
[illegible] Permutit Co
[illegible] Pfaudler Permutit Inc
[illegible] Pittsburgh-Des Moines Steel Co
[illegible] Precipitair Inc
[illegible] Premier Mill Corp
[illegible] Process Systems Inc
[illegible] Quigley Co Inc
[illegible] Rex Chainbelt Inc
[illegible] Riley Stoker Corp
[illegible] Roberts & Schaefer Co
[illegible] Rockwell Manufacturing Co
[illegible] Rotary Power Skimmer Co
[illegible] Schutte & Koerting Co
[illegible] Sprout Waldron & Co Inc
[illegible] Stock Equipment Co
[illegible] Struthers Wells Corp
[illegible] Sturtevant Div Westinghouse Elec Corp
[illegible] Swartwout Co
[illegible] Taylor Forge & Pipe Works
[illegible] Todd Shipyards Corp
[illegible] Union Iron Works Riley Stoker Corp
[illegible] Vapor Corp
[illegible] Vogt Machine Co
[illegible] Westinghouse Electric Corp
[illegible] The Wheelabrator Corp
[illegible] A.V. Bell Combustion Equipment Co
[illegible] Worthington Corp
[illegible] Western Precipitation Div Joy Mfg Co
[illegible] Wheeler Pump & Tank Co
[illegible] Worthington Pump Mfg Co
[illegible] Wellman Engineering Co
[illegible] Yuba Consolidated Industries Inc
[illegible] Zurn Industries Inc

[illegible], October 1970

Reliability and concer

PROJECT	COMPANY	LOCATION	CONSULTING ENGINEER	Year of initial operation	New or existing plant	Principal steam use	BOILERS: No. and type of new units	BOILERS: Manufacturer	BOILERS: Capacity each, 1000 lb/hr at MBtu/hr	BOILERS: Operating pressure, psig	BOILERS: Operating temp, F	FUEL: Type	FUEL: 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	130	175	Sat	[illegible]	N	P[illegible]
69	Carolina Paper Board Corp	Charlotte N C.		70	Ex	Pr Po SH	1 Pk	BW	50	175	Sat	O,G	N	P[illegible]
70	Central Park Ave Pumping Station	Chicago, Ill	Laramore Douglas & Popham	70	Ex	Pp[15]	5 Pk		40	175	577	O G	N	P[illegible]
[illegible]	[illegible]neday Co	Springfield Mo		70	Ex	Pr	1 Pk	KEE	45	166	Sat	O G	N	Pd
[illegible]	University of Texas	Arlington Texas	Cowan Love & Jackson Inc	69	Ex	SH	[illegible] Fi	CE	45	155	Sat	O G	N	P[illegible]
[illegible]	Armstrong Cork Co	Kankakee, Ill.		70	Ex	Pr SH	[illegible] Pk	KEE	40	155	Sat	O G	N	P[illegible]
[illegible]	Indiana University	Bloomington Ind	Brown Engineering Co	70	Ex	SH	[illegible] Fi	UR	150	160	Sat	[illegible]		BD
[illegible]	Seattle Steam Corp	Seattle Wash		70	Ex	SH	1 Pk	CE	100	150	Sat	O G	N	P[illegible]
[illegible]	[illegible] Chemical Co	Garfield Utah		70	Ex	Pr	1 Pk	MIW	50	160	Sat	O G	N	P[illegible]
[illegible]	[illegible] Corp of America, Inc	Bessemer City N C				Pr	1 Pk	BW	45	150	Sat	O G	N	P[illegible]
78	Rock Island Refinery Corp	Indianapolis Ind		70	Ex	Pr	[illegible] Fi	VO	40	150	470	O RG		BD
[illegible]	Great Meadows Institute	[illegible] N Y		70	New	Pr SH	4 Pk	CE	25	150		O	N	BD
80	General Motors Corp Fisher Body Div	Grand Rapids Mich		70	New	SH	2 Pk	BW	55	57	Sat	O	N	P[illegible]
81	General Motors Corp Harrison Radiator Div	Lockport, N Y	GMC, Argonaut Realty Div	70	New	SH	2 Pk	BW	50	155	Sat	O G	N	P[illegible]
82	Dow Chemical Co	Freeport Texas		[illegible]	New	Pr	3 Fi	KEE	167	150	Sat	O G	N	P[illegible]
83	University of Texas Medical Center	Galveston Texas	Gaynor & Sirmen Inc	[illegible]	Ex	SH	2 Pk	MIW	100	150	Sat	O	N	P[illegible]
84	S C Johnson & Son Inc	Waxdale Wis		70	Ex	Pr SH	2 Pk	BW	30	150	Sat	O G	N	P[illegible]
85	Scott Paper Co	Philadelphia Pa		70	Ex	Pr	[illegible] Pk	CE	50	50[14]	490	O G[15]	N	P[illegible]
86	Bassett-Walker Knitting Co	Martinsville Va	J E Sirrine Co	70	New	Pr	1 Pk	BW	75	150	Sat	O G	N	P[illegible]
87	The Quaker Oats Co	Rockford Ill					[illegible] Pk	BW	60	150	Sat	O G	N	P[illegible]
88	Weyerhaeuser Co	Fitchburg Mass	Jackson & Moreland	70	New	Pr	[illegible] Pk	BW	50	150	Sat	O G	N	P[illegible]
89	Detroit House of Correction	Detroit Mich	Snyder & McLean Inc	70	Ex	Pr SH	[illegible] Pk	CE	36.5	[illegible]	Sat	O G	N	P[illegible]
90	Bibb [illegible] Sanford Inc	Summerville Ga		69	New	Pr	2 Fi	CE	43	150	758	O		BD
91	Sacred Heart Medical Center	Spokane Wash	Valentine Fisher & Tomlinson	69	New	Pr SH	1 Pk	BW	40	150	Sat	O G	N	P[illegible]
92	[illegible] State School	Tupper Lake N Y	Paul L Geiringer & Associates	70	Ex	SH	2 Pk	KEE	20	150	366	O	N	P[illegible]
93	Wilson Pharm & Chem Corp Wilson Labs Div	Chicago Ill		69	Ex	Pr	[illegible] Pk	BW	30	150	Sat	O G	N	P[illegible]
94	Edgewater Hospital	Chicago	Dantze, Karlovkin & Associates	[illegible]	New	Pr SH	2 Pk	BW	24	150	Sat	O G	N	P[illegible]
95	Koppers Co Inc	Florence N C					1 Pk	MIW	24	150	Sat	O G	N	P[illegible]
96	Providence Hospital	Mobile Ala.	Evans & Young	70	Ex	Pr SH	2 Pk	MIW	20	150	366	O G	N	P[illegible]
97	Witco Chemical Corp	Petrolia Pa		69	Ex	Pr	[illegible] Pk	BW	60	140	Sat	O G	N	Pd
98	W R Grace & Co Dewey & Almy Chem Div.	Owensboro Ky		70	Ex	Pr SH	1 Pk	MIW	40	150	Sat	O G	N	P[illegible]
99	Townsends Inc	Millsboro Del		70	Ex	Pr	1 Pk	BW	40	150	[illegible]	O	N	Pd
100	[illegible]omberg-Carlson Corp	Rochester N Y		69	Ex	Pr SH	[illegible] Fi	KEE	10	150	Sat	O G	N	P[illegible]
[illegible]	[illegible] Co	Honolulu, Hawaii		[illegible]	Ex	Pr	[illegible] Pk	BW	100	125	Sat	O	N	P[illegible]
[illegible]	Chemetron Corp Tube Turns Div	Louisville Ky		70	Ex	Pr	[illegible] Pk	CE	60	125	Sat	O G	N	P[illegible]
[illegible]	Medical Center Development Corp	Detroit Mich	Albert Kahn Associates	70	New	Pr	[illegible] Pk	BW	70	125	Sat	O G	N	P[illegible]
104	General Motors Corp Diesel Eqt Div	Grand Rapids Mich	GMC Argonaut Realty Div	[illegible]	Ex	Pr SH	[illegible] Pk	BW	90	[illegible]	[illegible]	O G	N	P[illegible]
105	Chevron Chemical Co	San Francisco Calif		70	Ex	Pr	1 Pk	CE	100	100	Sat	O G	N	P[illegible]
106	The Babcock & Wilcox Co Tubular Prods Div	Beaver Falls Pa		70	Ex	Pr SH	[illegible] Pk	BW	175	125	[illegible]	O G	N	P[illegible]
[illegible]	Monsanto Co	Nitro W Va	Black & Veatch	70	Ex	Pr SH	[illegible]	EC	[illegible]	[illegible]	Sat	[illegible]		SD
[illegible]	[illegible] Dynamics Corp	Groton Conn		69	New	SH	[illegible] Pk	BW	[illegible]	[illegible]	[illegible]	O	N	P[illegible]
[illegible]	[illegible] State Hospital	[illegible] Ky	E R Ronald & Associates	70	Ex	SH	[illegible] Pk	MIW	30 00	[illegible]	[illegible]	O	N	P[illegible]
[illegible]	[illegible] Co Inc	[illegible]quehanna Pa			New	Pr	[illegible] Pk	MIW	[illegible]	[illegible]	Sat	O G	N	P[illegible]
[illegible]	Lake Superior State College	Sault Ste Marie Mich	Commonwealth Associates Inc		New	SH	1 Pk	CB	[illegible]	[illegible]	[illegible]	O G	N	P[illegible]
[illegible]	Owatonna Canning Co	Owatonna Minn		70	Ex	Pr	[illegible] Pk	MIW	50	[illegible]	[illegible]	O G	N	P[illegible]
[illegible]	International Paper Co	Ticonderoga N Y	H A Simons Ltd	69	New	SH	[illegible] Pk	EC	40	[illegible]	[illegible]	O	N	Pd
[illegible]	[illegible] Maker & [illegible] Inc	[illegible] Iowa	Helmick & Lutz Co	70	Ex	Pr	[illegible] Pk	CE	40	[illegible]	Sat	O G	N	SD
[illegible]	[illegible] State College	Sacramento Calif		70	Ex	SH	[illegible] Pk	MIW	9	[illegible]	[illegible]	O G	N	P[illegible]
[illegible]	[illegible] International [illegible]	Chattanooga Tenn					1 Pk	CE	[illegible]	[illegible]	[illegible]	O	N	P[illegible]
[illegible]	[illegible] Hospital	Schenectady N Y	Harold H Friedman Associates	70	New	Pr SH	2 Pk	MIW	[illegible]	[illegible]	Sat	O G	N	Pd
[illegible]	[illegible]	[illegible]				SH	[illegible] Pk	BW	[illegible]	[illegible]	[illegible]	O G	N	Pd
[illegible]	[illegible]	Columbia [illegible]		[illegible]	New	Pr SH	[illegible] Pk	BW	[illegible]	[illegible]	[illegible]	O G	N	SD
[illegible]	[illegible] Hospital	[illegible] Mont	[illegible]		New	SH	[illegible] Pk	BA	[illegible]	[illegible]	Sat	O G	N	Pd
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	New	Pr	[illegible]	CB	[illegible]	[illegible]	Sat	O G	N	Pd
[illegible]	[illegible]	[illegible] Pa		[illegible]	[illegible]	Pr	[illegible] Pk	BW	[illegible]	[illegible]	[illegible]	[illegible]	N	Pd
[illegible]	[illegible]	[illegible]		[illegible]	Ex	SH	[illegible] Pk	BW	[illegible]	[illegible]	[illegible]	[illegible]	N	Pd
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	New	SH	[illegible] Pk	BW	[illegible]	[illegible]	[illegible]		N	SD
[illegible]	[illegible]	[illegible]		[illegible]	Ex	Pr SH	[illegible] Pk	MIW	[illegible]	[illegible]	[illegible]	O G	N	Pd
[illegible]	[illegible]	[illegible]	[illegible] Associates	[illegible]	Ex	Pr	[illegible] Pk	UR	[illegible]	[illegible]	[illegible]	[illegible]	N	SD
[illegible]	[illegible]	[illegible]		[illegible]	Ex	SH	[illegible] Pk	UR	[illegible]	[illegible]	[illegible]	[illegible]	N	Pd

HIGH TEMPERATURE WATER SYSTEMS

PROJECT	COMPANY	LOCATION	CONSULTING ENGINEER	Year of initial operation	New or existing plant	Principal steam use	No. and type of new units	Manufacturer	Capacity	Operating pressure	Operating temp	Type	Ash fusion temp	Furnace type
[illegible]	[illegible]	[illegible] Mich	Commonwealth Associates Inc	[illegible]	New	SH	[illegible]	BW	[illegible]	[illegible]	[illegible]	O G		Pd
[illegible]	[illegible] State [illegible]	[illegible] N Y	[illegible] & Associates	[illegible]	New	SH	[illegible]	BW	[illegible]	[illegible]	[illegible]	O	N	Pd
[illegible]	[illegible]	[illegible]	Meyer [illegible] & [illegible]		New	SH	[illegible]	BW	[illegible]	[illegible]	[illegible]	O G		BD
[illegible]	[illegible] Redevelopment [illegible]	[illegible] Mo	Black & Veatch		New	SH	[illegible]	BW	[illegible]	90	[illegible]	O G		Pd
[illegible]	[illegible]	[illegible]		[illegible]	New	SH	[illegible]	[21]	5	[illegible]	[illegible]	O G		Pd

[illegible]

Co — Combined pneumatic and electronic
H₂ — Hydrogen
In — Internal water treatment
LNG — Liquid natural gas
M — Motor
Mc — Mechanical
MzD — Mixed-bed demineralizer
MuD — Multibed demineralizer
N — None
New — New
[illegible] — Pulp and paper industry

Pk, Pn, Po, Pr, Pd, PiG, PiR, Re, RG, SA, Sat, Sd

(EQUIPM)ENT		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]	
[illegible] SA	FAE	N	N		CE	M [illegible]	N	N	N		WC	T 25	Ft Z In	E	RE	N	N	N	N	45	67
	CE	N	N		FAA	M T 8	N	N	N			M T 100	Sc Ft Z In	Pn	CE	N	N	N	N	40	68
[illegible] SA	BW	N	N			M [illegible]	N	N	N	[illegible]	WC	M 40	Z In	Co	BM	N	Fs	N	N	50	69
[illegible] SA		N	N			M T [illegible]	N	N	N	[illegible]		M T 50	In	Pn	....	N	N	N	N	215	70
	COE	N	N			M 40	N	N	N		IP	T [illegible]	Z Da In	Co	COE	N	N	N	N	35	71
[illegible] MP	COE	N	N		COE	M [illegible]	N	N	N		PE	M 40	Z In	Co	COE	N	N	N	N	...	72
[illegible] SA	BW	N	N			M [illegible]	N	N	N	[illegible]		M T	Z In	Co	COE	N	N	N	N	...	73
	N	N	N		CE	M [illegible]		CE	M 350	Ex			Ex	E	HAY	....	N	Me, El	UOP, AS	Ex	74
[illegible] SA	[illegible]	N	N		[illegible]	[illegible]	N	N	N				Z In	Pn	BM	....	Fs	N	N	150[17]	75
[illegible] SA	[illegible]	N	N		[illegible]	M T [illegible]	N	N	N		PE	M 60	Z In	Co	BM	1	Fs	N	N	54	76
[illegible] SA	[illegible]	N	N		CE	M [illegible]	N	N	N		GP	T 60	In	Pn	BM	.	N	N	N	40	77
		N	N							[illegible] 13	IR	M T 60	Z In	Co	....	N	N	N	N	...	78
[illegible] SA	CE	N	N		CE	M [illegible]	N	N	N	[illegible]	WPM	M	In	Co	HAY	0.9	Fs	N	N	....	79
[illegible] SA	BW	N	N		[illegible]	M [illegible]	N	N	N	[illegible] 2	WC	M T 100	Z Da In	Co	BM	N	N	N	N	60	80
[illegible] SA	BW	N	N		CE	M	N	N	N	[illegible] 2	WD	M T 60	Z Da In	Co	BM	N	N	N	N	45	81
	FAE	N	N		BF	M [illegible]	N	N	N	[illegible] 2	BF	M 125	Z In	Co	F, HAY	N	N	N	N	30	82
	COE	N	N		COE AL	M [illegible]	N	N	N		GP	M 50	Da	E	....	N	N	N	N	50	83
[illegible] AA	BW	N	N		CE	M [illegible]	N	N	N		IR	M 50	Z In	Co	....	N	N	N	N	45	84
[illegible] SA	[illegible]	[illegible]	CE		[illegible]	M [illegible]	N	N	N		PE	M	Ft Z So In	Co	BM	N	N	N	N	30	85
	BW	N	N		[illegible]	M 10	N	N	N		WC	M T 25	Z In	Pn	BM	N	N	N	N	70	86
[illegible] SA	BW	N	N		CE	M 40	N	N	N	[illegible] 2	WC	M 40	Z In	Pn	BM	N	N	N	N	95	87
	COE	N	N			M [illegible]	N	N	N	[illegible]	GP	M 30	Z	E	COE	3	Fs	N	N	50	88
[illegible] SA	COE	N	N		AL	M [illegible]	N	N	N				Z In	E	COE	N	N	N	N	...	89
	N	N	N		FAA	M —		FAA	M	[illegible]		M T	Z In	Co	HAY	3.12	N	Me	FAA	40	90
[illegible] SA	BW	N	N			M 40	N	N	N		WC	M T 30	Z In	Pn	BM	....	N	N	N	....	91
[illegible] SA	CE	N	N		CE	M 30	N	N	N	[illegible]	IR	M 30	In	Co	TS	N	N	N	N	150[17]	92
	CE	N	N		CE	M [illegible]	N	N	N	[illegible]	IR UP	M 30	Z In	E	....	N	N	N	N	60	93
[illegible] SA	BW	N	N		CE	M 30	N	N	N	[illegible]	SnA	M [illegible]	Z In	Co	BM	N	N	N	N	....	94
	[illegible]	N	N		CE	M [illegible]	N	N	N	[illegible]	DHP	M 30	Ft In	E	CCI	3	N	N	N	40	95
[illegible] SA	[illegible]	N	N		MPM	M	N	N	N		IR	M 25	In	Co	HAY	N	N	N	N	100[17]	96
	BW	N	N		CE	M 40	N	N	N	[illegible]	APE	M T 50	Z In	Pn	BM	N	N	N	N	70	97
[illegible]	COE	N	N		CE	M [illegible]	N	N	N		GP	M 30	Ft Z In	E	COE	N	N	N	N	35	98
	BW	N	N		CE	M [illegible]	N	N	N	[illegible]	FMP	M 30	In	Pn	BM	3[16]	Fs	N	N	35	99
	PEC	N	N			M [illegible]	N	N	N	[illegible]	GP BP AMP	M T 30	Z In	Pn	BM	N	N	N	N	175[17]	100
	BW	N	N			M 100	N	N	N	[illegible] 4		M 100	Ex	Pn	....	.43	N	Me	BRL	110[17]	101
	COE	[illegible]	APC		AL	M [illegible]	N	N	N	[illegible]	CP	M 40	Z In	E	COE	2.1	N	N	N	30	102
	BW	N	N		CE		N	N	N	[illegible]	COC	M T	Z In	Pn	BM	N	N	N	N	45	103
[illegible] SA	BW	N	N		WE	M 60	N	N	N	[illegible]	WC	M T	Z Da In	..	BM	N	Fs	N	N	12	104
[illegible] SA	CE	N	N		FAA	M T 100	N	N	N	[illegible]		M T 30	Da Z In	Pn	BM	N	N	N	N	50	105
[illegible] SA	BW	N	N		CE	M [illegible]	N	N	N		DL	M 50	Z In	Pn	BM	N	N	N	N	75	106
	N	N	N		CE	M 4e		CE	T 30E	Ex	IR	T 125	Z In	Pn	BM	N	N	Me	FAA	90	107
[illegible] SA	BW	N	N		CE	M 40	N	N	N	[illegible]	IR	M 40	In	Co	BM	1.9	Fs	N	N	135[17]	108
1		N	N				N	N	N	[illegible] 2	DHP	M T 25	Z In	Pn	...	N	N	N	N	55	109
[illegible] SA	[illegible]	N	N		CE	M 25	N	N	N	[illegible]	GP	M [illegible]	Z In	E	CCI	2	N	N	N	40	110
1 Me	CE	N	N		CE	M 30	N	N	N		GP	M 30	Z	E	HAY	...	N	N	N	50	111
1	COE	N	N		AL	M 25	N	N	N		GP	M 40	Z In	E	CCI	N	N	N	N	80	112
[illegible] SA	[illegible]	N	N		AP	M 40	N	N	N	[illegible]	APC	M 25	In	E	CCI	N	N	N	N	36	113
[illegible] A	CE	N	N				N	N	N				Z	Pn	...	N	N	N	N	....	114
[illegible] SA	COE	N	N		AL	M [illegible]	N	N	N					E	HAY	N	N	N	N	28	115
1	[illegible]	N	N		CE	M 30	N	N	N		WC	M T 40	Z In	E	CE	N	N	N	N	...	116
[illegible] SA	[illegible]	N	N		[illegible]	M [illegible]	N	N	N	[illegible]	JF	M 25	Z Da	Pn	HCC	N	N	N	N	160[17]	117
	BW	N	N		[illegible]	M [illegible]	N	N	N				In	Pn	BM	N	N	N	N	34	118
1	COE	N	N		COE	M	N	N	N		GP	M 30	N	Co	COE	N	N	N	N	60	119
[illegible] A	BW	N	N		CE	M	N	N	N				Z Da In	Pn	BM	N	N	N	N	35	120
[illegible] AA	CE	N	N		CE	M [illegible]	N	N	N	[illegible]	IR	M [illegible]	Z In	E	....	N	N	N	N	15	121
[illegible] SA	BW	N	N		CE	M	N	N	N	[illegible]	APC	M [illegible]	Z In	E	RE	N	N	N	N	38	122
1	BW	N	N		COE	M [illegible]	N	N	N		PE	M [illegible]	Z In	E	BW	N	N	N	N	25	123
	BW	N	N		WE	M [illegible]	N	N	N		WC	M [illegible]	Z Da In	Co	HCC	N	N	N	N	126[17]	124
[illegible] SA	[illegible]	N	N		COE	M [illegible]	N	N	N					Pn	HCC	N	N	N	N	40	125
[illegible] AA	[illegible]	N	N		[illegible]	M	N	N	N		EL	T 25	Z In	Pn	HCC	N	N	N	N	60	126
[illegible] SA	[illegible]	N	N		CE	M [illegible]	N	N	N		WC		Z In	E	CE	2	Fs	N	N	150[17]	127
2	CE	N	N		CHE	M 60	N	N	N		CF	M 25	N	E	HAY	N	N	N	N	45	128
1	WNE	N	N		WNE	M [illegible]	N	N	N		DHP	M 15 20	In	Co	....	....	N	N	N	18.5	129
2	[illegible]	N	N		CE	M	N	N	N		WC	M 100	Z In	Pn	TS	0.5	N	Me	UOP	26	130
1	COE	N	N		AL	M 30	N	N	N		WC	M 40	M C	Pn	BM	N	N	N	N	150	131
[illegible]	[illegible]	N	N		CE	M	N	N	N				Sc In	E	CE	N	N	N	N	...	132

[illegible] pumps as standby. Boiler for rental service
[illegible] Will operate rate at [illegible] psig, 950 F
[illegible] Radial turbine
[illegible] POWER, April 1970, p 59
[illegible] On waste-heat boiler only
[illegible] On recovery boiler only
[illegible] pumps for 5 boilers
[illegible] Will operate rate at 400 psig
[illegible] One main, one auxiliary
[illegible] pumps for 2 boilers

14 Will operate rate at 265 psig, 550F
15 Will use black liquor later
16 Sulfur content will be 1% later
17 Heights 100 ft and above are measured from ground level
18 [illegible] pumps for 2 boilers
19 Plus 4 for startup
20 Approximate hp is for each motor or turbine
[illegible] Riley, Monitord Div.
[illegible] 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 flo out the use of surge da Applicable to chemical p ing, water treatment and r osmosis systems. Model 2 tures valve and piston c which permit material se 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 compre** single-stage, two-stage, cial booster units— with emphasis on co 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 g nical data on coating sories and end finis plings and connection 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 b tin, with illustrations and se tion tables on 36 models. right-angle types are said t available in single and c bination reduction; and para shaft types in single, double triple reduction.—Dodge Mf facturing Corp

503 **Technical** journal on bear has 266 pp on selection, ra 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 t lect and maintain them are topics of this 44-p booklet. C tains practical informa 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 s sheave diameter for A, B an sections. Tables list approx outside length and pitch le for the 107 "Torque-Flex" numbers available.—T B Wo Sons Co

506 **Ajusto-Gear** drives, ava from 1 hp through 20 hp maximum output speeds 4 410 through 7 rpm. Applica and dimensional data are cluded in 12-p booklet.—E Yale & Towne, Inc

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

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