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	BOIL Capacity ea, 1000 lb per hr	BOIL Throttle pressure, psig
1	Pennsylvania Power & Light Co	York Haven, Pa	Brunner Island	Ebasco Services, Inc	2	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	7-67	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	5-68	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[2]	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	Whitegeorville, 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	2-67	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, Engle & 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	12-65	22	245	850
47	City of Logansport	Logansport, Ind	Municipal	Camp Dresser, 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 Frankfort	Frankfort, Ind	Municipal	Camp Dresser, Weber & Geise	1	1-63	10.5	150	850
50	City of Peoria	Peoria, Ill	Municipal	Sargent & Lundy	1	1965	12.65	120	600

FOOTNOTES

1 Outdoor
2 Two units - data refers to each unit
3 Wall 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 Balanced draft
11 Each of two units
12 Gas as secondary fuel
13 Heater and deaerator reselect very
14 Hydrogen cooling on rotor only
15 One spare rotor 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 placed in service
19 Makeup and condensate preheat respectively
20 Plus ....30 sq ft auxiliary surface
21 New unit will use existing computer
22 Turbine No 4 serves No 5
23 Gas as secondary fuel
24 Supercritical once
25 Water spray for second reheater

SYMBOLS USED ABOVE

Att - Attemperators
B - Burners
Ba - Babcock
Bx - Gas bypass
Cy - Cyclone furnace
D - Damper
DB - Dry bottom
FG - Flying gate
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

[illegible]steam remains at 1000 F. Trend to outdoor plants continues

BOILERS: Surface 1000 sq ft							FURNACE					F D FANS						I D FANS						PROJECT
Boiler & wall	Superheater	Reheater	Economizer	Air heater	Superheat 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	Drive: Hp	Drive: Manufacturer	Per boiler	Capacity ea 1000 cu ft	Manufacturer	Flow control	Drive: Hp	Drive: Manufacturer	
74.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	WS TB	[illegible]	[illegible]	[illegible]	[illegible]	Pc,DB	[illegible]	303	WE	V	5000	CE	N	N	N	N	N	N	1
41.54	260	[illegible]	[illegible]	[illegible]	WS TB	TB	[illegible]	[illegible]	[illegible]	[illegible]	Pc,DB	[illegible]	240	SW	V	3500		N	N	N	N	N	N	2
20	76	[illegible]	[illegible]	[illegible]	[illegible]	WS GP	[illegible]	[illegible]	[illegible]	[illegible]	Pc	[illegible]	600	APC	HvC	4500	GE	N	N	N	N	N	N	3
34.9	62.4	[illegible]	[illegible]	[illegible]	WS	GP TB	[illegible]	[illegible]	50.5	[illegible]	Pc	[illegible]	600	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]	500	AS	V	7000	WE	N	N	N	N	N	N	5
54.1	62.4	[illegible]	[illegible]	[illegible]	W	W GP TB	[illegible]	[illegible]	13.6	[illegible]	Pc,DB	[illegible]	615	AS	V	4000		N	N	N	N	N	N	6
23.44	[illegible]	[illegible]	[illegible]	[illegible]	WS	WS GP	[illegible]	[illegible]	[illegible]	[illegible]	Pc,DB	[illegible]	592	WE	V	3000	EM	N	N	N	N	N	N	7
34.55	66.1	[illegible]	[illegible]	[illegible]	WS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pc,DB	[illegible]	641	AS	V[4]	3500	WE	N	N	N	N	N	N	8
20.74	[illegible]	[illegible]	[illegible]	[illegible]	WS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pc	[illegible]	600	AS	V	4130	WE	N	N	N	N	N	N	9
20.74	[illegible]	[illegible]	[illegible]	[illegible]	WS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Pc	[illegible]	602	AS	V	4130	WE	N	N	N	N	N	N	10
33.57	[illegible]	[illegible]	[illegible]	[illegible]	TB FR	WS GP	[illegible]	[illegible]	[illegible]	[illegible]	Pc,DB	[illegible]	560	WE	V,D	5000	WE	N	N	N	N	N	N	11
37.79	[illegible]	[illegible]	[illegible]	[illegible]	WS TB	WS TE	[illegible]	[illegible]	[illegible]	[illegible]	Ba	[illegible]	401	WE	V	1750	WE	[illegible]	597	WE	V	3500	WE	12
56.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	WS	TB	16.54	[illegible]	16.63	[illegible]	Pc	[illegible]	643	AS	V	2235	...	N	N	N	N	N	N	13
35.7	[illegible]	[illegible]	[illegible]	[illegible]	AH TB	AH GP TB	[illegible]	128	[illegible]	[illegible]	Pc	[illegible]	340	AC	HvC,D	3500	LA	N	N	N	N	N	N	14
—	[illegible]	[illegible]	[illegible]	[illegible]	GP	AH	[illegible]	[illegible]	[illegible]	[illegible]	Pc	[illegible]	450	BF	...	...		N	N	N	N	N	N	15
26.01	[illegible]	[illegible]	[illegible]	[illegible]	WS	WS TE	[illegible]	[illegible]	13.5	[illegible]	Pc,DB	[illegible]	470	APC	V	3500	AC	N	N	N	N	N	N	16
24.83	[illegible]	[illegible]	[illegible]	[illegible]	WS FR	WS GP	[illegible]	[illegible]	[illegible]	[illegible]	Pc,DB	[illegible]	453.17	WE	V	3000	LA	N	N	N	N	N	N	17
33	144	[illegible]	[illegible]	[illegible]	WS FR	AH GP	[illegible]	[illegible]	19.45	[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]	119.4	[illegible]	[illegible]	Pc,ST	[illegible]	435	AS	HvC	3500	GE	N	N	N	N	N	N	19
20.37	105.2	[illegible]	[illegible]	[illegible]	FR WS	GP	[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]	WS	WS	[illegible]	136	15.1	[illegible]	Pc,DB	[illegible]	740	WE	V	2250	WE	N	N	N	N	N	N	21
26.95	63.3	[illegible]	[illegible]	[illegible]	WS AH	WS AH	[illegible]	160.2	[illegible]	24	Pc,DB	[illegible]	416	AS	V	2500	EM	N	N	N	N	N	N	22
18.42	150.9	39.6	[illegible]	[illegible]	AH FR	AH GP	[illegible]	...	...	6	Pc,DB	[illegible]	295	SW	D	2500	....	N	N	N	N	N	N	23
23.5	42.6	[illegible]	[illegible]	[illegible]	WS	WS	[illegible]	50.7	36.9	16	Pc,DB	2	340	SW	V	2500	WE	N	N	N	N	N	N	24
28.5	64	92.0	[illegible]	[illegible]	WS	C WS	20	155.6	16.0	16	Pd,DE	2	345	...	V	....	...	N	N	N	N	N	N	25
19.6	95.22	[illegible]	36.4	364.6	AH GP	WS GP	20	124	15.5	24	Pc,DB	2	321	WE	V	1750	WE	N	N	N	N	N	N	26
[illegible]	99.04	65.4	[illegible]	[illegible]	AH TB	AH TB	-0.15	131.6	....	22	Bal DB	2	286	BF	V	800	AC	2	460	BF	V	1250	AC	27
25.61	[illegible]	[illegible]	[illegible]	356.4	AH GP	AH GR	[illegible]	65.07	22.5	5	Pc,ST	2	303	BF	V	3500	EM	N	N	N	N	N	N	28
[illegible]89	62.2	[illegible]	[illegible]	[illegible]	WS	TB	19.[illegible]	132	15.1	16	Pc,DB	2	...	SW	HyC	1740	WE	N	N	N	N	N	N	29
	61	[illegible]	[illegible]	[illegible]	WS	WS	24.5	89	[illegible]	16	Pc,DB	2	250	..	[illegible]	3700	GE	N	N	N	N	N	N	30
	[illegible]	[illegible]	[illegible]	[illegible]	WS	WS TB	10.25	104.6	15.4	16	Pd	2	291	AS	V,D	1500	LA	N	N	N	N	N	N	31
	5[illegible]	[illegible]	[illegible]	35	WS,GP TB	WS GR,TE	[illegible]	90	15.5	[illegible]	Pc	2	210	CWE	V	900	CWE	N	N	N	N	N	N	32
	47.6	[illegible]	[illegible]	[illegible]	WS	C WS	[illegible]	82.2	[illegible]	12	Pc,DB	2	193	AS	V	1000	GE	N	N	N	N	N	N	33
15.87	3[illegible]	[illegible]	[illegible]	[illegible]	WS	GP TB	6.75	49.3	[illegible]	12	Pc,DB	2	119	WE	V	700	AC	N	N	N	N	N	N	34
18.63	22.5	7.25	[illegible]	[illegible]	WS,TB	WS TB	....	4[illegible]	22	4	Pc	1	286	APC	V	943	LA	N	N	N	N	N	N	35
10.7	3.[illegible]	4.[illegible]	4.4	164.6	WS	WS,GP	2.	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]	AH TE	AH TB	[illegible]	245	[illegible]	48	Bal	2	404	HOW	V	900	CGE	2	[illegible]	HOW	V	2200	CGE	37
19.9	[illegible]	[illegible]	[illegible]	[illegible]	C WS	[illegible]	[illegible]	126	15.6	[illegible]	Pc,DB	[illegible]	242	AS	.....	1750	GE	N	N	N	N	N	N	38
16.86	[illegible]	[illegible]	[illegible]	[illegible]	WS	WS GP AH	[illegible]	42.2	[illegible]	[illegible]	Pc	[illegible]	190	SW	V	1250	....	N	N	N	N	N	N	39
15	[illegible]	[illegible]	[illegible]	[illegible]	WS	WS FR	[illegible]	4[illegible]	[illegible]	[illegible]	Ba,DB	[illegible]	95.5	AC	V,D	300	GE	[illegible]	140	AS	D	450	GE	40
14.5	[illegible]	[illegible]	[illegible]	[illegible]	WS	WS [illegible]	[illegible]	49.6[illegible]	18.0	[illegible]	Pc,DB	[illegible]	[illegible]	GF	D	500	GE	N	N	N	N	N	N	41
27.1	[illegible]	[illegible]	[illegible]	[illegible]	WS	N	[illegible]	14.6	29.3	[illegible]	Pc	[illegible]	126	WE	V	1500	AC	N	N	N	N	N	N	42
10	[illegible]	N	[illegible]	[illegible]	WS [illegible]	WS [illegible]	[illegible]	20	[illegible]	[illegible]	Pc,DB	[illegible]	[illegible]	SW	V,S	300,700	WE	N	N	N	N	N	N	43
26.6	[illegible]	N	[illegible]	[illegible]	WS	N	35	15.[illegible]	[illegible]	[illegible]	Pc	[illegible]	[illegible]	CF	V	500	EP	N	N	N	N	N	N	44
26.3	[illegible]	N	[illegible]	[illegible]	WS	N	-0.15	...	...	SS	Bal	[illegible]	54	WE	V	75	GE	[illegible]	180	WE	S,D	100,500	GE	45
19.3	[illegible]	N	[illegible]	N	AH	N	[illegible]	[illegible]	[illegible]	[illegible]	Pc	[illegible]	200	SW	V	100,250	GE	N	N	N	N	N	N	46
15.22	[illegible]	N	N	[illegible]	WS	N	[illegible]	13.4	22	SS	Ba	[illegible]	56.4	CF	S,D	[illegible]	EL	[illegible]	[illegible]	CF	S,D	450	EL	47
[illegible]	[illegible]	N	[illegible]	[illegible]	WS	N	[illegible]	4.9[illegible]	45	[illegible]	Pc	[illegible]	[illegible]	SW	S,V	250,400	GE	N	N	N	N	N	N	48
	[illegible]	N	[illegible]	[illegible]	AH	N	[illegible]	[illegible]	[illegible]	SS	Ba	[illegible]	[illegible]	GF	HvC,D	55,60	EL		155	...	HvC,D	250,300	EL	49
10.6	[illegible]	N	N	[illegible]	WS	N	[illegible]	4.5	[illegible]	[illegible]	Pc	1	36.8	GE	V,D	150	GE	N	N	N	N	N	N	50

MANUFACTURERS

- [illegible] - Associated Electrical Industries
- [illegible] - Air Preheater Co, Inc
- [illegible] - American Standard, Inc Div
- [illegible] - Allen Sherman-Hoff, Sub of BLH
- [illegible] - [illegible]rotec Industries Inc
- [illegible] - [illegible]erican Water Softener Section
- [illegible] - [illegible] Chainbelt Inc
- [illegible] - [illegible]own Boveri Corp
- [illegible] - [illegible]uffalo Forge Co
- [illegible] - Bingham Pump Co
- [illegible] - 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
- CDC - 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	516.3	.....	.....
3	5510	4500	PP	S	DT	13,350	GE	C	10738	N	N	N	N	N	N	N	.....	7	500	170	SWE
4	4400[11]	4373	PP	S	M,T	13,400	GE	C[12]	10738	N	N	N	N	N	N	N	.....	7	499	N	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	1918[10]	N	N	N	N	N	N	N	.....	7	500	170	WE,CHM
7	5290	4260	DL	R,HyC	DM,MTS	7200	GE	C	18.27	N	N	Ret	St	DP	N	N	298	7	560	16	WE
8	4600	4455	DL	S	DT	15,200	WE	C[12]	1050[10]	N	N	Y	....	.....	N	N	.....	7	600	100	WE,GW
9	4475	3950	WO	S	DT	13,537	GE	C,G	18.6,1333[10]	N	N	N	N	N	N	N	.....	7	500	....	WE
10	4475	3950	WO	S	DT	13,537	GE	C,G	18.6,1333[10]	N	N	N	N	N	N	N	....	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	4630	3915	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]	N	N	N	N	N	N	N	.....	7	491.6	95.1	WE,FW
14	3105	3930	WO	HyC	M,MTS	2500	LA	C	.....	5	CE	Ret	St	CV	Me	BU	306	7	463	130	YU
15	2950	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	2745	2140	PP	HyC	DM	2000	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]	18.37	N	N	Ret	St	DP	N	N	250	7	500	125	WE,COC
19	7560	2220	PP	S	T	14,500	WE	C	11.65	3	RS	Ro,Ret	ST	CV	EI	AS	315	7	495	N	WO
20	3813	4531	WO	S	2T	5700	GE	C	13.65	5	BW	Ro,Ret	St	DP	EI	RC	400	8	551	68.8	WO
21	2923	2175	BJ	HyC	DM	5520	WE	C	12.35	5	CE	Ro,Ret	St	CV	EI	RC	550	7	480	.....	WE
22	5930,2400	2840	IR	HyC	M,MTS	5000	WE,GE	C	12	3	RS	Ro,Ret	St	CV	EI	RC	300	6	480	150	FW
23	5670	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]	1366[10]	N	N	N	N	N	N	N	150	6	465	147	CHM,YU
25	4430	3950	....	HyC	M,TS	.....	.....	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	13.9	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	4609	3900	PP	HyC	DM	3000	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	93.6	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	2235	CIR	HyC	DM	2500	CWE	C	13.25	N	N	Ro,Ret	St	DP	N	N	270	5	460	47	GW
33	4066	2270	BJ	R	DM	1750	GE	C[23]	10.5	2	RS	Ro,Ret	St	DP	Me	AT	200	6	458	109	WE,CHM
34	963	2225	WO	R	M,T	1750	AC	C	18.4	N	N	N	N	N	N	N	.....	5	470	66.3	WE,FW
35	1000	1360	PP	R	M,T	1590	LA	G	.....	N	N	N	N	N	N	N	156	4	448	100	STW,AE
36	1720	2400	PP	R	M	2000	WE	C[23]	11	2[13]	BW	Ro,Ret	St	DP	Me	RC	250	5	467	125	YU,CHM

MUNICIPAL AND COOPERATIVE INSTALLATIONS

37	2250	2850	BJ	S	DM	5000	DGE	C[24]	?	6	GES	Ro,Ret	St	DP	Me	HOW,CAP	200	7	460	58	AEI
38	3.0	2225	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	2250	2422	AC	R	M	2250	AC	G	4	N	N	N	N	N	N	N	.....	5	343	100	SWE
40	2221	2265	PP	.....	DM	1250	LA	C	14	4	RS	Ro,Ret	St	CV	EI	AS	300	5	450	68	YU,GW[13]
41	420	2400	AC	R	DM	.....	GE	C	12.1	2	RS	Ro,Ret	St	DP	EI	AT	155	5	442	65	STW
42	800	395	AC	R	DM	1250	AC	G	1110[10]	N	N	N	N	N	N	N	.....	4	445	.....	YU
43	420	2000	BJ	R	M	1250	GE	C,G	18.27	N	N	N	N	N	N	N	.....	5	450	60	SWE,CHM
44	950	1000	DL	R	DM	450	EP	G[12]	1000[10]	N	Y	N	N	N	N	N	.....	5	350	35	SWE
45									900	SS	DSC	Ro,Ret	St	CV	Me,EI	.....	.....	3	520	134	.....
46			BJ					G	1550[10]	N	N	N	N	N	N	N	.....	4	375	75.2	WSC,CHM
47	950	1650	R	R,S,HyC	M,T	1750	GE	C[12]	12.5	N	N	Ret	St	DP	Me	RC	95	4	500	42	AC
48	420	750	WO	R	DM	400	GE	G	1000[10]	N	N	N	N	N	N	Y	.....	4	565	95	WM
49	950	900	R	HyC	M,T	800,700	GE	C	11.9	2[13]	#B	Ro,Ret	St	.....	Me	.....	80	4	550	75	.....
50	25	950	BJ	R	DM	250	LA	G,G	8.8,1000[10]	...	...	Ro,Ret	St	CV	Me,EI	.....	75	4	353	80	STW

DW - Dravo 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 Robbins, Inc
HT - Hungerford & Terry, Inc
IW - Infilco, Div Gen Amer Trans Corp
J - Ingersoll-Rand Co
W - Illinois Water Treatment Co
JW - Jervis B Webb Co
JM - Johns-Manville Co
JOY - Joy 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
NCC - 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, inhibited

PROJECT	TURBINES						CONDENSER					FEEDWATER			GENERATORS			CONTROLS				
	Capability, mw	Type	Exhaust, in Hg	No. of bleed points	No. of extractions	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, mfr	Computer, mfr
	735	TC							SSt	Ro	FW	De	De	COC	24	822	H_2, HC	CE	CE			
	650	TC							Ad	RP		So	HyC		24	868.6	H_2, Li					
	565	TC							SSt;Ad	Ro	IR	De	De	IN	22	845	H_2, Li	BM	BM			
	580	TC							SSt;Ad	RP	WO	De	De	COC PM[19]	22	645	H_2, Li	LN	LN			GE
	550	TC							SSt	J	IR	De	De	IN, LAW[19]	20	733	H_2, Li	LN	LN	WH	GE	GE
	565	TC							CuN	Ro	FW	De	De	PM	20	645	H_2	BM	BM			
	560	TC							AlB	J	IR	De	De	IN	18	640	H_2, HC	BM	BM			
	550	TC							Ad	Ro	IR	De	De	IW, IN[19]	18	640	H_2, HC	CE		CE	GE	
	550	TC							CuN	RP	FW	De	De	COC	24	695	H_2, Li	BM	BM			
	550	TC							CuN	Ro	FW	De	De	COC	24	695	H_2, Li	BM	BM			
	530	TC							SSt	Ro,J	FW	De	Air Hyd	PM	20	634	Li	BM	BM	DP	F	31
	500	TC							Ad	J	IR	De	.....	.....	22	564	H_2, HC	CE, HC	.....	.....	.....	.....
	500	TC							Ad	Ro	IR	De	De	IW	18	640.2	H_2, HC	HC	.....	CE	GE	GE
	420	TC							SSt	Ro	FW	De	N	IN	22	445	H_2, Li	CE	CE	CE	CE	GE
	414	TC							SSt;Ad	Ro	IR	De	De	.....	22	466	HC	.....	.....	.....	.....	.....
	395[16]	TC	3.74	7	4	WE	240	2	SSt;Ad	Ro	FW	De	De	IN	24	430	H_2	.....	.....	N	.....	16
	385	TC				WH	50		SSt;Ad	Ro	FW	De	De	GW	20	475.2	H_2	BM	BM	.....	.....	17
	380	TC				WH	180	4	A/E	J	WO	De	De	IN	22	427	H_2, Li, HC	BM	BM	DP	N	18
	378	TC	3.5			WH	115		SSt	J	MS	De	.....	HT	22	460	H_2, HC	BM	BM	N	N	19
	365	CC	3.25	6	4	GE	152	1	AlB, CuN	RP	WO	De	De, F	PM	20	714	H_2	LN	LN	DP	GE	GE
	336	TC	3.5	7	4	GE	220	...	AdBr	J	IR	De	.....	Self	18	360	H_2, Li	HCC	HCC	.....	WE	WE
	330	TC		6		GE	220		Ad	RF	WE	De	.....	IN	22	422.4	H_2, Li, HC	HCC	HCC	.....	WE	WE
	318	TC		5		WE	126		AsCu	.....	.....	De	De	.....	24	395	H_2, HC	BM	BM	.....	.....	.....
	318	TC				WE	152		SSt	Ro	WE	De	.....	IN	24	350	H_2, HC	F	F	N	N	N
	310	TC				WE	152		SSt	Ro	WE	De	.....	GW	20	330	H_2, Li, HC	.....	.....	N	N	N
	274	TC	2			GE	115	2	Ad SSt	Ro	.....	De	.....	.....								
	250	TC	3.5	6	3	GE	155	2	Adf	RP	BLH	De	.....	IW	20	320	H_2, Li	RF	RF	.....	N	N
	238	CC	3.5	5	3	GE	135	1	SSt;CuN	Ro,J	WE	De, Evac	.....	.....	16	267.8	H_2	HCC	BM	DP	F,RCA	F,RCA
	216	TC	3.5	6	3	GE	125	2	SSt;Ad	J	FW	De	Hyd	IW	22	256	H_2, Li	BM	BM	.....	.....	.....
	215	TC	3.5	6	3	GE	99	2	Adf	Ro	WE	.....	.....	.....	20	235.5	H_2, Li, HC	.....	.....	.....	.....	.....
	200	TC	3.5			GE	11920	2	Adl	.....	WO	De	De	PM, COC[19]	20	256	H_2, Li, HC	GE	GE	DP	.....	GE21
1	190	TC	2.5	5	3	WE	80	2	Ad	J	WO	.....	.....	.....	...	192	H_2	.....	.....	.....	.....	.....
1	165	TC	3.5	5	3	CAF	75	2	SSt;Ad	Ro,J	CAC	De	.....	.....	16	194.2	H_2, Li, HC	F	F	DP	FIS	FIS
1	140	TC	3.5	6	3	WE	81	2	SSt;Adl	Ro	WE	De	N	IN	18	175	H_2	.....	.....	.....	.....	.....
1	120	TC	3.5	5	3	GE	70	2	AlB	J	WO	De	N	AWS	14.4	15	H_2	F	F	N	N	N
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
123	90	TC	...	5	3	GE	40	2	SSt	J	IR	De	.....	.....	14.4	100	.....	.....	...	..	.....	.....

MUNICIPAL AND COOPERATIVE INSTALLATIONS

1	300	TC	3.5	7	4	AEI	155	2	Adl	J	FW	Sr	De	.....	16.5	353	H_2, Li, HC	BM	BM	..	.....	.....
1	200	TC	3.5	5	3	GE	145	2	SSt;AsCu	Ro	FW	De	De	.....	20	256	H_2, Li	.....	...	.....	.....	.....
1	155	TC	3.5	6	3	WE	85	2	Adl	RP	MS	Evac, De	.....	.....	18	196	H_2	F	F	N	N	N
1	125	TC	3.5	5	3	GE	80	2	Adl	Ro	AC	De	...	COC	13.8	98	H_2	RF	RF	N	N	N
1	75	TC	3.5	5	3	GE	50	2	Adl	J	FW	De	N	IW	13.8	98	H_2	RF	RF	N	N	N
1	61	SC	3.5	4	...	WH	42.5	2	SSt	Ro	IR	De	De	.....	13.8	82.5	H_2	BM	BM	N	N	N
1	55	SC	3.5	4	...	WH	44	2	Adl	Ro	SNE	De, Sr	F	.....	13.8	70	H_2	BM	BM	...	.....	.....
1	42	SC	3.5	4	...	WH	33	2	Adl	J	WC	Evac, Sc	.....	.....	13.8	44.1	H_2	RF	RF	N	N	N
1	29	SC	3.5	4	...	WH	27	2	Adf	...	WC	.....	.....	.....	13.8	34	H_2	.....	.....	N	N	N
1	22	SC	3.5	4	...	WH	20	2	Adl	J	FW	Evac	.....	FW	12.5	25.4	H_2	RF	RF	N	N	N
1	25	SC	3.5	4	3	GE	19	2	Adl	J	ELH	De	.....	IW	13.8	29.4	H_2	BM	BM	N	N	N
1	22	SC	3.5	4	3	WE	19	2	Ad	J	FW	De	.....	IN	13.8	29.4	H_2	BM	BM	N	N	N
1	16.8	SC	3.5	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
1	12.65	SC	3.5	4	3	WC	11	2	Ad	J	WC	De	.....	.....	13.8	13.52	Air	.....	.....	N	N	N

Al - Aluminum
AlB - Aluminum brass
Am - Ammonia
An - Anthracite
Ar - Arsenical admiralty
Au - Auxiliary
Br - Brass
C - Coal, bituminous
CC - Cross compound
D - Delayed coke
Ni - Copper-nickel
Cy - 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	11-65	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		1	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	3525	1800	1000	
10	ENEL	Livorno, Italy	Marzocco	BBC – Mannheim	2	10-65	55	1060	1320	1004	
11	ENEL (ADEL)	Venice, Italy	Fusina		3	12-64	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	518	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	Tromoay	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	Stader Hurter 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	Kansai, Japan	Himeji 2		2	3-64	125	1240	2400	1050	
37	Amal of Australia Proprietary Ltd	Queensland, Australia	Angiesea		1	4-68	150	750	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	11-64	30	360	900	850	
42	Ryukyu Electric Power Corp	Naha, Okinawa	Kin	Kuljian Corp	4	7-65	35	340	364.7	900	
CENTRAL AND SOUTH AMERICA											
43	Servicios Electricos Gran Buenos Aires	Buenos Aires, Argentina	Costanera	Merz & McLellan	5	10-68	175	935	1250	1045	
44	Companhia Energetica de Minas Gerais	Sabara, Brazil	Santa Luz	Gibbs & Hill, Inc		1-65		599	1800	1000	
45	Portland Electric Power Co	Portland, Oregon	Portland Gen B	Preece, Cardew & Rider		1-64		675	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 tri-sector air heaters, ea 300 sq ft each
7 - Gas bypass dampers, water spray in gas exit
8 - Spare motor-driven pump, 1 000 gpm, 1 535 psi a
9 - Pumping power from surface
10 - Fly ash
11 - One of two units two 50% regenerative heaters
12 - Uhde Ljungstrom type
13 - Heater and generator, respectively
14 - Turbine manufacturer's guarantee heat rate
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 at 35% load
19 - Make-up and condensate treatment, respectively
20 - Engineering joint operated by Canada under the Colombo Plan
21 - Direct contact condenser, dry cooling tower
22 - Dual wall superheater, final and platen stages
23 - Under construction
24 - Estimated installed cost
25 - Three units by AEI, four by EE

DIMENSIONS AS INDICATED ABOVE
Air temperatures

Ax - Axial fans with variable pitch blades
B - Burners
Bal - Balanced
By - Gas bypass
Cy - Cyclone furnace
Cyc - Cyclone dust collector
D - Damper
DB - Dry bottom
DC - Direct contact condenser
ES - Economizer
EX - Flue gas recirculation
FWC - Feed water conditioning
G - Gas turbine
M - Motor
N - Nozzle
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
Wg - Water gas
WS - Water scrub

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

BOILERS																												PROJECT
SURFACE, 1000 SQ FT																	F D FANS			DRIVE		I D FANS			DRIVE			
Boiler &	Superheater	Reheater	Economizer	Air heater	Superheat 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	30	Bal,DB	2	553	HOW	S,V	1665	LDC	2	920	HOW	S,V	2260	LDC	1
					A11	A11,B+					Bal,DB													
					WC	A	-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	A11	A11,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
										4	Pd,DB	2												
31.2	30.5		6	27	WC	WC		47										N	N	N	N	N	N	8
51	182	A11	74		WC	WC	20	695	18.2	36	Pd,DB	2	554	RAT	V	3500	NN	N	N	N	N	N	N	8
25.77	92		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	9
23.3	94		72.6	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	10
33	28	74	23	107	WS GR	WS GR	-0.2	52	16	20	Pd,DB	2	340	MAR	S,V	1540	SIE	N	N	N	N	N	N	
																		2		BUT	V			6
										4	Pd,DB	2						N	N	N	N	N	N	7
48.7	74.5	117.6	30	295	WC,GR TB	WC,GR,TB	-0.2	98.3	15.1	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	-0.65	96.9	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			111.2		6	Ba,ST	1		NOR	D					NOR	D			13
13.3	67	31.3	26.5	116	WC	WC,GR	0.2	61	27.7	16	Bal,DB	2	264	SVF	Aa	1140	ASEA	2	328	SVF	Aa	1280	ASEA	14
14	67	31.3	26.5	116	WC,GR	GR	6.5	36.4		16	Pc	2	267	SVF	V	770	ASEA	2	285	SVF	V	565	ASEA	15
8.45	50		18.7	72.5														2	240	SVF	V	99	ASEA	16
										4	Bal	2	140	SVF	V	90	BRP	2	68	D	V	185	BRP	17
15	6	N		9.4	WC	N		9.2	29.4	4	Bal	1	50.2	D	V	115		2		KKK	D			18
13.7	4.82	N	14.7		WS	V	6	55.3		4	Bal	2		NOR	D			N	N	N	N	N	N	19
48.4	76.5	38.3	35.2	253	WC	WC		6.99	34.1	6	Pc	1	55.5	CF	V	600	GE	N	N	N	N	N	N	
16.3	4.3	N	N		A11	N	33.4			6														
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		-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	2.05	45	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	A11,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
	19.4	N	3.63	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,A11	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	2.9	58.6	A11	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											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	A11	N		21.6	35.4	6	Pc	1	219	SW	V	1000	TD	N	N	N	N	N	N	33
		N			WS	N	10	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	N	24.5		N				55	Bal	1	117	AT	V,D	60								
7.26	N	N	1.75	6	WS	N	0.25	3.94	26.7															
62	74	34	18	87	WS,FR	A11,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	A11,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	10[17]	336.7	WC	N				6	Bal,DB	2	261	C	V	670		2	558	D	V	1200		37
8.14	30.7	N	4.5	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
								6.56	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	8.1	WC	N	20	6.44	32.5	4	Pc	1	260	WO	V			N	N	N	N	N	N	42
		N	N	26.8	WC																			
8.36	88	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	7.5	76.5	A11	A11,GR	6	55.3		8	Ba,DB	2	122.6	WE	V	300	WE	2	180	WE	D	600	WE	44
5.86	12.55		16.22	42.6	WC	N	6.15	30	20.2	6	Ba	2	134	D	HvC	510	LDC	2	204	D	HvC	520	LDC	45
36.26	10.5	N	N	93.5	A11	N		20.78	29.4	6	Ba				V	400	RE				V	700	RE	46

...CTURERS
...ASEA
...Aberdare Engineering, Ltd
...Allis-Chalmers Mfg Co
...Allgemeine Elektricitats Gesellschaft
...Associated Electrical Industries
...Aston Industries, Ltd
...Aqua Chemical Co
...American Standard, Industrial Div
...Babcock & Wilcox Ltd
...Balcke GmbH
...B,S Leitch Co
...Bentec Industries
...American Water Softener Section, Res Chamberlt Inc
...Bolton Co
...Balcke GmbH
...Brown 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 - T 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
ELG - Elgin & Menes
ENEL - Ente Nazionale Elettricita
EPA - Elliott Process Automation, Ltd
FG - Fisher Governor Co
FIMI - FIMI Sarzuno, SA
FIP - Cie Fives-Pennoet
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	10,350	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	15,000	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	R	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	WO
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	1062	2091	...	HyC	3M	2720	TT	O	17.3	N	N	N	N	N	N	N	....	9	453	71.1	STA,B
16	400,200	1370	HAL	R	3M	450,230	ASEA	O	17.6	N	N	N	N	N	N	N	....	4	360	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	1090	1260	HE	R	3M[15]	1375	HE	C	11.4	4	IC	Ro,Ret	St	CLY	EI	LOD	330	5	388	....	EE
21	1090	1260	HE	R	3M[15]	1400	HE	C	11.4	4	BW	Ro,Ret	St	BW	EI	LOD	240	5	395	....	HN
22	1030	4545	IR	HyC	M	2500	WE	O	18.5	N	N	Ret	Air	....	N	N	250	5	465	465	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	1800	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	120	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	WO
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	566	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	275	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	WO
44	1035	1750	IR	R	M	2250	WE	O,C	....	....	BW	Ret	St	DP	....	....	225	5	453	75	WE
45	415	1085	MPL	..	M	1450	MPL	O,G	13.5,16.5	N	N	Ro,Ret	St	DP	N	N	175	5	420	93	CAP
46	110	....	...	R	1M	450	DRL	C	12.6	3	FW	Ret	St	DP	Me	HOW	164	3	427	27.7	SWE,SC

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

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

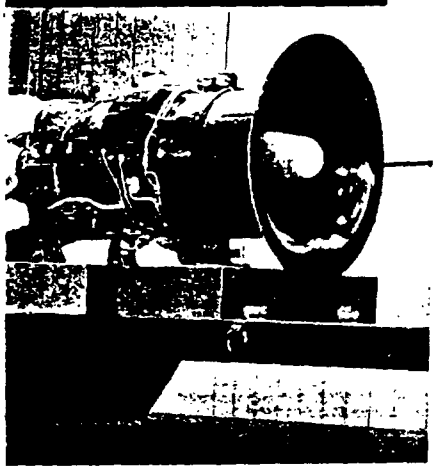
TURBINES					CONDENSER					FEEDWATER				GENERATORS			CONTROLS					PROJECT
	Type	Exhaust in Hg	No. of bleed points	No. of exhausts	Manufacturer	Surface, 1000 sq ft	No. of water passes	Tube material	Air removal	Manufacturer	Makeup treatment	Condensate treatment	System manufacturer	Voltage, kv	Rating, mva	Cooling	Combustion, mfr	Feedwater, mfr	Closed-circuit tv mfr	Data logger	Computer	
	CC	0.8	6		EE	45		CuNi	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	2.0			AEI	300		70 30 Br	Rc	AEI	De			22	588	H_2,Li						
	TC	2.0			EE	300		A,B	Ro	EE	De	De		22	588	H_2,Li,HC	GK	GK	N	N	N	5
	TC	1.25														H_2	ASK	ASK	N	N	N	6
	TC	0.9			BE	54.8	2	SS	Ro	BB	De,Evap	De	DEG									
	TC	0.48			BBR	366	1	Al	Rc	FIP	De			20	665	H_2						
	TC							AlB	Ro		De	Hyd		20	474	H_2,Li	GE	GE	N	N	GE	8
	TC				GE						De	N	MR	22	300	H_2,Li,HC	GE	GE	N	N	N	9
	TC				SE	95		Acl	RP	WO	De	De					ASK	ASK	FIMI	N	N	10
	TC				BB					BB												11
	TC				YC	91	2	AlB,CuNi	J	TO	De	De										12
	TC				YC	140		AlB	J	TO												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[1]	97	3	AlB	Rc,J	STA	De	N	MB	12.5	300	H_2	SIE	SIE	SIE	N	N	15
	CC		5	4	STA	211.9	1	A,B	Rc,J	STA	De	De		12.5	200	H_2	HB	HB		N		16
	RF	0.5	4		STA	10.8	2	AlB	J	STA	So,Evap	F	STA	6.6	16.75	Air	HB	HB	N	N	N	16
	SC	28.35	2	1[4]	TO	11.5	2	AlB	J	TO	Evap	N	AQ	11	15.6	Air	BM	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	AlB	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	100	2	AlB	Rc,J	WO	De	N	AJ	15	189.3	H_2	BM	BM	DP	N	N	22
	TC	3.5	6		SIE	42.4		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	AlB	J	TO	Evac	N		11	15	Air			N	N	N	24
	SC	0.7	3		TC	9	1	AlB	J	EE	Evap,De	Hyd	AQ,PM			Air	BM	BM	N	N	N	25
	TC	1.5	5	2	EE	21	1	AlB	J	EE												
	TC	1.5	6		GE	85	3	AlB	J	FW	De		HT	15	176.5	H_2	BM	BM	DP	N	N	26
	SC	2.5	6		GE	45	2	Acl,CuNi	J	MS	De,So			13.8	78.125	H_2	RF	RF	N	N	N	27
	SC	2.5	6		GE	45	2	Acl,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
	TC	2.75	5		HIT	43.7	2	Ac	J	HIT	De	Hyd	MIT	11	43.13	H_2	BM	BM	N	N	N	30
	SC	2.75	5		MEL	31.02	2	AlB	J	MIT												
	TC	2.5	5		GE	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
	SC	2.5	5		CCE	13.5	1	SSt,AlB	J	VIE	Evap	N	FW	11	16.63	Air	BM	BM	N	N	N	33
	SC		3		DL	DC[21]			J	BLH				11	9.375	Air	BM	BM	N	N	N	34
	TC	1.0	13		GE	290		AlB	Ro	TOS	De	De		22	625	H_2,Li	LN				GE	35
	TC	1.5	8		MHI	709.9	1	AlB	J	MIT	De			24	396	HC	BM	BM	N		N	36
	TC	1.5	8		SIE	61		Acl	RP		De			13.8	167	H_2			N	N	N	37
	TC	1.5	4		AEI,EE[24]	26	2	AlB	J	AEI,EE[24]	Evap,De,Sc	De	PM,HH	11	35.3	Air	GK	ORL	N	N	N	38
	TC		4				2	AlB	J	HIT	De,Seg	O_2	MIC	11	75	H_2	EPA	EPA	M	N	N	39
	SC	2.64	6		MHI	50	2															
	SC	2.51	5		MHI	22.6	2	AlB	J	MIT	De,Sc		KUR	11	37.5	Air	GK	GK	N	N	N	40
	SC	0.5	5		BE	14.5	2	AlB	J	RWG	De,So	Hyd	PM	11	12.5	Air	GK	ORL	N	N	N	41
	SC		6		GE	21.25	2		J	WO	De	De	PM,WC[19]	13.8	29.4	H_2			N			42
	TC	1.4	6		AE	80		Ac	J	WO	Evap,So		MO	13.8	150	H_2	BM	BM	N	N	N	43
	TC				AE	95.5		AlB	J	WE	Sc		EUG	13.5	96	H_2	HCC	HCC	N	N	N	44
	TC	1.5	6		CAP	95		CuNi	J	CAP	Evac,De,Sc		UWS	22.4	53	H_2	BM	ORL	N	N	N	45
	SC		6		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
Adl - 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
Pl - 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

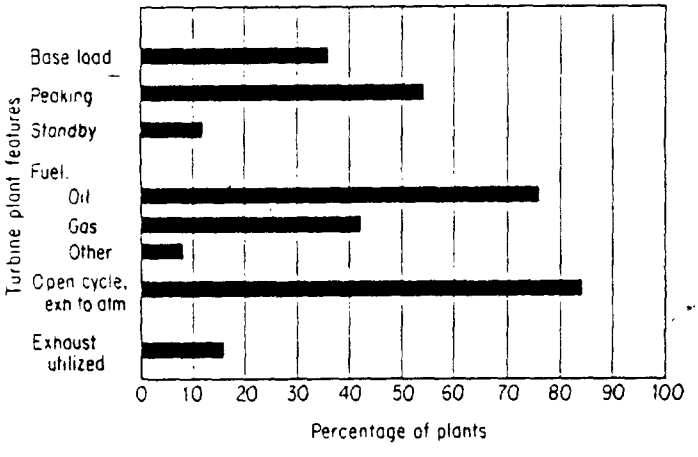


Main use is peaking service although combi cycle plants gain for base load operation

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.

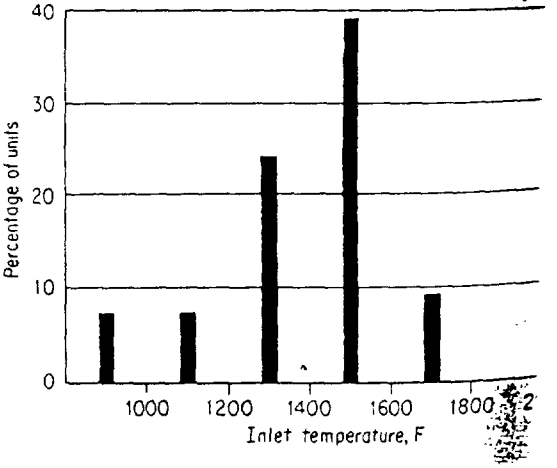
Emergency standby gas turbine sets are finding an important appl in large computer-controlled central stations, where a continuous liable source of power is essential to automatic operation. Since alm these stations are oil-fired, a gas turbine standby set is a logical ap

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



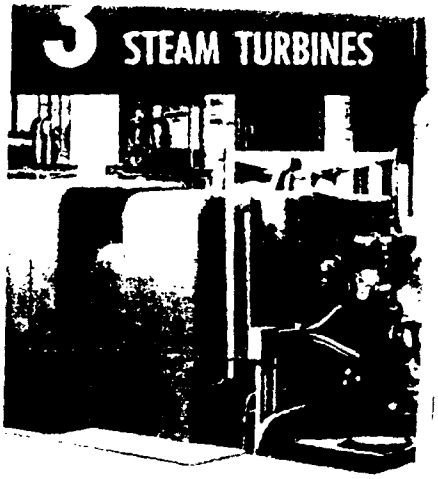
EFFICIENCY of a gas turbine depends to a great extent on temperature. While 1500-1550 F is common, aim is 22

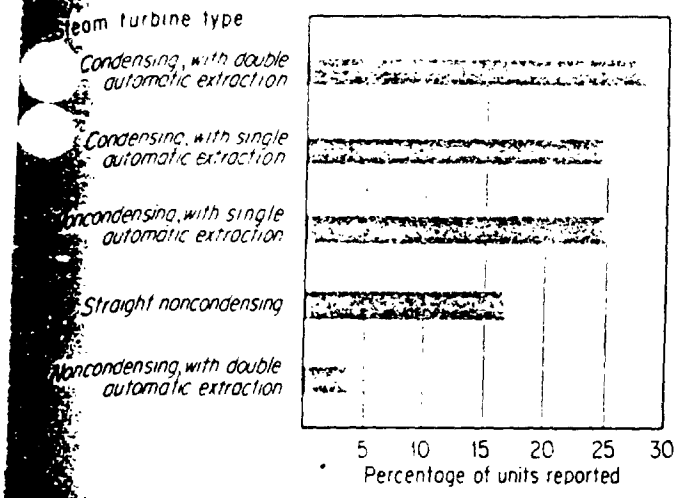
Comparison of gas turbine sizes with those listed in 1963 survey

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





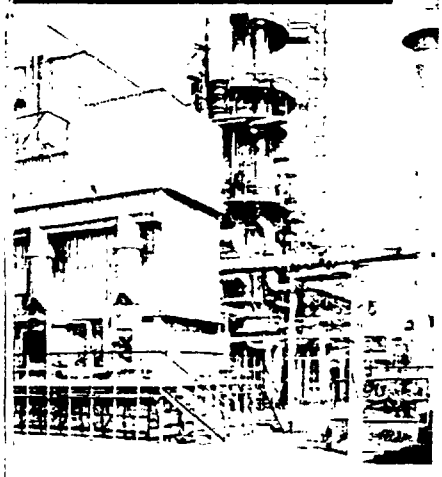
out 45% of all electricity generated in the U.S. sed by industry with about 20% generated within industrial plant. It is generally believed that the end toward self-generation will continue in paper ills, petroleum and chemical plants and, to a lesser tent, in food processing. There is also a trend to 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	Hawaiian Agricultural Co Ltd	Waialua, Hawaii	1	WE	9375	450	650	80	Con	2.5	15	15	Air	N
2	Avtex Chemical Corp	Stevenson, Ala	1	GE	12,000	900	840	....	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, NC	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	4	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	2	425 150	....	....	4
12	Pittsburgh Plate Glass Co	New Martinsville, W Va	1	GE	66,000	1450	950	85	Con	2	80	....	....	1
13	U S Navy	Guantanamo Bay, Cuba	1	WE	7500	600	825	80	Con	3.5	100	20	Air	N
14	S D Warren Co	Westbrook, Me	1	WC	12,500	360	720	80	NC	4	100	4	....	N
15	Empire State Sugar Co	Montezuma, NY	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	5	150	....	....	N
17	Philip Carey Co	Lockland, Ohio	1	WE	6750	1650	930	80	NC	60	175	....	Air	N
18	Owens-Illinois Glass Corp	Brierisland, Va	1	WE	6750	650	750	80	Con	3.5	175 30	....	Air	N
19	Alabama Kraft Co	Mantt, Ala	1	WE	25,000	850	825	80	Con	3.5	160 5	....	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	80	NC	150	.....	....	....	N
22	St Croix Paper Co	Woodland, Maine	1	GE	20,000	850	825	80	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	15,000	1500	825	85	NC	360	400	....	....	N
25	Crown Zellerbach Corp	Camas, Wash	1	GE	24,000	875	725	85	Con	2	160 60	....	....	N
OVERSEAS TURBINE INSTALLATIONS														
26	Industria Chimica Italiana	Milan, Italy	1	AEG	30,400	2850	800	....	NC	30	....	....	Air	477
27	Badische Anilin und Soda Fabrik BASF	Ludwigshafen, Germany	1	AEG	25,000	1940	955	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	2.5	50	20	Air	161
30	Montecatini	Pisticci, Italy	1	TC	60,000	2050	1004	....	Con	1	4	9?	H2	182
1	Concepcion Fernen	Tenenauro, Chile	1	GE	5000	625	824	80	Con	2	157.43	....	....	188, 189
2	Cartone ed Euro	Caserta, Italy	1	GE	4000	527	756	80	Con	2	20	....	....	N
3	Water Development Authority	Israel, West Africa	1	WE	30,000	1250	950	80	Con	3.5	.....	....	....	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).

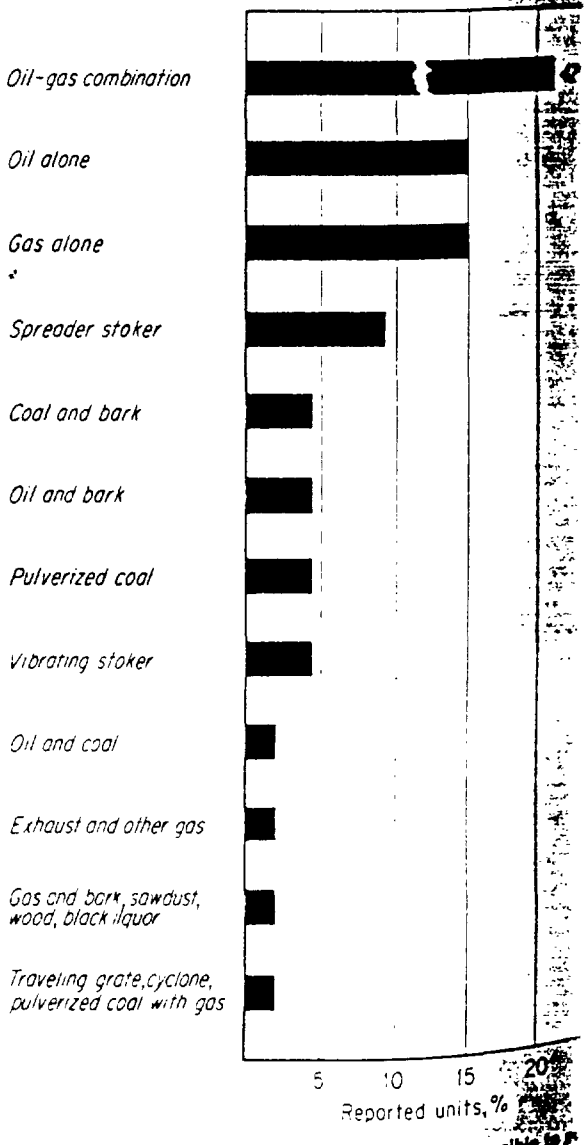
Most striking feature of the boilers su is the great flexibility of their firing equipme

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.

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

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.

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	Wisconsin 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	Procter & 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	650	600	19.8	O,Bk,SD	3	
13	Bowaters Southern Paper Corp	Calhoun, Tenn	Rust Engrg Co	1966	Ex	Pr	1 Fi	CE	274	650	825	58.5	BL	0.5	
14	Kaiser Aluminum & Chemical Corp	Baton Rouge, La		1965	Ex	P_2,Pr	1 Fi	RS	225	650	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,G	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		G,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	560		O	0.3	
32	U S Navy		Bureau of Yards & Docks	965	New	P_2	2 Pk	WB	50	600	488	4	O		
33	U S Navy	Norfolk Shipyards, Va	Bureau of Yards & Docks	964		Pr	1 Pk	WB	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	Sodemoim, 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	WB	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	199	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	410	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	Koppers Co	Parrigora, Pa		1965	Ex	Pr	1 Fi	EC	50	250	Sat	6.5	S	3.5	
57	Aerojet Chemical Inc	El Dorado, Ark		1965	Ex	P_2	1 Pk	KEE	50	200	Sat		S		
58	Rayonier Inc Pulp	Jesup, Ga		1965	Ex	Pr	1 Pk	CE	100	250	Sat	5.5	S	3.5	
59	Buckeye Cellulose Corp	Perry, Fla	Hicks & Ingles	1964	New	Pr	1 Pk	BW	25	100	Sat	2.1	S		
60	Food Machinery & Chemical Co, Bartlett Div	San Jose, Calif		1965	Ex	Pr	1 Pk	KEE	15	250	Sat	1	S		
61	Mayfair Investment Co	Dallas, Texas	Dunwart & Warner	1965	New	P_2,SH	3 Pk	VO	12	225	Sat		S		
62	Mayfair Investment Co	Dallas, Texas	Dunwart & Warner	1965	New	P_2,SH	1 Pk	VO	30	225	Sat		S		
63	Food Machinery Chemical Co, Pr	Westlake Park, Ohio		1965	Ex	P	2	VO	35	200	Sat		S		
64	Food Machinery Chemical Co	Institute, WVa		1964	Ex	Pr	2 Pk	VO	40	225	390	5	S		
65	Parsons Paper Co	Fitchburg, Mass		1964	Ex	P_2,P	1 Pk	BW	30	250	620	2.5	S		

MANUFACTURERS

AC	- A-C-F Chanmers 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	- Electric Heating Corp	BG	- ITT Bell and Gossett Hydronics	CB	- Cleaver Brooks Co, Springfield Boiler Div	DAR	- Darling Bros
AMP	- American Marsh Pumps Inc	BIG	- Bigelow Co	CBC	- Cooper-Bessemer Corp	DHP	- Dean mill 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	- Barney 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	CSE	- Spen Co	ECA	- Electronics & Combustion Co
				CSM	- Conract Controls Co, Inc		

FIRING EQUIPMENT: Stoker or	Burner type, No. per boiler	Burner manufacturer	Soot blowers mfr & No	Dust collector type	Dust collector mfr	AIR HEATER: Type	Manufacturer	No. per boiler	F-D FANS: Manufacturer	Type drive	No. per boiler	I-D FANS: Manufacturer	Type drive	BOILER FEED SYSTEM: No. of pumps	Manufacturer	Type drive	Feedwater treatment	COMBUSTION CONTROL: Type	Control manufacturer	Corresponding turbine project No.	PROJECT
N	[illegible] Me	[illegible]	[illegible]	N	N	[illegible]	APC	.	WE	V	N	N	N	[illegible]	PP	Du	Ca,F,Mu	Co	RF	7	1
CE			[illegible]	Me	WF		N		WE	V	N			Co			Ca,F,So,Z,Mu	Pn			2
BW	[illegible] Me	BA	[illegible]	Me	WF	[illegible]	APC		SW	M	N	N	N		PP	M	EV	Pn	RF	12	3
DSC	[illegible]	FA	[illegible]	Me	FAA		BW	1	WE	M		WE		3 4	BPC	T	Mu	Pn	BM	11	4
CE	[illegible]	[illegible]		Me	[illegible]	Re	APC		AB	T		AB		Ex			Ex	Pn	HCC		5
N	[illegible] SA	[illegible]		N	N	[illegible]	APC		CF	V	N	N	N		BPC	M	Z,Mu	Pn	BMC		6
CE	[illegible] SA	[illegible]	[illegible] DP	Me	[illegible]	[illegible]	APC		BF	Tu		AT	M		BJ	Du	So,Z	Pn	BM	5	7
N		[illegible]	N	N	N	N	N			Tu	N	N					Mu	Pn	CE		8
CE	[illegible]	[illegible]	[illegible] DP	Me	[illegible]	Re	APC		WE	Tu		WE			UP	T	Ca,F,Mu,In	Pn	F	6	9
N	[illegible] Me	PEC	[illegible]	N	N	Re	A[illegible]	.	CF	M	N	N	N		PP	M	EV	Pn	CV	10	10
N	[illegible]	FW	N	N	N	N	N		SW	T	N	N	N		PP	M,T	F,So,Z	Pn	F	4	11
RS	[illegible] Me	[illegible]	[illegible]	Me	WF		RS		SA	V		SW			GP		So,Z	Pn	BV		12
N	[illegible] BL	[illegible]	[illegible] DP	[illegible]	[illegible]		AT		AS	V		AS	M			M,T	Mu,In	Pn	BM		13
N		[illegible]	N	N	N	Re	APC		CF	T	N	N	N		PP	T	Mu,EV	Pn	F		14
CE	[illegible] Ta	CE	[illegible] DP	Me	RC	Tu	CE		SW	M		SW	M		IR	M,T	Mu,In	Pn	BM	5	15
FW	[illegible]	FW	[illegible]	Me	RC	Re	APC		WE	V	N	N	N	Ex	PP	M,T	Z,Mu	Co	RF		16
N	[illegible] Cc	PEC		N	N	N	N		CF	M	N	N	N	Ex	PP	M	Ca,F,Z,In	Pn	RF		17
RS	6 SA	RC ENG	[illegible] DP	Me	AT	Tu	RS	2	AS	T		AS	T	[illegible]	RWO	M	Mu	Pn	BM	..	18
	1 COC	FW	[illegible] DP	N	N	N	N			V	N	N	N	2	IR	T	Z	Co	BM	..	19
N	12 SAF	CE	30 DP	E[illegible]	RC	S[illegible]	As		SW	T		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	[illegible] CV	Me	WP	St,Tu	CE		SW	M		SW	T	1	BJ	M	Mu,In	Pn	BM	3	22
CE	[illegible] SA	BW	[illegible] DP	N	N	Re	APC	1	CF	M	N	N	N	[illegible]	BJ	M,T	Mu,In	Pn	BM	..	23
N	3 SA	CE	[illegible] CV	N	N	Re	APC		CF	M	N	N	N	Ex	AC	M,T	Ca,F,Z,Mu,In	E	HAY	..	24
CE			[illegible] CV	Me	PD	N	N		BF	T	1	BF	T	1	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	AA	[illegible]	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]	W/E	[illegible] CV	N	N	N	N	1	AS	V	N	N	N	2	UP	M,T	Mu	Pn	F	..	32
N		W/E	[illegible] DP	N	N	N	N	1	AS	M	N	N	N	2	UP	M,T	Mu	Pn	F	..	33
N		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
.C	3 SA	BW	5 DP	Me	BRL	Tu	BW	1	GF	Du	[illegible]	FAA	Du	2	WO	T,M	EV,In	Pn	BM	..	36
	4 SA	CE	6 CV	N	N	N	N	2	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	1	WO	T	Sc	Pn	BM	.	38
RS	4 SA	RI	[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	2	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	M	2	SW	M	3	BPC	M,T	So,Z,In	Co	BM	20	46
HCE	N	N	[illegible] DP	Me	AT	N	N	[illegible]	WE	M	1	WE	M		.	...		Pn	HCC	..	47
N	[illegible]	PEC	N	N	N	N	N	[illegible]	SW	M	N	N	N	Ex	WO	M,T	Co,F,Z,In	Pn	BM	..	48
RS	[illegible]	FC	[illegible] CV	Me	AT	Re	APC	[illegible]	AT	M		AS	M	Ex	GP	M	So	Pn	BM	.	49
N	2 BL	BW	25 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] DP	Me	FAA	N	N	[illegible]	FAA	M	.	FAA	M			...	Z	E	PEC	.	52
N		FW	[illegible] DP	N	N	N	N	[illegible]	CF	M	N	N	N	[illegible]	BF	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	1	WO	M	Z,In	Co	BM		55
EC	N	N	DP	Me	FAA	N	N	[illegible]	CF	-		CF	T	[illegible]	IF	M,T	Z	Pn	HCC	.	56
N		COE	N	N	N	N	N	[illegible]	COE	M	N	N	N	[illegible]	DHP	M,T	In	Co	COE	..	57
	SA	COE	[illegible] DP	N	N	Re	APC	.	CF	M	N	N	N		...	-	Ca,F	E	HAY	..	58
N	Me	FW	DP	N	N	N	N		CF	M	N	N	N	[illegible]	IR	M	Z,In	Co	BV	...	59
N		COE	N	N	N	N	N	[illegible]	COE	M	N	N	N	.	GP	Du	So,Z,In		COE	.	60
N			N	N	N	N	N	N	N	N	N	N	N	Ex			In		-		61
N		COE	N	N	N	N	N	[illegible]	VO	M	N	N	N	[illegible]	WO	M,T	In		...	.	62
N		COE	N	N	N	N	N		AL	M	N	N	N	[illegible]	WO	M,T	Z,In	Co	COE		63
N		COE	N	N	N	N	N	.	COE	M	N			Ex	AC	M,T	Ca,F,So,Z,In	Co	COE		64
N	1 SA	COE	DP	N	N	N	N	.	COE	M				[illegible]		M	In	E	COE		65

EL - Elliott Co
ENG - Engineer Co
F - 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
- Green Fuel Economizer Co, Inc
- Gould Pumps, Inc
- 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 - Recoil 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: 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: Fuel	Max. sulfur content, %	FURNACE: 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	Texize 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	250	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	100	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	G		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	MW	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	6	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	1 Fl	BW	60	130	Sat	6.5	SD,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	1 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	200	135	Sat	3.4	O		Pd	Ir
102	Ternstedt, GMC	Elyria, Ohio		1965		Pr	1 Fl	WIB	100	150	Sat	7.3	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 Mahan	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	9.1	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	160	Sat	9.2	O	3.5	Pd	
109	Seattle Steam Co	Seattle, Wash	Bouillon, Christofferson & Schairer	1965	Ex	Pp,SH	1 Pk	CE	120	165	Sat		O		Pd	UV
110	Borg, Inc	Chicago, Ill		1965	Ex	Pr	2 Pk	MW	44	150	Sat	3.2	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	Pr,SH	2 Pk	BW	20	125	Sat		O,G		Pd	Ir
113	Murray Corp	Scranton, Pa		1964	Ex	Pr,SH	1 Pk	BW	50	130	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	3.3	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	50	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	1.0	BD	N
119	Fletcher Oil Co	Wilmington, Calif		1964	Ex	Pr	1 Pk	BRO	20	150	Sat	2.9	G		Pd	UV
120	Dr Dansbury's Lab	Charles City, Iowa		1965	Ex	Pr	1 Pk	BRO	50	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	130	Sat		O		BD	N
123	S C Johnson & Sons, Inc	Wax Lake, 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	Nitram 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 - Backsiae
BD - Balanced draft
BF - Blast furnace gas
Bk - Bark
Bo - Bowl mill
BL - Black liquor
C - Coal, bituminous
Ca - Cogeneration
Co - Continuous ignition
Cp - Combined pneumatic and electronic
Cst - Cutter spreaders
Cw - 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
Fl - Field-erected

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 - Hydrazine
- 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 - Sraig 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	Manufacturer	Capacity each, 1000 lb per hr	Operating pressure, psig	Operating temp, F	Heating surface, 1000 sq ft, incl superheater	FUEL: Fuel	Max sulfur content, %	FURNACE: Furnace type	Furnace safeguard, type	Manufacturer
171	Oscar Mayer & Co	Chicago, Ill		1964	Ex	Pr	1 Pk	CE	30	210	Sat	2.8	O,G	2.25	...	UV	ECA
172	Linde Div Union Carbide Corp	Moorhead, Ala		1965	New	Pr	2 Pk	VO	35.5	300	Sat	8.9	G	....	...	UV	ECA
173	Veterans Administration Hosp	Marion, Ind		1964	Ex	Pr,SH	1 Fr	VO	30	125	Sat	4	C	3	BD	N	■
174	Pepsi Cola	West Kankakee, Ill		1965	Ex	Pr,SH	1 Pk	BW	50	150	Sat	.	G	...	...	....	ECA
175	N.A.W. Tobacco Co	S Windsor, Conn	Seitz Engrg Co	1965	Ex	Pr	1 Pk	CE	35	190	Sat	....	O	..	Pd	....	—
176	Baltimore City Hosp	Baltimore, Md	Henry Adams	1965	Ex	SH	1 Pk	BW	50	125	Sat	4.4	O	2.5	BD	UV	■
177	Lenoir Memorial Hosp	Butner, NC	W C Olsen & Assoc	1965	New	Pr	3 Pk	BW	100	125	Sat	.	O,G	...	Pd	UV	ECA
178	Kennebec Pulp & Paper Co	Madison, Me		1965	Ex	Pr	1 Pk	BW	25	125	Sat	2.7	O	...	...	....	■
179	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
180	Bongards Creameries	Bongards, Minn	Babcock & Wilcox Co	1964	Ex	Pr,Pr	2 Pk	BW	50	175	Sat	5	O,G	.	Pd	Ir	■
181	Stonecutter Mills Corp	Spindale, NC		1965	Ex	Pr	1 Fr	BW	55	135	Sat	6.5	C	..	BD	N	■
182	Williams College	Williamstown, Mass	Lockwood Greene Engrg	1965	Ex	SH	1 Fr	KEE	50	125	453	7.3	C	1	BD	....	....
183	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
184	Penn Packing Co	Philadelphia, Pa	A L Colabella	1965	Ex	Pr	1 Pk	FW	35	100	Sat	4	O,G	...	Pd	UV	■
185	Montefiore Hosp	Bronx, NY	M Caretsky Assoc	1963	Ex	Pr,SH	2 Fr	BW	100	115	Sat	.	O	.	Pd	Ir	ECA
186	Methodist Hosp	Memphis, Tenn	Allen & Hoshall	1965	Ex	SH	1 Fr	BW	30	110	Sat	5	O	...	BD	....	....
187	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
188	Thoreson P & R Rubber Co	Lincoln, Neb		1965	Ex	Pr	1 Pk	BW	50	125	Sat	5.1	O,G	...	BD	Ir	ECA
189	Marcolt Paper Products Co	Milwaukee, Wis		1965	Ex	Pr,SH	1 Pk	SP	30	175	Sat	3.1	O,G	...	Pd	Ir	ECA
190	Mercy Hosp	San Diego, Calif	Dunn & Ryan	1965	Ex	Pr,SH	1 Pk	BW	28	150	Sat	...	O,G	....	Pd	Ir	ECA
191	Carolina Agricultural & Technical College	Greensboro, NC	Watson Engrs	1965	Ex	Pr,SH	1 Fr	CE	20	125	Sat	4.7	C	.	BD	N	■
192	Aultman Hosp	Canton, Ohio		1965	Ex	SH	2 Pk	BW	24	150	Sat	2.7	G	.	Pd	....	....
193	St Joseph's Hosp	South Bend, Ind		1965	New	Pr,SH	2 Pk	BW	24	110	Sat	2.7	O,G	....	Pd	UV	ECA
194	New Mexico State University	University Park, NM	Bridgers & Paxton	1965	New	SH	2 Pk	RFE	38	125	Sat	4.4	O,G	....	Pd	UV	■
195	Stamford Hosp	Stamford, Conn	Segnar & Dalton	1965	Ex	Pr,SH	1 Pk	KEE	21	125	Sat	....	O,G	....	....	....	—
196	Pet Milk Co	Greenville, Ill		1965	Ex	Pr	1 Pk	KEE	20	145	Sat	3	C	3.12	BD	N	■
197	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
198	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
199	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
200	U S Dept of Agriculture	Beltsville, Md		1965	Ex	SH	1 Pk	BW	22	110	Sat	2.5	O	.	Pd	Ir	—
201	Airtemp Plant Addition, Chrysler Corp	Dayton, Ohio	Giffels & Rossetti	1965	Ex	Pr,SH	1 Fr	WIB	60	175	Sat	6.8	C	2.5	BD	N	■
202	Limestead Hosp	Butner, NC	Wm C Olsen & Assoc	64-65	Ex	SH	3 Pk	BW	125	Sat	40	3.3	O,G	....	Pd	UV	ECA
203	Chase Gardens	Eugene, Ore	C C Moore & Co	1964	Ex	SH	1 Pk	BW	40	150	Sat	3.9	G	.	Pd	Ir	■
204	Montana State University	Missoula, Mont	R L Preussing Engrs	....	Ex	SH	1 Fr	KEE	20	125	Sat	1.0	G	.	BD	UV	■
205	H B Klement Rubber Co	College Point, NY	Walter Kidde Constructors	1965	Ex	Pr,Pr,SH	1 Pk	BW	50	150	Sat	....	O	....	....	....	—
206	Duggies Co	St Louis, Mo	McClure & Assoc	1965	New	Pr,SH	1 Pk	CE	20	165	Sat	2.25	O,G	...	...	....	■
207	Armco Steel Corp	Ambridge, Pa		1965	Ex	Pr,SH	1 Fr	BW	37.3	150	366	9.5	C	1.34	Pd,DB	N	■
208	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)																
209	Brigham Young University	Provo, Utah	Paul L Geringer & Assoc	1965	Ex	SH	1 Fr[4]	BW	400	250	400	. .	C	0.5	BD	....	—
210	IBM Component Div	Burlington, Vt	Theo J Kaufield	....	New	SH	2 Pk[5]	IBW	100	250	400	3	O	.	....	....	—
211	NASA Flight Center	Mashall, Miss	U S Army Engineers	...	..	SH	3 Pk[5]	IBW	45	250	400	1.7	G,RF	..	....	....	—
212	Florida Atlantic University	Boca Raton, Fla	Dignum Assoc	..	New	SH	1 Pk[5]	IBW	28.4	250	250	1.6	O,G	....	....	....	—
213	S Connecticut State College	New Haven, Conn	Westcott & Mapes	..	New	SH	2 Pk[5]	IBW	100	425	450	. .	O,G	...	Pd	UV	—
214	New York State University	Vestal, NY	Syska & Hennessey Inc	..	New	SH	4 Pk[5]	IBW	250	250	400	10.5	C,G	....	Pd	UV	—
215	New York State University	Plattsburgh, NY	Syska & Hennessey Inc	..	New	SH	3 Pk[5]	IBW	175	135	350	7.3.6	O	....	Pd	UV	—
216	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	—
217	Corning Glass Works	Corning, NY	Jaros, Baum & Bolles	...	New	Pr,SH	2 Pk[5]	IBW	70	250	400	1.3	O,G	.	Pd	UV	—
218	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																
219	Västerås Kabelverk AB	Västerås, Sweden		1963	New	Pr,SH	2 Fr	MOT	4900	1800	1000	100	O	2	BD	UV	■
220	Gas and Waterworks	Mannheim, Germany	Rhein-Neckar AG	..	New	Pr,Pr,SH	1 Fr	ASG	129	1800	552	13.3	O	....	Pd	Me	■
221	Virgin Islands Water & Power Authority	St Thomas, VI	Burns & Roe	1965	Ex	Pr	2 Pk	CE	65	600	750	.	O	3	Pd	....	—
222	Montecatini	Fusina, Italy		1966	New	Pr,Pr	1 Fr	TO	1190	2090	1004[6]	51	O	....	Pd	....	—
223	Edison Montana	Ravenna, Italy	Compagnia Tecnica Industrie Petroli	1965	New	Pr,Pr	1 Fr	TO	42	327	590	5.4	O,EG	4	Pd	....	—
224	Montecatini Edison Petrochemical	Pontelongo, Italy		1965	Ex	Pr,Pr	1 Fr	TO	177	597	734	15.5	O,G	4	Pd	....	—
225	Rosandra Plant	Tuzla, Yugoslavia	Dham Projekt	1966	Ex	Pr,Pr	1 Fr	TO	154	625	806	3.3	O,G	4	Pd	Ir	—
226	Fertilizer Plant Arles	Fos-sur-Mer, France	The Lummus Co	1966	New	Pr	2 Fr	BW	150	750	770	14	O,G	3.4	Pd	Ir	—
227	Petrochemical Refinery	Talcahuano, Chile	The Lummus Co	1965	New	Pr,Pr	1 Fr	CE	75	650	750	4.7	Rec	.	Pd	N	—
228	Petrochemical Refinery	Talcahuano, Chile	The Lummus Co	1965	New	Pr,Pr	3 Pk	CE[7]	50	650	750		O,G	....	Pd	UV	—
229	Lloyd Register of Shipping	Banbury, England	Matthew Hall Engrg, Ltd	1964	New	Pr	.	THO	60	250	Sat	.	O,Cat	.	BD	....	—
230	Wellcome Foods Ltd	Kent, England		1964	New	Pr,Pr	1 Fr	ICE	150	300	315	.	O	4	BD	EI	■
231	Rubber Regenerating Co Ltd	Burton, England		1965	New	Pr	2 Fr	THO	23	200	Sat	.	O	1.3	BD	Me	■
232	Thermal Insulating Industries	Milton, England		1966	Ex	Pr,Pr	1 Fr	BWL	633	2000	1025	.	O	..	Pd	N	—
233	UKEA	Ashtara, Turkey		1965	Ex	Pr	1 Fr	TO	106	640	842	9.3	O	.	Pd	....	—
234	Scott & Co	Edinburgh, Scotland		1965	Ex	Pr,SH	4 Pk	THO	30	150	Sat	4	O	.	Pd	UV	■
235	Bruce Peebles		Jackson & Moreland	1963	Ex	Pr	1 Fr	CE	630	1750	1000	45.5	O,Tw	3	BD	TV	■
236	Caribbean Petroleum Co	Bayamon, Puerto Rico		1966	New	Pr,Pr	1 Fr	RS	75	325	530	10.4	O,EG		Pd	UV	—

MANUFACTURERS NOT PREVIOUSLY LISTED

ABC - ABCO Ltd
ABE - Aberle Energ 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: Stoker or pulverizer mfr	Burner type No. per boiler	Burner manufacturer	Soot blowers mfr & No	Dust collector type	Dust collector mfr	AIR HEATER: Type	Manufacturer	F-D FANS: No per boiler	Manufacturer	Type drive	I-D FANS: No per boiler	Manufacturer	Type drive	BOILER FEED SYSTEM: No of pumps	Manufacturer	Type drive	Feed-water treatment	COMBUSTION CONTROL: Type	Control manufacturer	Corresponding turbine project No.	PROJECT
N	SH	COE	1 CV		N	N	N	1	COE	M	N	N	N	3	DBP	M	Sc,Z,In	E	COE	.	131
N		COE	N	N	N	N	N	1	COE	M	N	N	N	...	GP	M	Z	Co	COE	.	132
HCE	N	N	3 CV	Me	PC	N	N	.	CF	M	1	CF	M	Ex			Z	E	.	.	133
N		BW	N	N	N	N	N	.	CF	M	N	N	N	2	W	M,T	Sc,Z,In	Co	.	.	134
N	1 SA	PEC	CV	N	N	N	N	1		M	N	N	N	2	IR	M,T	In	..	.	.	135
N	2 SA	PEC	2 DP	N	N	N	N	1	CF	M	N	N	N	1	IR	Du	Sc,Mu	Pn	HCC		136
N	2 SA	BW	2 DP	N	N	N	N	1	CF	M	N	N	N	1	IR	T	In	Pn	BM		137
N	1 SA	BW	N	N	N	N	N	1	CF	M	N	N	N	1		M	In	E	RE	.	138
N	1 SA		1 CV	N	N	N	N	1	BF	M	N	N	N	2	BE	M,T	F	Pn	HCC	.	139
N	1 SA	BW	1 DP	N	N	N	N	1	CF	M	N	N	N	1	AC	T	In	Pn	BM	.	140
	N	N	2 DP	Me	WP	N	N	1	SW	M	1	SW	M	2	GP	M,T	In	Pn	RF	..	141
DSC	N	N	2 DP	N	N	N	N	1	CF	M	.	CF	M	2	WPI	T	Sc	Pn	BV	.	142
N	1 SA	COE	2 CV	N	N	N	N	1	AL	M	N	N	N	Ex			Sc,Z	Pn	RV	.	143
N	1 SA	COE	1 CV	N	N	N	N	1	RE	M	N	N	N	1	IR	M	Sc,Z	E	COE	.	144
N	1 SA	BW	1 DP	N	N	N	N	1	CF	M	N	N	N	2	WO	M,T	In	Pn	BV	.	145
N	1	WED		N	N	N	N	1	N	N	N	CF	M	1	IR	M	In	E	HCC	..	146
N	1 SA	COE	2 DP	N	N	N	N	1	AL	M	N	N	N	1	GP	T		Pn	BM	.	147
N	1 SA	BW	2 DP	N	N	N	N	1	CF	M	N	N	N	1	WO	M	So,Z	Co	HCC	...	148
...		CF	1 DP	N	N	N	N	1	CB	M	N	N	N	2	FM	M	Z,Mu	...	....	...	149
N	1 SA	BW	N	N	N	N	N	1	CF	M	N	N	N	2	....	M	Z,In	....	....	...	150
CE	N	N	3 DP	Me	AT	N	N	1	CF	M	1	CF	M	1	DL	T	In	E	HAY	..	151
N	BW		N	N	N	N	N	1	CF	M	N	N	N	1	WSP	M,T	Z	Pn	BV	..	152
N	1 SA	BW	1 DP	N	N	N	N	1	CF	M	N	N	N	1	IR	M	Z,In	E	HAY	..	153
N	1 SA	FA	3 CV	N	N	N	N	1	CF	M	N	N	N	1	IR	M,T	Z	...	...	..	154
N	2 RC	WNB	1	N	N	N	N	1	WEB	M	1	WIN	M	Ex	...	..	In	....	....	..	155
LC	N	N		N	N	N	N	1	....	M	N	N	N	Ex	..	..	Ca,Sc,Z,In	Co	HAY	...	156
N	1 US	TC	DP	N	N	N	N	1		M	1	..	M	1	GP	M	Z,In	Ei	CCI	...	157
N	1 SA	PEC	CV	N	N	N	N	1	CF	M	N	N	N	1	SHA	M	Sc,Z,In	Ei	HAY	....	158
N	1 SA	COE	1 DP	N	N	N	N	1	AL	M	N	N	N	2	IR	M,T	Sc,In	Pn	BM	...	159
N	1 SA	BW	1 DP	N	N	N	N	1	...	M	N	N	N	2	..	M,T	In	Pn	BM	....	160
DSC	N	N	4 DP	Me	AAF	N	N	1	SW	M	1	SW	M	2	GP	M,T	...	Pn	BM	...	161
N	1 SA	BW	1 DP	N	N	N	N	1	CF	M	N	N	N	Ex	IR	M,T	In	Pn	BM	....	162
N	1	BW		N	N	N	N	1	CF	M	N	N	N	2	AC	M	Ev,In	Pn	BV	.	163
....	2	WED	N		N	N	N	1	AC	M	N	N	N	1	DHP	T	So,Z,Mu,In	Co	BM	....	164
...		BW		N	N	N	N	1	CF	M	N	N	N	2	IR	M,T	....	Pn	BM	..	165
N	1 SA	PEC	1 CV	N	N	N	N	1	CF	M	N	N	N	2	..	M	Z	EI	PEC	...	166
BW	N	N	2 DP	Me	DRA	N	N	1	WE	M	1	WE	M	2	DL	M,T	Z	Pn	BV	...	167
LS	2 SA	COE	4 CV	N	N	N	N	1	....	Du	1	....	Du	....	....	M,T	In	EI	HAY	....	168
DSC	N	N	2 DP	Me	WP	N	N	1	FAA	M	1	FAA	M	2	WS	M	..	Pn	BM	....	169
N		WNB	2 DP	N	N	N	N	1	CB	M	N	N	N	..	..	...	..	Pn	HCC	...	170
N	1 AA	FLA	2 DP	N	N	N	N	N	N	N	N	N	....	....	...	...	....	Pn	HCC	...	171
N	1 AA	FLA	2 DP	N	N	N	N	N	N	N	N	N	N	....	...	....	....	E	BC	....	172
N		FEC	2 DP	N	N	N	N	N	N	N	N	N	N	....	....	..	...	Pn	HCC	.	173
DSC		COE	2 DP	N	N	N	N	N	N	N	N	N	N	...	..	..	...	Pn	HCC	....	174
N		WNB	2 DP	N	N	N	N	1	CBC	M	N	N	N	...	.	.	..	Pn	HCC	....	175
RSC		COE	2 DP	N	N	N	N	N	N	N	N	N	N	..	...	..	...	Pn	HCC	..	176
N		TC	2 DP	N	N	N	N	N	N	N	N	N	N	..		.	...	Pn	HCC	....	177
N		WNB	2 DP	N	N	N	N	1	CBC	M	N	N	N	1	BF	M	.	E	...		178
...	9 SA	PEC	24 SC-3	Me	SFF	Re	LJ	4	SFF	M	1	SFF	M	3	ABP	M	M	E	SIE	...	179
N	4 SA	KCC	TTE	N		Re,St	LJ	.	VEN	M	N	N	N	2	REI	M	Ca,Mu	Cc	SH	..	180
N		PEC	4 CV	N	N	N	N	1	SW	M	N	N	N	0.5	WO	M	In	Pn	HCC	29	181
N	16 Ta	TC		N	N	Re	TO	2	TO	M	N	N	N	3	KSB	M,T	Mu	...	HE	30	182
N	4 Ta	TC	5 TC	N	N	Re	TO	1	TO	M	N	N	N	....	....	...	Ev,In	....	...	.	183
N	4 SA	TC	10 TC	N	N	Re	TO	1	TO	M	N	N	N	1	KSB	T	Sc,Z	..	...	28	184
N	4 SA	TC	TCC	N	N	Re	TO	1	TC	T	N	N	N	2			In	Cc	REG		185
N	4 Me	PFL	N	N	N	N	N	.	VEN	Du	N	N	N	2	KSB	-	M	E	F	.	186
N			2 CV	N	N	N	N	.	AL	M	N	N	N	1	..					..	187
...	1 SA	COE	1 CV			..	.	1	AL	M	.	.	.	.	.	DL	Ca,Sc,Z,F,In	Pn	..	2	188
ABC	1 SA	ABC		Me	DAV	TL	THO	2									...	...	...	31	189
N	4 Me	ICC	3 ABE	N		TL	TEL	.	DCC	M	.	DCO	M	.	WEP	M,T	M	Pn	BM	.	190
THO	N	N	DCL	Me	ICL	N	N	.	THC	M	.	DCO	M	2	...	M	...	Pn	BM	.	191
....	8 SA	BWL		N	N	Re,St		.							...			..	.	25	192
N	2 SA	TC	5 TC	N	N	Re	TO	.	TO	M	N	N	N	2	KSS	M,T	Mu	Hr	REG	..	193
N	2 RC		10 CV	N	N	N	N	3	WOM	M	N	N	N	3	WEP	M,T		E	F	...	194
..	12 Ta	CE		N		Re	APC	2	GF	M	.	GF	M	2	IF	M	M	Pn	BM	.	195
N			4 DP	N	N	N	N	2	CB	T	N	N	N	Ex	...	.	Ex	Pn	..	...	196

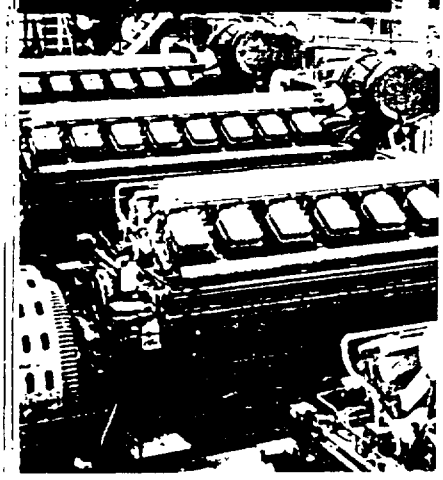
-Svenska Flaktfabriken
-Siemens Schuckertwerke AG
-L & C Steinmueller, GmbH
-Superior Combustion Industries, Inc
-Thermal Efficiency Ltd

THO - John Thompson Ltd
TC - Franco Tosi SpA
TRL - Trist Ltd
VEN - Vente
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

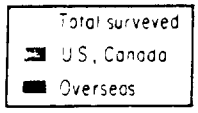


Almost twice as many engines

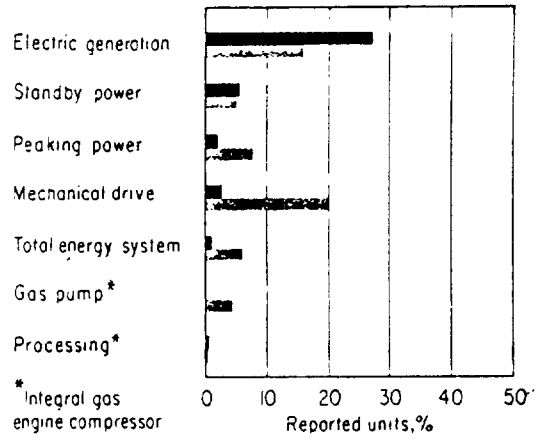
Of special interest here is that of the 712 units surveyed throu the world, only 48% are full diesel. This is mainly due to th nomics and availability of natural gas. Generating electricity i the main use, by over 70%. The fact that the total energy co accounts for 7% of the various uses is worth keeping 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

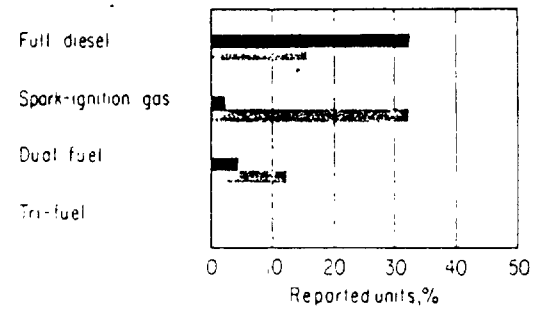


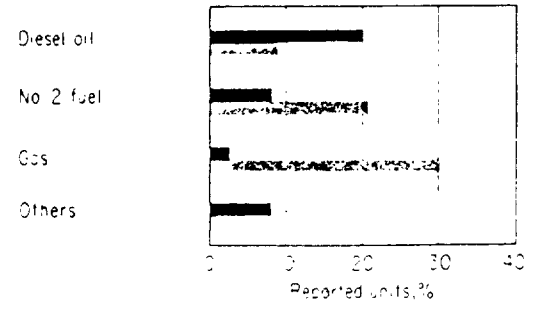
Principal use



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

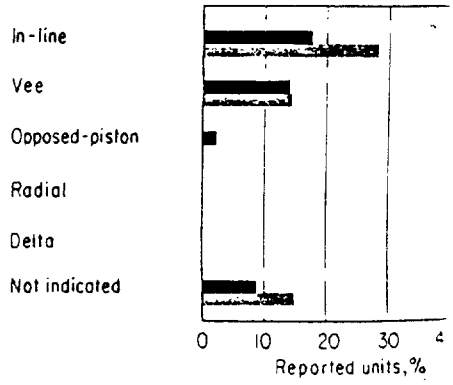
Type engine and fuel used





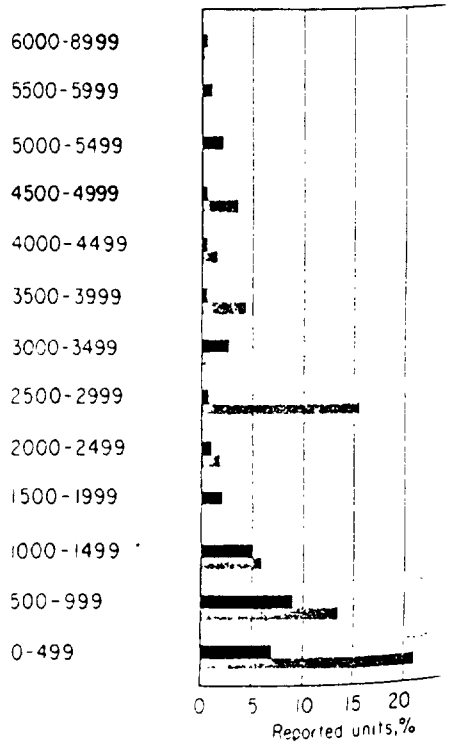
FULL DIESELS overseas are more than double the total in U.S.-Canada, no doubt because natural gas is not available in most other countries

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: Supercharged	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			96.6	NW	Dual	In				Exp	1955	E	CTo	....
	City of Fulton	Fulton, Mo			96.6	NW	Dual	In				Exp	1955	E	Air	....
	Municipal Power Plant	Glencoe, Minn				EN	Dual	Vee				Ext	1936	Ei	Air	....
	City of Waverly	Waverly, Iowa				EN	Dual	Vee				New	1965	E	CTo	....
	City of Hoisington	Hoisington, Kansas			166.3	WC	Dual	Vee				Exp	1939	E	CTo	....
	City of Blair	Blair, Neb				CBC	Dual	Vee	Dc			Exp	1955	Ei	CTo	JW
	Town of Easton	Easton, Md				CBC	Dual	Vee	Dc			Exp	1955	E	CTo	JW
	Municipal Power Plant	Geneseo, Ill				EM	Dual	In				Exp	1962	Ei	Air	....
	City of Clete	Clete, Neb				EM	Dual	In				Exp	1955	E	CTo	....
	City of Brownfield	Brownfield, Texas				NW	Dual	Vee				Exp	1954	Ei	Air	....
	Nantucket Gas & Electric Co	Nantucket Island, Mass				CBC	Dual	Vee				Exp	1965	E	Dir	JW
	City of Kingfisher	Kingfisher, Okla				EN	Dual	Vee				Exp	1955	Ei	Air	....
	City of Burlington	Burlington, Colo				EN	Dual	Vee				Mod	1955	Ei	Air	....
	City of River Falls	River Falls, Minn				EM	Dual	Dc	Dc			Exp	1965	Pk	Air	....
	City of Forest City	Forest City, Iowa			165	CBC	Dual	Vee	Gas			Exp	1965	Ei	CTo	JW
	City of Tonkawa	Tonkawa, Okla			92.8	EM	Dual	In	2			Exp	1965	Ei	CTo	....
	City of Goodland	Goodland, Kan			92.8	EM	Dual	In	2			Exp	1965	Ei	CTo	....
	City of West Point	West Point, Neb		514	178	NM	Dual	Vee	2		1	Exp	1965	Ei	Air	....
	City of New Roads	New Roads, La			178	NM	Dual	Vee	Dc			Exp	1965	Ei	CTo	....
	City of David City	David City, Neb			166	MC	Dual	Vee	2			Exp	1963	Ei	Inc	....
	City of River Falls	River Falls, Minn				EM	Dual	Dc	2			Exp	1965	Ei	Air	....
	City of Kissimmee	Kissimmee, Fla				EM	Dual	Dc	2			Exp	1965	Ei	Air	....
	City of Business	Business, I				EM	Dual	Dc	2			Exp	....	Ei	Air	....
	City of Ellis	Ellis, Kan				EM	Dual	Dc	Dc			Exp	....	Ei	Air	....
	City of Madelia	Madelia, Minn				EM	Dual	Dc	2			Exp	1962	Ei	Air	....
	City of Elkinwood	Elkinwood, Kan				EM	Dual	Dc	2		1	Exp	1965	Ei	Air	....
	City of Meade	Meade, Kan				EM	Dual	Dc	2		1	Exp	1965	Ei	Air	....
	City of Sweston	Sweston, Mo			....	GME	Full	Vee	Dc		3	New	1965	Pk	Air	....
	City of Reading	Reading, Ohio			....	GME	Full	Vee	Dc		3	New	1965	Pk	Air	....
	City of New Smyrna Beach	New Smyrna Beach, Fla			....	GME	Full	Vee	Dc		3	New	1966	Pk	Air	....
	City of Lake Worth	Lake Worth, Fla			....	GME	Full	Vee	Dc		3	New	1965	Pk	Air	....
	Central Kansas Power & Light Co	Bird City, Kan			....	GME	Full	Vee	Dc		3	New	1965	Pk	Air	....
	City Electric System	New West Fla			....	GME	Full	Vee	Dc		3	New	1965	Pk	Air	....
	City of Kaukauna	Kaukauna, Wis			....	GME	Full	Vee	Dc		3	New	1966	Pk	Air	....
	Black Hills Power & Light Co	Rapids City, SD			....	GME	Full	Vee	Dc		3	New	1965	Pk	Air	....
	City of St John	St John, Kan				CBC	Dual	Int	Dc	Rb	1	Exp	1965	Ei	Dir	JW
	City of Newton Falls	Newton Falls, Ohio				WC	Dual	Int	2	Rt	6	Exp	1966	Ei	Inc	....
	City of Oakley	Oakley, Kan				EM	Dual	Int	2	....	1	Exp	1965	Ei	CTo	....
	Town of Culpeper	Culpeper, Va				NM	Dual	Int	4	Rt	3	Exp	1965	Ei	Air	....
	City of Crosbyton	Crosbyton, Texas				EM	Dual	Dc	2	....	1	Exp	1965	Ei	Air	....
	City of Petersburg	Petersburg, Alaska				WDE	Dual	Int	2	Rt	1	Exp	1966	Ei	Air	....
	Boro of Hatfield	Hatfield, Pa				EM	Full	Dc	Dc	Rb	1	Exp	1965	Ei	CTo	....
	City of Carrin	Carrin, Nev				EM	Dual	Dc	Dc	....	1	Exp	1965	Ei	Air	....
	City of Lowell	Lowell, Mich				EM	Dual	Dc	2	....	1	Exp	1965	Ei	CTo	....
	Town of Strawberry Point	Strawberry Point, Iowa				EM	Dual	Dc	2	....	1	Exp	1965	Ei	Air	....
	City of Trenton	Trenton, Mo			....	WDE	....	In	Dc	Rb	1	Exp	1965	Ei	CTo	....
	City of Randolph	Randolph, Neb				EM	Dual	Dc	2	....	1	Exp	1965	Ei	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 & Mach Co
- FM - Fairbanks Morse & Co Inc Power Systems Div
- FSM - Fiat-Stabilimento Grand. Motor
- 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 - Murrees National Ltd
- NEC - Nagata Engrg Co, Ltd
- NM - Nordberg Mfg Co
- OM - Otto Grain-Maukesha
- 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
- Ei - Electric generation, continuous power
- Ev - Evaporative coil cooler
- Eg - Exhaust gas
- Exp - Expansion
- Full - Full diesel
- Gc - Gas pump
- Inc - Incinerator
- In - In-line
- Int - 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
- St - 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