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SP-CRU SERIES

Condensate Recovery Unit

ISO 9001 : 2008
Certificate Number 6397

CRU Tank Design Code : **ASME SEC.VIII, DIV. 1, ED. 2010.**

SP-CRU Advantages

If you are looking to improve you steam system efficiencies and reduce your energy bill, flash steam recovery is the answer for you.

With today's energy pricing and the need to reduce emissions, a plant's steam/condensate systems cannot afford to vent flash steam to the atmosphere. The modulating steam system's operational design requires the condensate to be recovered by a gravity (0 psig) condensate system. A typical steam system will incorporate a condensate receiver that allows the flash steam to vent to the atmosphere.

What Does CRU Do?

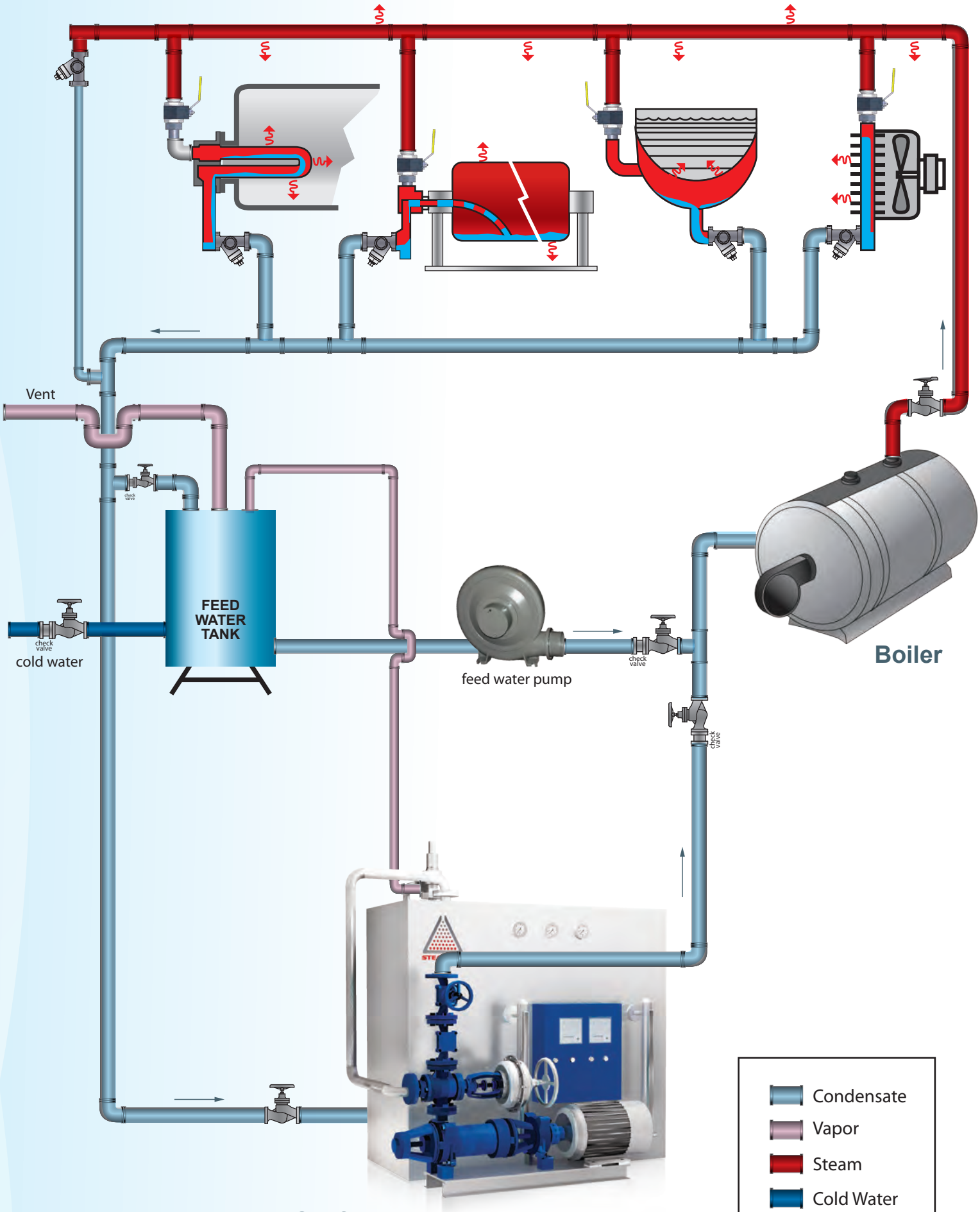
CRU system is a closed vessel system and collect condensate from main condensate line and pump much higher condensate temperature back to the boiler directly so that the boilers don't have to work as hard, thus saving fuel. For complete and maximum steam energy conservation, SteamPro manufactures and provides High Pressure Condensate Recovery Unit (SP-CRU). SteamPro Recovery System recovers condensate at a much higher temperature condensate than the usual pump in the market.

The SP-CRU system recovers flash steam that was normally discharged to the atmosphere and not returned to the boiler. The flash steam recovery can be used to your advantage and results in energy or fuel savings.

Along with energy conservation, the SP-CRU includes the following advantages:

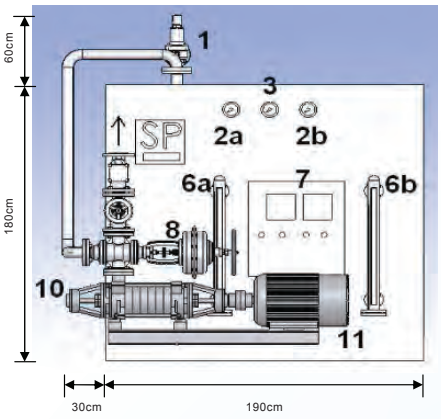
1. Recovers condensate at elevated temperatures directly to the boiler, saving energy & improved efficiency with reduced power consumption.
2. Reduction of the volume of make-up water and water treatment chemicals is an obvious saving.
3. Increase in boiler feed water quality leads to an increase in steam quality that in turn reduces the required blow down volume thus further increasing the energy savings.
4. Increased water temperature decreases the Oxygen content of the steam; this reduces corrosion to the piping and equipment that reduces down time repair and maintenance.
5. Easy construction and installation with minimum space required.
6. The system is designed to withstand high temperatures and pressures while also maintaining an efficient continuous discharge pressure.
7. To discharged remaining flash steam can be recovered to preheat boiler make-up water.
8. GREEN ENVIRONMENT! Reduced or eliminate flash steam release to the atmosphere.

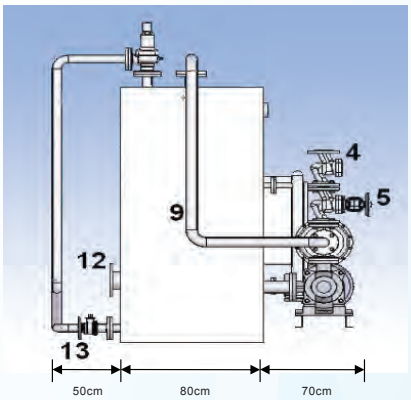
CRU Diagram-Boiler Room



SP-CRU is a by-pass system and no modification will be done to the existing system.

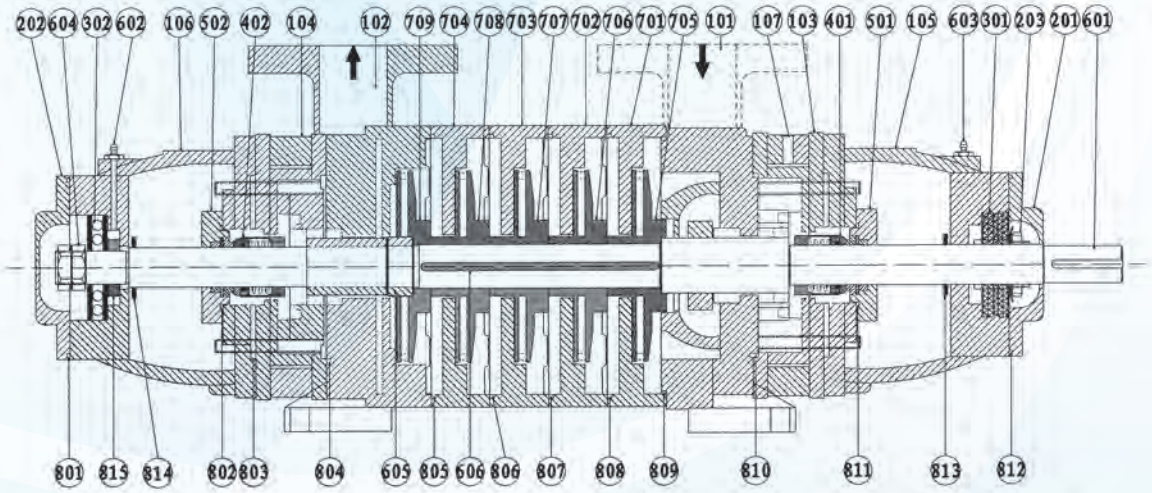
SP-CRU Product Description & Accessories





Item No	Description
1	**Safety Valve 11/2" up to 10bar** - Automatic safety valve with variable pressure settings
2a	**Pressure Gauge for Vessel Tank Left** - Pressure Indication for Vessel Tank Left
2b	**Pressure Gauge for Vessel Tank Right** - Pressure Indication for Vessel Tank Right
3	**Temperature Gauge 0-200°C** - Temperature Indicator for Vessel Tank Left
4	**2" Check valve** - To stop water from flowing back into pump when pump stopped.
5	**2" Discharge Valve** (always in open position when pump running) - Discharge connection to Boilers
6a	**Transparent Water Level Vessel Tank Left** - Indicator Water Level in Vessel Tank Left
6b	**Transparent Water Level Vessel Tank Right** - Indicator Water Level in Vessel Tank Right
7	**Electronic Control Module** - Power Supply 415V 3Φ, Sensor Control, Relay, Contactor, Transformer and Diode for 24DC
8	**3-Way Control Valve** - Open position when water level is medium and close position when water level is low at Water Level Sensor (6a). Close when maintenance is required for Check Valve or Solenoid Valve
9	**Circulation pipe** - Connecting to Vessel Tank Left to create vacuum when water level low when pump running
10	**High Pressure Pump attached with motor** - Auto Mode: Motor will start and stop according to the timer settings. - Manual Mode: Motor will start when water level medium and stop when water level low.
11	**Motor** - Attached to the pump, drives the pump
12	**Receiver Tank Inlet** - Inlet connection from Main returns condensate line (always in open position)
13	**1 1/2 " Ball Valves** - Drainage valve, to drain water from Vessel Tank Left and Right. (Always in closed position)

Sectional Drawing



No.	Part Name	No.	Part Name	No.	Part Name	No.	Part Name
101	Suction Casing	401	Mechanical Seal (Front)	703	Stage Casing 3	806	O-Ring
102	Discharge Casing	402	Mechanical Seal (Back)	704	Stage Casing 4	807	O-Ring
103	Cooling Jacket	501	Mechanical Seal Cover	705	Impeller 1	808	O-Ring
104	Cooling Jacket	502	Mechanical Seal Cover	706	Impeller 2	809	O-Ring
105	Bearing Case (Front)	601	Shaft	707	Impeller 3	810	O-Ring
106	Bearing Case (Back)	602	Grease Nipple	708	Impeller 4	811	O-Ring
107	Cooling Water Outlet	603	Grease Nipple	709	Impeller 5	812	O-Ring
201	Bearing Cover (Front)	604	Lock Nut	801	O-Ring	813	Water Slinger
202	Bearing Cover (Back)	605	Lock Nut	802	O-Ring	814	Water Slinger
203	Adapter Sleeve	606	Impeller Key	803	O-Ring	815	Washer
301	Thrust Bearing	701	Stage Casing 1	804	O-Ring		
302	Roller Bearing	702	Stage Casing 2	805	O-Ring		

Chart for Temperature & Fuel Reduction with SP-CRU

Chart of Average Feeding Temperature

Temperature of supplimentary water: 20º

(Example)

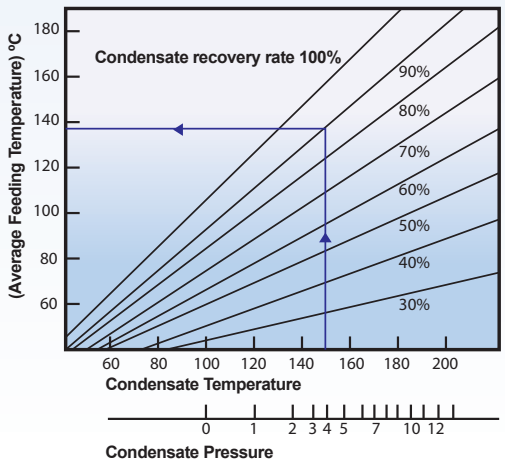
Total volume of boiler feed water: **5000kg/hr**

Volume of condensate: **4500kg/hr 150ºC**

Volume of supplimentary water: **500kg/hr 20ºC**

Condensate recovery rate: $\frac{\textbf{4500kg/hr}}{\textbf{5000kg/hr}}$ **= 90%**

Average feeding temperature: **137ºC**



Rate of Fuel Reduction

- **When the internal pressure of boiler is P kg/cm²G.**
- **The fuel can be reduced R% by rising of feed water temperature from t1ºC to t2ºC.**

$$R=100 \times \left(1-\frac{i''-i_2'}{i''-i_1'}\right)$$

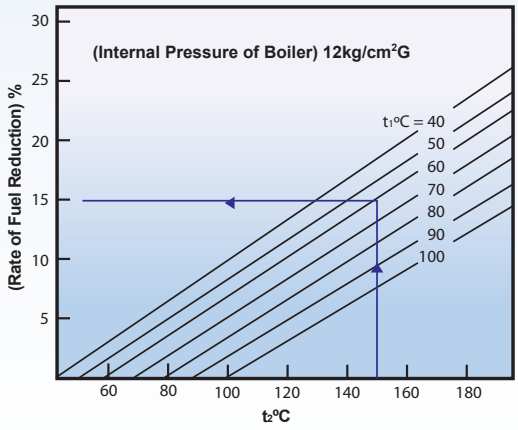
i" = Steam Enthalpy at P kg/cm²G (kcal/kg)
i' = Feed-water Enthalpy at t1ºC (kcal/kg)
i2' = Feed-water Enthalpy at t2ºC (kcal/kg)

(Example)

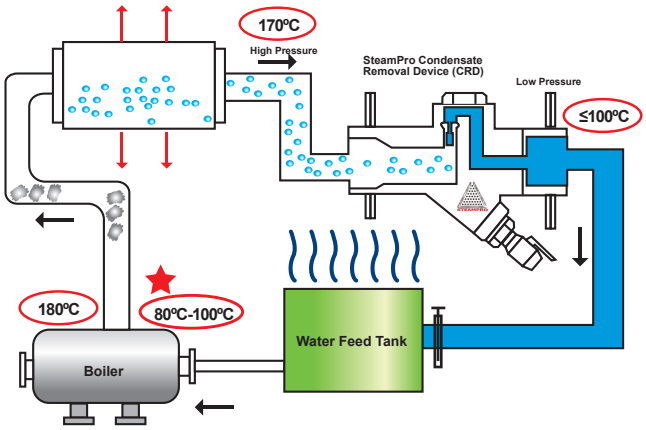
Internal pressure of boiler(P) = **12kg/cm²G**

t1 = 60ºC **t2 = 150ºC**

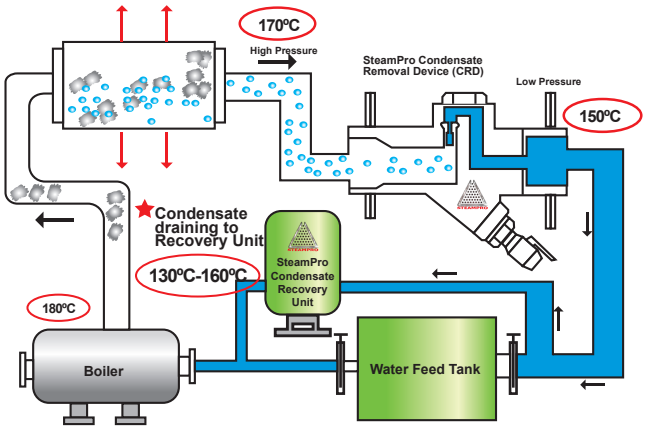
Reduction rate(R) = **about 15%**



Conventional - Open Type



SP-CRU Closed Loop System

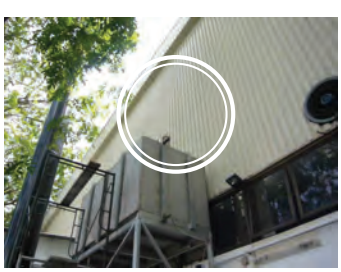


Results after implementing SP-CRU


Before


After


Before


After


Before


After


Before


After

Saturated Steam Table

Pressure	Saturation Temperature	Specific Enthalpy of Water (hf)	Specific Enthalpy of Evaporation (hfg)	Specific Enthalpy of Steam (hg)	Density of Steam	Specific Volume of Steam (vg)
bar gauge	(°C)	(kcal/kg)	(kcal/kg)	(kcal/kg)	(kg/m³)	(m³/kg)
0	100.00	100.00	539.34	639.51	0.598	1.674
0.5	111.64	111.64	531.89	643.82	0.870	1.150
1	120.45	120.45	526.08	646.94	1.136	0.880
1.5	127.62	127.62	521.23	649.39	1.398	0.715
2	133.25	133.25	517.01	651.40	1.657	0.603
2.5	139.02	139.02	513.25	653.09	1.914	0.522
3	143.76	143.76	509.84	654.55	2.169	0.461
3.5	148.05	148.05	506.71	655.83	2.422	0.413
4	151.97	151.97	503.79	656.96	2.674	0.374
4.5	155.58	155.58	501.06	657.97	2.925	0.342
5	158.95	158.95	498.48	658.88	3.175	0.315
5.5	162.10	162.10	496.04	659.71	3.424	0.292
6	165.06	165.06	493.71	660.46	3.672	0.272
6.5	167.86	167.86	491.48	661.15	3.920	0.255
7	170.51	170.51	489.34	661.79	4.167	0.240
7.5	173.04	173.04	487.28	662.38	4.413	0.227
8	175.45	175.45	485.29	662.92	4.660	0.215
8.5	177.76	177.76	483.36	663.42	4.905	0.204
9	179.97	179.97	481.50	663.89	5.151	0.194
9.5	182.10	182.10	479.68	664.33	5.396	0.185
10	184.15	184.15	477.92	664.74	5.641	0.177
10.5	186.13	186.13	476.21	665.12	5.886	0.170
11	188.05	188.05	474.53	665.47	6.131	0.163
11.5	189.90	189.90	472.89	665.81	6.376	0.157
12	191.69	191.69	471.29	666.12	6.620	0.151
12.5	193.43	193.43	469.73	666.41	6.865	0.146
13	195.12	195.12	468.19	666.69	7.109	0.141
13.5	196.77	196.77	466.69	666.94	7.354	0.136
14	198.37	198.37	465.21	667.19	7.598	0.132
14.5	199.93	199.93	463.76	667.41	7.843	0.128
15	201.45	201.45	462.34	667.62	8.087	0.124
15.5	202.93	202.93	460.93	667.82	8.332	0.120
16	204.38	204.38	459.55	668.01	8.577	0.117
16.5	205.80	205.80	458.19	668.18	8.822	0.113
17	207.19	207.19	456.86	668.35	9.067	0.110
17.5	208.54	208.54	455.54	668.50	9.312	0.107
18	209.87	209.87	454.24	668.65	9.557	0.105
18.5	211.17	211.17	452.95	668.78	9.802	0.102
19	212.45	212.45	451.68	668.91	10.048	0.100
19.5	213.70	213.70	450.43	669.02	10.294	0.097
20	214.93	214.93	449.20	669.13	10.540	0.095
21	217.32	217.32	446.77	669.32	11.032	0.091
22	219.63	219.63	444.39	669.49	11.525	0.087
23	221.86	221.86	442.07	669.62	12.019	0.083
24	224.02	224.02	439.79	669.74	12.515	0.080
25	226.11	226.11	437.55	669.83	13.011	0.077
30	235.74	235.74	426.91	669.98	15.510	0.064
35	244.24	244.24	417.00	669.75	18.044	0.055
40	251.88	251.88	407.64	669.23	20.617	0.049

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