Power 1965

ENERGY SYSTEMS DESIGN SURVEY

This exclusive 48-p report gives specific engineering data on 1060 projects in the U.S., Canada and overseas. Results of the seven areas surveyed are summarized in graphic form to help you detect trends affecting central stations, industrial plants, institutions, and commercial buildings. Survey is a fair cross-section of current engineering practice. Use it as a ready reference for planning and decision-making.

OCTOBER • 1965

STATIONS

Once-through boilers favored above 240

TABLE 1: U.S. and Canada

Each project listing covers 4 pages

PROJECT	COMPANY	LOCATION	PLANT NAME	CONSULTING ENGINEER	Unit No., new unit	Date first operation	Unit capacity, mw	BOILER: Capacity as, 1000 lb per hr	BOILER: Throttle pressure, psig
1	Pennsylvania Power & Light Co	York Haven, Pa	Brunner Island	Ebasco Services, Inc	3	9-68	715	5700	3675
2	Carolina Power & Light Co	Roxboro, NC	Roxboro	Ebasco Services, Inc	2	1-68	650	4650	2525
3	Texas Power & Light Co	Savoy, Texas	Valley	Brown & Root, Inc	1	11-67	582	3980	3500
4	Dallas Power & Light Co	Dallas, Texas	Mountain Creek	Ebasco Services, Inc	8	3-67	580	3980	3500
5	Commonwealth Edison Co	Kincaid, Ill	Kincaid	Sargent & Lundy	1	1-67	580	4200	2520
6	Houston Lighting & Power Co	Richmond, Texas	W A Parish	Ebasco Services, Inc	4	11-67	565	3980	3500
7	Plymouth County Electric Co	Sandwich, Mass	Canal	Stone & Webster Engrg Corp	1	5-63	560	3720	3675
8	Mississippi Power & Light Co	Vicksburg, Miss	Baxter Wilson	Bechtel Corp	1	11-66	550	3600	3500
9	New Orleans Public Service Inc	Michoud, La	Michoud	Ebasco Services, Inc	3	1-67	531	3980	3500
10	Louisiana Power & Light Co	Westwego, La	Nine Mile Point	Ebasco Services, Inc	4	1969	531	3980	3500
11	West Penn Power Co	Maidsville, W Va	Fort Martin	Burns and Roe, Inc	2	5-69	500	4000	3500
12	Detroit Edison Co	Trenton, Mich	Trenton Channel		9	12-67	500	3850	2520
13	Arkansas Power & Light Co	Helena, Ark	Robert E Ritchie[6]	Bechtel Corp	2	1-68	500	3600	3500
14	Florida Power Corp	Crystal River, Fla	Crystal River	Black & Veatch	1	7-66	420	2548	2400
15	Northern Indiana Public Service Co	Baileytown, Ind	Bailly	Sargent & Lundy	8	1-68	414	2569	3675
16	Public Service Co of Indiana	West Terre Haute, Ind	Wabash River	Sargent & Lundy	6	5-43	387	2360	2400
17	Consumers Power Co	West Olive, Mich	James H Campbell	Commonwealth Associates Inc	2	3-67	385	2550	3500
18	Boston Edison Co	Boston, Mass	New Boston	Stone & Webster Engrg Corp	2	10-67	380	3540	2400
19	Tampa Electric Co	Tampa, Fla	Gannon[4]	Stone & Webster Engrg Corp	5	3-67	378	3000	2400
20	Potomac Electric Power Co	Chalk Point, Md	Chalk Point[4]	Bechtel Corp	2	2-65	365	3500	3500
21	Wisconsin Electric Power Co	Oak Creek, Wis	South Oak Creek	Stone & Webster Engrg Corp	8	6-67	336	2000	2520
22	Georgia Power Co	Whitegeorge, Ga	Harllee Branch	Southern Services, Inc	2	6-67	319	2246	2400
23	Ohio Edison Co	Stratton, Ohio	W H Sammis	Commonwealth Associates Inc	5	10-67	318	2355	2520
24	Public Service Co of Oklahoma	Washita, Okla	Southwestern	Black & Veatch	3	3-67	310	1900	2200
25	Central Illinois Light Co	Sommer, Ill	E D Edwards	Commonwealth Associates Inc	2	1-68	274	1870	2520
26	Alabama Power Co	Greene County, Ala	Greene County	Southern Services, Inc	1	6-65	250	1750	2400
27	New England Power Co	Somerset, Mass	Brayton Point	Stone & Webster Engrg Corp	2	7-64	228	1675	2520
28	Northern States Power Co	Minneapolis, Minn	Riverside	Pioneer Service & Engineering Co	3	5-64	216	1500	2400
29	Iowa Southern Utilities Co	Burlington, Iowa	Burlington	Black & Veatch	1	5-68	215	1425	1850
30	South Carolina Electric & Gas Co	Canadys, SC	Canadys	Gilbert Associates, Inc	3	5-67	200	1494	2400
31	Montana Power Co	Billings, Mont	Billings	Bechtel Corp	2	10-68	190	1166	1800
32	Shawinigan Water & Power Co	Tracy, Que, Can	Tracy	United Engineers & Constructors	2	9-65	165	1150	1850
33	Iowa Electric Light and Power Co	Cedar Rapids, Iowa	Prairie Creek	Stone, Engr-ic & Self	4	1-67	140	950	1850
34	Central Maine Power Co	Cousins Island, Me	W F Wyman	Jackson and Moreland	3	7-65	120	800	1800
35	New Mexico Electric Service Co	Hobbs, NM	Maddox	Gibbs and Hill	1	1-67	100	810	1450
36	St Joseph Light & Power Co	St Joseph, Mo	Lake Road	Black & Veatch	5	4-67	90	525	1800

MUNICIPAL AND COOPERATIVE INSTALLATIONS

37	Calgary Power Ltd	Wabamun, Alta, Can	Wabamun	Montreal Engrg Co, Ltd	1	5-67	200	1500	2450
38	Omaha Public Power District	Omaha, Neb	North Omaha	Gibbs, Hill, Durham & Richardson Inc	5	5-68	200	1600	2520
39	Lower Colorado River Authority	Austin, Texas	Sim Gideon	Green & Hill, Inc	2	6-68	125	990	1800
40	Central Electric Power Cooperative, Inc	Conway, SC	Conway	Burns and Roe, Inc	2	2-66	75	620	1800
41	City of Cleveland	Cleveland, Ohio	Lake Road	Burns and Roe, Inc	11	1-68	75	625	1450
42	City of Denton	Denton, Texas	City Power Plant	Black & Veatch	1	1-68	61	590	1250
43	City of Burbank Public Service Dept	Burbank, Calif	Olive Ave	Fluor Corp	2	10-64	55	440	1450
44	Lea County Electric Cooperative, Inc	Lovington, NM	Lovington	Tibbetts & Lee	2	5-66	42	400	893
45	City of Henderson	Henderson, Ky	Municipal Power Plant	Burns & McDonnell Engrg Co	5	1-66	28	255	850
46	City of Bryan	Bryan, Texas	Municipal	Lutz, Daniel & Brain	5	12-55	22	245	850
47	City of Logansport	Logansport, Ind	Municipal	Lamstein, Debbe, Weber & Geise	4	9-63	22	240	900
48	City of Greenville	Greenville, Texas	Municipal	Tibbetts & Lee	1	5-66	12	135	893
49	City of Hampton	Hampton, Ind	Municipal	Lamstein, Debbe, Weber & Geise	1	1-60	10.5	150	850
50	City of Peoria	Peoria, Fla	Municipal	Nolan Dale	1	1-65	12.65	120	600

FOOTNOTES

1 Outdoor
2 Two units - data refers to each unit
3 Tangent firing
4 Vane and burner registers
5 Jointly with Potomac Edison and Monongahela Power Co
6 Station originally named Helena
7 Main control by feedwater flow balance
8 Water spray in emergency only
9 Vane inlet damper outlet
10 By-pass duct
11 Each 3 fan units
12 Gas as secondary fuel
13 Heater and deaerator reselect very
14 Hydraulic coupling on motor only
15 One spare motor for two boilers
16 387 mw with 5% overpressure, 351 mw normal service
17 Provision made for future coal firing
18 Revised data - not yet installed
19 Makeup and condensate treatment respectively
20 Plus ....30 sq ft auxiliary surface
21 New unit will use existing computer
22 Turbine No 4 serves No 3
23 Gas as secondary fuel
24 Supercritical boiler
25 Water spray for second reheater

SYMBOLS USED ABOVE

Att - Attemperators
B - Burners
Bal - Balanced
By - Gas by-pass
Cy - Cyclone furnace
D - Damper
DB - Dry bottom
EF - Firing axis
GR - Flue gas recirculation
HyC - Hydraulic
M - Motor
N - None
Pd - Pressure
PD - Proportion
R - Regular
S - Speed control
SS - Spreader
ST - Slag tap
T - Turbine
TB - Tilting
V - Vane control
WS - Water spray

…steam remains at 1000 F. Trend to outdoor plants continues

BOILERS — SURFACE, 1000 SQ FT: Boiler & wall	Superheater	Reheater	Economizer	Air heater	Superheat control	Reheat control	FURNACE: Pressure, in. water	Volume, 1000 cu ft	Heat release, 1000 Btu per cu ft per hr	No. of burners	Type	F D FANS: Per boiler	Capacity ea, 1000 cu ft	Manufacturer	Flow control	DRIVE: Hp	DRIVE: Manufacturer	I D FANS: Per boiler	Capacity ea, 1000 cu ft	Manufacturer	Flow control	DRIVE: Hp	DRIVE: Manufacturer	PROJECT
74.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pc,DB	[illegible]	[illegible]	WE	V	5000	GE	N	N	N	N	N	N	1
41.54	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pc,DB	[illegible]	[illegible]	SW	V	3500		N	N	N	N	N	N	2
20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pc	[illegible]	[illegible]	APC	HvC	4500	GE	N	N	N	N	N	N	3
34.9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pc	[illegible]	[illegible]	WE	V,D[9]	4000	AC	N	N	N	N	N	N	4
138.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pc,ST	[illegible]	[illegible]	AS	V	7000	WE	N	N	N	N	N	N	5
54.1	62.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pc,DB	[illegible]	[illegible]	AS	V	4000		N	N	N	N	N	N	6
23.44	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	15.6	[illegible]	Pc,DB	[illegible]	[illegible]	WE	V	3000	EM	N	N	N	N	N	N	7
34.55	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pc,DB	[illegible]	[illegible]	AS	V[4]	3500	WE	N	N	N	N	N	N	8
20.74	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pc	[illegible]	[illegible]	AS	V	[illegible]	WE	N	N	N	N	N	N	9
20.74	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pc	[illegible]	[illegible]	AS	V	4130	WE	N	N	N	N	N	N	10
33.57	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pc,DB	[illegible]	[illegible]	WE	V,D	5000	WE	N	N	N	N	N	N	11
37.79	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Ba	[illegible]	[illegible]	WE	V	1750	WE	[illegible]	[illegible]	WE	V	3500	WE	12
56.3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	128	[illegible]	[illegible]	Pc	[illegible]	[illegible]	AS	V	2235	...	N	N	N	N	N	N	13
35.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pc	[illegible]	[illegible]	AC	HvC,D	3500	LA	N	N	N	N	N	N	14
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pc	[illegible]	[illegible]	BF	...	...		N	N	N	N	N	N	15
26.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pc,DB	[illegible]	470	APC	V	3500	AC	N	N	N	N	N	N	16
24.83	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pc,DB	[illegible]	453	WE	V	3000	LA	N	N	N	N	N	N	17
33	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pc,DB	[illegible]	402	WE	V	2000	WE	N	N	N	N	N	N	18
33.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pc,ST	[illegible]	435	AS	HvC	3500	GE	N	N	N	N	N	N	19
20.37	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pc,DB	2	416	AS	HvC	2500	GE	N	N	N	N	N	N	20
20.86	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	136	15.1	[illegible]	Pc,DB	[illegible]	740	WE	V	2250	WE	N	N	N	N	N	N	21
36.95	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	24	Pc,DB	[illegible]	416	AS	V	2500	EM	N	N	N	N	N	N	22
18.42	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6	Pc,DB	[illegible]	295	SW	D	2500	....	N	N	N	N	N	N	23
23.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	50	36.9	16	Pc,DB	2	340	SW	V	2500	WE	N	N	N	N	N	N	24
28.5	64	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20	155.6	[illegible]	16	Pd,DE	2	345	...	V	....	...	N	N	N	N	N	N	25
19.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20	124	15.5	24	Pc,DB	2	321	WE	V	1750	WE	N	N	N	N	N	N	26
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	131.8	...	[illegible]	Bal DB	2	286	BF	V	800	AC	2	460	BF	V	1250	AC	27
25.61	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	65.07	[illegible]	5	Pc ST	2	303	BF	V	3500	EM	N	N	N	N	N	N	28
[illegible]	62.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	132	15.1	16	Pc,DB	2	...	SW	HyC	1740	WE	N	N	N	N	N	N	29
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	89	[illegible]	16	Pc,DB	2	250	..	[illegible]	3700	GE	N	N	N	N	N	N	30
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10.25	104.6	15.4	16	Pd	2	291	AS	V,D	1500	LA	N	N	N	N	N	N	31
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	90	[illegible]	[illegible]	Pd	[illegible]	210	CWE	V	900	CWE	N	N	N	N	N	N	32
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	82.2	[illegible]	12	Pc DB	[illegible]	192	AS	V	1000	GE	N	N	N	N	N	N	33
15.87	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.75	49.3	[illegible]	[illegible]	Pc,DB	[illegible]	119	WE	V	700	AC	N	N	N	N	N	N	34
18.63	22.5	[illegible]	[illegible]	[illegible]	WS,TB	[illegible]	...	[illegible]	[illegible]	4	Pc	1	286	APC	V	943	LA	N	N	N	N	N	N	35
10.7	[illegible]	[illegible]	[illegible]	164.8	WS	WS,GF	[illegible]	33.7	...	[illegible]	Pc,ST	1	213	AS	V	3000	WE	N	N	N	N	N	N	36
MUNICIPAL AND COOPERATIVE INSTALLATIONS																								
66.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-0.25	245	[illegible]	48	Bal	2	404	HOW	V	900	CGE	2	[illegible]	HOW	V	2200	CGE	37
19.9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	126	16.6	[illegible]	Pc,DB	[illegible]	[illegible]	AS	.....	1750	GE	N	N	N	N	N	N	38
16.86	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	42.2	[illegible]	[illegible]	Pc	[illegible]	190	SW	V	1250	....	N	N	N	N	N	N	39
35	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	48	[illegible]	[illegible]	Ba, DB	[illegible]	95.5	AC	V,D	300	GE	[illegible]	140	AS	D	450	GE	40
34.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	49.67	18.0	[illegible]	Pc DB	[illegible]	[illegible]	GF	D	500	GE	N	N	N	N	N	N	41
27.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	14.8	29.3	[illegible]	Pc	[illegible]	128	WE	V	1500	AC	N	N	N	N	N	N	42
10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20	[illegible]	[illegible]	Pc DB	[illegible]	[illegible]	SW	V,S	300 700	WE	N	N	N	N	N	N	43
28.6	[illegible]	N	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pc	[illegible]	[illegible]	CF	V	500	EP	N	N	N	N	N	N	44
26.3	[illegible]	N	N	[illegible]	[illegible]	N	-0.15	...	.....	SS	Ba	[illegible]	54	WE	V	75	GE	[illegible]	180	WE	S,D	100,500	GE	45
19.3	[illegible]	N	[illegible]	N	[illegible]	N	[illegible]	[illegible]	[illegible]	[illegible]	Pc	[illegible]	[illegible]	SW	V	100,250	GE	N	N	N	N	N	N	46
[illegible]	[illegible]	N	[illegible]	[illegible]	[illegible]	N	[illegible]	[illegible]	[illegible]	SS	Ba		50.4	CF	S,D	143	EL	[illegible]	[illegible]	CF	S,D	450	EL	47
[illegible]	[illegible]	N	N	[illegible]	[illegible]	N	[illegible]	4.97	[illegible]	[illegible]	Pc		[illegible]	SW	S,V	250,40	GE	[illegible]	N	N	N	N	N	48
[illegible]	[illegible]	N	[illegible]	[illegible]	AS	N	[illegible]	[illegible]	[illegible]	SS	Ba		[illegible]	GF	HvC,D	55,60	EL	[illegible]	155	...	HvC,D	250,300	EL	49
10.6	[illegible]	N	N	[illegible]	[illegible]	N	[illegible]	4.5	[illegible]	[illegible]	Pc	1	36.8	GE	V,D	150	GE	N	N	N	N	N	N	50

…FACTURERS

- …Associated Electrical Industries
- …Air Preheater Co, Inc
- …American Standard, Inc Div
- …Allen Sherman-Hoff, Sub of BLH
- …Aerotec Industries, Inc
- …erican Water Softener Section,
- …x Chainbelt Inc
- …own Boveri Corp
- …uffalo Forge Co
- …Bingham Pump Co
- …Byron-Jackson Pumps, Inc,
- Sub of Borg Warner Corp

- BLH - Baldwin-Lima-Hamilton
- BM - Bailey Meter Co
- Bu - Buell Engineering Co, Inc
- BW - Babcock & Wilcox Co
- CAC - Canadian Allis-Chalmers Mfg Co
- CAP - C A Parsons, Ltd
- CDC - Control Data Corp
- CE - Combustion Engineering, Inc
- CES - Combustion Engineering Superheater Co, Ltd
- CF - Clarage Fan Co
- CHH - Chicago Heater Co
- CIR - Canadian Ingersoll-Rand Co

- COC - Cochrane Div, Crane Co
- CV - Copes-Vulcan Div, Blaw-Knox Co
- CWE - Canadian Westinghouse Co, Ltd
- DE - Diamond Electric Corp
- DHP - Dean Hill Pump Co
- DL - De Laval Turbine Inc
- DP - Diamond Power Specialty Corp
- DSC - Detroit Stoker Co
- DT - Dage Television Co
- EC - Erie City Iron Works
- EP - Electric Products Co
- EE - English Electric Co, Ltd

- EL - Elliott, Div of Carrier Corp
- EM - Electric Machinery & Mfg Co
- F - The Foxboro Co
- FAA - Fly Ash Arrestor Corp
- FE - Fairfield Engineering Co
- FG - Fisher Governor Co
- FM - Fairbanks Morse, Div of Colt Industries
- FW - Foster Wheeler Corp
- GE - General Electric Co
- GF - Green Fuel Economizer Co, Inc, Sub of BLH
- GP - Goulds Pumps, Inc
- GPL - General Precision Inc

Advances in tandem-compound turbine design are clearly reflect

PROJECT	BOILER FEED PUMPS					DRIVE		FUEL		FIRING		SOOT			DUST			HEATER				
	Capacity ea, gpm	Discharge, psig	Manufacturer	Flow control	Drive type	Hp	Manufacturer	Type	1000 Btu per lb	Pulverizers per boiler	Manufacturer	Blower type	Blowing medium	Manufacturer	Collector type	Manufacturer	Stack height, ft	Number	Feedwater exit, F	Max deaerating pressure, psia	Manufacturer
1	6750	4450	WO	S	DT	13,500	GE	C	12.25	6	CE	Ret	St	CV	EI	.....	600	8	554	81	FW,GW
2	5030	2740	....	S	DT	10,200	GE	C	13.2	6	CE	Ro,Ret	Air	DP	Me	RC	.....	8	536.3	.....	.....
3	5510	4500	PP	S	DT	13,350	GE	C	13.2[10]	4	W	W	N	W	W	N	.....	7	500	170	SWE
4	4400[11]	4373	PP	S	M,T	13,400	GE	C[12]	13.2[10]	4	W	W	N	W	W	N	.....	7	499	W	FW
5	4475	3650	IR	S,HyC[14]	MTS,T,M[15]	12,200	WE	C	9.8	3[13]	BW	Ro,Ret	St	DP	EI	RC	500	11	480.3	149.7	BLH,GW
6	5000	4450	BJ	S	DT	.....	GE	C	13.18[10]	W	W	W	N	W	W	W	.....	7	500	170	WE,CHM
7	5290	4260	DL	R,HyC	DM,MTS	7200	GE	C	13.27	W	W	Ret	St	DP	W	W	238	7	560	16	WE
8	4600	4455	DL	S	DT	15,200	WE	C[12]	1050[10]	W	W	Y	....	.....	W	W	.....	7	600	100	WE,GW
9	4475	3950	WO	S	DT	13,537	GE	C,G	13.6,13333[10]	W	W	W	W	W	W	W	.....	7	500	....	WE
10	4475	3950	WO	S	DT	13,537	GE	C,G	13.6,13333[10]	W	W	W	W	W	W	W	.....	7	500	.....	WE
11	3900	4620	DL	S	DT	15,200	DL	C	11.6	5	.....	Ret	Air	DP	EI	AT	550	10	520	62	WE,YU
12	4650	3975	IR	S	DT	9,150	GE	C	11.7	5	CE	Ret	St	CV	EI	AS	.....	7	483	.....	WE
13	4620	4455	DL	S	DT	.....	WE	G	1020[10]	W	W	W	W	W	W	W	.....	7	491.6	95.1	WE,FW
14	3125	3930	WO	HyC	M,MTS	2500	LA	C	.....	5	CE	Ret	St	CV	We	BU	306	7	463	130	YU
15	3950	4633	....	S	M,2T	3900	GE	C,G	11.4,21.5	3[13]	BW	.....	Air	DP	EI	.....	400	7	496.5	120.3	WE,FW
16	3745	3140	PP	HyC	DM	7000	WE	C	11.1	5	CE	Ret	Air	DP	EI	RC	297	7	472.4	139	FW
17	6100,1500	4405,2735	DL,AC	HyC,R	M,T	4000	LA	C	11.6	3	BW	Ro,Ret	Air	CV	EI	BU	400	7	550	115	FW,CHM
18	5500,2100	5000	WO	HyC,R	M,MTS	4500	WE	C[17]	13.37	W	W	Ret	St	DP	W	W	250	7	500	125	WE,COC
19	7560	5220	PP	S	T	14,500	WE	C	11.65	3	RS	Ro,Ret	ST	CV	EI	AS	315	7	495	W	WO
20	3810	4531	WO	S	2T	5700	GE	C	13.65	5	BW	Ro,Ret	St	DP	EI	RC	400	8	551	68.8	WO
21	5520	3175	BJ	HyC	DM	5520	WE	C	12.35	5	CE	Ro,Ret	St	CV	EI	RC	550	7	480	.....	WE
22	5930,2400	3840	IR	HyC	M,MTS	5000	WE,GE	C	12	3	RS	Ro,Ret	St	CV	EI	RC	300	6	480	150	FW
23	5610	5560	....	HyC	MTS	.....	.....	C	12.18	3	BW	Ro,Ret	Air	.....	EI	.....	.....	8	544.5	119	.....
24	3710	3900	DL	HyC	DM	4600	WE	C[12]	1066[10]	W	N	W	N	W	N	N	150	6	465	147	CHM,YU
25	4430	3950	....	HyC	MTS	.....	.....	C	10.3	4	CE	Ro,Ret	Air	DP	EI	.....	500	7	483	110	.....
26	3295	3510	PP	HyC	DM	5000	WE	C	12.2	4	BW	Ret	St	CV	EI	AS	300	6	475	137	BLH,CC
27	2430,4320	.....	R	R	M,MTS	4000	AC	C	13.3	4	CE	Ret	Air	DP	EI	KC	3500	7	495	107	COC
28	4350	2957	WO	R	DM	4000	EM	C	10.4,14.1	5[13]	BW	Ret	St	DP	EI	RC	243	7	480.2	32.1	WO,COC
29	4600	3900	PP	HyC	DM	5000	EM	C	11	4	CE	Ro,Ret	Air	CV	EI	.....	.....	6	470	128.7	CHM
30	3630	3330	WO	S	T	8300	GE	C	13.5	4	FW	Ret	Air	DP	Me	AT	200	7	522	83.6	YU,WO[1]
31	3525	.....	DL	R	DM	2250	LA	C	8.95	4	CE	Ro,Ret	St	CV	EI	.....	.....	5	466	.....	SWE
32	3550	3235	CIR	HyC	DM	2500	CWE	C	13.25	W	W	Ro,Ret	St	DP	W	W	270	5	460	47	GW
33	4066	3270	BJ	R	DM	3750	GE	C[23]	10.5	2	RS	Ro,Ret	St	DP	Me	AT	200	6	458	109	WE,CHM
34	963	3225	WO	R	M,T	3750	AC	C	13.4	W	W	W	W	W	W	W	.....	5	470	66.3	WE,FW
35	4000	3360	PP	R	M,T	3590	LA	G	.....	W	W	W	W	W	W	W	156	4	448	100	STW,AE
36	3720	2400	PP	R	M	3000	WE	C[23]	11	2[13]	BW	Ro,Ret	St	DP	We	RC	250	5	467	125	YU,CHM

MUNICIPAL AND COOPERATIVE INSTALLATIONS

37	3750	3850	BJ	S	DM	5000	CGE	C[24]	?	6	CES	Ro,Ret	St	DP	Me	HOW,CAP	300	7	460	58	AEI
38	3.0	3225	PP	HyC	DM	4500	AC	C,G	12.5,23.2	3	FW	Ret	St	DP	EI	BU	200	7	487.7	87.2	FW,GW
39	4750	3412	AC	R	M	3250	AC	G	4	W	W	W	N	W	N	N	.....	6	343	100	SWE
40	4200	3750	PP	.....	DM	7250	LA	C	14	4	RS	Ro,Ret	St	CV	EI	AS	300	5	450	98	YU,GW[13]
41	420	3400	AC	R	DM	.....	GE	C	12.1	2	RS	Ro,Ret	St	DP	EI	AT	155	5	442	65	STW
42	600	395	AC	R	DM	1250	AC	G	1110[10]	W	W	W	N	W	N	N	.....	4	445	.....	YU
43	420	2000	BJ	R	M	1250	GE	C,G	13.27	W	W	W	N	W	W	W	.....	5	450	60	SWE,CHM
44	450	1000	DL	R	DM	450	EP	G[12]	1000[10]	W	Y	W	N	W	N	N	.....	5	450	35	SWE
45									900	SS	DSC	Ro,Ret	St	CV	Me,EI	.....	.....	3	500	134	.....
46			BJ					G	1000[10]	W	W	W	N	W	W	W	.....	4	375	15.2	WSC,CHM
47	450	1650	R	R,HyC	M,T	1000	GE	C[12]	12.5	W	W	Ret	St	DP	Me	RC	95	4	500	42	AC
48	420	750	WO	R	DM	400	GE	C[12]	1000[10]	W	W	Y	N	W	W	Y	.....	4	385	15	WM
49	450	600	R	HyC	M,T	800,700	GE	C[12]	1000[10]	2[13]	#B	Ro,Ret	St	.....	Me	.....	80	4	350	75	.....
50	25	350	BJ	R	DM	500	LA	G,G	8.8,1000[10]	W	W	Ro,Ret	St	CV	Me,EI	.....	75	4	353	80	STW

- AW - Graver Water Conditioning Co, Div of Union Tank Car Co
- HCO - Hagan Controls Corp, Sub of WE
- HFE - Hoffman Combustion Engrg Corp
- HOW - James Howden Co
- HR - Hewitt-Robins, Inc
- HT - Hungerford & Terry, Inc
- IW - Infilco, Div Gen Amer Trans Corp
- J - Ingersoll-Rand Co
- M - Illinois Water Treatment Co
- RW - Lewis B Reed Inc
- MM - Morris-Manning Co
- NOY - Noy Manufacturing Co
- KC - Koppers Co, Ltd
- LA - Louis Allis Co
- LAW - Los Angeles Water Conditioning Co
- LN - Leeds & Northrup
- MCT - Motorola Co
- MR - Milton Roy Co
- MS - Maryland Shipbuilding & Drydock Co
- NOC - Nalco Chemical Co
- PE - Peabody Engineering Co
- PM - Permutit Co, Div Pfaudler Permutit, Inc
- PP - Pacific Pumps, Inc
- RA - Raymond Div of CE
- RC - Research-Cottrell, Inc
- RF - Reaction Div, Rockwell Mfg Co
- RO - Robbins Co
- RS - Riley Stoker Corp
- SA - Stephens Adamson Mfg Co
- STW - Struthers Wells Corp
- SW - Sturtevant Div, Westinghouse Electric Corp
- SWE - Southwest Engineering Co
- UC - United Conveyor Corp
- UI - Union Iron Works
- VUL - Vulcan
- WE - Westinghouse Electric Corp
- WIB - Wickes Boiler Co
- WM - Whitlock Mfg Co
- WO - Worthington Corp
- WSC - Western Supply Co
- YU - Yuba Heat Transfer Div, Yuba Consolidated Industries

SYMBOLS USED ABOVE

- Ad - Admiralty
- Adf - Admiralty, unfinned

PROJECT	TURBINES						CONDENSER						FEEDWATER			GENERATORS			CONTROLS				
	Capability, mw	Type	Exhaust, in Hg	No. of bleed points	No. of exhausts	Manufacturer	Surface, 1000 sq ft	No. of water passes	Tube material	Air removal	Manufacturer	Makeup treatment	Condensate treatment	System manufacturer	Voltage, kv	Rating, mva	Cooling	Combustion, mfr	Feedwater, mfr	Closed-cycle, mfr	Data logger, mfr	Computer, mfr	
	735	TC			4	WE	240	2	SST	RC	FW	De	De	COC	24	822	H_2, HC	CE	CE				1
	650	TC							Ad	RC		So	HyC		24	858.6	H_2, HC						2
	565	TC							SST, Ad	RC	IR	De	De	IN	22	645	H_2, Li	BW	BW	W			4
	580				4	WE			SST, Ad	RP	WO	De	De	COC, PM[19]	22	645	H_2, Li	LN	LN	W	GE	GE	5
	550	TC							SST	J	IR	De	De	IN, LAW[19]	20	733	H_2, Li	LN	LN	W	GE	GE	
	565	TC				WE	220		CuN	Ro	FW	De	De	PM	22	645	H_2	BW	BW	W			6
	560	TC							Al B	J	IR	De	De	IN	18	640	H_2, HC	BW	BW	W			
	550	TC			4	WE	220	2	Ad	RC	IR	De	De	IN, IN[19]	18	640	H_2, HC	BW		W	GE	GE	
	550	TC							CuN	RP	FW	De	De	COC	24	655	H_2, Li	BW	BW				
	550	TC				GE	220	2	CuN	Ro	FW	De	De	COC	24	655	H_2, Li	BW	BW				
	530	TC				WE	200	2	SST	Ro, J	FW	De	Air, Hyd	PM	22	634	Li	BW	BW	W		F	11
	500	TC							Ad	RC	IR	De			22	564	H_2, HC	BW, HCC	HCC	W			12
	500	TC				WE	200	2	Ad	RC	IR	De	De	IW	18	640.2	H_2, HC	HCC	HCC	W	GE	GE	13
	420	TC				GE	170	2	SST	Ro	FW	De	N	IN	22	445	H_2, Li	GE	GE	GE	GE	GE	14
	414	TC				GE	210	2	SST, Ad	Ro	IR	De	De		22	466	HC						15
	395[16]	TC	2.14	7	4	WE	240	2	SST, Ad	Ro	FW	De	De	IW	24	430	H_2			W			16
	385	TC				WE	150		SST, Ad	Ro	FW	De	De	GW	20	475.2	H_2	BW	BW			N	17
	380	TC				WE	180		Al E	J	WO	De	De	IN	22	422	H_2, Li, HC	BW	BW	DF	W	N	18
	378	TC	1.5			WE	210		SST	J	MS	De		HT	22	460	H_2, HC	BW	BW	W		N	19
	365	CC	1.25	6	4	GE	152	2	Al B, CuN	RP	WO	De	De, F	PM	20	714	H_2	LN	LN	DF	GE	GE	20
	336	TC	2.5	7	4	GE	220		Ad, Bl	J	IR	De		Self	16	360	H_2, Li	HCC	HCC		WE	WE	21
	318	TC		6		GE	220		Ad	RF	WE	De		IN	22	422.4	H_2, Li, HC	HCC	HCC		WE	WE	22
	318	TC	2.5			WE	168		AsCu			De	De		24	395	H_2, HC	BW	BW				23
	318	TC				WE	150		SST	Ro	WE	De		IN	24	350	H_2, HC	F	F	W	N	N	24
	310	TC				GE	215	2	Ad, SST	Ro		De		GW	20	330	H_2, Li, HC			N	N	N	25
	274	TC	2			GE	215	2	Ad	RP	BLH	De		IW	20	320	H_2, Li	RF	RF		N	N	26
	250	TC	2.5	6	2	GE	155	2	Adf	J	WE	De, Evac			16	267.8	H_2	HCC	BM	DF	F, RCA	F, RCA	27
	238	CC				GE	135	2	SST, CuN	Ro, J	WE	De, Evac			16	256	H_2, Li	BM	BM				28
	216	TC				GE	125	2	SST, Ad	J	FW	De	Hyd	IW	22	256	H_2, Li						29
	215	TC		6		GE	99	2	Adf	Ro	WE				20	235.5	H_2, Li, HC						30
	200	TC	1.5			GE	11920	2	Adl		WO	De	De	PM, COC[19]	20	256	H_2, Li, HC	GE	GE	DF		GE21	
1	190	TC	2.5	5	3	WE	85	2	Ad	J	WO					192	H_2						31
1	165	TC	2.5	5	3	CAF	75	2	SST, Ad	Rc, J	CAC	De			16	194.2	H_2, Li, HC	F	F	DF	FIS	FIS	32
1	140	TC	2.5	6	3	WE	81	2	SST, Adl	Ro	WE	De	N		18	175	H_2						33
1	120	TC	2.5	5	3	GE	70	2	Al B	J	WO	De	N	AWS	14.4	15	H_2	F	F	N	N	N	34
1	100	TC	3.5	4	3	WE	65	2	Ad	J	WE	Evac, So		LAW	13.8	133.7	H_2	F	F	N	N	N	35
122	90	TC		5	3	GE	40	2	SST	J	IR	De			14.4	100							36

MUNICIPAL AND COOPERATIVE INSTALLATIONS

1	300	TC	2.5	7	4	AEI	155	2	Adl	J	FW	Sc	De		16.5	353	H_2, Li, HC	BM	BM				37
1	200	TC	2.5	7	4	GE	145	2	SST, AsCu	Ro	FW	De	De		20	256	H_2, Li						38
1	155	TC	2.5	6	3	WE	85	2	Adl	RP	MS	Evac, De			18	196	H_2	F	F	N	N	N	39
1	125	TC	2.5	6	3	GE	80	2	Adl	Ro	AC	De	N	COC	13.8	98	H_2	RF	RF	N	N	N	40
1	75	TC	2.5	5	3	GE	50	2	Adl	J	FW	De	N	IW	13.8	98	H_2	RF	RF	N	N	N	41
1	61	SC	2.5	4		WE	42.5	2	SST	Ro	IR	De	De		13.8	82.5	H_2	BM	BM	N	N	N	42
1	55	SC	2.5	4		WE	44	2	Adl	Ro	SNE	De, Sc	F		13.8	70	H_2	BM	BM				43
1	42	SC	2.5	4		WE	35	2	Adl	J	WC	Evac, Sc			13.8	44.1	H_2	RF	RF	N	N	N	44
1	29	SC	2.5	4		WE	27	2	Adf		WC				13.8	32	H_2			N	N	N	45
1	22	SC	2.5	4		WE	20	2	Adl	J	FW	Evac		FW	12.5	25.4	H_2	RF	RF	N	N	N	46
1	25	SC	2.5	4	3	GE	19	2	Adl	J	ELH	De		IW	13.8	29.4	H_2	BM	BM	N	N	N	47
1	20	SC	2.5	4	3	WE	18	2	Ad	J	FW	De		IN	13.8	25	H_2	BM	BM	N	N	N	48
1	16.6	SC		4	3	WE	14	2	Ad	J	EL	Evac, Sc	De	WE, EL[19]	13.8	18.5	H_2	BM	BM	N	N	N	50
1	10.65	SC		4	3	WC		2	Ad	J	WC	De			13.8	13.5	Air						

Al - Aluminum
Al B - Aluminum brass
Am - Ammonia
An - Anthracite
As - Arsenical admiralty
Au - Auxiliary
B - Brass
Bi - Coal, bituminous
C - Cross compound
D - Delayed coke
Ni - Copper-nickel
Pc - Cyclone furnace

De - Demineralizer
Du - Dumper
El - Electrostatic
Evac - Evaporator
F - Separate filters
G - Gas
GC - Gas-cooled
H - Heater
H_2 - Hydrogen
HC - Hollow conductor
HyC - Hydraulic coupling
Hyd - Hydrazine

J - Steam jet
Li - Liquid
Lp - Low pressure
M - Motor
MT - Dual drive, motor and turbine
MTS - Main turbine shaft
Me - Mechanical
N - None
O - Oil
P - Pulverizer
Pi - Pipeline
Pn - Pneumatic

Pol - Polishing demineralizer
R - Regulator
Rel - Retractable
Ro - Rotary pump or blower
RP - Reciprocating pump
S - Speed control
SC - Single cylinder
So - Softener
SST - Stainless steel
St - Steam
T - Turbine
TC - Tandem compound

Pressurized furnaces are in minority overseas. U

TABLE 2: Overseas

Each project listing covers 4 pages

PROJECT	COMPANY	LOCATION	PLANT NAME	CONSULTING ENGINEER	Unit No., new unit	Date first operation	Unit capacity, mw	BOILERS: Capacity ea, 1000 lb per hr	BOILERS: STEAM: Throttle pressure, psig	BOILERS: STEAM: Throttle	BOILERS: STEAM: Reheat [illegible]
EUROPE											
1	South of Scotland Electricity Board	Fife, Scotland	Longannet	Merz & McLellan	1	3-68	500	1000	2300	1050	
2	Central Electricity Generating Board	Yorkshire, England	Thorpe Marsh		2	1965	550	2750	2400	1050	
3	Central Electricity Generating Board	Lincolnshire, England	Cottam		1	2-68	500	3400	2400	1055	
4	Central Electricity Generating Board	Yorkshire, England	Ferrybridge C		1-4	65-67	500	3450	2400	1055	
5	Central Electricity Generating Board	Nottinghamshire, England	West Burton		1	71-65	500	3450	2400	1055	
6	Rheinische-Westphalisches Elek Werk AG	Dettingen-am-Main, Germany	Dettingen		1	1965	305	705	2080	986	
7	Electricite de France	Porcheville, France	Porcheville B		5	5-67	600	4000	2960	1050	
8	Iberduero, S A	Santurce, Spain	Santurce	Ebasco Services Inc	1	3-68	350	2441	2520	1050	
9	Hidricas Asturianas	Asturias, Spain	De Soto	Ebasco Services Inc	2	3-67	222	1525	1800	1000	
10	ENEL	Livorno, Italy	Marzocco	BBC – Mannheim	2	10-65	55	1060	1320	1004	
11	ENEL (ADEL)	Venice, Italy	Fusina		3	10-64	160	1190	2000	1000	
12	Edison-Milano	Venice, Italy	Porto Marghera		2	3-64	150	1230	2000	1000	
13	Sonderjyllands mosdaemningsvaerk	Aabenraa, Denmark	Aabenraa		2	1965	150	918	2720	1005	
14	Swedish State Power Board	Stenungsund, Sweden	Stenungsund		3	10-66	275	1800	2000	1000	
15	Electricity Supply Authority of Stockholm	Stockholm, Sweden	Hasselby		1,2	1-67	150[11]	1080[11]	1606	995	
16	Vaxjo Kraft AB	Jotland, Sweden	Sirie	Electro-Invest, Stockholm	11	1954	27.5	160	1000	950	
17	Malta Electricity Board	Malta GC	Marsa	Preece, Cardew & Rider	1,2	3-65	12.5	200	625	975	
18	Public Power Corp	Ptolemais, Greece	Ptolemais		3	10-65	125	682	1606	1009	
19	Cukurova Elektrik AS	Mersin, Turkey	Mersin	Burns & Roe, Inc.	1,2	1966	28.5	350	950	900	
AFRICA AND MIDDLE EAST											
20	Pretoria City Council	Pretoria, South Africa	Rooiwal	Merz & McLellan	1,2	1964	60	550	900	900	
21	Johannesburg City Council	Johannesburg, South Africa	Kelvin B	Merz & McLellan	3	1965	60	550	900	900	
22	Israel Electric Corp, Ltd	Haifa, Israel	Haifa B	Sargent & Lundy, Inc	3,4	1-67	325	3335	2000	1000	
23	Ministry of Electricity & Water	Shuaiba, Kuwait	Shuaiba	Preece, Cardew & Rider	1,2	4-65	30	725	925	915	
24	Government of Qatar	Doha, Qatar	Ras Abu Aboud	Preece, Cardew & Rider	1	9-66	15	180	625	875	
25	Electricity Authority of Cyprus	Moni, Cyprus	Moni	Preece, Cardew & Rider	1	1-66	30	311	900	900	
INDIA AND PAKISTAN											
26	Tata Hydroelectric Power Supply Co	Andhra Valley, India	Thomav	Ebasco Services Inc	4	7-65	125	1056	2400	1050	
27	Delhi Electric Supply Undertaking	New Delhi, India	Indraprastha	Gibbs & Hill, Inc	2	11-66	62.5	600	1250	950	
28	Orissa Electricity Dept	Orissa, India	Talcher	Gibbs & Hill, Inc	1	7-66	62.5	600	1250	950	
29	Andhra Pradesh State Electricity Board	Andhra Pradesh, India	Kothagudem	Ewbank & Partners Ltd	1,2	1966	60	660	1250	950	
30	Delhi Electric Supply Undertaking	New Delhi, India	Delhi C	Kuljian Corp	1	10-64	38.8	180	850	900	
31	Karachi Electric Supply Corp	Karachi, Pakistan	Korangi	Kuljian Corp	1,2	7-65	74.7	558	1264	950	
32	Water and Power Development Authority	Lahore, West Pakistan	Lyallpur	Commonwealth Associates Inc	1,2	9-66	66	600	1250	950	
33	Water and Power Development Authority	Sukkur, West Pakistan	Jaber Sind	Shader Hutter International Ltd[20]	1,2	3-65	12.5	140	450	750	
34	Water and Power Development Authority	Quetta, West Pakistan	Quetta	Kuljian Corp	1,2	3-64	7.5	80	625	835	
FAR EAST AND AUSTRALASIA											
35	Chubu Electric Power Co, Inc	Chubu, Japan	Chita	Ebasco Services Inc	3	1967	500	3719	3500	1000	
36	Kansai Electric Power Co	Himeji, Japan	Himeji 2		2	3-64	125	1240	2400	1050	
37	Amal of Australia Proprietary Ltd	Queensland, Australia	Angiesea		1	4-68	150	1250	1500	1000	
38	New Zealand Electricity Dept	North Island, New Zealand	Meremere	Preece, Cardew & Rider	1-3	1967[23]	30	300	635	965	
39	Public Utilities Board	Singapore	Pasir Panjang B	Merz & McLellan	1,2	1-69	60	360	1250	950	
40	Central Electricity Board	Malaya	Prai	Preece, Cardew & Rider	1,2	1-66	30	700	925	925	
41	Central Electricity Board	Johore, Malaya	Sultan Ismail	Preece, Cardew & Rider	1-3	68-64	30	50	900	850	
42	Ryukyu Electric Power Corp	Naha, Okinawa	Kin	Kuljian Corp	4	1-65	35	340	364.7	900	
CENTRAL AND SOUTH AMERICA											
43	Servicios Electricos Gran Buenos Aires	Buenos Aires, Argentina	Costanera	Merz & McLellan	5	10-68	125	735	1250	1045	
44	Compania Hidroelectrica Escondida	Escondida, Brazil	Escondida	Gibbs & Hill, Inc		1-65		1000	2400	1000	
45	Trinidad & Tobago Electricity Commission	Port of Spain, Trinidad	Port of Spain B	Preece, Cardew & Rider		1-64		375	925	915	
46	Empresa de Energia Electrica de Bogota	Bogota, Colombia	Martin del Corral	Ayub Ahrabi Engineers		1-65		345	900	900	

FOOTNOTES

1 - Outdoor
2 - Plus auxiliary motor, regulator controlled
3 - With excess air
4 - Supplementing existing boiler
5 - Plant built into rock mountainside
6 - Plus two tubular air heaters, ea 300 sq ft each
7 - Gas bypass dampers, water spray in gas exit
8 - Spare motor-driven pump, 1 000 gpm, 1 555 psia
9 - Regulating rotary rock surface
10 - Dry bottom
11 - One of two turbines two 165 regenerative heaters
12 - Tangentially fired
13 - Heater and generator, respectively
14 - Turbine manufactured 1 000 rpm, 3 600 rpm via gear reducer
15 - Three pumps to two turbine-generator sets
16 - Jointly with Clark Chapman Ltd
17 - Including 16 oil burners
18 - Load-carrying coal burners, also 12 oil burners on 15th pair
19 - Make-up and condensate treatment, respectively
20 - Equipment joint donated by Canada under the Colombo Plan
21 - Direct contact condenser, dry cooling tower
22 - Dual wall furnace, tangential firing
23 - First unit installed in June
24 - Three units by AEI, four by EE

SYMBOLS USED ABOVE

Ab - Air temperature
Ax - Axial fans with variable pitch blades
B - Burners
Bal - Balanced
Bv - Gas bypass
Cy - Cyclone furnace
Cyc - Cyclone dust collector
D - Damper
DB - Dry bottom
DC - Direct contact condenser
ES - Electrostatic precipitator
EX - Flue gas recirculation
FWC - Fixed wall cooling
G - Gypsum
M - Motor
N - None
O2 - Oxygen scavenging
P1 - Pressurized
PD - Proportioning dampers
R - Regulator control
RF - Contra-rotating, variable flow
S - Speed control
Sed - Sedimentation
SS - Spreader stoker
ST - Spray tap
Sul - Sulphite treatment
T - Turbine
TB - Tilting burners
V - Vane control
VP - Variable pitch fan
WB - Wet bottom
Wp - Water pump
Ws - Water scrub

...s are generally smaller, but steam temperatures show lead

BOILERS												FURNACE				F D FANS			DRIVE		I D FANS			DRIVE		PROJECT
SURFACE, 1000 SQ FT																										
Boiler &	Superheater	Reheater	Economizer	Air heater	Superheater control	Reheat control	Pressure, in water	Volume, 1000 cu ft	Heat release, 1000 Btu per cu ft per hr	No of burners	Type	Per boiler	Capacity ea, 1000 cu ft	Manufacturer	Flow control	Hp	Manufacturer	Per boiler	Capacity ea, 1000 cu ft	Manufacturer	Flow control	Hp	Manufacturer	
36.9	159.7	268.9	468.9	569*	WC	WC?	-0.2	430	12.75	32	Bal,DB	2	553	HOW	S,V	1665	LDC	2	920	HOW	S,V	2260	LDC	1
					AH	AH,B+					Bal,DB													2
					WC	AH	-0.5	763	12.9	32	Bal,DB	2	554	D	S	1395,895	BRP	2	800	D	S	2580,1550	BRP	3
27	195.2	133.8	322	357.6	AH	AH,B+	-0.2			46	Bal,DB	2												4
					WC	TB				32	Bal,DB	2	463	D	V	1300	AEI	2	800	D	V	2600,1740	AEI	5
														BUT	V			2		BUT	V			6
					WC	WC			4*	4	Pd,DB	2												7
31.2	30.5		6	67	WC	WC				4	Pd,DB	2						N	N	N	N	N	N	8
51	182		74		WC	WC		26	28.2	36	Pd,DB	2	554	RAT	V	3500	NN	N	N	N	N	N	N	9
25.77	91		73.2	175.2	WC	WC,GR TB	24	230	14.2	16	Pd,DB	2	344	AS	V,D	2500	GE	N	N	N	N	N	N	10
23.3	94		74	206.2	WC	TB	-0.15	144.5	15.7	20	Ba	2	289	CF	V,D	500	AC	2	396.5	CF	D	1500	AC	9
33	28		23	67	WS GR	WS GR	8.0	72	18	20	Pd,DB	2	340	MAR	S,V	1540	SIE	N	N	N	N	N	N	10
																		2		BUT	V			11
																		N	N	N	N	N	N	12
48.7	74.5	117.6	30	295	WC,GR,TB	WC,GR,TB	-0.2	98.3	35.1	16	Bal,DB	2	224	TO	D	680	SIE	2	328	TO	D	1717	SIE	11
48.4	47.5	77.65	27.6	332	WC	WC,GR,TB	12.65	90.9	26.3	16	Pd,DB	2	395	TO	C	2385		N	N	N	N	N	N	12
48.4	39.3		30.4	330	WC			72.2		6	Ba,ST			NOR	D					NOR	D			13
13.7	37		26.5	316	WC	WC,GR	0.2	61	27.7	16	Bal,DB	2	264	SVF	Ax	1140	ASEA	2	328	SVF	Ax	1280	ASEA	14
14	61		18.7	152.1	WC,GR	GR	8.5	36.4		15	Pc	2	267	SVF	V	770	ASEA	2	285	SVF	V	565	ASEA	15
8.45	50									4	Bal	2	140	SVF	V	90	ASEA	2	240	SVF	V	99	ASEA	16
15	6	N	...	9.4	WC	N				4	Bal	1	50.2	D	V	115	BRP	2	68	D	V	185	BRP	17
13.7	4.82	N	3.47	N	WS	V	6	9.2	29.4	4	Bal	2		NOR	D			2	....	KKK	D	....	....	18
48.4	26.5	38.3	19.2	253	WC	WC		55.3		6	Bal							N	N	N	N	N	N	19
16.3	4.3	N	N	-	AH	N	13.4	6.99	34.1	6	Pc	1	55.5	CF	V	600	GE	N	N	N	N	N	N	
15.13	19.96	N	28.55	184	WS,TB	N	0.25	42.5	16	16	Bal,DB	2	100.2	D	V	300	LSE	2	145	D	S,V	365,195	LSE	20
22.2	25.4		25.6	108	WC	WC	-0.1	46.6	16.7	16	Bal,DB	2	114	D	V	325	EE	2	166.5	D	S,V	320,180	EE	21
16.39	42.9	35.35	33.65	150.5	WS,TB	TB	8.65	50.86	25.3	12	Pd	1	340	SW	V	1750	FM	N	N	N	N	N	N	22
42.92	18.24	N	57.14	N	WS	N	2.25	42	24.8	6	Pd	2	112	HOW	V	550	EE	N	N	N	N	N	N	23
16.45	3.62	N	6.4	N	Att,TB	N	-0.2	7.56	33.1	4	Ba,DB	1	65	TO	D	150	....	1	104	TO	D	235	....	24
22.3	6.08	N	N	27.36	WS	N	7.3	10.59	35.7	4	Pd,DB	1	91.5	D	V	495	EE	N	N	N	N	N	N	25
16.8	80.5	12.8	81	329.8	WS	WC,TB	-.05	105	....	20[17]	Bal,DB	2	152	WE	V,D	400	WE	2	242	WE	V,D	1000	WE	26
	27.9	N	32.63	168	WC	N	-0.25	55	13.6	15	Bal,WB	2	107	D	V,D	300	HV	2	179	D	V,D	500	HV	27
	21.9	N	31.63	129.4	WC	N	-0.2	37.3	20	9	Bal,WE	1	180	WE	D	400	LA	1	263	WE	V,D	1000	LA	28
1.9	19.4	N	22.9	183	WC,Att	N		41	17.8	6[18]	Bal,DB	2	85.4	DEN	V	375	TOS	3	137	DEN	HvC	482	TOS	29
.8	27.8	N	23.9	58.6	Att	N	0.2	11.82	18.95	8	Ba	2	39.7	OB	V,D	234	MEL	2	86.2	OB	V,D	470	MEL	30
3.8	5.4	N	2.9	N	....	N	....	....	....	....	....	....	....	....	....	....	GE	N	N	N	N	N	N	31
....	....	....	....	....	....	....	....	25.16	....	6	Pc	2	80	GF	V	....	WE	N	N	N	N	N	N	32
28.02	16.07	N	9.04	N	Att	N	....	....	....	....	....	....	....	....	....	....	WE	N	N	N	N	N	N	33
....	....	N	....	....	WS	N	10	21.6	35.4	6	Pc	1	219	SW	V	1000	TD	N	N	N	N	N	N	33
....	....	N	....	24.5	....	N	....	6.7	29.8	4	Pc	1	42.4	SE	V	200	AC	1	127.7	AC	D	150	AC	34
12.7	1.25	N	1.75	6	WS	N	0.25	3.94	26.7	55	Bal	1	117	AT	V,D	60	....	....	....	....	....	....	....	....
7.26	N	N	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
62	74	34	18	87	WS,TB	Att,GR	19.2	175	24.5	32	Pc	2	547	....	VP	4150	MIT	N	N	N	N	N	N	35
33.6	135.6	65	56.2	516	Att,GR	TB,GR	10.9	129	23.7	40	Pc	2	352	MIT	V	2280	MIT	N	N	N	N	N	N	36
17.78	76.6	N	100.7	336.7	WC	N	....	....	....	6	Bal,DB	2	261	D	V	670	....	2	558	D	V	1200	....	37
8.14	30.7	N	43.5	87	WC	N	....	33.6	11.6	6	Bal,DB	2	103	JB	V	104	AEI	2	170	JB	V	400	AEI	38
480	18.27	N	69.1	33.4	WC	N	-0.25	29	26.9	8	Ba,DB	2	82.23	D	V	298	LDC	2	121.33	D	S,V	360,227	LDC	39
....	....	....	....	....	....	....	....	6.58	18.1	6	Bal	1	85	MEL	HvC	200	MEL	1	130	MEL	HvC	376	MEL	40
13.69	6.3	N	6.4	37.1	WC	N	....	6.125	....	6	Bal	1	44	D	V	80	AEI	1	78	D	HvC	200	AEI	41
14.4	3.14	N	5.68	28.8	WC	N	20	6.44	32.5	4	Pc	1	260	WO	V	....	....	N	N	N	N	N	N	42
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
8.36	68	34.9	17.37	295	WS,TB	WC,TB	0.25	97.6	19.5	16	Bal,DB	2	133	HOW	V	405	AEI	2	219	HOW	S,V	450,800	AEI	43
9.4	39.3	9.6	10.5	74.5	AH	Att,GR	0	55.3	....	6	Ba,DB	2	122.5	WE	V	300	WE	2	180	WE	D	600	WE	44
5.86	17.22	....	16.22	42.6	WC	N	0.15	30	20.2	5	Ba	2	134	D	HvC	510	LDC	2	204	D	HvC	520	LDC	45
36.26	10.5	N	N	93.2	AH	N	....	20.78	29.4	6	Ba	....	....	....	V	400	RE	....	....	....	V	700	RE	46

...CTURERS
- ASEA
- ...bertare Engineering, Ltd
- ...llis-Chalmers Mfg Co
- ...llgemeine Elektricitats Gesellschaft
- ...ssociated Electrical Industries
- ...lton Industries, Ltd
- ...qua Chemical Co
- ...merican Standard, Industrial Div
- ...ublicana GmbH
- ...A.S Leitch Co
- ...lontec Industries
- ...merican Water Softener Section, Res Chambelt Inc
- ...rston Co
- ...abcock GmbH
- ...rown Boveri Co

BCL - Belco (Canada) Ltd
BGE - British General Electric Co, Ltd
BLH - Baldwin-Lima-Hamilton Corp
BM - Bailey Meter Co
BRE - Societa Italiana Ernesto Breda
BRP - Bruce Peebles & Co, Ltd
BUT - Buettner Werke AG
BW - Babcock & Wilcox (Africa) Pty, Ltd
BWM - Babcock & Wilcox & Goldie McCulloch, Ltd
CAP - C A Parsons, Ltd
CE - Combustion Engineering, Inc
CF - Clarage Fan Co
CGE - Canadian General Electric Co Ltd
CHR - "J Christ" AG
CLY - Clyde Blowers, Ltd (Scotland)
CRL - Copes Regulators, Ltd
CV - Copes-Vulcan Div, Blaw-Knox Co
CWE - Canadian Westinghouse, Ltd
D - Davidson & Co, Ltd
DEG - Cie Degremont
DEN - Dengyosha Machine Works
DEW - Dewrance Co
DL - DeLaval Turbine Inc
DP - Diamond Power Specialty Corp
EE - English Electric Co, Ltd
EG - Elgin & Menes
ENEL - Ente Nazionale Elettricita
EPA - Elliott Process Automation, Ltd
FG - Fisher Governor Co
FIMI - FIMI (Saronno) SA
FIP - Cie Fives-Penhoet
FM - Fairbanks Morse Div of Colt Industries
FW - Foster Wheeler Corp
FWC - Foster Wheeler of Canada, Ltd
FWJB - Foster Wheeler, John Brown Land Boilers, Ltd
GDL - Gadelius Co, Japan
GE - General Electric Co
GF - Green Fuel Economizer Co, Inc, Sub of BLH
GJW - G & J Weir, Ltd
GK - George Kent & Co, Ltd
GW - Graver Water Conditioning Co, Div of Union Tank Car Co
H - Honeywell, Inc
HAL - Halberg, AB
HB - Hartmann & Braunn AG
HCC - Hagan Chemicals & Controls, Inc
HE - Harland Engineering, Ltd
HF - Hopkinson-Ferranti
HH - Hick Hargreaves & Co, Ltd

Oil is predominant fuel; but low quality coal and cooling wa

PROJECT	BOILER-FEED PUMPS				DRIVE			FUEL		FIRING		SOOT			DUST			HEATER			
	Capacity ea, gpm	Discharge psig	Manufacturer	Flow control	Type	Hp	Manufacturer	Type	1000 Btu per lb	Pulverizers per boiler	Manufacturer	Blower type	Blower medium	Manufacturer	Collector type	Manufacturer	Stack height, ft	Number	Feedwater exit, F	Max deaerating pressure, psia	Manufacturer
1	7200	3220	GJW	R,S	T,M	19,000	EE	C	9.67	8	FWJB	Ro,Ret	St	CLY	EI	HOW	500	9	526	60	GJW
2	6330	3800	GJW	R	T	20,350	AEI	C	10.8	9	BW	Ro,Ret	St	...	EI	...	....	7	....	....	HN
3	...	....	...	...	T	13,500	EE	C	10.5	4	JT	Ret	St	CLY	EI	HOW	550	8	485	...	GJW
4	...	....	....	....	4T	25,000	CAP	C	10.4	8	BW	Ro,Ret	St	....	EI	....	....	7	485	44	CAP
5	...	...	...	....	T	13,500	EE	C	10.95	6	IC	Ro,Ret	St	ABD	Me,EI	....	....	7	485	44	EE
6	620	2540	HAL	R	2M	...	AEG	O,C	17.3,12.6	4	KSG	...	...	...	EI	LUR	...	....	....	....	....
7	8000	3900	GUL	S	MTS	18,500	...	O	18.8	N	N	Ret	St	DP	....	....	720	7	530	450	FRPL
8	7780	3845	IR	HyC,S[2]	MTS,T	6100,6200	GE	O	18.32	N	N	Ret	St	DP	Me	....	..	7	478	460	....
9	2115	2350	IR	R	1M	3500	WE	C	9.05	5	CE	Ro,Ret	St	CV	Me,EI	RC	450	6	465	468	WD
10	3220	2540	KSB	S,HyC	3M	3750	TIB	O	....	N	N	Ro,Ret	St	BRE	N	N	260	7	464	....	....
11	..	..	..	..	..	....	..	O,C	13.5,11.7	4	TO	Ro,Ret	St	TO	..	....	..	4	475	....	TO
12	..	..	..	..	..	....	..	O	13.5	N	N	Ret	St	TO	N	N	..	..	....	....	....
13	..	..	KSB	R	M	....	AEG	C	8.64	2	KSG	Ro	St	CLY	EI	MAL	..	..	....	....	....
14	4600	2950	GJW	S	T,M	5600	STA	O	17	N	N	Ret	Air	SUP	Me	SVF	280[9]	7	485	37	STA
15	1162	2251	..	HyC	3M	2720	TT	O	17.3	N	N	N	N	N	N	N	....	3	453	71.1	STA,E
16	400,200	1370	HAL	R	3M	450,230	ASEA	O	17.6	N	N	N	N	N	N	N	....	4	560	65	STA
17	350	825	MPL	R	T,2M	350	MPL	O	18	N	N	N	N	N	N	N	..	2	300	18	TO
18	....	..	KSB	..	3M	....	....	L	4.25	6	KSG	....	....	....	....	....	..	6	470	48.8	BB
19	320	1025	KSB	R	2M	..	....	O	18.4	N	N	N	N	N	N	N	....	4	370	36.7	HIT,D
20	1190	1260	HE	R	3M[15]	1375	HE	C	11.4	4	IC	Ro,Ret	St	CLY	EI	LOD	330	5	388	....	EE
21	1190	1250	HE	R	3M[15]	1400	HE	C	11.4	4	BW	Ro,Ret	St	BW	EI	LOD	240	5	395	....	HN
22	1020	4545	IR	HyC	M	2500	WE	O	18.5	N	N	Ret	Air	....	N	N	250	5	465	165	GW
23	1375	1280	MPL	R	3T,2M	1680,1730	MPL	O,G	19.6,21.2	N	N	N	N	N	N	N	....	3	310	43.1	HN
24	470	925	KSB	R	M,T	350	TO	O,G	19,19	N	N	N	N	N	N	N	....	3	300	17.2	TO
25	563	1235	GJW	R	M	810	EE	O	18.7	N	N	N	N	N	N	N	....	5	385	26.7	EE
26	1360	3090	WO	R	T,M	300	WE	C[12]	7.5	5	CE	Ret	St	CV	Me,EI	RC	200	5	474	84	WE,WO
27	1525	1550	PP	R	2M	1750	WE	C	6.5	5	BW	Ro,Ret	St	BW	Me,EI	AT	200	5	450	90	SWE
28	1525	1550	PP	R	2M	1750	WE	C	7.2	9	BW	Ro,Ret	St	DP	Me,EI	AS	200	5	452	90	SWE
29	1120	1610	HIT	S	M,T	1300	HIT	C,O[18]	6.1,18	2	IHH	Ro,Ret	St	GDL	Me	GDL	251	4	415	60.5	HIT
30	430	1200	MIT	R	3M	....	MDK	C	11.4	2	MIT	Ro,Ret	St	MIT	Me	NTC	200	4	415	66	MEL
31	720	1623	PP	R	3M	....	GE	O,G	....	N	N	N	N	N	N	N	112	5	315	79	STW,GF
32	775	1585	BJ	R	2M	1000	WE	G	21.3	N	N	N	N	N	N	N	....	5	430	100	WD
33	338	575	PP	R,S	M,T	200,164	TO,CWE	G	970[10]	N	N	N	N	N	N	N	50	3	304.6	69.8	ASL
34	290	350	IR	R	4M	150	GE	C	..	N	N	Ro,Ret	St	DP	Cyc	AT	121	3	370	50	BLH
35	4950,2350	4083 4150	WO[22]	S,R	T,2M	13,670 3750	GE	O	....	N	N	Ret	Air	MIT	N	N	....	13	535.3	74.5	....
36	1600	2910	MIT	S,R	M,2T	6360,6290	MEL,MIT	O	18	N	N	Ret	St	MIT	N	N	329	10	512	....	MIT
37	1610	2200	..	R	3M	2250	..	L	....	6	KSG	Ro,Ret	Air	DP	EI	WP	350	5	435	87.2	....
38	641	835	MPL,GJW	R	M,T	475	EE,GJW	C	10.6	3	BW	Ro,Ret	St	DEW	Me	D	150	4	345	....	AEI,EE
39	1084	1650	HE	R	3M[15]	1750	HE	O	18.6	N	N	Ro,Ret	St	CLY	N	N	300	6	422	28	HIT
40	966	1210	TSK	R	T,2M	600	TSK,MEL	O	18.5	N	N	Ret	St	MIT	N	N	200	5	385	13.5	MIT
41	575	950	MPL	R	T,3M	325	MPL	O	18.5	N	N	N	N	N	N	N	....	3	310	5.7	AJT
42	629	1120	IR	S	M	450	GE	O	19.5	N	N	N	N	N	N	N	....	4	351	75	SWE
43	930	2090	MPL	R	2M	3000	AEI	O,C,G	8.5,11.3,22	4	IC	Ret	Air	DP	N	N	295	5	435	38	WD
44	1035	1250	IR	R	M	1250	WE	O,C	....	....	BW	Ret	St	DP	....	....	205	5	453	75	WE
45	415	1085	MPL	..	M	1150	MPL	O,G	13.5,16.5	N	N	Ro,Ret	St	DP	N	N	175	5	420	93	CAP
46	110	....	....	R	2M	450	DRL	C	12.6	3	FW	Ret	St	DP	Me	HOW	164	3	427	27.7	SWE,SC

HIT	- Hitachi	KTA	- Kunta Ltd	MPL	- Mather & Platt Ltd	SAF	- Schoppe & Faeser AG
HOW	- James Howden, Ltd	KUR	- Kunta Manufacturing Co	MS	- Maryland Shipbuilding & Drydock Co	SE	- Sheldons Engrg Co
HT	- Hydetorp & Terry, Inc	LA	- The Lavis Atlas Co	MT	- Mitchell Engineering Group	SHI	- Shiba Electric Co
HV	- Heavy Electricals, Ltd	LDC	- Lancashire Dynamo & Crypto	NCK	- Neckar Ltd	SIE	- Siemens Schuckertwerke AG
IC	- International Combustion Ltd	LEF	- Leffer	NN	- NCCE, Nancy	SIV	- Sivebaek AB
IGE	- International General Electric Co	LN	- Leeds & Northrup	NOR	- Nordisk Ventilator AB	STA	- Stal-Laval Turbine Co
IHH	- Ishikawajima Harima Heavy Industries	LOD	- Lodge Cottrell Ltd	NTC	- Nikko Trading Co, Inc	STW	- Struthers-Wells Corp
IP	- Ingersoll-Rand Co	LJE	- Lawrence Scott & Electromotors	OB	- Osaka Blower Mfg Co, Ltd	SUL	- Sulzer Bros Ltd
IR	- Impersonal Co	LUR	- Lurgi GmbH	ORL	- Oerlikon	SUP	- Superior Sootblower Co
JB	- Johnson Bramley Ltd	LY	- S T Lyngsoe	PM	- Permutit Co, Div Pfaudler Permutit, Inc	SVF	- Svenska Flaktfabriken
JT	- John Thompson Water Tube Boilers, Ltd	M	- Marconi Ltd	RAT	- Societé Rateau	SVM	- Svenska Maskinverken
JTA	- John Thompson Australia Pty Ltd	MAR	- Soc Mare in SA	RC	- Research-Cottrell Inc	SWE	- Southwestern Engineering Co
JTK	- John Thompson Kennicott Ltd	MEL	- Mitsubishi Electric Mfg Co	RE	- Reyrance Electric & Engrg Co	TO	- Tamper, Div of Canada Iron Foundries Ltd
KHK	- Kuhne, Kopp & Kausch AG	MI	- Mobrs	RF	- Republic Div, Rockwell Mfg Co	TIB	- TIBB - Milano) SA
KSB	- Klein Schanzlin & Becker	MIC	- Marubeni-Iida Co, Ltd	RS	- Riley Stoker Corp	TO	- Franco Tosi SA
KSG	- Kohlenscheidungs Gesellschaft	MIT	- Mitsubishi Heavy Industries	RWG	- Richardsons Westgarth Ltd	TOS	- Toshiba Machine Co

...te design in many countries. Degree of automation is negligible

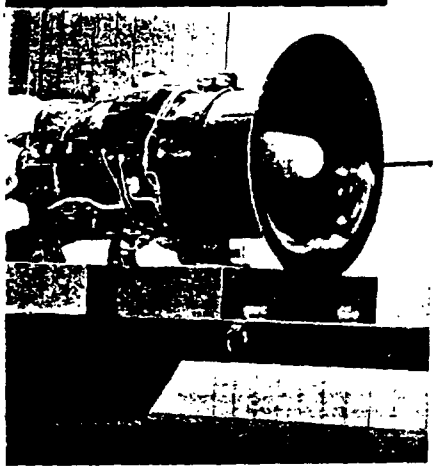
PROJECT	TURBINES						CONDENSER						FEEDWATER				GENERATORS			CONTROLS				
	Type	Exhaust in Hg	No. of bleed points	No. of exhausts	Manufacturer	Surface, 1000 sq ft	No. of water passes	Tube material	Air removal	Manufacturer	Makeup treatment	Condensate treatment	System manufacturer	Voltage, kv	Rating, mva	Cooling	Combustion, mfr	Feedwater, mfr	Closed-circuit tv mfr	Data logger	Computer	
	CC	0.8	6		EE	45		Cu/Ni	Ro	HH	De			17	353	H_2,Li,HC						
	CC	1.0	6	4	AEI					HH	De	De		19	647	H_2,Li						
	TC	1.0			EE	300		70 30 Br	Ro	EE	De			22	588	H_2,Li,HC				N	N	
	TC	2.87			AEI	300		70 30 Br	Ro	AEI	De			22	586	H_2,Li						
	TC	1.25			EE	300		A,B	Ro	EE	De	De		22	588	H_2,Li,HC	GK	GK	N	N	N	5
																H_2	ASK	ASK	N	N	N	6
	TC	0.9			RE	54.8	2	SS	Ro	BB	De,Evap	De	DEG									
	TC	0.48			RAT	366	1	Al	Ro	FIP	De			20	665	H_2						
	TC							A1B	Ro		De	Hyd		20	474	H_2,Li	GE	GE	N	N	GE	8
	TC				GE				Ro		De	N	MR	22	300	H_2,Li,HC	GE	GE	N	N	N	9
	TC				SE	96		Ad	RP	WO	De	De					ASK	ASK	FIMI	N	N	10
	TC				RB					BB												11
	TC				YC	91	2	A1B,CuNi	J	TO												12
	TC				YC	140		A1B	J	TO	De	De										13
	TC	0.75	6		AEG	27.5	1	Ac	Ro	AEG	De	De	SIV				SIE	EY	N	N	N	14
	CC	0.9	5	4	STA	97	3	A1B	Ro,J	STA	De	N	MIB	12.5	300	H_2	SIE	SIE	SIE	N	N	15
	CC		5	4	STA	211.9	1	A1B	Ro,J	STA	De	De		12.5	200	H_2	HB	HB		N		
	RF	0.5	4		STA	10.8	2	A1B	J	STA	So,Evap	F	STA	6.6	16.75	Air	HB	HB	N	N	N	16
	SC	28.35	2	1¼	TO	1.5	2	A1B	J	TO	Evap	N	AQ	11	15.6	Air	BV	HF	N	N	N	17
	TC	1.35	7	3	BE	80	2	Ac	WJ	BB	De	N	CHR	15.75	147	H_2	SAF	FG	N	N	N	18
	TC	1.5	4		AEG	18.5	1	A1B	J	AEG	Lime	Sul	GW,MR[19]	13.8	31.2	Air	BM	BM	N	N	N	19
	TC	2.4	5		EE	55	3	Ad	J	HH	De	O_2	JTK,NCK[13]	11	75	Air	GK	GK	N	N	N	20
	TC	2.5	6		BCE	65	3	Ac	J	VA	De	C_2	JTK,NCK[13]	11.8	75	H_2	GK	GK	N	N	N	21
	TC	3.5	6		GE	105	2	A1B	Ro,J	WO	De	N	AY	15	189.3	H_2	BM	BM	DP	N	N	22
	TC	3.5	6		SIE	42.4	2	CuNi	J	SIE	Evap,De	Hyd	WRW	13	87.5	H_2	H	H	N	N	N	23
	TC	3.75	4		TC	5.85	2	A1B	J	TO	Evac	N		11	15	Air			N	N	N	24
	SC	0.7	3		TC	21	2	A1B	J	TO	Evap,De	Hyd	AQ,PM			Air	BM	BM	N	N	N	25
	TC	1.5	5	2	EE																	
1K	TC	1.5	6		GE	85	2	A1B	J	FW	De		HT	15	176.5	H_2	BM	BM	DP	N	N	26
	SC	2.5	5		GE	45	2	Ad,CuNi	J	MS	De,So			13.8	78.125	H_2	RF	RF	N	N	N	27
	SC	2.5	5		GE	45	2	Ad,CuNi	J	WO	Sc			13.8	78.125	H_2	RF	RF	N	N	N	28
	TC	2.5	5		HIT	43.7	2	Ac	J	HIT	De		KTA	13.8	66.7	H_2	BM	BM	SHI	N	N	29
	SC	2.75	5		MEL	31.02	2	A1B	J	MIT	De	Hyd	MIT	11	43.13	H_2	BM	BM	N	N	N	30
	TC	2.5	5		CE	56	2	Ad	J	MS	Evap	N	GW	13.8	88.2	H_2	RF	RF	N	N	N	31
	TC	3.5	5		WE	45	2	Ac	J	FW	Evac,So	N	WE,HT	11	85	H_2	HCC	HCC	N	N	N	32
65	SC	2.5	5		CCE	13.5	1	SSt,A1B	J	VIE	Evap	N	FW	11	16.63	Air	BM	BM	N	N	N	33
12.5	SC		3		DE	DC[21]			J	BLH				11	9.375	Air	BM	BM	N	N	N	34
7.5																						
500	TC	1.0	13		GE	296		A1B	Ro	TOS	De	De		22	625	H_2,Li	LN				GE	35
135	TC	1.5	8		MIT	709.9	1	A1E	J	MIT	De			24	396	HC	BM	BM	N		N	36
150	TC	1.5	8		SIE	61		Ad	RP		De			12.8	167	H_2			N	N	N	37
80	TC	1.5	4		AEI,EE[24]	26	2	A1E	J	AEI,EE[24]	Evap,De,Sc	De	PM,HH	11	95.3	Air	GK	ORL	N	N	N	38
30	SC	2.64	6		MIT	50	2	A1B	J	HIT	De,Seg	O_2	MIC	11	75	H_2	EPA	EPA	M	N	N	39
30	SC	2.51	5		MIT	22.6	2	A1B	J	MIT	De,Sc		KUR	11	37.5	Air	GK	GK	N	N	N	40
15	SC	0.5	5		BE	14.5	2	A1B	J	RWG	De,So	Hyd	PM	11	12.5	Air	GK	ORL	N	N	N	41
15	SC		6		GE	21.25	2		J	WO	De	De	PM,WC[19]	13.8	29.4	H_2			N			42
129	TC	1.4	6		AE	80		Ac	J	WO	Evap,So		MO	13.8	150	H_2	BM	BM	N	N	N	43
87.5	TC				AE	93.5		A1B	J	WE	Sc		EUG	13.5	96	H_2	HCC	HCC	N	N	N	44
50	TC	2.5/2.75	6		CAP	93.5		Cu/Ni	J	CAP	Evac,De,Sc		UWS	22.4	53	H_2	BM	ORL	N	N	N	45
37.5	SC		5		ICE	22.5	1	Ac	J	FW	Evap,So		AWS	13.8	44.12	H_2	HCC	HCC	N	N	N	46

TSK - Tonshima Shersakusho
TT - Titan AE
UWS - United Water Softeners Ltd
VA - Vickers-Armstrong (Engineers) Ltd
VIE - Vancouver Iron & Engg Works Ltd
WAL - Walther GmbH
WE - Westinghouse Electric Corp
WO - Worthington Corp
WP - Western Precipitation Corp
WRW - Weir Westgarth Ltd
YA - Yarrow (Africa) Pty. Ltd

SYMBOLS USED ABOVE

Ac - Admiralty
Adi - Admiralty, inhibited
Al - Aluminum
AlB - Aluminum brass
Am - Ammonia
An - Anthracite
AsAd - Arsenical admiralty
Aux - Auxiliary
Br - Brass
C - Coal, bituminous
CC - Cross compound
Ck - Delayed coke
CuNi - Copper-nickel
Cy - Cyclone furnace
De - Demineralizer
Du - Dumper
Es - Electrostatic
Evap - Evaporator
F - Separate filters
G - Gas
GC - Gas-cooled
H - Heater
H_2 - Hydrogen
HC - Hollow conductor
HyC - Hydraulic coupling
Hyd - Hydrazine
J - Steam jet
Li - Liquid
Lp - Low pressure
M - Motor
MT - Dual drive, motor and turbine
MTS - Main turbine shaft
Me - Mechanical
N - None
O - Oil
P - Pulverizer
Pi - Pipeline
Pn - Pneumatic
Pol - Polishing demineralizer
R - Regulator
Ret - Retractable
Ro - Rotary pump or blower
RP - Reciprocating pump
S - Speed control
SC - Single cylinder
Sed - Sedimentation
So - Softener
SSt - Stainless steel
St - Steam
T - Turbine
TC - Tandem compound

2 GAS TURBINES

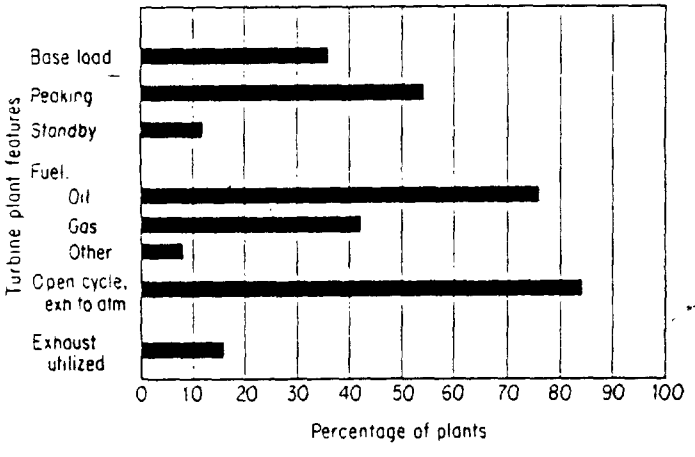


Main use is peaking service although combi cycle plants gain for base load operation

Gas turbine installations are making a major contribution in re electrical generation costs in central stations. The higher operating older steam plants accounts for many such turbines in peaking s Base load gas turbine generation, on the other hand, will not be as eco ally attractive until fuel costs are cut. A step in this direction has b development of coal-firing techniques—although technology is still experimental, one such lignite-fired gas turbine is in the tabulation.

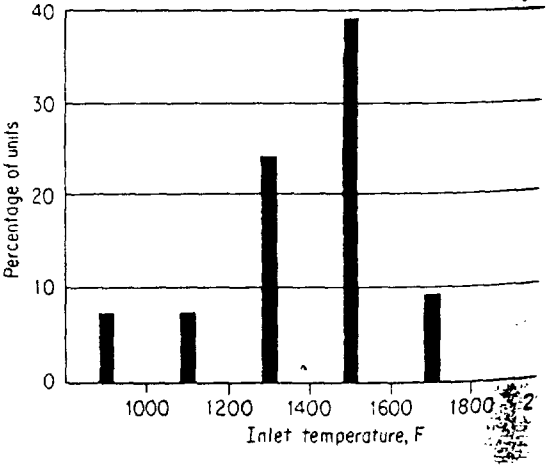
Emergency standby gas turbine sets are finding an important appl in large computer-controlled central stations, where a continuous liable source of power is essential to automatic operation. Since alm these stations are oil-fired, a gas turbine standby set is a logical ap

Plant features



PEAKING SERVICE accounts for greatest number of gas turbine generator sets in central stations. Use of exhaust heat boilers grows

Turbine inlet temperatures



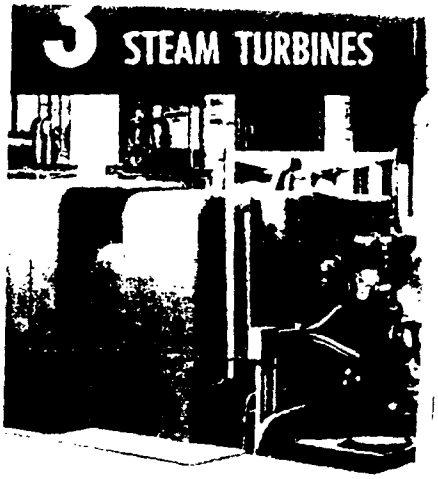
EFFICIENCY of a gas turbine depends to a great extent on temperature. While 1500-1550 F is common, aim is 22

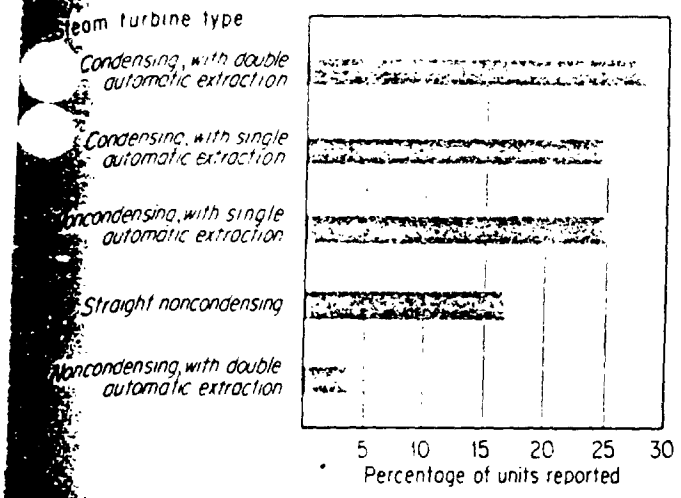
Comparison of gas turbine sizes with those listed in 1963 survey

TURBINE CAPACITY in central station generator sets shows continuing growth. Wide use of aircraft jet engines as gas generators reflects

their outstanding reliability for peaking and emergency s bojet or coal firing may lead to more base-load gas tur

ore in-plant generation reported





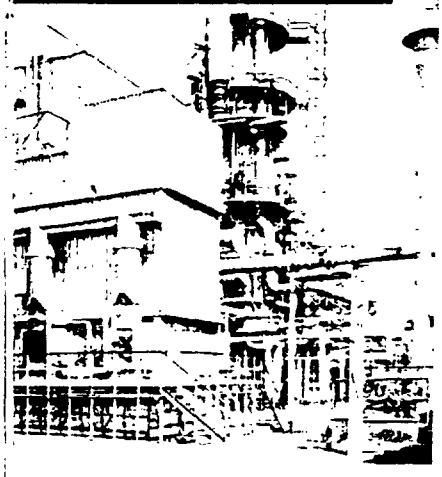
out 45% of all electricity generated in the U.S. sed by industry with about 20% generated within industrial plant. It is generally believed that the end toward self-generation will continue in paper ills, petroleum and chemical plants and, to a lesser tent, in food processing. There is also a trend to rger turbines to cut initial investment per kw and prove operating efficiency. The 1965 survey be- lists 25 industrial turbines installed or under construction in the U.S. and Canada. Chart above shows how these divide by type. Note that 53% are condensing with automatic steam extraction for process, space heating and hot water. A small sample of 8 overseas installations is also included. While the turbine business is cyclic, orders last year were good and the outlook for 1965-66 looks promising. This is in sharp contrast with conditions just a few years ago when ten turbines a year was a good average.

PROJECT	COMPANY	LOCATION	No. of new turbines	Manufacturer	Rated capacity, kw	Throttle pressure, psig	Throttle temperature, F	Power factor, %	Condensing, Non condensing	Back pressure, psig or in. Hg	Pressure at extraction, psig, or number of extraction pts	Pressure at deaerating heater, psig	Cooling medium	Corresponding boiler project
U.S. AND CANADIAN INSTALLATIONS														
1	Ka'ana Agricultural Co Ltd	Kaiaiua, Hawaii	1	WE	9375	450	650	80	Con	0.5	15	15	Air	N
2	Arkla Chemical Corp	Shreveport, La	1	GE	12,000	900	846	....	Con	4	365	20	....	N
3	East Texas Pulp & Paper Co	Lufkin, Tex	1	GE	15,000	600	750	85	Con	4	170.65	....	....	20
4	American Oil Co	Texas City, Texas	1	GE	15,625	650	820	80	Con	4	400,125	10	Air	11
5	Albemarle Paper Mfg Co	Roanoke Rapids, N.C.	1	GE	22,500	825	825	85	NC	150	.....	....	....	19
6	Mead Corp	Kingsport, Tenn	1	WE	9375	650	825	80	NC	45	400	....	Air	9
7	Mobil Oil Co	Beaumont, Tex	1	GE	20,000	1525	925	85	NC	150	425	....	....	1
8	Procter and Gamble Co	Cincinnati, Ohio	1	GE	12,500	850	825	80	NC	355	.....	....	....	1
9	Clinton Corn Processing Co	Clinton, Iowa	1	GE	9375	450	650	80	Con	5	160	....	Air	35
10	Crown Zellerbach Corp	St Francisville, La	1	GE	12,500	575	725	80	NC	60	150	....	....	23
11	Hudson Pulp and Paper Co	Palatka, Fla	1	GE	25,000	1250	900	85	Con	5	425,150	....	....	4
12	Pittsburgh Plate Glass Co	New Martinsville, W Va	1	GE	66,000	1250	950	85	Con	5	150	....	....	1
13	U S Navy	Guantanamo Bay, Cuba	1	WE	7500	600	825	80	Con	0.5	150	20	Air	N
14	S D Warren Co	Westbrook, Me	1	WC	12,500	360	725	80	NC	4	100	....	....	N
15	Empire State Sugar Co	Montezuma, N.Y.	1	WE	5000	400	560	80	NC	60	.....	....	Air	45
16	Penobscot Paper Co	Great Works, Me	1	WC	12,500	600	750	85	NC	5k	150	....	....	N
17	Philip Carey Co	Lockland, Ohio	1	WE	6460	1650	930	90	NC	60	175	....	Air	N
18	Owens-Illinois Glass Corp	Brierisland, Va	1	WE	6470	650	750	80	Con	4.5	175,30	....	Air	N
19	Alabama Kraft Co	Mantt, Ala	1	WE	25,000	850	825	80	Con	4.5	160,5k	....	H2	N
20	Amalgamated Sugar Co	Ogden, Utah	1	GE	3000	400	575	80	NC	40	.....	....	.....	40
21	Fibreboard Paper Products Corp	San Francisco, Calif	1	GE	14,500	1000	925	90	NC	150	.....	....	....	N
22	St Croix Paper Co	Woodland, Maine	1	GE	20,000	850	825	90	NC	50	150	....	....	N
23	Marathon Paper Co	Rothschild, Wis	1	GE	12,500	850	825	85	NC	55	150,50	....	....	N
24	International Paper Co	Mobile, Ala	1	GE	25,000	1500	825	85	NC	360	400	....	....	N
25	Crown Zellerbach Corp	Camas, Wash	1	GE	24,000	875	725	85	Con	5	160,60	....	....	N
OVERSEAS TURBINE INSTALLATIONS														
26	Industria Chimica Italiana	Milan, Italy	1	AEG	30,400	2850	800	....	NC	30	....	....	Air	177
27	Badische Anilin und Soda Fabrik BASF	Ludwigshafen, Germany	1	AEG	25,000	1940	950	85	NC	270	....	....	Air	N
28	SEDAC	Ashiya, Japan	1	GE	6000	850	825	....	Con	4.5	.....	....	Air	184
29	Wilpen Island Coal	Wilpen Island, Australia	1	WE	7500	850	750	80	Con	0.5	50	20	Air	161
30	Montecatini	Pisticci, Italy	1	TC	60,000	2050	1004	....	Con	1	1	9.5	H2	182
31	Concepcion Fernen	Tenancingo, Chile	1	GE	5000	625	824	80	Con	2	157,43	....	....	188, 189
32	Cartonera [illegible]	[illegible]	1	GE	4000	527	756	80	Con	0	20	....	....	N
33	Water Development Authority	[illegible], West Pakistan	1	WE	66,000	1250	950	80	Con	0.5	.....	....	....	N

MANUFACTURERS
AEG - Allgemeine Elektricitats Gesellschaft
GE - General Electric Co
TC - Franco Tosi SA
We - Westinghouse Electric Corp
WC - Worthington Corp

SYMBOLS
Con - Condensing
NC - Noncondensing
N - None

4 INDUSTRIAL STEAM SYSTEMS



Boilers are now equipped w

The 1965 survey of new industrial and spac steam boilers consists of 168 installations in and Canada, covering a total of 226 units ge over 10,000 lb of steam per hr each. Total st erating capacity of these boilers is close to lion lb per hr. We estimate that this sampl sents about one-third of the total number o of this size installed during the past twelve As was the case last year, preferred pressu for large industrial boilers is between 600 psi at 700 to 799 F (tabulation, below).

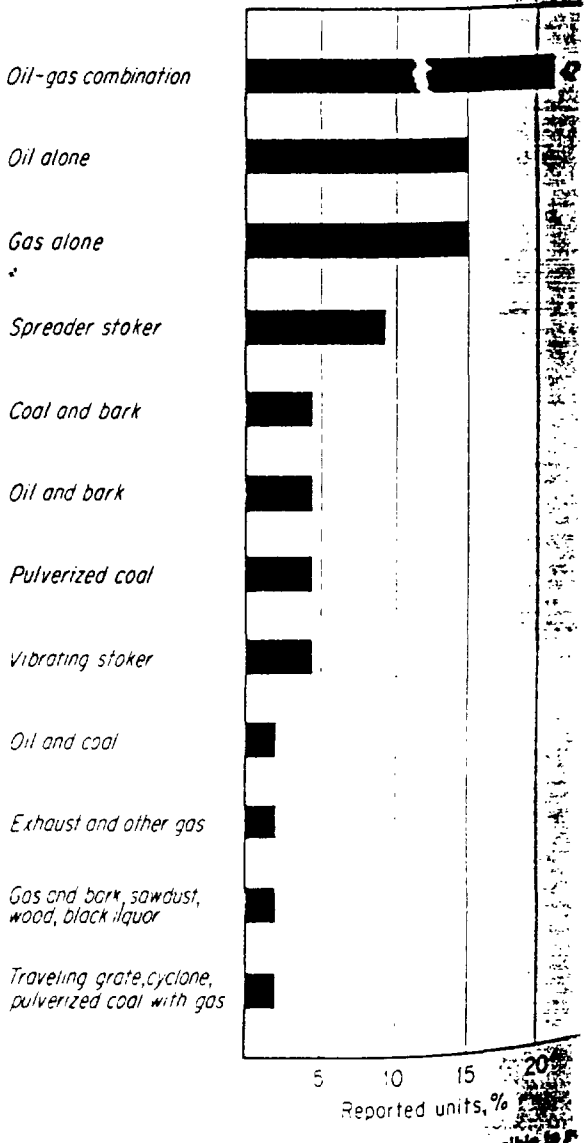
Most striking feature of the boilers su is the great flexibility of their firing equipme

Total hourly steam generating capacity, thousand lb per hr, and number of new units surveyed at various pressures and temperatures in the U.S. and Canada

	Temperatures, F						
Pressure, psig	Below 400	400-499	500-599	600-699	700-799	800-899	900 & above
Below 200	5700* (111)**						
200-299	545 (22)	1100 (25)	40 (1)	100 (1)			
300-399		30 (1)	360 (5)				
400-499			1205 (6)	740 (6)	1580 (8)		
500-599			60 (1)				
600-699		180 (2)		220 (3)	4540 (17)	130 (1)	
700-799							
800-899						1950 (6)	190 (1)
900-999						300 (1)	500 (3)
1000 and above							2555 (5)
Totals, 1965 21,925 (226)	6245 (133)	1310 (28)	1665 (13)	960 (10)	6120 (25)	2380 (8)	3245 (9)
Totals, 1964 19,600 (155)	4400 (86)	1470 (17)	110 (3)	1210 (9)	6600 (22)	3310 (12)	2500 (6)

*Total hourly steam generating capacity, without parenthesis
**Number of units surveyed, in parenthesis

Firing methods



GREATER FLEXIBILITY of firing equipment makes it possible to f the most economical fuel. Exhaust fuel is used on more pre

wider variety of firing equipment and controls

R J BENDER, Consulting Editor

designed for any single fuel, but rather for a ination of fuels. This reflects the growing de- f owners to take advantage of any fluctuation ikely to occur in the availability or price of fuel. More boilers are fired with recovered heat, such as blast furnace gas, CO from catalytic operation and exhaust gases from a turbine or some chemical process. Byproducts and waste materials are also used more frequently as fuel, in firing equipment adapted to the efficient combustion of bagasse, wood, sawdust, coffee grounds, etc.

Spreader type stoker, still the leader, is used for coal as well as for some of the byproduct fuels mentioned. Among pulverizers, it is interesting to note an increase in the number of hammer mills. This seems to indicate more use of pulverized coal by smaller industrial boiler installations. In the 1920's, boilers generating as little as 50,000 lb of steam per hr were pulverized-coal fired.

Maximum sulfur content of fuels used is tabulated. Except for systems burning natural gas, this information shows that few boilers would be able to comply with pollution control regulations, if "fuel quality" rather than "ambient air" is used as the criterion of atmospheric pollution. However, the number of boilers now provided with dust collectors, even in medium-size installations, indicates that more thought is being given to air pollution control. Survey shows 39 units equipped with dust collectors, mostly electrostatic or mechanical types.

Trend toward pressurized furnaces (58% have them) and elimination of ID fans continues for both high- and low-pressure boilers.

Corrosion. Our survey question on corrosion protection was not clear enough. Some assumed we were talking about waterside corrosion and gave more details on "internal treatment," an item also covered in the feedwater section. From this we learned that a great many plants use sulfite and, again as many, amines, for waterside corrosion protection. Others assumed this question was aimed at gas-side corrosion. Their answers revealed that a large number of oil-fired boilers use anticorrosion additives. This may be a powder injected into the furnace or boiler passages, or take the form of an additive for fuel oil.

Feedwater treatment is always provided even for relatively small boilers at low pressure. In most s, a combination of several techniques is used. n as coagulation, filtration, zeolite softening and demineralizing. Particular mention was made on many returns of the importance of removing silica. Deaerating heaters are employed whenever justified by size of the plant or nature of the process.

In-plant generation. A great deal of the steam drives steam turbines to generate electricity. Higher steam pressures and temperatures predominate in the petroleum and chemical industries and are slightly lower in the paper industry. Almost complete independence from any outside utility connections show the high degree of reliability that has been reached by these systems.

Mechanical drives. Many steam turbines also drive high speed pumps or compressors. One turbine, listed in the survey, provides about 18,000 hp at 10,000 rpm for direct drive of the gas compressor in an ammonia fertilizer plant. Steam conditions are 900 psig, 900 F. Turbine is the condensing type, with automatic steam extraction at about 400 psi. There appears to be a definite trend to steam turbine drives for high speed rotating equipment.

Topping type turbine, developed a few years ago, is a newcomer in the paper industry. In this type of system steam extracted from a high pressure turbine supplements steam from a lower-pressure boiler at the throttle of a low-pressure condensing-type turbine.

Manufacturers report a substantial increase in the use of electro-hydraulic control systems which make operation of the steam turbine much more flexible. Also gaining favor is the static excitation system, including built-in spare capacity for both silicon rectifiers and automatic regulator, with provision for switching to spare capacity under load. Cost is not any higher than a comparable rotating system.

High-temperature water systems are making progress for space heating and process. Ten installations, covering 21 units with a total heat generation of some 1160 million Btu per hr, are included in the survey. The HTW expansion tank is balanced with either steam or nitrogen under pressure (see table above) mostly according to designer preference.

Details of high-temperature water systems

Water			Pressurizing medium	
Pressure, psig	Temperature, F Outlet	Return	Temperature, F Steam	Nitrogen
15	250	180	—	300
135	350	250	—	300
248	400	250	250	300
425	450	300	—	500

More large boilers supply high-pressure st

TABLE 1: 200 psig and above

PROJECT	COMPANY	LOCATION	CONSULTING ENGINEER	Date of initial operation	New or existing plant	Principal steam use	BOILERS: No. new units, type	BOILERS: Manufacturer	BOILERS: Capacity each, 1000 lb per hr	BOILERS: Operating pressure, psig	BOILERS: Operating temp, F	BOILERS: Heating surface, 1000 sq ft, incl superheater	FUEL: Fuel	FUEL: Max. sulfur content, %	
STEAM SYSTEMS, 1525 to 200 psig															
1	Mobil Oil Co	Beaumont, Texas	Brown & Root, Inc	1965	New	P_2,Pr	1 Fi	CE	500	1525	925	18.24	G,O		
2	Texcosa Edwards Paper Co	Port Edwards, Wis	Pfeifer & Shultz	1966	Ex	P_2,Pr	1 Fi	CE	225	1500	955	14.0	O,Bk	3	
3	Pittsburgh Plate Glass Co	New Martinsville, W Va	Sargent & Lundy	1966	Ex	P_2	1 Fi	BW	750	1300	955	35.3	O	3.18	
4	Hudson Pulp & Paper Co	Palatka, Fla	J E Sirrine Co	1966	Ex	P_2,Pr	1 Fi	BW[1]	360	1275	900	42.4	Bk,O	2	
5	International Paper Co	Panama City, Fla		1965	Ex	Pr	1 Fi	CE	300	1250	950	23.5	O,Bk,O,G		
6	St Regis Paper Co	Bucksport, Me	# P Langan & Partners	1966	New	Pr	1 Fi	RS	300	975	900	19.8	O,G		
7	Proctor & Gamble Co	Cincinnati, Ohio		1965	Ex	P_2,Pr,SH	1 Fi	CE	300	900	925	25.8	O,O	2	
8	Borden Chemical Co	Geismar, La		1966	New	Pr	2	CE	100	900	900		O		
9	The Mead Corp	Kingsport, Tenn		1966	Ex	P_2,Pr	1 Fi	CE	300	675	750	31.5	O,Bk		
10	Marcona Mining Co	San Francisco, Calif	Utah Construction & Mining Co	1966	Ex	P_2	1 Fi	CE	190	965	905	13.1	O	2	
11	American Oil Co	Texas City, Texas	United Engineers & Constructors, Inc	1965	New	P_2,Pr	1 Fi	BW	500	665	820	42	G,EG		
12	P H Glatfelter Co	Spring Grove, Pa	H M Wilson Co	1965	Ex	P_2,Pr	1 Fi	RS	200	350	600	19.8	O,Bk,SD	3	
13	Bowaters Southern Paper Corp	Calhoun, Tenn	Rust Engrg Co	1966	Ex	Pr	1 Fi	CE	274	450	825	58.5	BL	0.5	
14	Kaiser Aluminum & Chemical Corp	Baton Rouge, La		1965	Ex	P_2,Pr	1 Fi	RS	225	350	550	22.5	G		
15	Albermarle Paper Mfg Co	Roanoke Rapids, NC	Rust Engrg Co	1965	Ex	P_2,Pr	1 Fi	CE	350	650	825	23.5	O,Bk,O		
16	Celanese Fibers Co	Rock Hill, SC	J E Sirrine Co	1966	Ex	P_2,Pr	1 Fi	FW	792	650	750	22	O,O	1.2	
17	Celanese Fibers Co	Rock Hill, SC	J E Sirrine Co	1966	Ex	P_2,Pr	1 Pk	CE	100	650	750	7	O,G	0.7	
18	Weyerhaeuser Co	Plymouth, NC	Chas T Main	1965	Ex	P_2,Pr	1 Fi	RS	500	650	700		O,Bk,O	2	
19	Badger Paper Mills Co	Prestigo, Wis		1965	New	Pr	2 Pk	BW	120	675	750		O,O		
20	West Virginia Pulp & Paper Co	Charleston, SC		1966	Ex	Pr	1	CE	514	600	715	34	BL,O	2.15	
21	Monochem, Inc	Geismar, La	Chemical Construction Corp	1965	Ex	Pr	1 Fi	CE	140	600	750	22	G,EG		
22	East Texas Pulp & Paper Co	Vancouver, BC, Can	H A Simons, Ltd	1966	Ex	P_2,Pr	1 Fi	CE	500	625	750	32.8	Bk,G		
23	Crown Zellerbach Corp	Wauna, Ore		1965	New	Pr	1 Fi	BW	420	600	750	29	O,G	2	
24	Scovill Mfg Co	Waterbury, Conn		1965	Ex	P_2	1 Pk	CE	120	660	750	6.4	O	1	
25	Chemstrand Corp	Decatur, Ala	Lockwood-Greene	1965	Ex	Pr	1 Fi	CE	180	650	750	20.3	O	3	
26	Alan Wood Steel Co	Conshohocken, Pa	H M Wilson Co	966	Ex	P_2,Pr	1 Pk	CE	150	610	720	19	O,BF	3	
27	Cities Service Helex	Sarania, Kan		1965	Ex	P_2,Pr	1 Fi	BW	200	600	750	9.5	G		
28	Jefferson Chemical Co	Port Neches, Texas	Stone & Webster Engrg Corp	1965	Ex	P_2,Pr	1 Fi	VO	200	625	750	19.5	G,EG		
29	Celanese Plastics Co	Greenville, SC	J E Sirrine Co	964	New	Pr,SH	2 Pk	UR	18	650	497	2.4	G		
30	El Paso Natural Gas Products Co	Odessa, Texas	Fish Engrg & Construction, Inc	1965	New	Pr	2 Fi	VO	160	900	750	14.3	G		
31	Standard Packaging Corp	Lincoln, Me	Anderson-Nichols & Co, Inc	1964	Ex	P_2	1 Pk	BW	100	600	660		O	0.3	
32	U S Navy		Bureau of Yards & Docks	965	New	P_2	2 Pk	WIB	50	600	488	4	O		
33	U S Navy	Norfolk Shipyards, Va	Bureau of Yards & Docks	964		Pr	1 Pk	WIB	50	600	488	4	O		
34	Jefferson-Koppers Co, Inc	Port Arthur, Texas	Reese Stanton & Porter	1965	Ex	Pr	1 Pk	CE	50	600	365		G		
35	Clinton Corn Processing Co	Clinton, Iowa	Stanley Engrg Co	1965	Ex	P_2,Pr	1 Fi	BW	330	450	550	15.15	O		
36	Waialua Agricultural Co, Ltd	Waialua, Hawaii	Sodemolm, Sorensen & Assoc, Inc	1966	New	Pr	1 Fi	BW	290	450	560	3.4	Ba,O	1.1	
37	Pure Oil Co	Palatine, Ill		1965	Ex	P_2,Pr	1 Fi	CE	220	450	700	2 St	O,G,EG	3	
38	Olin Mathieson Co	Lake Charles, La		1965	Ex	P_2,Pr	3 Fi	BW	300	480	710	13.7	G		
39	University of North Carolina	Chapel Hill, NC	Wm C Olsen & Assoc	1965	Ex	SH	1 Fi	UR	135	425	750	13.6	O,O	0.5	
40	Rayonier, Inc	Port Angeles, Wash		1965	Ex	Pr	1 Fi	BW	150	450	630	10	O	2	
41	American Potash & Chemical Corp	Trona, Calif		1964	Ex	P_2,Pr	1 Pk	BW	100	425	700		O		
42	Ohio Penitentiary	Columbus, Ohio	Barrows, Moulenbelt & Seifert	1965	Ex	P_2,Pr,SH	1 Fi	EC	100	415	750	15.5	O	1	
43	Tenneco Manufacturing Co	Pasadena, Texas		1964	Ex	Pr	1 Fi	VO	100	460	600	10	G		
44	Amoco Chemicals Corp	Joliet, Ill		1965	Ex	Pr	1 Fi	FW	150	425	505	14	O,G		
45	Empire State Sugar Co	Montezuma, NY	Vitro Engrg Co	1965	New	Pr	3 Pk	CE	100	425	560	4.5	O	3	
46	Amalgamated Sugar Co	Rupert, Idaho		1965	New	P_2,Pr	2 Fi	EC	100	675	750		O[4]		
47	American Viscose Co	Fredericksburg, Va		1964	Ex	Pr	1 Fi	WIB	50	420	700	602	S		
48	Cedar Bayou Plant, Gulf Oil Corp	Baytown, Texas	Stone & Webster Engrg Corp		Ex	P_2	1 Pk	UR	600	425	675	6.5	S		
49	North Carolina Finishing Co	Salisbury, NC	J E Sirrine Co	964	Ex	P_2,Pr	1 Fi	UR	109	425	604	9	S	1.21	
50	Champion Papers, Inc	Canton, NC	J E Sirrine Co	1965	Ex	P_2,Pr	1 Fi	BW	374	425	750	13.3	BL		
51	Bethlehem Steel Co	Sparrows Point, Md	United Engineers & Constructors, Inc	1965	New	Pr	3 Pk	CE	300	332	550	9.7	O	3	
52	Allied Paper Corp	Jackson, Ala	Eastern Engrg Co	1965	New	Pr	1 Fi	CE	90	350	435	7.2	Bk,O		
53	Minnesota Mining & Mfg Co	Medford, Ore		1965	New	Pr,SH	1 Pk	BW	30	300	470	3.3	O,O		
54	Carmac Potash	Hobbs, NM		1965	New	Pr,SH	3 Pk	KEE	50	250	Sat		S		
55	California University	Irvine, Calif	Ralph E Phillips, Inc	1965	New	SH	2 Pk	BW	29	240	Sat	2.9	S		
56	Hooters Co	Perrysburg, Pa		1965	Ex	Pr	1 Fi	EC	50	250	Sat	6.5	S	3.5	
57	Arkansas Chemicals, Inc	El Dorado, Ark		1965	Ex	P_2	1 Pk	KEE	50	200	Sat		S		
58	Russell Industries Corp	Jasper, Ore		1965	Ex	Pr	1 Pk	CE	100	250	Sat	5.5	S	1.45	
59	Burgess Paper Co	Berlin, NC	Hicks & Ingles	964	New	Pr	1 Pk	BW	25	100	Sat	2.1	S		
60	Int Minerals & Chemical Co, Potash Div	San Jose, Calif		965	Ex	Pr	1 Pk	KEE	75	350	Sat	5	S		
61	Mayfair Investment Co	Dallas, Texas	Dunwart & Warner	965	New	P_2,SH	3 Pk	VO	60	225	Sat	4	S		
62	Mayfair Investment Co	Dallas, Texas	Dunwart & Warner	965	New	P_2,SH	1 Pk	VO	30	115	Sat		S		
63	Joseph Dixon Crucible Co	Wagenhorse, Ohio		965	Ex	P_2	2	VO	35	200	Sat	4	S		
64	Dobbs House Chemicals, Inc	Institute, WVa		964	Ex	Pr	1 Pk	VO	40	225	340	5	S		
65	Eastern Paper Co	Fitchburg, Mass		964	Ex	P_2,P	1 Pk	BW	30	250	620	2.5	S		

MANUFACTURERS

AC	- Allis-Chalmers Mfg Co	BC	- Barber Coleman Co	BW	- Babcock & Wilcox Co	COW	- Frederick Co
AAF	- American Air Filter Co, Inc	BF	- Buffalo Forge Co	BY	- Bayer Co	CV	- Copes-Vulcan
AC	- Arco Industrial Corp	BG	- ITT Bell and Gossett Hydronics	CB	- Cleaver Brooks Co, Springfield Boiler Div	DAR	- Darling Bros
AHP	- American Marsh Pumps, Inc	BIG	- Bigelow Co	CBC	- Cooper-Bessemer Corp	DHP	- Dean Hill Pur
APC	- Air Preheater Co, Inc	BJ	- Byron-Jackson Pumps, Inc, Sub of Borg-Warner Corp	CCI	- Cleveland Controls, Inc	DL	- De Laval Turb
APD	- Aurora Pump Div, New York Air Brake Co	BM	- Barley Meter Co	CE	- Combustion Engrg, Inc	DP	- Diamond Power
		BP	- Buffalo Pumps Div, Buffalo Forge Co	CF	- Clarage Fan Co	DRA	- Bravo Corp
AS	- American Standard, Industrial Div	BPL	- Bellows Separator Co	CHB	- Chicago Blower Corp	DSC	- Detroit Stoker
AT	- Ametek, Inc, Industries, Inc	BRO	- Bros, Inc	CHH	- Chicago Heater Co	EC	- Erie City Iron
BAV	- Bayley Blower Co	BU	- Buell Engrg Co, Inc	COE	- Coen Co	ECA	- Electronics C Combustion Co
				COM	- Conract Controls Co, Inc		

[illegible]rbines driving generators, high speed compressors and pumps

FIRING EQUIPMENT						AIR HEATER		F-D FANS			I-D FANS			BOILER FEED SYSTEM				COMBUSTION CONTROL			
Stoker or	Burner type, No per boiler	Burner manufacturer	Soot blowers, mfr & No	Dust collector type	Dust collector mfr	Type	Manufacturer	No per boiler	Manufacturer	Type drive	No. per boiler	Manufacturer	Type drive	No of pumps	Manufacturer	Type drive	Feedwater treatment	Type	Control manufacturer	Corresponding turbine project No.	PROJECT
N	[illegible] Me	[illegible]	[illegible]	N	N	Re	APC		WE	V	N	N	N	[illegible]	PP	Du	Ca,F,Mu	Co	RF	7	1
CE			[illegible]	Me	AF	[illegible]	N		WE	V	N			Cc			Ca,F,So,Z,Mu	Pn			2
BW	[illegible] Me	BA	[illegible]	Me	AF	Re	APC		SW	M	N	N	N	[illegible]	PP	M	EV	Pn	RF	12	3
DSC	[illegible]	FA	[illegible] CF	Me	FAA		BW	1	WE	M	[illegible]	WE	[illegible]	3 4	BPC	T	Mu	Pn	BM	11	4
CE	[illegible] T3	[illegible]		Me	P[illegible]	Re	APC		AB	T		AB	T	Ex			Ex	Pn	HCC		5
N	[illegible] SA	[illegible]		N	N	Re	APC	[illegible]	CF	V	N	N	N	[illegible]	BPC	M	Z,Mu	Pn	BMC		6
CE	[illegible] SA	[illegible]	4 DP	Me	[illegible]	Re	APC	[illegible]	BF	Tu		AC	M	[illegible]	BJ	Du	So,Z	Pn	BM	5	7
N		[illegible]	N	N	N	N	N	[illegible]		Tu	N	N	[illegible]	[illegible]			Mu	Pn	CE		8
CE	[illegible]	[illegible]	4 DP	Me	[illegible]	Re	APC		WE	Tu		WE	[illegible]	[illegible]	UF	T	Ca,F,Mu,In	Pn	F	6	9
N	[illegible] Me	PEC	[illegible]	N	N	Re	A[illegible]C		CF	M	N	N	N	[illegible]	PP	M	EV	Pn	CV	10	10
N	[illegible]	FW	N	N	N	N	N	[illegible]	SW	T	N	N	N	[illegible]	PP	M,T	F,So,Z	Pn	F	4	11
RS	[illegible] Me	[illegible]	[illegible]	Me	AF	[illegible]	RS	[illegible]	SA	V		SW		[illegible]	GP	T	So,Z	Pn	BV		12
N	10 BL	[illegible]	[illegible] DF	[illegible]	[illegible]		AC	[illegible]	AS	V		AS	M	[illegible]		M,T	Mu,In	Pn	BM		13
N	[illegible]	[illegible]	N	N	N	Re	APC	[illegible]	CF	T	N	N	N	[illegible]	PP	T	Mu,EV	Pn	F		14
CE	4 Ta	CE	[illegible] DP	Me	RC	[illegible]	CE	[illegible]	SW	M	[illegible]	SW	M	[illegible]	IR	M,T	Mu,In	Pn	BM	5	15
FW	4	FW	[illegible]	Me	RC	Re	APC	[illegible]	WE	V	N	N	N	Ex	PP	M,T	Z,Mu	Co	RF		16
N	1 Cc	PEC		N	N	N	N	[illegible]	CF	M	N	N	N	Ex	PP	M	Ca,F,Z,In	Pn	RF		17
RS	6 SA	RC ENG	10 DP	Me	AT	Tu	RS	2	AS	T	[illegible]	AS	T	[illegible]	RWO	M	Mu	Pn	BM	..	18
	1 COC	FW	[illegible] DF	N	N	N	N			M	N	N	N	2	IR	T	Z	Co	BM	..	19
N	10 SAF	CE	30 DF	E[illegible]	RC	St	As	[illegible]	SW	T	[illegible]	SW	T	Co	IR	M,T	Ca,F,Mu,In	Pn	BM	.	20
N	6	CE	N	N	N	N	N	N	N	N	N	N	N	Ex	...		In	Pn	RF	..	21
N	16 Ta	CE	4 CV	Me	WP	St,Tu	CE	[illegible]	SW	M		SW	T	1	BJ	M	Mu,In	Pn	BM	3	22
CE	[illegible] SA	CE	4 DP	N	N	Re	APC	1	CF	M	N	N	N	[illegible]	BJ	M,T	Mu,In	Pn	BM	..	23
N	[illegible] SA	BW	4 CV	N	N	Re	APC		CF	M	N	N	N	Ex	AC	M,T	Ca,F,Z,Mu,In	E	HAY	..	24
CE		CE	8 CV	Me	PD	N	N		BF	T	1	BF	T	[illegible]	PP	T	So,Z	Pn	BM	.	25
N	4 Ta	CE	4 DP	N	N	St,Tu	CE	[illegible]	WS	T	[illegible]	WS	T	3	EL	M,T	Ca,F,Z,In	Pn	HCC	.	26
N	[illegible]	BW	N	N	N	Re	APC	[illegible]	APC	V	N	N	N	1	PP	T		Co	BM	..	27
N	[illegible]	FG	N	N	N	N	N	[illegible]	BF	T	N	N	N	1	PP	T	Ca,F,Z,In	E	BM	..	28
N	[illegible] AA	TS	N	N	N	N	N	[illegible]	TS	M	N	N	N	1	BJ	Du	In	El	ECA	...	29
N	[illegible]	FG	N	N	N	N	N	[illegible]	BF	Du	N	N	N	3	PP	M,T	Mu	Pn	BM	..	30
N	1 SA	COE	[illegible] DP	N	N	Re	APC	1	WE	M	N	N	N	1	BPC	M	Z	Co	....	...	31
N	[illegible]	WE	[illegible] CV	N	N	N	N	1	AS	V	N	N	N	2	UP	M,T	Mu	Pn	F	..	32
N	[illegible]	WE	[illegible] DP	N	N	N	N	1	AS	V	N	N	N	2	UP	M,T	Mu	Pn	F	..	33
N	[illegible]	PEC	N	N	N	N	N	1	CF	V	N	N	N	1	IR	Du	Ca,F,So,Z,In	Pn	BM		34
N	N	N	4 DP	N	N	Re	APC	1	BF	T	N	N	N	Ex			Z	Pn	BM	9	35
	3 SA	BW	5 DP	Me	BRL	Tu	BW	1	CF	Du	[illegible]	FAA	Du	2	WO	T,M	EV,In	Pn	BM	..	36
[illegible]C	4 SA	CE	6 CV	N	N	N	N	[illegible]	CF	T	N	N	N	2	WO	M,T	Ca,F,So,Z,In	Pn	F	...	37
	5	PEC	N	N	N	Tu	BW	1	AS	T	.	AS	Du	[illegible]	WO	T	So	Pn	BM	.	38
RS	4 SA	RC	[illegible] DP	Me	AT	Re	APC	1	FAA	M	N	N	N	2	WO	T	So,In	Pn	RF	...	39
N	4 SA	BW	[illegible] DP	N	N	St,Re	APC	.	CF	V	N	N	N	Ex	...	T,M	F,In	Pn	HCC	...	40
N	[illegible]	COE	N	N	N	Re	APC	1	WE	M	N	N	N	2	PP	M	In	Co	BM	..	41
LC	N	N	6 DP	Me	AT	N	N	1	CF	M	[illegible]	AT	M	[illegible]	IR,WO	M,T	In	Pn	HCC	.	42
N	[illegible]	FC	N	N	N	N	N	1	CB	Du	N	N	N	Ex	...	M,T	F,Z	Pn	BM	...	43
N	4 SA	PEC	[illegible]	N	N	Re	APC	1	BF	M	N	N	N	2.5	IR	M,T	F,So,Z	..	...	..	44
N	1 SA	PEC	[illegible] CV	N	N	N	N	[illegible]	...	M	N	N	N	1	GP	T	Ca,F,So,Z,In	Co	H	15	45
N	4 Me	EC	N	Me			EC	2	SW	V	2	SW	M	3	BPC	M,T	So,Z,In	Co	BM	20	46
HCE	N	N	[illegible] DF	Me	AT	N	N	[illegible]	WE	V	1	WE	M			...		Pn	HCC	..	47
N	[illegible]	PEC	N	N	N	N	N	[illegible]	SW	V	N	N	N	Ex	WO	M,T	Co,F,Z,In	Pn	BM	..	48
RS	[illegible]	RC	[illegible] CV	Me	AT	Re	APC	[illegible]	AT	V	[illegible]	AS	M	Ex	GF	M	So	Pn	BM	.	49
N	2 BL	BW	26 DP	N	N	St	SW	2	SW	M	[illegible]	SW	T	Ex	...	M,T	Z	Pn	F	.	50
N	2 SA	PEC	[illegible] CV	N	N	Re	APC	[illegible]	CF	T		CF	T	1 2	WO	Du	So,In	Co	F	.	51
CE	2 Me	PEC	[illegible] CF	Me	FAA	N	N	[illegible]	FAA	M	[illegible]	FAA	M			..	Z	E	PEC	.	52
N		BW	[illegible] DF	N	N	N	N	[illegible]	CF	M	N	N	N	[illegible]	SF	M	So,Z,Mu,In	Pn	BM		53
N		PEC	N	N	N	N	N	[illegible]			N	N	N	[illegible]	PE	M,T	Ca,So,Z	El	RE	.	54
N	1	BW	[illegible] DP	N	N	N	N	[illegible]	CF	M	N	N	N	[illegible]	WO	M	Z,In	Co	BM		55
EC	N	N	DF	Me	FAA	N	N	[illegible]	CF	T		CF	T	[illegible]	IF	M,T	Z	Pn	HCC	.	56
N		COE	N	N	N	N	N	[illegible]	COE	V	N	N	N	[illegible]	DHP	M,T	In	Co	COE	..	57
	[illegible] SA	COE	[illegible] DF	N	N	Re	APC	.	CF	V	N	N	N			T	Ca,F	E	HAY	..	58
N	[illegible] Me	FW	[illegible] DF	N	N	N	N	[illegible]	CF	M	N	N	N	[illegible]	IR	M	Z,In	Co	BV	...	59
N		COE	N	N	N	N	N	[illegible]	COE	V	N	N	N	[illegible]	GP	Du	So,Z,In		COE	.	60
N		[illegible]	N	N	N	N	N	N	N	N	N	N	N	Ex			In				61
N		[illegible]	N	N	N	N	N	[illegible]	VO	M	N	N	N	[illegible]	WO	M,T	In		..	.	62
N		[illegible]	N	N	N	N	N	[illegible]	[illegible]	V	N	N	N	[illegible]	WO	M,T	Z,In	Co	COE		63
N		[illegible]	N	N	N	N	N	[illegible]	COE	V	N			Ex	AC	M,T	Ca,F,So,Z,In	Co	COE		64
N	[illegible] SA	[illegible]	[illegible] DP	N	N	N	N	[illegible]	COE	M				[illegible]		M	In	E	COE		65

EL - Elliott Co
ENG - Engineer Co
[illegible] - Foxboro Co
FAA - Fly Ash Arrestor Co
FM - Fairbanks Morse Power Systems Div Colt Industries
FO - Forney Engrg Co
FW - Foster Wheeler Corp
GE - General Electric Co
[illegible] - Green Fuel Economizer Co, Inc
[illegible] - Gould Pumps, Inc
[illegible] - Honeywell

HAY - Hays Corp
HCC - Hagan Chemicals & Controls, Inc
HCE - Hoffman Combustion Engrg Co
HL - Hall Laboratories
ILG-ILG - Electric Ventilating Co
IBW - International Boiler Works Co
IR - Ingersoll-Rand Co
KC - Koppers Co, Inc
KEE - Keeler Boiler Co
KEW - Kewanee Boiler, American Standard Industrial Div

LA - The Louis Allis Co
LS - LaClede Stoker Co
MCB - McBurney Stoker Co
MER - Mercoid Corp
MGE - McGraw Edison Co
MHD - M H Detrick Co
MIW - Murray Iron Works Co
MP - Moore Products Co
OS - Orr & Sembower, Inc
PEC - Peabody Engrg Corp
PP - Pacific Pumps, Inc

RE - Ray Burner Sales Inc
RC - Research-Cottrell, Inc
RE - Reliance Electric & Engrg Co
REC - Recold Corp
RF - Republic Flow Meters Co
RK - Ruggles-Klingeman Mfg Co
ROC - Rockwell Mfg Co
RS - Riley Stoker Corp
SHA - Fred H Schaub Engrg Co
SP - Springfield Boiler Co
SW - Sturtevant Div Westinghouse Electric Corp

CONTINUED ON NEXT PAGE

Four types of dust collectors play vital role

TABLE 2: Below 200 psig

PROJECT	COMPANY	LOCATION	CONSULTING ENGINEER	Date of initial operation	New or existing plant	Principal steam use	BOILERS						FUEL		FURNACE	
							No new units, type	Manufacturer	Capacity each, 1000 lb per hr	Operating pressure, psig	Operating temp, F	Heating surface, 1000 sq ft, incl superheater	Fuel	Max. sulfur content, %	Furnace type	Furnace safeguard, type
66	International Business Machines Corp	Endicott, NY	Burns & McDonnell Engrg Co	1964	New	Pr,SH	3 Pk	KEE	20	200	387	2.4	O		Pd	UV
67	Texaco Corp	Plainview, Texas			New	Pr	1 Pk	CB	25	250	Sat		G			UV
68	Watergate Development	Washington, D C		1965	New	SH	2 Pk	WIB	40	275	Sat	4.5	O,G		Pd	UV
69	Everett Plywood Corp	Everett, Wash	J Witman	1965	Ex	Pr	1 Fl	KEE	60	350	Sat		O,G		BD	Me
70	Minnesota Mining & Mfg Co	St Paul, Minn		1965	Ex	Pr,SH	1 Fl	BRO	150	295	Sat	10.3	O,G		Pd	UV
71	Chevrolet Motor Div, General Motors Corp	Livonia, Mich		1955		Pr	2 Fl	WIB	80	200	Sat	8.5	O		BD	N
72	Massachusetts Institute of Technology	Cambridge, Mass	Jackson & Moreland	1964	Ex	SH	2 Fl	WIB	200	200	425	8.8	O,G		Pd	UV
73	U S Plywood Corp	Gaylord, Mich		1965	New	Pr	1 Fl	RS	52	235	Sat		Wd,G		BD	
74	Equitable Life Assurance Society	Chicago, Ill	Skidmore, Owings & Merrill	1965	New	SH	3 Pk	SP	21	200	Sat	2.2	O,G		Pd	UV
75	American Cyanamid Co	Pace, Fla		1965	Ex	Pr	1 Pk	BW	100	250	Sat	2.1	O		Pd	UV
76	Crown Zellerbach Corp	Port Angeles, Wash		1965	Ex	Pr	1 Pk	BW	80	250	Sat		O	1.2	Pd	Ir
77	First District Assn	Litchfield, Minn		1965	Ex	Pr	1 Pk	BRO	100	235	Sat	6.9	G		Pd	UV
78	Texas Instruments, Inc	Dallas, Texas		1965	Ex	Pr	1 Pk	BW	100	235	Sat	2.1	O,G		Pd	UV
79	Stauffer Chemical Co	Westend, Calif	C Moore & Co	1965	Ex	Pr	1 Pk	BW	100	250	Sat		G		BD	UV
80	Rancho Los Amigos Hosp	Downey, Calif	M A Nishkian Co	1965	New	SH	1 Pk	MIW	25	250	Sat		O,G		Pd	UV
81	The Hartford Gas Co	Hartford, Conn	Seerve, Stevenson, Value, & Knecht	1964	Ex	SH	1 Pk	CE	75	250	Sat	5	O,G		Pd	UV
82	Celanese Corp	Rome, Ga	T J Kaufield	1965	Ex	Pp,Pr,SH	1 Fl	EC	100	235	650	12.2	O,G		BD,DB	Ir
83	B F Goodrich Chemical Co	Henry, Ill		1965	Ex	Pr	2 Pk	CE	100	225	Sat	9.6	O,G		Pd	UV
84	Gergy Chemical Co	Cranston, RI	Samuel Rudginskey Assoc	1965	Ex	Pr	1 Fl	CE	75	250	Sat	8.9	O,G	3	BD	UV
85	University of Oregon Medical School	Portland, Ore	J Donald Kroeker & Assoc	1965	Ex	SH	1 Pk	BW	40	225	Sat	0.8	O	2	Pd	UV
86	Lunday Thagard Oil Co	South Gate, Calif		1964	Ex	P	2 Pk	BW	40	250	Sat		O,G	0.5	Pd	
STEAM SYSTEMS below 200 psig																
87	Schlitz Brewing Co	Longview, Texas	Stone & Webster Engrg Corp	1966	New	Pr	2 Pk	CB	60	125	Sat	6.2	O	4	Pd	Ir
88	St Joseph Hosp	Orange, Calif	Bouillon, Christofferson & Schairer	1964	New	SH	3 Pk	BW	42	140	Sat	1.5	O,G		BD	Ir
89	University of Idaho	Moscow, Idaho	Bouillon, Christofferson & Schairer	1964	Ex	SH	1 Pk	BW	50	150	Sat	5	O,G		BD	Ir
90	Piedmont Plush Mills, Inc	Greenville, SC	J E Sirrine Co	1965	Ex	Pr,SH	1 F	AS	38.5	135	Sat	0.7	O,G			
91	Central Missouri State College	Warrensburg, Mo	John Fasnacht	1965		SH	1 Fl	BRO	60	125	Sat	6.0	O,G		BD	
92	Coats & Clark, Inc	Albany, Ga	J E Sirrine Co	1965	Ex	Pr,SH	3 Fl	BW	60	100	Sat	6.5	SO,Wd,O	2.5	BD	Ir
93	St John's Hosp	Santa Monica, Calif	Bouillon, Christofferson & Schairer	1965	Ex	SH	1 Pk	BW	25.5	140	Sat	2.3	O,G		BD	Ir
94	Bethlehem Boiler Plant	Pittsburgh, Pa	Peter F Loftus Corp	1966	Ex	SH	1 Fl	EC	100	375	Sat	11.2	O	2	BD	
95	Bloch Bros Tobacco Co	Wheeling, W Va	Peter F Loftus Corp	1965	Ex	Pr	1 Fl	CE	30	325	Sat	6	O	3.7	BD	N
96	Columbia High School	Richland, Wash	Bouillon, Christofferson & Schairer	1965	New	SH	2 F	OS	40	10	240	80	O,G		BD	Ir
97	Ford Motor Co	Sterling, Mich	J F Pritchard & Co	1965	Ex	Pr,SH	3 Fl	WIB	120	125	Sat	13.3	O	2	BD	Me
98	South Florida Sugar	South Bay, Fla		1964	Ex	Pr	1 Fl	WIB	125	150	420	13.9	Ba,O		BD	Ir
99	Seattle Steam Corp	Seattle, Wash			Ex	Pr,SH	1 Pk	CE	120	150	Sat	6.3	O	2	Pd	UV
100	Bowaters Carolina Corp	Catawba, SC		1964	Ex	Pr	1 Pk	CE	100	150	Sat	6.3	O	0.2	Pd	UV
101	Oxford Paper Co	Rumford, Me		1965	Ex	Pr	1 Pk	CE	100	135	Sat	3.4	O		Pd	Ir
102	Ternstedt, GMC	Elyria, Ohio		1965		Pr	1 Fl	WIB	100	150	Sat	7.8	O		BD	
103	Children's Hosp	Columbus, Ohio			New	SH	2 Pk	WIB	20	125	Sat		O,G		Ir	
104	Farmers Union Central Exchange	Laurel, Mont	Wayne E Manan	1965	Ex	Pr	1 Fl	CE	100	165	Sat	11.3	O,G	3	Pd	
105	Brown & Williamson Tobacco Corp	Louisville, Ky		1965	Ex	Pr,SH	1 Fl	VO	173	150	Sat	3.1	O,G	2	Pd	UV
106	American Cyanamid Co	Willow Island, W Va		1965	Ex	Pr	3 Pk	BW	100	150	Sat		G		Pd	UV
107	University of Alabama	University, Ala	I C Thomasson & Assoc	1965	Ex	SH	1 Fl	VO	100	125	Sat	11.3	O	3.3	BD	N
108	General Electric Co	Philadelphia, Pa	United Engineers & Constructors, Inc	1965	Ex	Pr	1 Pk	CE	100	150	Sat	5.2	O	3.5	Pd	
109	Seattle Steam Co	Seattle, Wash	Bouillon, Christofferson & Schairer	1965	Ex	Pp,SH	1 Fl	CE	120	165	Sat		O		Pd	UV
110	Borg, Inc	Chicago, Ill		1965	Ex	Pr	2 Pk	MIW	44	150	Sat	1.2	O,G		BD	UV
111	Chicago Carton Co	Chicago, Ill		1965	Ex	Pr,SH	1 Pk	SP	20	200	Sat	1.8	O	2	Pd	Ir
112	Resurrection Hosp	Chicago, Ill	Schmidt, Graben & Erickson	1964	New	Pp,SH	2 Pk	BW	20	125	Sat		O,G		Pd	Ir
113	Murray Corp	Scranton, Pa		1964	Ex	Pr,SH	1 Pk	BW	50	150	Sat	4.4	O,G		BD	
114	St Vincent's Hosp	Billings, Mont	P L Prussing	1964	New	SH	2 Pk	BW	20	125	Sat	2.0	O,G			UV
115	Inspiration Consolidated Copper Co	Inspiration, Ariz		1965	Ex	Pr	1 Pk	KEE	35	270	Sat	3.8	O,G		BD	Ir
116	American Medical Assn	Chicago, Ill	O F Murphy	1965	New	Pp,SH	2 Fl	BW	25	125	344		O,G		Pd	UV
117	Stockyards Service & Supply	Sioux City, Iowa		1964	Ex	Pr	1 Pk	BW	60	150	Sat	4.8	O,G		Pd	Me
118	Wedron Silica Co	Wedron, Ill		1964	Ex	Pr,SH	1 Fl	BW	46.5	170	Sat	4.4	O	3.0	BD	N
119	Fletcher Oil Co	Wilmington, Calif		1964	Ex	Pr	1 Pk	BRO	20	150	Sat	2.9	G		Pd	UV
120	Dr Carsoury's Lab	Charles City, Iowa		1965	Ex	Pr	1 Pk	BRO	60	170	Sat	4.5	O,G		Pd	
121	Cummins Engine Co	South Bend, Ind	Sam R Lewis & Assoc	1965		Pr,SH	2 Pk	BRO	40	150	Sat	3.67	O	2	Pd	Ir
122	Lincoln State School	Lincoln, Ill		1964	Ex	SH	1 Fl	BW	0	120	Sat		O		BD	N
123	C Thomson & Sons, Inc	Wautoma, Wis		1964	Ex	Pr,SH	2 Pk	BW	40	150	Sat		O,G		BD	Ir
124	Southern Illinois University	Carbondale, Ill	Schroeder & Townsend Assoc	1965	Ex	SH	1 Fl	WIB	40	125	Sat	2.5	O,G	3.8	BD	
125	Mankato State College	Mankato, Minn	Evans, Mitchell, Dewey, Hamberg & Erickson	1965	Ex	SH	2 Pk	BRO	20	150	Sat	2.5	O,G		Pd	UV
126	Dow Chemicals Co	Williamsport, Pa		1965	Ex	Pr,SH	1 Pk	KEE	25	250	Sat		O			Ir
127	Frank Wilson Co	Stockton, Calif	F R Honeman	1965	Ex	P	2 Pk	BW	50	150	Sat	5.1	O		BD	UV
128	Boys Town	Boys Town, Neb	Leo A Daly Co	1965	Ex	Pp,SH	2 Pk	BW	30	125	Sat		O,G		Pd	Ir
129	General Foods Corp	Kankakee, Ill	Sargent & Lundy	1965	Ex	P	2 Pk	BW	70	250	Sat	7.6	O		Pd	
130	Witham Chemicals, Inc	Tampa, Fla		1965	Ex	Pr	2 Pk	BW	50	125	Sat		O	1.2	Pd	Ir

TE - Terry Steam Turbine Co
TS - Todd Shipyards Corp, Products Div
UP - Union Pump Co
UR - Union Iron Works Div, Ruby Stoker Corp
VO - Henry Vogt Machine Co
WE - Westinghouse Electric Corp
WB - Wickes Boiler Co
WN - Wing Mfg Co
WMC - Whiton Machine Co
WNB - W N Best Combustion Equipment Co, Inc

WO - Worthington Corp
WP - Western Precipitation Corp
WPI - Western Pumps, Inc
WPM - Weinman Pump Mfg Co
WS - Wilson-Snyder Works, U S Steel Corp
YOR - York-Shipley Inc

SYMBOLS USED ABOVE
AA - Air-atomizing
Ba - Backpass
BD - Balanced draft
BF - Blast furnace gas
Bk - Bark
Bo - Bowl mill
BL - Black liquor
C - Coal, bituminous
Ca - Cogeneration
Co - Continuous ignition
CS - Combined pneumatic and electronic
Ext - Extra furnaces
Con - Condensing
Cy - Cyclone
DB - Dry bottom
DH - Deaerating heater
Du - Dual drive
E - Electrical
EG - Exhaust gas
ES - Electrostatic
EV - Evaporation
Ex - Existing
F - Fluetube boiler
FE - Field-erected

ıt against air pollution, but sulfur content of fuel remains high

FIRING EQUIPMENT						AIR HEATER			F-D FANS			I-D FANS			BOILER FEED SYSTEM				COMBUSTION CONTROL			PROJECT
Stoker or	Burner type No. per boiler	Burner manufacturer	Soot blowers wtl & No.	Dust collector type	Dust collector mfr	Type	Manufacturer	No. per boiler	Manufacturer	Type drive	No. per boiler	Manufacturer	Type drive	No. of pumps	Manufacturer	Type drive	Feedwater treatment	Type	Control manufacturer	Corresponding turbine project No.	
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- Fl - Fluidized bed combustion
- G - Gas
- Gar - Garbage
- H2 - Hydrazine
- HM - Hammer mill
- HTW - High temp water
- Hy - Hydraulic
- In - Internal water treatment
- It - Ilmenite
- M - Mixed
- Me - Mechanical
- M - Mixed bed demineralizer
- MeA - Mechanical atomizing
- ML - Multibed demineralizer
- N - None
- NC - Noncondensing
- O - Oil
- OT - Once-through boiler
- PC - Pulverized coal
- Pc - Pressurized
- Pk - Packaged
- R - Rake
- Pn - Pneumatic
- Pc - Power
- RC - Rotary-cup burner
- Re - Regenerative
- Rec - Recovery
- Rf - Rocket fuel
- Ro - Roller mill
- SA - Steam-atomizing
- Sat - Saturated
- SD - Sawdust
- Sh - Space heat
- So - Softening
- SS - Spreader stoker
- St - Steam
- ST - Scrag tap
- T - Turbine
- Ta - Tangential
- Tar - Tar pitch
- TG - Traveling-grate stoker
- Tu - Tubular
- Ut - Underfeed stoker
- UV - Ultraviolet
- VG - Vibrating-grate stoker
- Us - Ultrasonic
- Wd - Wood
- Z - Zeolite

Continued on next page

Survey reveals large high temperature water

TABLE 3: Below 200 psig; HT water systems and overseas

PROJECT	COMPANY	LOCATION	CONSULTING ENGINEER	Date of initial operation	New or existing plant	Principal steam use	BOILERS: No. new units, type	BOILERS: Manufacturer	BOILERS: Capacity each, 1000 lb per hr	BOILERS: Operating pressure, psig	BOILERS: Operating temp, F	BOILERS: Heating surface, 1000 sq ft, incl superheater	FUEL: Fuel	FUEL: Max sulfur content, %	FURNACE: Furnace type	FURNACE: Furnace safeguard, type	FURNACE: Manufacturer
.101	Oscar Mayer & Co	Chicago, Ill		1964	Ex	Pr	1 Pk	CE	30	310	Sat	2.8	O,G	2.25	...	UV	ECA
.102	Linde Div, Union Carbide Corp	Moorer, Ala.		1965	New	Pr	2 Pk	VO	35.3	300	Sat	8.9	G	....	...	UV	ECA
.103	Veterans Administration Hosp.	Marion, Ind.		1964	Ex	Pr,SH	1 Fr	VO	30	125	Sat	4	C	3	BD	N	■
.104	Pfizer Corp	West Kankakee, Ill		1965	Ex	Pr,SH	1 Pk	BW	50	150	Sat	.	G	...	...	....	ECA
.105	N.Y.W. Tobacco Co	S. Windsor, Conn.	Seitz Engrg Co	1965	Ex	Pr	1 Pk	CE	35	190	Sat	....	O	..	Pd	....	—
.106	Baltimore City Hosp.	Baltimore, Md.	Henry Adams	1965	Ex	SH	1 Pk	BW	50	125	Sat	4.4	O	2.5	BD	UV	■
.107	Lenoir Memorial Hosp	Butner, NC	W C Olsen & Assoc.	1965	New	Pr	3 Pk	BW	100	125	Sat	.	O,G	...	Pd	UV	ECA
.108	Kennebec Pulp & Paper Co	Madison, Me		1965	Ex	Pr	1 Pk	BW	25	125	Sat	2.7	O	...	...	....	■
.109	Bethlehem Steel Co.	Bethlehem, Pa	Voorhees Walker, Smith, Smith & Haines	1965	Ex	SH	1 Pk	KEE	45	150	Sat	3.8	O,G	.	Pd	Ir	ECA
.110	Bongards Creameries	Bongards, Minn	Babcock & Wilcox Co	1964	Ex	Pr,Pr	2 Pk	BW	50	175	Sat	5	O,G	.	Pd	Ir	■
.111	Stonecutter Mills Corp	Spindale, NC		1965	Ex	Pr	1 Fr	BW	55	135	Sat	6.5	C	..	BD	N	■
.112	Williams College	Williamstown, Mass.	Lockwood Green Engrg.	1965	Ex	SH	1 Fr	KEE	50	125	453	7.3	C	1	BD	....	....
.113	Kansas State Teachers College	Emporia, Kan	F R Applegate	1965	Ex	SH	2 Pk	KEE	42	175	Sat	4.5	O,G	...	Pd	UV	ECA
.114	Penn Packing Co	Philadelphia, Pa.	A L Sciabella	1965	Ex	Pr	1 Pk	FW	35	100	Sat	4	O,G	...	Pd	UV	■
.115	Montefiore Hosp	Bronx, NY	M Caretsky Assoc	1963	Ex	Pr,SH	2 Fr	BW	100	135	Sat	.	O	.	Pd	Ir	ECA
.116	Methodist Hosp	Memphis, Tenn.	Allen & Hoshall	1965	Ex	SH	1 Fr	BW	30	110	Sat	5	O	...	BD	....	....
.117	Falstaff Brewing Corp	St Louis, Mo.	Rogers-Schmidt Engrg Co.	1965	Ex	Pr	1 Pk	BW	60	150	Sat	5	O,G	...	Pd	Ir	ECA
.118	Thickvear T & S Rubber Co.	Lincoln, Neb		1965	Ex	Pr	1 Pk	BW	50	125	Sat	5.1	O,G	...	BD	Ir	ECA
.119	Wilcolt Paper Products Co	Milwaukee, Wis		1965	Ex	Pr,SH	1 Pk	SP	30	175	Sat	3.1	O,G	...	Pd	Ir	ECA
.120	Mercy Hosp	San Diego, Calif	Dunn & Ryan	1965	Ex	Pr,SH	1 Pk	BW	28	150	Sat	...	O,G	....	Pd	Ir	ECA
.121	Carolina Agricultural & Technical College	Greensboro, NC	Watson Engrs	1965	Ex	Pr,SH	1 Fr	CE	20	125	Sat	4.7	C	.	BD	N	■
.122	Aultman Hosp	Canton, Ohio		1965	Ex	SH	2 Pk	BW	24	150	Sat	2.7	G	.	Pd	....	....
.123	St Joseph's Hosp	South Bend, Ind		1965	New	Pr,SH	2 Pk	BW	24	110	Sat	2.7	O,G	....	Pd	UV	ECA
.124	New Mexico State University	University Park, NM	Bridgers & Paxton	1965	New	SH	2 Pk	RFE	38	125	Sat	4.4	O,G	....	Pd	UV	■
.125	Stamford Hosp	Stamford, Conn.	Segnar & Dalton	1965	Ex	Pr,SH	1 Pk	KEE	21	125	Sat	....	O,G	....	....	....	—
.126	Pet Milk Co	Greenville, Ill		1965	Ex	Pr	1 Pk	KEE	20	145	Sat	3	C	3.12	BD	N	■
.127	Burlington County Memorial Hosp.	Mt Holly, NJ	Pennell & Wilberger	1965	New	Pr,SH	2 Pk	KEE	16	100	Sat	2.4	O,G	....	BD	Ir	ECA
.128	Minneapolis-St Paul Sanitary Dist.	St Paul, Minn	Toltz, King, Duvall & Anderson, Assoc	1965	Ex	Pr	2 Pk	BRO	20	125	Sat	2.5	O	....	Pd	Ir	ECA
.129	North Memorial Hosp.	Robbinsdale, Minn.	Orr, Schelen, Mayeron & Assoc.	1964	Ex	SH	2 Pk	BRO	25	150	Sat	2.5	O,G	....	Pd	Ir	ECA
.130	U S Dept of Agriculture	Beltsville, Md		1965	Ex	SH	1 Pk	BW	22	110	Sat	2.5	O	.	Pd	Ir	—
.131	Amemic Plant Addition, Chrysler Corp	Dayton, Ohio	Giffels & Rossetti	1965	Ex	Pr,SH	1 Fr	WIB	50	175	Sat	6.8	C	2.5	BD	N	■
.132	Limstead Hosp.	Butner, NC	Wm C Olsen & Assoc	64-65	Ex	SH	3 Pk	BW	125	Sat	40	3.3	O,G	....	Pd	UV	ECA
.133	Chase Gardens	Eugene, Ore	C C Moore & Co.	1964	Ex	SH	1 Pk	BW	40	150	Sat	3.9	G	.	Pd	Ir	■
.134	Montana State University	Missoula, Mont.	R L Preussing Engrs	....	Ex	SH	1 Fr	KEE	70	125	Sat	10	G	.	BD	UV	■
.135	H B Klement Rubber Co.	College Point, NY	Walter Kidde Constructors	1965	Ex	Pa,Pr,SH	1 Pk	BW	50	150	Sat	....	O	....	....	....	—
.136	Duppies Co	St Louis, Mo.	McLure & Assoc	1965	New	Pr,SH	1 Pk	CE	20	165	Sat	2.25	O,G	...	...	....	■
.137	Armco Steel Corp	Ambridge, Pa.		1965	Ex	Pr,SH	1 Fr	BW	37.3	150	366	9.5	C	1.34	Pd,DB	N	■
.138	U S Army	Fort Dix, NJ		1965	Ex	SH	5 Fr	KEE	30	125	Sat	....	C,O	....	BD	....	—
HIGH TEMPERATURE WATER SYSTEMS (Total capacity in million Btu per hr)																	
.139	Brigham Young University	Provo, Utah	Paul L Geringer & Assoc	1965	Ex	SH	1 Fr[4]	BW	400	250	400	. . .	C	0.5	BD	....	—
.140	IBM Component Div	Burlington, Vt	Theo J Kaufield	....	New	SH	2 Pk[5]	IBW	100	250	400	3	O	..	...	....	—
.141	NASA Flight Center	Mashall, Miss	U S Army Engineers	...	..	SH	3 Pk[5]	IBW	45	250	400	1.7	G,RF	..	...	....	—
.142	Florida Atlantic University	Boca Raton, Fla	Dignum Assoc	..	..	SH	1 Pk[5]	IBW	28.4	250	250	1.5	O,G	....	....	....	—
.143	S Connecticut State College	New Haven, Conn	Westcott & Mapes	..	New	SH	2 Pk[5]	IBW	100	425	450	. .	O,G	...	Pd	UV	—
.144	New York State University	Vestal, NY	Syska & Henessey Inc	..	New	SH	4 Pk[5]	IBW	250	250	400	10,5 &	C,G	....	Pd	UV	—
.145	New York State University	Plattsburgh, NY	Syska & Heressey Inc	..	New	SH	3 Pk[5]	IBW	175	135	350	7,3,5	O	....	Pd	UV	—
.146	Air Force Base	Grand Forks, ND	U S Corps of Engineers	...	Ex	SH	1 Pk[5]	IBW	50	260	414	5.2	C,O	....	Pd	UV	—
.147	Corning Glass Works	Corning, NY	Jaros, Baum & Bolles.	...	New	Pr,SH	2 Pk[5]	IBW	70	250	400	1.3	O,G	.	Pd	UV	—
.148	Smith, Kline & French Lab	Upper Marion, Pa.	Walter Kidde & Co, Inc.	...	New	SH	2 Pk[5]	IBW	32	250	400	1.7	G,O	.	Pd	UV	—
OVERSEAS STEAM SYSTEMS																	
.149	Västerås Lads Centralvärmeverk AB	Västerås, Sweden		1963	New	Pa,SH	2 Fr	MOT	4900	1800	1000	100	O	.	BD	UV	■
.150	Gas and Waterworks	Mannheim, Germany	Rhein-Neckar AG	..	New	Pa,Pr,SH	1 Fr	ASG	129	1800	552	13.3	O	....	Pd	Me	—
.151	Virgin Islands Water & Power Authority	St Thomas, VI	Burns & Roe.	1965	Ex	Pr	2 Pk	CE	65	600	750	.	O	3	Pd	....	—
.152	Montecatini	Fusina, Italy		1966	New	Pa Pr	1 Fr	TO	1190	2090	1004[6]	51	O	....	Pd	....	—
.153	Cabot Montana	Ravenna, Italy	Compagnia Tecnica Industrie Petroli	1965	New	Pa,Pr	1 Fr	TO	42	327	590	5.4	O,EG	4	Pd	....	—
.154	Pontecorvo Sugar Refinery	Pontecorvo, Italy		1965	Ex	Pa,Pr	1 Fr	TO	177	597	734	35.5	O,G	4	Pd	....	—
.155	Rosinovac Brod	Dradevo, Yugoslavia	Dam Projects	1966	Ex	Pr,Pr	2 Fr	TO	154	625	506	3.3	O,G	4	Pd	Ir	—
.156	Fontvieille Power Plant	Fontvieille, France	The Lummus Co	1966	New	Pr	3 Fr	BW	150	750	770	14	O,G	3.4	Pd	Ir	—
.157	Concepcion Refinery	Talcahuano, Chile	The Lummus Co	1965	New	Pa,Pr	1 Fr	CE	75	650	750	4.7	Rec	.	Pd	N	—
.158	Concepcion Refinery	Talcahuano, Chile	The Lummus Co	1965	New	Pa,Pr	3 Pk	CE[7]	50	650	750		O,G	....	Pd	UV	—
.159	Lloyd B.S.K. Corp. Ltd	Banbury, England	Matthew Hall Engrg. Ltd.	1964	New	Pr	.	THO	60	250	Sat	.	O,Cat	.	BD	....	—
.160	Wilkins Paints & Colours	Kent, England		1964	New	Pa,Pr	1 Fr	ICE	150	300	315	.	O	4	BD	EI	■
.161	Ruse Paints P & Derbon Ltd	Burton, England		1966	New	Pr	2 Fr	THO	23	200	Sat	.	O	1.3	BD	N	■
.162	Howards Chemical Industries	Alton, England		1966	Ex	Pa,Pr	1 Fr	BWL	618	2000	1025	.	O	..	Pd	....	—
.163	ICEDA	Asmara, Eritrea		1965	Ex	Pa	1 Fr	TO	106	640	842	9.3	O	.	Pd	....	—
.164	[illegible]	Edinburgh, Scotland		1965	Ex	Pr,SH	2 Pk	THO	30	150	Sat	4	O	.	Pd	UV	■
.165	[illegible]	[illegible]	Jackson & Moreland	1963	Ex	Pa	1 Fr	CE	630	1750	1000	45.5	C,Tw	3	BD	TV	■
.166	[illegible] Refining Co	Barranca, Puerto Rico		1966	New	Pa,Pr	1 Fr	RS	75	325	530	10.4	O,EG		Pd	UV	—

MANUFACTURERS NOT PREVIOUSLY LISTED

ABC - ABCO Ltd
ABE - Aberle & Engrg Co Ltd
ABP - A B Pumpindustri
AEG - Allgemeine Elektrizitaets Gesellschaft
BWL - Babcock & Wilcox Ltd
CLY - Clyde Blowers Ltd
DAV - Davidson & Co Ltd
DCO - Davidson Air Preheaters
HB - Hartmann & Braun AG
ICE - International Combustion Ltd
ICL - J & T Industrial Construction Ltd
LJ - Ljungstrom Air Preheater
KSB - Klein, Schanzlin & Becker
KSG - Kontenschei-tungs Gesellschaft
MOT - Motala Verkstad
PIL - J P Bard & Co
REG - Regulator Srl
REI - Reinhammer & Weller
RWO - Rang & Worth

systems are favored for sprawling universities and military bases

FIRING EQUIPMENT							AIR HEATER		F.D FANS			I.D FANS			BOILER FEED SYSTEM				COMBUSTION CONTROL			PROJECT
Type & No. per boiler	Stoker or pulverizer mfr.	Burner type No. per boiler	Burner manufacturer	Soot blowers mfr. & No.	Dust collector type	Dust collector mfr.	Type	Manufacturer	No. per boiler	Manufacturer	Type drive	No. per boiler	Manufacturer	Type drive	No. of pumps	Manufacturer	Type drive	Feed-water treatment	Type	Control manufacturer	Corresponding turbine project No.	
	N		SH	COE	CV						COE	W	N	N	N	3	DBP	M	Sc,Z,In	E	COE		131
	N										COE	W	N	N	N		GF	M	Z	Co	COE		132
	N					M					OF	W				Ex			Z	E			133
	HCE	N									OF	W	N	N	N	2	N	M,T	Sc,Z,In	Co			134
	N			BW								W	N	N	N	2	IR	M,T	In				135
	N		SA	PEC	CV							W	N	N	N								
					DP																		
	N		SA	PEC	DP						OF	W	N	N	N	1	IR	DL	Sc,Mu	Pn	HCC		136
	N		SA	BW	DP						OF	W	N	N	N	1	IR	T	In	Pn	BW		137
	N		SA	BW							OF	W	N	N	N	1		M	In	E	RE		138
	N		SA	BW							OF	W	N	N	N	2	BE	M,T	F	Pn	HCC		139
			SA		CV						BF	W	N	N	N	2	AC	T	In	Pn	BM		140
	N		SA	BW	DP						OF	W	N	N	N	1	AC	T	In				
	N		N	N	DP	Me	WP	N	N		SW	W	1	SW	W	2	GP	M,T	In	Pn	RE		141
	DSC	N	N		DP			N			OF	W		OF	W	2	WP	T	Sc	Pn	BW		142
	N		SA	COE	CV			N			AL	W	N	N	N	Ex			Sc,Z	Pn	RW		143
	N		SA	COE	CV			N			RE	W	N	N	N		IR	M	Sc,Z	E	COE		144
	N		SA	BW	DP			N			OF	W	N	N	N	2	WD	M,T	In	Pn	BW		145
	N			WSB				N			N	W	N	OF	W	1	IR	M	In	E	HCC		146
	N		SA	COE	DP			N			AL	W	N	N	N	1	GP	T		Pn	BM		147
	N		SA	BW	DP			N			OF	W	N	N	N	1	WD	M	So,Z	Co	HCC		148
					DP			N			CB	W	N	N	N	2	FM	M	Z,Mu				149
	N		SA	BW				N			OF	W	N	N	N	2		M	Z,In				150
	CE	N	N		DP	Me	AT	N	N		OF	W	1	OF	W	1	DL	T	In	E	HAY		151
	N		BW					N			OF	W	N	N	N	1	WSP	M,T	Z	Pn	BW		152
	N		SA	BW	DP			N			OF	W	N	N	N	1	IR	M	Z,In	E	HAY		153
	N		SA	FA	CV			N			OF	W	N	N	N	1	IR	M,T	Z				154
	N		PC	WSB				N			WEB	W	1	WIN	W	Ex			In				155
	LC	N	N		DP	N	N	N	N			W	N	N	N	Ex			Ca,Sc,Z,In	Co	HAY		156
	N		Us			N	N	N	N			W	1		W	1	GP	M	Z,In	E	CCI		157
	N		SA	PEC	CV	N	N	N	N		OF	W	N	N	N	1	SHA	M	Sc,Z,In	El	HAY		158
	N		SA	COE	DP	N	N	N	N		AL	W	N	N	N	2	IR	M,T	Sc,In	Pn	BW		159
	N		SA	BW	DP	N	N	N	N			W	N	N	N	2		M,T	In	Pn	BM		160
	DSC	N	N		DP	Me	AAF	N	N		SW	W	1	SW	W	2	GP	M,T		Pn	BM		161
	N		SA	BW	DP	N	N	N	N		OF	W	N	N	N	Ex	IR	M,T	In	Pn	BM		162
	N			BW		N		N	N		OF	W	N	N	N	2	AC	M	Ev,In	Pn	BW		163
				WED	N			N	N		AC	W	N	N	N	1	DHP	T	So,Z,Mu,In	Co	BM		164
				BW		N		N	N		OF	W	N	N	N	2	IR	M,T		Pn	BM		165
	N		SA	PEC	CV	N	N	N	N		CF	W	N	N	N	2		M	Z	El	PEC		166
	BW		N	N	DP	Me	DRA	N	N		WE	W	1	WE	W	2	DL	M,T	Z	Pn	BW		167
	LS		SA	COE	CV	N	N	N	N			Du	1		Du			M,T	In	El	HAY		168
	DSC	N	N		DP	Me	WP	N	N		FAA	M	1	FAA	M	2	WS	M		Pn	BM		169
	N			WNB	DP	N	N	N	N		CB	W	N	N	N					Pn	HCC		170
	N		AA	FLA	DP	N	N	N	N		N	N	N	N	N					Pn	HCC		171
	N		AA	FLA	DP	N	N	N	N		N	N	N	N	N					E	BC		172
	N			PEC	DP	N	N	N	N		N	N	N	N	N					Pn	HCC		173
	DSC			COE	DP	N	N	N	N		N	N	N	N	N					Pn	HCC		174
	N			WNB	DP	N	N	N	N			W	N	N	N					Pn	HCC		175
	RSC			COE	DP	N	N	N	N		N	N	N	N	N					Pn	HCC		176
	N				DP	N	N	N	N		CBC	W	N	N	N		BF	W		E			178
	N			WNB	DP	N	N	N	N														
			SA	PEC	24 SC[3]	Me	SFF	Re	LJ		SFF	M	3	SFF	M	3	ABP	M	M	E	SIE		179
			SA	KCC	CTE	N		Re,St	LJ		VEN	W	N	N	N		REI	W	Ca,Mu	Co	SH		180
	N		SA	PEC	CV	N	N	N	N		SW	W	N	N	N	6,8	WD	W		Pn	HCC	28	181
	N			PEC	CV	N	N	N	N		TC	W	N	N	N		KSB	M,T	Mu		HB	30	182
	N		Te			N	N	Re	TO		TO	M	N	N	N				Ev,In				183
	N		Te		6 SC	N	N	Re	TO		TO	M	N	N	N							28	
	N		SA		10 SC	N	N	Re	TO		TO	W	N	N	N		KSB	T	Sc,Z				184
	N		SA		SC	N	N	Re	TO		TC	W	N	N	N				In	Co	REG		185
	N		SA			N	N	Re				W	N	N	N		KCB		M	E	F		186
	N		Me			N	N	N	N		VEN	GL	N	N	N								187
	N				CV	N	N	N	N		AL	W	N	N	N								188
			SA	COE	CV					1	AL	W				1		GL	Ca,So,Z,F,In	Pn		2	189
																						31	190
	ABC		SA	APC		Me	DAV	TC	THO					DCO	W	3	WEP	M,T	M	Pn	BM		191
	N		Me			N		TC	TEL	2	DCC	W	2	DCO	W	3		M		Pn	BM		192
	THO		N			Me	TCL	N	N		THC	W										29	193
			SA	BW		N	N	Re,St									KSB	M,T	Mu	Hr	REG		194
	N		SA		SC	N	N	Re	TO		TO	W	N	N	N	2							195
	N		PC			N	N	N	N	5	WOM	M	N	N	N	3	WEP	M,T		E			196
				CE	SC CV	N		Re	APC	2	GF	M	5	GF	M	2	IR	W	M	Pn	BM		197
	N				DP	N	N	N	N	2	CB	T	N	N	N	Ex			Ex	Pn			198

- Svenska Flaktfabriken
- Siemens Schuckertwerke AG
- L & C Steinmueller, GmbH
- Superior Combustion Industries, Inc
- Thermal Efficiency Ltd

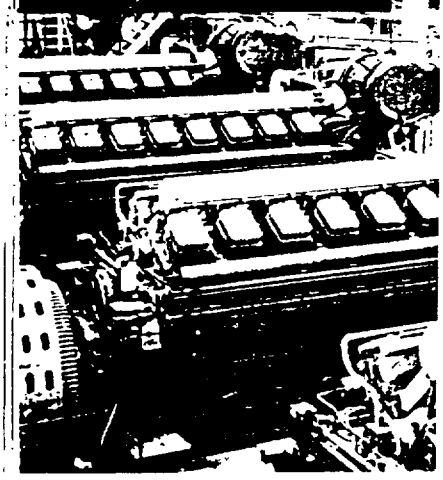
THO - John Thompson Ltd
TC - Franco Tosi SpA
TRL - Trist Ltd
VEN - Venta
WEP - G & J Weir Ltd

WOM - Woods Ltd

FOOTNOTES:
1 - 420,000 lb per hr oil-fired boiler also installed
2 - Also 16 BL, Me burners

3 - Air operated
4 - Once-through boiler, steam pressurizing
5 - Once-through boiler, 300 or 500 psi nitrogen pressurizing
6 - With second reheat to 1004 F
7 - Also 75,000 lb per hr CO boiler
8 - Pulverized coal planned later

5 OIL AND GAS ENGINES

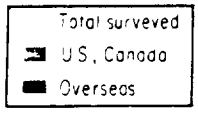


Almost twice as many engines

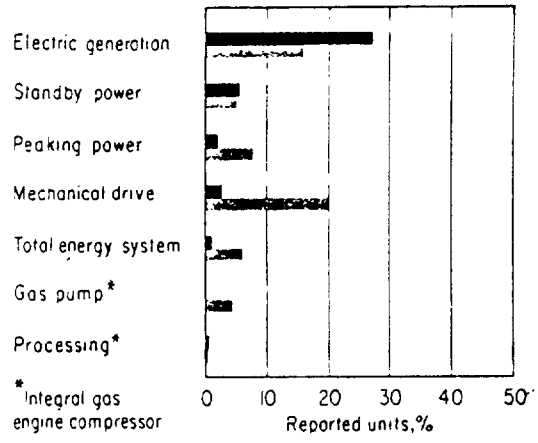
Of special interest here is that of the 712 units surveyed throu the world, only 48% are full diesel. This is mainly due to th nomics and availability of natural gas. Generating electricity i the main use, by over 70%. The fact that the total energy co accounts for 7% of the various uses is worth keeping an eye on. it comes to engine capacity, size range up to 500 hp contains 28 the units surveyed. Interestingly enough, 46% of the total are in-line type, with V-block cylinders accounting for over 28%.

Unquestionably oil and gas engines are going through a dyn era of research and development. This year POWER readers requ us to survey more units, which are tabulated on the following

STEVE ELONKA, Senior Associat

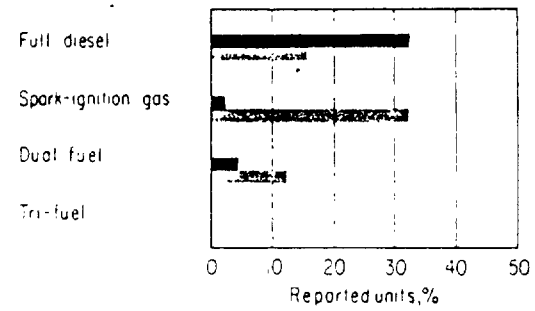


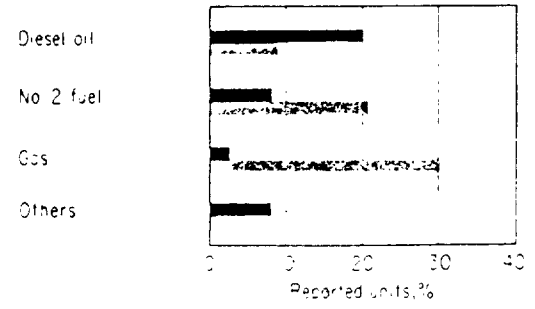
Principal use



OVERSEAS UNITS are used mainly for power generation. U.S.-Canada lead in number of engines for total energy systems, mechanical drives

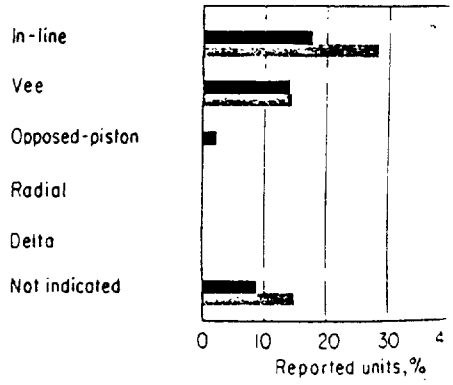
Type engine and fuel used





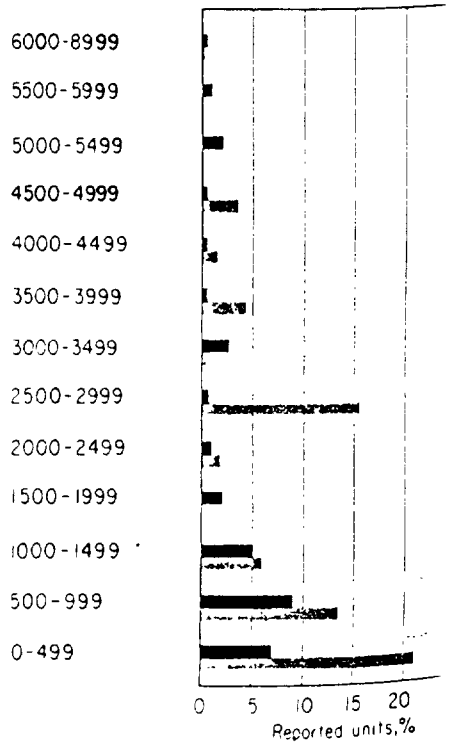
FULL DIESELS overseas are more than double the total in U.S.-Canada, no doubt because natural gas is not available in most other countries

Cylinder block



IN-LINE AND V-TYPE cylinder block are most popular of the fi types surveyed, although over 23% did not indicate type o

Engine capacity, hp



WORK HORSE range for larger engines is 2500-2999 hp cate the U.S. and Canada. More of the smaller engines are used c

surveyed this year; about 70% generate electricity

TABLE 1: Electric utilities

PROJECT	COMPANY	LOCATION	CAPACITY: Horsepower	CAPACITY: Revolutions per minute	CAPACITY: Brake mean effective pressure	ENGINE CHARACTERISTICS: Engine builder	ENGINE CHARACTERISTICS: Type engine	ENGINE CHARACTERISTICS: Cylinder block design	ENGINE CHARACTERISTICS: Type fuel	ENGINE CHARACTERISTICS: Supercharger	ENGINE CHARACTERISTICS: Number of units	PLANT DESCRIPTION: New or existing	PLANT DESCRIPTION: Starting date	PLANT DESCRIPTION: Principal use	PLANT DESCRIPTION: Cooling method	PLANT DESCRIPTION: Heat recovery
	City of Carthage	Carthage, Mo	[illegible]	[illegible]	96.6	NW	Dual	In	[illegible]	[illegible]	[illegible]	Exp	1955	E	CTo	....
	City of Fulton	Fulton, Mo	[illegible]	[illegible]	96.6	NW	Dual	In	[illegible]	[illegible]	[illegible]	Exp	1955	E	Air	....
	Municipal Power Plant	Glencoe, Minn	[illegible]	[illegible]	[illegible]	EN	Dual	Vee	[illegible]	[illegible]	[illegible]	Ext	1936	E	Air	....
	City of Waverly	Waverly, Iowa	[illegible]	[illegible]	[illegible]	EN	Dual	Vee	[illegible]	[illegible]	[illegible]	New	1965	E	CTo	....
	City of Hoisington	Hoisington, Kansas	[illegible]	[illegible]	166.3	WC	Dual	Vee	[illegible]	[illegible]	[illegible]	Exp	1939	E	CTo	....
	City of Blair	Blair, Neb	450	720	120	CBC	Dual	Vee	Dc	[illegible]	1	Exp	1965	E	CTo	JW
	Town of Easton	Easton, Mr	450	720	120	CBC	Dual	Vee	Dc	[illegible]	1	Exp	1965	E	CTo	JW
	Municipal Power Plant	Geneseo, Ill	450	720	120	CBC	Dual	Vee	Dc	[illegible]	1	Exp	1965	E	Air	....
	City of Clete	Clete, Neb	450	720	120	FM	Dual	In	[illegible]	[illegible]	1	Exp	1965	E	CTo	....
	City of Brownfield	Brownfield, Texas	450	720	120	NW	Dual	Vee	[illegible]	[illegible]	1	Exp	1965	E	Air	....
	Nantucket Gas & Electric Co	Nantucket Island, Mass	[illegible]	[illegible]	[illegible]	CBC	Fuel	Vee	[illegible]	[illegible]	[illegible]	Exp	1965	E	Dir	JW
	City of Kingfisher	Kingfisher, Okla	[illegible]	[illegible]	[illegible]	EN	Dual	Vee	[illegible]	[illegible]	[illegible]	Exp	1965	E	Air	....
	City of Burlington	Burlington, Iowa	[illegible]	[illegible]	[illegible]	EN	Dual	Vee	[illegible]	[illegible]	[illegible]	Mob	1965	E	Air	....
	City of River Falls	River Falls, Minn	[illegible]	[illegible]	[illegible]	FM	Fuel	Dc	Dc	[illegible]	[illegible]	Exp	1968	Pk	Air	....
	City of Forest City	Forest City, Iowa	[illegible]	[illegible]	165	CBC	Dsl	Vee	Gas	[illegible]	[illegible]	Exp	1965	E	CTo	JW
	City of Tonkawa	Tonkawa, Okla	[illegible]	[illegible]	[illegible]	FM	Dual	In	[illegible]	[illegible]	[illegible]	Exp	1965	E	CTo	....
	City of Goodland	Goodland, Kan	[illegible]	[illegible]	[illegible]	FM	Dual	In	2	[illegible]	[illegible]	Exp	1965	E	CTo	....
	City of West Point	West Point, Neb	[illegible]	514	178	NM	Dual	Vee	2	[illegible]	1	Exp	1965	E	Air	....
	City of New Roads	New Roads, La	[illegible]	[illegible]	[illegible]	NM	Dual	Vee	Dc	[illegible]	[illegible]	Exp	1965	E	CTo	....
	City of Davis City	Davis City, Neb	[illegible]	[illegible]	166	MC	Dual	Vee	[illegible]	[illegible]	[illegible]	Exp	1963	E	Inc	....
	City of River Falls	River Falls, Minn	[illegible]	[illegible]	[illegible]	FM	Dual	Dc	[illegible]	[illegible]	[illegible]	Exp	1965	E	Air	....
	City of Kissimmee	Kissimmee, Fla	[illegible]	[illegible]	[illegible]	FM	Dual	Dc	[illegible]	[illegible]	[illegible]	Exp	1965	E	Air	....
	City of Business	Business, [illegible]	[illegible]	[illegible]	[illegible]	FM	Dual	Dc	[illegible]	[illegible]	[illegible]	Exp	....	E	Air	....
	City of Ellis	Ellis, Kan	[illegible]	[illegible]	[illegible]	FM	Dual	Dc	Dc	[illegible]	[illegible]	Exp	1965	E	Air	....
	City of Madelia	Madelia, Minn	[illegible]	[illegible]	[illegible]	FM	Dual	Dc	[illegible]	[illegible]	[illegible]	Exp	1962	E	Air	....
	City of Ellinwood	Ellinwood, Kan	[illegible]	[illegible]	[illegible]	FM	Dual	Dc	[illegible]	[illegible]	1	Exp	1965	E	Air	....
	City of Meade	Meade, Kan	[illegible]	[illegible]	[illegible]	FM	Dual	Dc	[illegible]	[illegible]	[illegible]	Exp	1965	E	Air	....
	City of Sweetser	Sweetser, Ind	[illegible]	[illegible]	....	GME	Fuel	Vee	Dc	[illegible]	[illegible]	New	1965	Pk	Air	....
	City of Reading	Reading, Ohio	[illegible]	900	....	GME	Fuel	Vee	Dc	[illegible]	[illegible]	New	1965	Pk	Air	....
	City of New Smyrna Beach	New Smyrna Beach, Fla	[illegible]	900	....	GME	Fuel	Vee	Dc	[illegible]	[illegible]	New	1966	Pk	Air	....
	City of Lake Worth	Lake Worth, Fla	[illegible]	900	....	GME	Fuel	Vee	Dc	[illegible]	[illegible]	New	1965	Pk	Air	....
	Central Kansas Power & Light Co	Bird City, Kan	[illegible]	900	....	GME	Fuel	Vee	Dc	[illegible]	[illegible]	New	1965	Pk	Air	....
	City Electric System	Key West, Fla	[illegible]	900	....	GME	Fuel	Vee	Dc	[illegible]	[illegible]	New	1965	Pk	Air	....
	City of Kaukauna	Kaukauna, Wis	[illegible]	900	....	GME	Fuel	Vee	Dc	[illegible]	[illegible]	New	1966	Pk	Air	....
	Black Hills Power & Light Co	Rapids City, SD	[illegible]	900	....	GME	Fuel	Vee	Dc	[illegible]	[illegible]	New	1965	Pk	Air	....
	City of St John	St John, Kan	2400	360	165	CBC	Dual	Inl	Dc	Rb	1	Exp	1965	E	Dir	JW
	City of Newton Falls	Newton Falls, Ohio	2495	450	182	WC	Dual	Inl	2	Rb	6	Exp	1966	E	Inc	....
	City of Oakley	Oakley, Kan	2250	360	176	FM	Dual	Inl	2	....	1	Exp	1965	E	CTo	....
	Town of Culpeper	Culpeper, Va	2100	514	176	NM	Dual	Inl	2	Rb	1	Exp	1965	E	Sy	....
	City of Crosbyton	Crosbyton, Texas	1950	720	80.3	FM	Dual	Dc	2	....	1	Exp	1965	E	Air	....
	City of Petersburg	Petersburg, Alaska	1700	360	147	WDE	Dual	Inl	2	Rb	1	Exp	1966	E	Air	....
	Borg of Hatfield	Hatfield, Pa	1700	720	90.1	FM	Fuel	Dc	Do	Rb	1	Exp	1965	E	CTo	....
	City of Carrin	Carrin, Nev	1600	720	84.6	FM	Dual	Dc	Dc	....	1	Exp	1965	E	Air	....
	City of Lowell	Lowell, Mich	1600	720	84.6	FM	Dual	Dc	2	....	1	Exp	1965	E	CTo	....
	Town of Strawberry Point	Strawberry Point, Iowa	1600	720	84.6	FM	Dual	Dc	2	....	1	Exp	1965	E	Air	....
	City of Trenton	Trenton, Mo	1400	360	....	WDE	....	In	Dc	Rb	1	Exp	1965	E	CTo	....
	City of Randolph	Randolph, Neb	1260	720	64.6	FM	Dual	Dc	2	....	1	Exp	1965	E	Air	....

MANUFACTURERS

- AP - Alco Products, Inc
- AS - W H Allen Sons & Co, Ltd
- BLH - Baldwin-Lima-Hamilton Corp
- CAT - Caterpillar Tractor Co
- CBC - Cooper-Bessemer Corp
- CPE - Crossley-Premier Engines Ltd
- DD - Daihatsu Kogyo Kabushiki Daisha
- EE - English Electric Co, Ltd
- EN - Enterprise Engine & Mech Co
- FM - Fairbanks Morse & Co Inc Power Systems Div
- FSM - Fiat-Stabilimento Grandi Motori
- GME - Detroit Diesel Engine Div, GMC
- GME - Electro-Motive Div, GMC
- IFB - Isotta Fraschini Breda
- IP - Ingersoll-Rand Works Ltd
- KHD - Klockner Humboldt Deutz AG
- MH - Mitsubishi Heavy Industries Ltd
- MN - Mirrlees National Ltd
- NEC - Niigata Engrg Co, Ltd
- NW - Nordberg Mfg Co
- OM - Grant-Waukesha
- PH - Ruston & Hornsby Ltd
- WAK - Waukesha Motor Co
- WDE - White Diesel Engine Div, WMC
- WHD - W H Dorman & Co
- WC - Worthington Corp
- YD - Yanmar Diesel Ltd

SYMBOLS (continued)

- CTo - Cooling Tower
- Dir - Direct
- Do - Diesel oil
- Dual - Dual Fuel
- Ec - Ebullient cooling
- El - Electric generation, continuous power
- Ev - Evaporative coil cooler
- Eg - Exhaust gas
- Exp - Expansion
- Fuel - Fuel diesel
- Gs - Gas pump
- Inc - Incinerator
- In - In-line
- Ib - Internal turbo-blower
- JW - Jacket water
- MC - Mechanical drive
- Mech - Mechanical
- Mod - Modernization
- N - New
- Ns - Navy special fuel
- Op - Opposed piston
- Pk - Peaking power
- Pr - Processing
- Sig - Spark-ignition gas
- Sy - Standby power
- TE - Total energy system
- Ker - Kerosene No. 1
- Air - Air-cooled heat exchanger
- Cr - Crude
- 2 - No. 2 diesel fuel
- 5 - No. 5 diesel fuel
- 6 - No. 6 diesel fuel

FOOTNOTES

- 3 - Plus exhaust gas heat recovery
- 4 - Plus exhaust gas and jacket water heat recovery