

ADVANTAGES: ELECTRODE BOILERS vs FOSSIL-FIRED BOILERS

1. Lower Installed Capital Cost
2. Smaller Size (Small footprint)
3. Higher Efficiency—99.5% @ 100% output
-will not decrease over time
-performance studies/test not required
4. Full Modulation from 0-100% Output
5. Rapid Response to Load Swings
(0-100% output change in < 5 seconds)
6. Better Steam Quality—99.95% Pure
7. Lower Maintenance Cost
8. Higher Reliability
9. Environmentally Friendly
—no products of combustion
10. Faster Start-up
11. Less Chemical Usage
12. Lower Insurance Costs
13. More Forgiving to Operator Error
14. No Possible Damage from Low Water
15. No Chance of “Catastrophic” Failure
(ie, Fireside Explosion)
16. No “Cold Water” Shock Damage
17. Few Proprietary Spare Parts

ENERGY COST COMPARISON*

STEAM COST @3412 BTU/KWH (\$/1000 PPH)	ELECTRICITY @3412 BTU/KWH (\$/KWH)	NATURAL GAS @100,000 BTU/THERM (\$/DECATHERM)	#2 FUEL OIL @138,000 BTU/GAL (\$/GAL)
6.00	0.020	4.680	0.662
6.50	0.022	5.070	0.718
7.00	0.024	5.460	0.773
7.50	0.025	5.850	0.828
8.00	0.027	6.240	0.883
8.50	0.029	6.630	0.938
9.00	0.031	7.020	0.994
9.50	0.032	7.410	1.049
10.00	0.034	7.800	1.104
10.50	0.036	8.190	1.159
11.00	0.037	8.580	1.214
11.50	0.039	8.970	1.270
12.00	0.041	9.360	1.325
12.50	0.042	9.750	1.380
13.00	0.044	10.140	1.435
13.50	0.046	10.530	1.490
14.00	0.048	10.920	1.546
14.50	0.049	11.310	1.601
15.00	0.051	11.700	1.656
15.50	0.053	12.090	1.711
16.00	0.054	12.480	1.766
16.50	0.056	12.870	1.822
17.00	0.058	13.260	1.877
17.50	0.059	13.650	1.932
18.00	0.061	14.040	1.987
18.50	0.063	14.430	2.042
19.00	0.065	14.820	2.098

EFFICIENCY: 99.5% 78% 80%

NOTE: This Comparison is relevant to Energy Costs only and does not take into account non-fuel costs such as maintenance, fuel handling, insurance, building requirements, testing and licensing/permitting.

Contact Us For These Quality Products

- Electric Hot Water and Steam Boilers
10KW - 5000KW to 3000 PSI;
Carbon Steel & Stainless Steel
- Electric Storage Water Heaters
125 to 5500 Gallons
- Thermal Storage Systems
Space Heating & Domestic
or Process Water; Electric,
Gas or Steam Fired
- Electrode High Voltage Boilers
- Pressure Vessels
Water Storage Tanks
Flash Tanks
Blowdown Tanks
- Tank with Tube Bundle(s)
- Unfired Hot Water and Steam
Generators
- Semi-Instantaneous Water Heaters
- Boiler Feedwater Systems and
Deaerators (Spray and Tray)
- Gas or Oil-Fired Vertical
Firetube Boilers and
Water Heaters
- Gas-Fired Copper Finned-Tube
Boilers and Water Heaters
- Fuel Oil Pumping Systems
- Steam Superheaters-Electric
- Circulation Heaters-Electric
- Chemical Bypass Feeders and
Automatic Feed Systems

NOTE: In pursuing our policy of continuous development of products, **PRECISION** reserves the right to vary any detail in this bulletin without notice.

Represented in your Area By



5727 Superior Drive
Morristown, TN 37814
PHONE (423) 587-9390
FAX (423) 581-7749
E-mail: pbi@precisionboilers.com
WEB: www.precisionboilers.com

PRECISION

ELECTRODE HIGH VOLTAGE BOILERS



Bob Jones University
12MW/40000 PPH @ 125 psi
HVJ-228

Delta Airlines
2 x 6.8MW/900 GPM @ 50° ΔT
HVJ-132HW

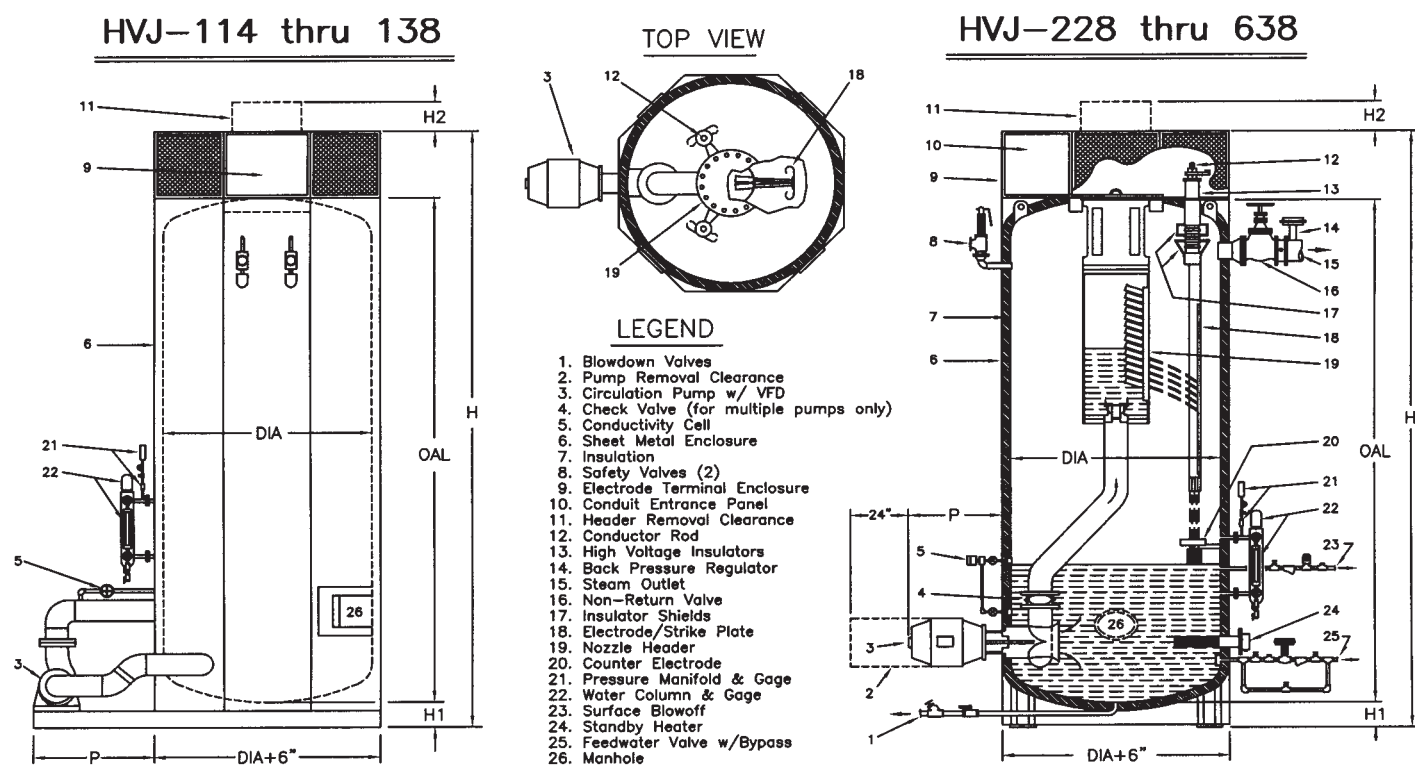
PRECISION "MODEL HVJ" ELECTRODE STEAM BOILER

The model HVJ is a high voltage jet-type boiler in which water from the lower part of the boiler shell is pumped by either an internal or external circulation pump (3) to the nozzle header (19) and flows by gravity through the jets to strike the electrode (18), thus creating a path for the electrical current. As the unevaporated portion of the water flows from electrode (18) to the counter electrode (20), a second path for current is created. Primary voltage connections are made directly to the electrode terminals (12) often eliminating the need for a step-down transformer. At maximum rated conductivity, approximately 3% of the flowing water is evaporated.

Regulation of the boiler output is accomplished by variable frequency drive of the circulation pump, which controls the amount of water reaching the nozzle header. This pump speed is regulated by the boiler pressure and load control system either to hold the steam pressure constant or to stay within an adjustable KW limit.

Regulation is stepless between no-load and full-load, so that the boiler output is finitely responsive to demand variation. No-load to full-load regulation may be accomplished as quickly as 5 seconds, and vice-versa.

Boilers are now available with Precision's "Arc Prevention System" (Patent Pending)

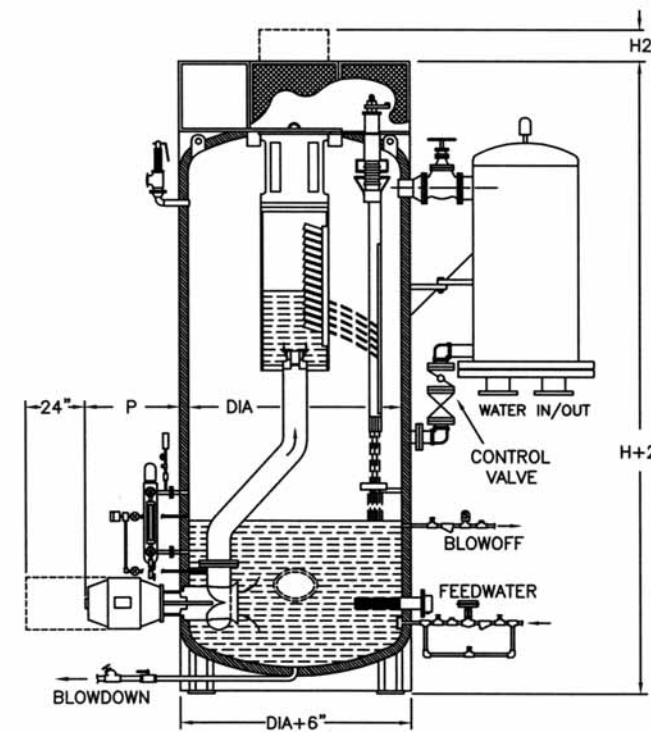


MODEL NUMBERS, RATINGS & DIMENSIONS

Model Number	Nominal Rating**(KW)			Nominal Rating**(PPH)			No. of Electrodes	Dimensions (inches) @ 13.2KV						Weights (Lbs)***	
	4160V	6.9KV	13.2KV	4160V	6.9KV	13.2KV		Dia	OAL	H	H1	H2	P	Ship	Operate
HVJ-114*	800	1680	3000	2700	5600	10000	3	60	136	166	6	6	30	10000	13800
HVJ-120*	1200	2400	4200	4000	8000	14000	3	60	146	176	6	12	30	10500	14900
HVJ-128*	1700	3400	6000	5700	11300	20000	3	60	156	186	6	24	30	11000	15600
HVJ-132*	1900	3800	6800	6300	12700	22600	3	60	166	196	6	28	36	11800	16400
HVJ-138*	2300	4600	8200	7700	15300	27300	3	60	176	206	6	36	36	13000	17800
HVJ-228	3400	6700	12000	11300	22300	40000	6	72	182	211	5	24	32	16000	23200
HVJ-232	3800	7600	13600	12700	25300	45300	6	72	192	221	5	28	32	16800	24500
HVJ-238	4600	9200	16400	15300	30600	54600	6	72	207	236	5	36	32	18000	27100
HVJ-328	5100	10100	18000	17000	33600	60000	9	84	200	233	6	21	32	23000	38000
HVJ-332	5700	11200	20000	19000	37300	67000	9	84	210	243	6	25	32	24000	39500
HVJ-338	7100	14000	25000	23600	46600	83000	9	84	210	243	6	33	32#	27000	40000
HVJ-428	6800	13400	24000	22600	44600	80000	12	96	198	231	6	21	32#	30000	47000
HVJ-432	7600	15100	27000	25300	50300	90000	12	96	209	242	6	25	32#	31000	49000
HVJ-438	9300	18500	33000	31000	61600	110000	12	102	229	262	6	33	32#	34000	57000
HVJ-538	11900	23500	42000	39600	78300	140000	15	108	234	267	6	33	32#	42000	70000
HVJ-638	14200	28000	50000	47300	93200	167000	18	120	231	264	6	33	32##	52000	82000

* These models utilize external ANSI standard pump: ** Ratings are for operation at 150 psi with 220F feedwater *** Weights are for 175 psi design pressure
These models utilize (2) internal pumps ## These models utilize (3) internal pumps

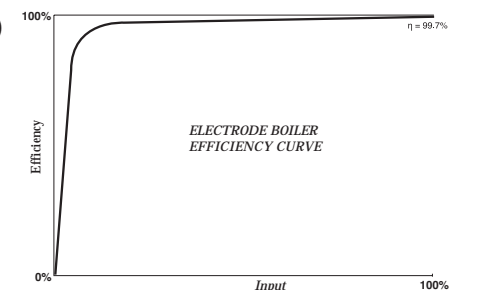
AND "MODEL HVJ-HW" ELECTRODE HOT WATER BOILER



The Precision Electrode hot water boiler utilizes a standard electrode boiler onto which a heat exchanger is attached. The vertically oriented shell and tube heat exchanger is connected on the shell side directly to the boiler drum and is in effect an extension of the boiler steam chest. The shell side condensate flows via gravity through a temperature control valve back into the boiler without the use of a condensate pump. The heating system water is continuously circulated through the tubes of the heat exchanger. Control of the discharge water temperature is effected by restricting the outflow of condensate and thus varying the exposed tube surface area. For example, if the supply water temperature exceeds the setpoint, the temperature control valve closes and floods the heat exchanger which, in turn, reduces the condensation of steam, thereby reducing boiler output. Thus, to attain maximum output, the temperature control valve is opened fully for maximum tube exposure.

The benefits of this unique system are many, with just a few listed below:

- High efficiency (>99 %) throughout the operating range (20:1 turndown)
- Minimum attendant requirement (fully automatic w/SCADA interface)
- Closed loop steam side minimizes use of chemical treatment
- Using electricity as the fuel is environmentally friendly
- No possibility of catastrophic failure (ie, "fireside explosions")
- Electrode-type boilers are "fail safe" in respect to low water level
- The perfect solution for "Fuel Switching" to minimize energy cost



CONVERSIONS / EQUATIONS

$$KW = \frac{GPH \times \Delta T (^{\circ}F)}{410} = \frac{LPH \times \Delta T (^{\circ}C)}{862}$$

$$KW = GPM \times T (^{\circ}F) \times .146$$

$$10KW = 1.02 BHP = 34 \text{ Lbs Steam/Hr} = 34,120 \text{ BTU/H}$$

$$GPH = \frac{KW \times 410}{\Delta T (^{\circ}F)} \quad \text{Amps (3 phase)} = \frac{KW \times 1000}{\text{Volts} \times 1.732}$$

$$GPH = \frac{BTU/H}{8.33 \times \Delta T (^{\circ}F)} \quad \text{Amps (1 phase)} = \frac{KW \times 1000}{\text{Volts}}$$

$$BTU/H = KW \times 3412 \quad BTU/H = \Delta T \times 500 \times GPM$$

$$1 \text{ gal water at } 62^{\circ}F = 8.34 \text{ Lbs} \quad 1 \text{ cu ft} = 7.48 \text{ gallons}$$

$$1 \text{ cu ft water at } 62^{\circ}F = 62.4 \text{ Lbs} \quad 1 \text{ ft water} = 0.435 \text{ psi}$$

$$\text{Enthalpy of water} = \text{Temp } (^{\circ}F) - 32 \text{ BTU/LB}$$

SATURATED STEAM: PRESSURE vs TEMPERATURE

0 psig = 0 KPa = 212°F	150 psig = 1034 KPa = 366°F
8 psig = 55 KPa = 235°F	175 psig = 1207 KPa = 377°F
15 psig = 103 KPa = 250°F	200 psig = 1379 KPa = 388°F
30 psig = 207 KPa = 274°F	225 psig = 1551 KPa = 397°F
50 psig = 345 KPa = 298°F	250 psig = 1724 KPa = 406°F
80 psig = 552 KPa = 324°F	300 psig = 2068 KPa = 422°F
100 psig = 690 KPa = 338°F	350 psig = 2413 KPa = 436°F
125 psig = 862 KPa = 353°F	400 psig = 2758 KPa = 448°F