```
import pandas as pd
data=pd.read csv('01.Data Cleaning and Preprocessing 2.csv')
type(data)
pandas.core.frame.DataFrame
data.info
<bound method DataFrame.info of Observation Y-Kappa</pre>
                                                         ChipRate
BF-CMratio BlowFlow ChipLevel4
      31-00:00
                  23.10
                            16.520
                                      121.717 1177.607
                                                             169.805
       31-01:00
                  27.60
                            16.810
                                       79.022
                                               1328,360
                                                             341.327
2
      31-02:00
                  23.19
                           16.709
                                       79.562
                                               1329.407
                                                             239.161
      31-03:00
                  23.60
                           16.478
                                       81.011
                                               1334.877
                                                             213.527
       31-04:00
                  22.90
                            15.618
                                       93.244
                                               1334.168
                                                             243.131
319
       10-16:00
                  23.75
                            12.667
                                       93.450
                                               1178.252
                                                             276.955
320
        9-19:00
                   19.80
                            12.558
                                       94.352
                                               1184.119
                                                             297.071
321
        9-20:00
                  23.01
                            12.550
                                       90.842
                                               1188.517
                                                             289.826
                            13.083
322
        9-21:00
                  24.32
                                       88.910
                                               1192.879
                                                             318,006
323
        9-22:00
                  25.75
                            13.417
                                       85.451
                                               1186.342
                                                             248.312
    T-upperExt-2
                   T-lowerExt-2
                                   UCZAA WhiteFlow-4
SteamFlow-4
           358.282
                          329.545 1.443
                                               599.253
0
67.122
          351.050
                          329.067 1.549
                                               537.201 ...
1
60.012
           350.022
                          329.260 1.600
                                               549.611 ...
61.304
           350.938
                          331.142 1.604
                                               623.362 ...
68.496
                          332.709
           351.640
                                     NaN
                                               638.672 ...
70.022
. .
. . .
319
           347.286
                          310.970 1.523
                                               513.956 ...
61.141
                          319.576 1.451
                                               570.058 ...
320
           399.135
```

67.667				
321 66.446	373.633	314.591	1.457	549.306
322	364.081	308.559	1.523	504.852
61.054	256 200	210 402	1 474	407 275
323 58.247	356.289	310.482	1.474	497.375
Lowe BlackFlow	r-HeatT-3	Upper-HeatT-3	ChipMass-4	WeakLiquorF
0	329.432	303.099	175.964	1127.197
1319.039	222 222	204 070	162 202	665 075
1 1297.317	330.823	304.879	163.202	665.975
2	329.140	303.383	164.013	677.534
1327.072	220 075	202 254	101 407	767 052
3 1324.461	328.875	302.254	181.487	767.853
4	328.352	300.954	183.929	888.448
1343.424				
		•••	•••	
319	330.117	304.006	148.174	1027.201
1357.271 320	330.848	304.616	165.178	906.962
1311.177		3011010	103.170	3001302
321	330.226	304.686	160.841	887.125
1319.226 322	327.346	304.363	147.589	804.423
1320.225				
323 1320.848	328.092	304.093	144.218	828.328
1320.040				
		eamHeatF-3 T-T	•	
	57.325 41.182	54.612 46.603	252.077 251.406	NaN 29.11
2 2	37.272	51.795	251.335	NaN
	39.478 15.372	54.846 54.186	250.312 249.916	29.02 29.01
4 2	13.372	34.100	249.910	29.01
319 3	81.643	45.264	252.947	30.86
320 321	25.494 0.638	50.528 45.549	252.092 252.438	30.70 NaN
322	0.000	43.725	253.176	31.13
323	1.276	43.840	253.216	NaN
[324 rows	x 23 colu	mns]>		
data.desc	ribe()			

count mean std min 25% 50% 75% max	324.6 20.6 3.6 12.1 18.3 20.8 23.6	Kappa 000000 335370 070036 170000 882500 345000 032500	ChipRa 319.0000 14.3479 1.4990 9.9830 13.3580 14.3080 15.5170 16.9580	00 307 37 87 95 7 00 68 00 81 00 86 00 92	CMratio .000000 .464456 .995012 .645000 .823000 .739000 .372000 .717000	308.00 1237.83 100.59	00000 37614 93735 00000 .5250 88500	ChipLevel4 323.000000 258.164483 87.987452 0.000000 213.527000 271.792000 321.680000 419.014000	\
	T-upr	erExt-2	T-low	erExt-2		UCZAA	WhiteF	low-4	
AAWhite count 173.00	eSt - 4 32	\ 22.00000		22.0000		000000	323.0	000000	
mean	35	6.90429	5 3	24.0201	80 1.	492010	591.	732260	
6.1404 std	10	9.20929	0	7.6214	02 0.	105923	67.0	016351	
0.0816		1.000		04 6000		100000	405	111000	
min 5.8900		39.16800	00 2	84.6330	00 I.	182000	405.	111000	
25%	35	0.24125	0 3	21.4200	00 1.	431500	540.9	989500	
6.0890 50%		6.84300	0 3	25.6690	00 1.	498000	592.8	895000	
6.1350 75%		52.24225	.o 3	29.1750	00 1	560500	639 4	480500	
6.1990	00								
max 6.3400		99.13500	0 3	37.0120	00 1.	747000	731.3	394000	
		SteamFl	οw- <i>Δ</i> Ι	ower-He	a+T_3 II	lpper-Hea	ı+Τ₋3	ChipMass-	
4 \								•	
count		323.0	00000	322.0	00000	322.0	000000	323.000000)
mean		66.6	68285	325.5	67820	300.5	25699	162.222322	2
std		5.7	08587	4.6	09862	4.5	68484	14.160688	3
min		48.5	68000	318.0	51000	293.3	312000	113.922000)
25%		62.5	18000	321.3	85500	296.5	13250	153.032500)
50%		67.4	29000	324.7	41000	299.1	26000	163.690000)
75%			22000	329.8			244750	172.555000	
			47000	333.8			.46000	189.268006	
max		70.1	47000	232.8	54000	211.1	.40000	109.200000	,
		iquorF	BlackF	low-2	WeakWas	shF Ste	eamHeat	F-3 T-Top-	
Chips-		3.000000	322.	000000	323.000	0000	322.00	0000	

323.0000	900			
mean	873.828941	1175.917016	263.543068	49.696907
251.2400	987			
std	122.073521	149.334010	163.666942	4.551909
1.283432	2			
min	486.938000	838.948000	0.000000	35.510000
248.3590	900			
25%	792.019500	1044.817500	134.649000	46.389750
250.3120	900			
50%	865.254000	1150.221500	269.193000	50.277000
251.3800	900			
75%	965.286500	1319.021250	405.563000	53.294250
252.3235				
max	1226.277000	1395.767000	715.715000	63.332000
254.1220	900			

SulphidityL-4 173.000000 count 30.411671 mean 0.701317 std 29.010000 min 29.970000 25% 30.370000 50% 75% 30.820000 32.840000 max

[8 rows x 22 columns]

data=data.drop_duplicates()
data

	Observation	Y-Kappa	ChipRate	BF-CMratio	BlowFlow	ChipLevel4
\ 0	31-00:00	23.10	16.520	121.717	1177.607	169.805
1	31-01:00	27.60	16.810	79.022	1328.360	341.327
2	31-02:00	23.19	16.709	79.562	1329.407	239.161
3	31-03:00	23.60	16.478	81.011	1334.877	213.527
4	31-04:00	22.90	15.618	93.244	1334.168	243.131
298	12-09:00	20.90	15.167	84.640	1283.706	339.440
299	12-10:00	24.98	NaN	85.034	1278.345	368.564
		21.00	NaN	88.013	1307.722	278.842
300	12-11:00	21.00	IValV	00.013	1307.722	2/0.042

T-upperExt-2	301	12-12:00	21.40	NaN	85.490	1255.986	273.484
T-upperExt-2 T-lowerExt-2 UCZAA WhiteFlow-4 SteamFlow-4 \ 0	307	31-05:00	20.89	14.308	94.172	1327.832	251.120
SteamFlow-4 0 358.282 329.545 1.443 599.253 67.122 1 351.050 329.067 1.549 537.201 60.012 2 350.022 329.260 1.600 549.611 61.304 3 350.938 331.142 1.604 623.362 68.496 4 351.640 332.709 NaN 638.672 70.022 298 354.803 311.041 1.635 532.419 65.561 299 357.723 321.387 NaN 520.365 65.795 300 357.438 322.689 NaN 590.199 71.456 307 351.263 332.485 1.522 631.514 71.286 Lower-HeatT-3 Upper-HeatT-3 ChipMass - 4 WeakLiquorF 81ackFlow-2 0 329.432 303.0					-		
0 358.282 329.545 1.443 599.253 67.122 351.050 329.067 1.549 537.201 60.012 350.022 329.260 1.600 549.611 61.304 330.938 331.142 1.604 623.362 68.496 4 351.640 332.709 NaN 638.672 70.022 70.022 298 354.803 311.041 1.635 532.419 65.561 399 357.438 323.757 NaN 553.070 65.799 300 357.438 322.689 NaN 590.199 71.456 63.2689 NaN 590.199 71.286 Lower-HeatT-3 Upper-HeatT-3 ChipMass-4 WeakLiquorF 81ackFlow-2 \(0 329.432 303.099 175.964 1127.197			T-low	erExt-2	UCZAA Whit	eFlow-4	
1 351.050 329.067 1.549 537.201 60.012 350.022 329.260 1.600 549.611 61.304 3 350.938 331.142 1.604 623.362 68.496 4 351.640 332.709 NaN 638.672 298 354.803 311.041 1.635 532.419 65.561 299 357.723 321.387 NaN 520.365 65.729 300 357.438 323.757 NaN 553.070 65.795 301 361.365 322.689 NaN 590.199 71.286 Lower-HeatT-3 Upper-HeatT-3 ChipMass-4 WeakLiquorF 81ackFlow-2 \ 0 329.432 303.099 175.964 1127.197 1319.039 1 330.823 304.879 163.202 665.975 1297.317 2 329.140 303.383 164.013 677.534 1327.072 3 328.875 302.254 181.487 767.853 1324.461 4 328.352 300.954 183.929 888.448 1343.424 298 332.924 307.626 145.299 832.906 1344.708 299 332.523 307.169 151.544 905.639 1344.469 300 331.263 306.400 157.954 908.691	0	-		329.545	1.443	599.253	
2 350.022 329.260 1.600 549.611 61.304 3 350.938 331.142 1.604 623.362 68.496 4 351.640 332.709 NaN 638.672 70.022 298 354.803 311.041 1.635 532.419 65.561 299 357.723 321.387 NaN 520.365 65.729 300 357.438 323.757 NaN 553.070 65.795 301 361.365 322.689 NaN 590.199 71.456 307 351.263 332.485 1.522 631.514 71.286 Lower-HeatT-3 Upper-HeatT-3 ChipMass-4 WeakLiquorF RlackFlow-2 \ 0 329.432 303.099 175.964 1127.197 1319.039 1 330.823 304.879 163.202 665.975 1297.317 2 329.140 303.383 164.013 677.534 1327.072 3 328.875 302.254 181.487 767.853 1324.461 4 328.352 300.954 183.929 888.448 1343.424 298 332.924 307.626 145.299 832.906 1344.708 299 332.523 307.169 151.544 905.639 1344.460 299 332.523 307.169 151.544 905.639 1344.460 300 331.263 306.400 157.954 908.691	1	351.050		329.067	1.549	537.201	
3 350.938 331.142 1.604 623.362 68.496 4 351.640 332.709 NaN 638.672 70.022 298 354.803 311.041 1.635 532.419 65.561 299 357.723 321.387 NaN 520.365 65.729 300 357.438 323.757 NaN 553.070 65.795 301 361.365 322.689 NaN 590.199 71.456 307 351.263 332.485 1.522 631.514 71.286 Lower-HeatT-3 Upper-HeatT-3 ChipMass-4 WeakLiquorF BlackFlow-2 \ 0 329.432 303.099 175.964 1127.197 1319.039 1 330.823 304.879 163.202 665.975 1297.317 2 329.140 303.383 164.013 677.534 1327.072 3 328.875 302.254 181.487 767.853 1324.461 4 328.352 300.954 183.929 888.448 1343.424 298 332.924 307.626 145.299 832.906 1344.708 299 332.523 307.169 151.544 905.639 1344.469 300 331.263 306.400 157.954 908.691	2	350.022		329.260	1.600	549.611	
4 351.640 332.709 NaN 638.672 70.022	3	350.938		331.142	1.604	623.362	
	4	351.640		332.709	NaN	638.672	
298							
299	298	354.803		311.041	1.635	532.419	
300 357.438 323.757 NaN 553.070 65.795 301 361.365 322.689 NaN 590.199 71.456 307 351.263 332.485 1.522 631.514 71.286 Lower-HeatT-3 Upper-HeatT-3 ChipMass-4 WeakLiquorF BlackFlow-2 \ 0 329.432 303.099 175.964 1127.197 1319.039 1 330.823 304.879 163.202 665.975 1297.317 2 329.140 303.383 164.013 677.534 1327.072 3 328.875 302.254 181.487 767.853 1324.461 4 328.352 300.954 183.929 888.448 1343.424 298 332.924 307.626 145.299 832.906 1344.708 299 332.523 307.169 151.544 905.639 1344.469 300 331.263 306.400 157.954 908.691	299	357.723		321.387	NaN	520.365	
301 361.365 322.689 NaN 590.199 71.456 307 351.263 332.485 1.522 631.514 71.286 Lower-HeatT-3 Upper-HeatT-3 ChipMass-4 WeakLiquorF BlackFlow-2 \ 0 329.432 303.099 175.964 1127.197 1319.039 1 330.823 304.879 163.202 665.975 1297.317 2 329.140 303.383 164.013 677.534 1327.072 3 328.875 302.254 181.487 767.853 1324.461 4 328.352 300.954 183.929 888.448 1343.424 298 332.924 307.626 145.299 832.906 1344.708 299 332.523 307.169 151.544 905.639 1344.469 300 331.263 306.400 157.954 908.691	300	357.438		323.757	NaN	553.070	
307	301	361.365		322.689	NaN	590.199	
BlackFlow-2 \ 0	307	351.263		332.485	1.522	631.514	
0 329.432 303.099 175.964 1127.197 1319.039 1 330.823 304.879 163.202 665.975 1297.317 2 329.140 303.383 164.013 677.534 1327.072 3 328.875 302.254 181.487 767.853 1324.461 4 328.352 300.954 183.929 888.448 1343.424 298 332.924 307.626 145.299 832.906 1344.708 299 332.523 307.169 151.544 905.639 1344.469 300 331.263 306.400 157.954 908.691	Lo	ower-HeatT-3	Upper	-HeatT-3	ChipMass-4	WeakLiquorF	
1 330.823 304.879 163.202 665.975 1297.317 329.140 303.383 164.013 677.534 1327.072 3 328.875 302.254 181.487 767.853 1324.461 4 328.352 300.954 183.929 888.448 1343.424 298 332.924 307.626 145.299 832.906 1344.708 399 332.523 307.169 151.544 905.639 1344.469 300 331.263 306.400 157.954 908.691	0	329.432		303.099	175.964	1127.197	,
2 329.140 303.383 164.013 677.534 1327.072 3 328.875 302.254 181.487 767.853 1324.461 4 328.352 300.954 183.929 888.448 1343.424 298 332.924 307.626 145.299 832.906 1344.708 299 332.523 307.169 151.544 905.639 1344.469 300 331.263 306.400 157.954 908.691	1	330.823		304.879	163.202	665.975	i
3 328.875 302.254 181.487 767.853 1324.461 328.352 300.954 183.929 888.448 1343.424 298 332.924 307.626 145.299 832.906 1344.708 299 332.523 307.169 151.544 905.639 1344.469 300 331.263 306.400 157.954 908.691	2	329.140		303.383	164.013	677.534	ı
4 328.352 300.954 183.929 888.448 1343.424 298 332.924 307.626 145.299 832.906 1344.708 299 332.523 307.169 151.544 905.639 1344.469 300 331.263 306.400 157.954 908.691	3	328.875		302.254	181.487	767.853	3
298	4	328.352		300.954	183.929	888.448	3
298 332.924 307.626 145.299 832.906 1344.708 299 332.523 307.169 151.544 905.639 1344.469 300 331.263 306.400 157.954 908.691							
299 332.523 307.169 151.544 905.639 1344.469 300 331.263 306.400 157.954 908.691	298			307.626	145.299	832.906	i
300 331.263 306.400 157.954 908.691	299	332.523		307.169	151.544	905.639)
	300	331.263		306.400	157.954	908.691	

301							
Name			. 032	308.732	174.069	986.2	06
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data.isnull() Observation Y-Kappa ChipRate BF-CMratio BlowFlow ChipLevel4 OFalse False False False False False False False False False False False False False True False False False False False False TruepperExt-2 True False False False False TrupperExt-2 True False False False False Talse False False False False False False	298 299 300 301	388.911 418.979 462.712 457.313	L 49 9 48 2 54 3 55	9.524 8.135 4.373 3.194	251.833 251.614 251.197 251.324	30 30	.29 .47 NaN .46
Observation Y-Kappa ChipRate BF-CMratio BlowFlow ChipLevel4 0 False False False False False False 1 False False False False False False False 2 False False False False False False False 3 False False False False False False False 4 False False False False False False False 5 False False False False False False False 6 False False False False False False False 7 False False True False False False 8 False False False False False False False 8 False False False False False False False 8 False False False False False False False	[301	rows x 23	columns]				
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98 False False False False alse 99 False False False False alse 00 False False False False
98 False False False False alse 99 False False False False alse 00 False False False False alse 01 False False False False
98 False False False False alse 99 False False False False alse 00 False False False False alse 01 False False False False alse
98 False False False False 99 False False False False alse 00 False False False False alse 01 False False False False alse 07 False False False False
False
False 299 False False False False False 300 False False False False False 301 False False False False False 507 False False False False False
False
False

2 3 4	False False False	F	False False False	False False False		True alse alse
298 299 300 301 307	False False False False False	 	 False False False False	False False False False False	F	alse Talse True True True
[301 rows	x 23 co	lumns]				
data.isnu	ll(). <mark>sum</mark>	()				
Observation Y-Kappa ChipRate BF-CMration BlowFlow ChipLevelor T-upperExt T-lowerExt UCZAA WhiteFlow AAWhiteSt AA-Wood-4 ChipMoiston SteamFlow Lower-Heat Upper-Heat ChipMass-of WeakLiquo BlackFlow WeakWashF SteamHeat T-Top-Chip Sulphidity dtype: in	t-2 t-2 -4 -4 -4 tT-3 tT-3 tT-3 4 rF -2	0 0 4 14 13 1 1 24 1 141 1 1 1 1 1 1 1 1 1 1				
data.notn		V Vanna	ChimData	DE CMartic	Dlay Elay	Chinley ald
\	rvation _	Y-Kappa _	ChipRate _	BF-CMratio _	BlowFlow _	ChipLevel4
0	True	True	True	True	True	True
1	True	True	True	True	True	True
2	True	True	True	True	True	True
3	True	True	True	True	True	True

4	True	True	True		True	Tru	е	True
298	True	True	True		True	Tru	e	True
299	True	True	False		True	Tru	e	True
300	True	True	False		True	Tru		True
301	True	True	False		True	Tru	e	True
307	True	True	True		True	Tru	е	True
T-u SteamFlo	pperExt-2	T-lower	Ext-2	UCZAA	White	Flow-4		
0	True		True	True		True		
True 1	True		True	True		True		
True								
2 True	True		True	True		True		
3	True		True	True		True		
True 4	True		True	False		True		
True	1140		1140			1146	• • •	
298	True		True	True		True		
True 299	True		True	False		True		
True								
300 True	True		True	False		True		
301	True		True	False		True		
True 307	True		True	True		True		
True								
Low	er-HeatT-3	Upper-H	eatT-3	ChipMa	ss-4	WeakLiq	uorF	
BlackFlo 0	w-2 \ True		True		True		True	
True								
1 True	True		True		True		True	
2	True		True		True		True	
True 3	True		True		True		True	
True	TTUC		Truc		TTUC		TTUC	

4 True	Tr	ue	True	True		True
298	Tr	ue	True	True		True
True 299	Tr	ue	True	True		True
True 300	Tr	ue	True	True		True
True 301	Tr	ue	True	True		True
True 307	Tr		True	True		True
True						
0 1 2 3	WeakWashF True True True True	SteamHeatF-3 True True True True		os-4 True True True True	Sulphidit	tyL-4 False True False True
4	True	True		True		True
298 299 300 301 307	True True True True True	True True True True True		True True True True True		True True False True False
[301	rows x 23 c	olumns]				
<pre>data.isnull().sum().sum()</pre>						
352						

data2=data.fillna(value=0)
data

	Observation	Y-Kappa	ChipRate	BF-CMratio	BlowFlow	ChipLevel4
0	31-00:00	23.10	16.520	121.717	1177.607	169.805
1	31-01:00	27.60	16.810	79.022	1328.360	341.327
2	31-02:00	23.19	16.709	79.562	1329.407	239.161
3	31-03:00	23.60	16.478	81.011	1334.877	213.527
4	31-04:00	22.90	15.618	93.244	1334.168	243.131

298	12-09:00	20.90	15.167	84.64	40	1283.706		339.440
299	12-10:00	24.98	NaN	85.03	34	1278.345		368.564
300	12-11:00	21.00	NaN	88.01	13	1307.722		278.842
301	12-12:00	21.40	NaN	85.49	90	1255.986		273.484
307	31-05:00	20.89	14.308	94.17	72	1327.832		251.120
	-upperExt-2	T-lowe	erExt-2	UCZAA Wł	hite	Flow-4		
SteamFl	-		220 545	1 442		500 252		
0 67.122	358.282		329.545	1.443		599.253		
1 60.012	351.050		329.067	1.549		537.201		
2	350.022		329.260	1.600		549.611		
61.304 3	350.938		331.142	1.604	(623.362		
68.496	251 640		222 700			600 670		
4 70.022	351.640		332.709	NaN		638.672		
70.022								
298	354.803		311.041	1.635		532.419		
65.561								
299	357.723		321.387	NaN		520.365		
65.729	357.438		222 757	NaN		EE2 070		
300 65.795	337,430		323.757	IValV		553.070		
301	361.365		322.689	NaN		590.199		
71.456	302.000		0					
307	351.263		332.485	1.522		631.514		
71.286								
Lo BlackFl	ower-HeatT-3	Upper-	HeatT-3	ChipMass-	- 4	WeakLiq	uorF	
0	329.432		303.099	175.9	964	112	7.197	
1319.03				_,				
1	330.823		304.879	163.2	202	66	5.975	
1297.33								
2	329.140		303.383	164.0	913	67	7.534	
1327.07 3	328.875		302.254	181.4	107	76	7.853	
1324.46			302.234	101.4	+0/	70	1.000	
4	328.352		300.954	183.9	929	88	8.448	
1343.42								

298 1344.		332.924		307.626	145.299	832	.906
299 1344.	3	332.523		307.169	151.544	905	.639
300	3	331.263		306.400	157.954	908	.691
1344. 301	3	333.032		308.732	174.069	986	.206
1348. 307	3	328.699		300.706	180.229	903	.605
1323.							
0 1 2 3 4 298 299	241 237 239 215	.325 .182 .272 .478 .372 	46 51 54 54	.612 .603 .795 .846 .186 	Top-Chips-4 252.077 251.406 251.335 250.312 249.916 251.833 251.614		yL-4 NaN 29.11 NaN 29.02 29.01 30.29 30.47
300 301 307	462 457	.712 .313 .729	54 53	.373 .194 .503	251.197 251.324 250.084		NaN 30.46 NaN
[301	rows x	23 colu	umns]				
data2	.isnul	l(). <mark>sum</mark> ((). <mark>sum</mark> ()				
0							
data							
0	bservat	tion Y-	Карра	ChipRate	BF-CMratio	BlowFlow	ChipLevel4
ò	31-00	9:00	23.10	16.520	121.717	1177.607	169.805
1	31-03	1:00	27.60	16.810	79.022	1328.360	341.327
2	31-02	2:00	23.19	16.709	79.562	1329.407	239.161
3	31-03	3:00	23.60	16.478	81.011	1334.877	213.527
4	31-04	4:00	22.90	15.618	93.244	1334.168	243.131
298	12-09	9:00	20.90	15.167	84.640	1283.706	339.440
299	12-10	9:00	24.98	NaN	85.034	1278.345	368.564
300	12-13	1:00	21.00	NaN	88.013	1307.722	278.842

301	12-12:00	21.40 NaN	85.490	1255.986	273.484
307	31-05:00	20.89 14.308	94.172	1327.832	251.120
507	31 03.00	20103 141300	341172	1327.032	231.120
Т	-upperExt-2	T-lowerExt-2	UCZAA Whit	eFlow-4	
SteamF	low-4 \				
0	358.282	329.545	1.443	599.253	
67.122					
1	351.050	329.067	1.549	537.201	
60.012					
2	350.022	329.260	1.600	549.611	
61.304	250 020	221 142	1 604	622 262	
3	350.938	331.142	1.604	623.362	
68.496	251 640	332.709	NaN	620 672	
4 70.022	351.640	332.709	NaN	638.672	
298	354.803	311.041	1.635	532.419	
65.561	33 11003	3111011	11033	3321113 111	
299	357.723	321.387	NaN	520.365	
65.729					
300	357.438	323.757	NaN	553.070	
65.795					
301	361.365	322.689	NaN	590.199	
71.456					
307	351.263	332.485	1.522	631.514	
71.286					
1.	ower-HeatT-3	Upper-HeatT-3	ChipMass-4	WeakLiquorF	
BlackF		opper-nearr-3	CIIIpiiass-4	WeakLIquoii	
0	329.432	303.099	175.964	1127.197	
1319.0		3031033	1731301	11271137	
1	330.823	304.879	163.202	665.975	
1297.3					
2	329.140	303.383	164.013	677.534	
1327.0	72				
3	328.875	302.254	181.487	767.853	
1324.4					
4	328.352	300.954	183.929	888.448	
1343.4	24				
		111			
298	222 024	207 626	145 200	832.906	
296 1344.7	332.924	307.626	145.299	032.900	
299	332.523	307.169	151.544	905.639	
1344.4		507.109	1311344	303.039	
300	331.263	306.400	157.954	908.691	

1344	. 588			
301	333.0	32 308.	732 174.069	986.206
1348		200	700 100 000	000 005
307	328.6	99 300.	706 180.229	903.605
1323	.082			
	WeakWashF	SteamHeatF-3	T-Top-Chips-4	SulphidityL-4
0	257.325	54.612	252.077	NaN
1	241.182	46.603	251.406	29.11
2	237.272	51.795	251.335	NaN
3	239.478	54.846	250.312	29.02
4	215.372	54.186	249.916	29.01
 298	388.911	49.524	251.833	30.29
290	418.979	48.135	251.633	30.29
300	462.712	54.373	251.197	NaN
301	457.313	53.194	251.324	30.46
307	232.729	54.503	250.084	NaN

[301 rows x 23 columns]

data3=data.fillna(method='pad')
data

C:\Users\HP\AppData\Local\Temp\ipykernel_6720\2453711831.py:1:
FutureWarning: DataFrame.fillna with 'method' is deprecated and will
raise in a future version. Use obj.ffill() or obj.bfill() instead.
 data3=data.fillna(method='pad')

	Observation	Y-Kappa	ChipRate	BF-CMratio	BlowFlow	ChipLevel4
0	31-00:00	23.10	16.520	121.717	1177.607	169.805
1	31-01:00	27.60	16.810	79.022	1328.360	341.327
2	31-02:00	23.19	16.709	79.562	1329.407	239.161
3	31-03:00	23.60	16.478	81.011	1334.877	213.527
4	31-04:00	22.90	15.618	93.244	1334.168	243.131
298	12-09:00	20.90	15.167	84.640	1283.706	339.440
299	12-10:00	24.98	NaN	85.034	1278.345	368.564
300	12-11:00	21.00	NaN	88.013	1307.722	278.842
301	12-12:00	21.40	NaN	85.490	1255.986	273.484

307	31-05:00	20.89 14.308	94.172	1327.832	251.120
		T-lowerExt-2	UCZAA White	eFlow-4	
SteamF 0 67.122	low-4 \ 358.282	329.545	1.443	599.253	
1 60.012	351.050	329.067	1.549	537.201	
2 61.304	350.022	329.260	1.600	549.611	
3 68.496	350.938	331.142	1.604	623.362	
4 70.022	351.640	332.709	NaN	638.672	
298 65.561	354.803	311.041	1.635	532.419	
299 65.729	357.723	321.387	NaN	520.365	
300 65.795	357.438	323.757	NaN	553.070	
301 71.456	361.365	322.689	NaN	590.199	
307 71.286	351.263	332.485	1.522	631.514	
	ower-HeatT-3	Upper-HeatT-3	ChipMass-4	WeakLiquorF	
BlackF 0 1319.03	329.432	303.099	175.964	1127.197	
1 1297.3	330.823	304.879	163.202	665.975	
2 1327.0	329.140	303.383	164.013	677.534	
3 1324.40	328.875	302.254	181.487	767.853	
4 1343.42	328.352 24	300.954	183.929	888.448	
298 1344.70	332.924	307.626	145.299	832.906	
299 1344.40	332.523	307.169	151.544	905.639	
300 1344.58	331.263	306.400	157.954	908.691	
301 1348.7	333.032	308.732	174.069	986.206	

307	328.69	99 300.	706 180.229	903.605
1323	. 082			
	WeakWashF	SteamHeatF-3	T-Top-Chips-4	SulphidityL-4
0	257.325	54.612	252.077	NaN
1	241.182	46.603	251.406	29.11
2	237.272	51.795	251.335	NaN
3	239.478	54.846	250.312	29.02
4	215.372	54.186	249.916	29.01
298	388.911	49.524	251.833	30.29
299	418.979	48.135	251.614	30.47
300	462.712	54.373	251.197	NaN
301	457.313	53.194	251.324	30.46
307	232.729	54.503	250.084	NaN

[301 rows x 23 columns]

data4=data.fillna(method='bfill')
data4

C:\Users\HP\AppData\Local\Temp\ipykernel_6720\1594516589.py:1:
FutureWarning: DataFrame.fillna with 'method' is deprecated and will
raise in a future version. Use obj.ffill() or obj.bfill() instead.
 data4=data.fillna(method='bfill')

	Observation	Y-Kappa	ChipRate	BF-CMratio	BlowFlow	ChipLevel4
0	31-00:00	23.10	16.520	121.717	1177.607	169.805
1	31-01:00	27.60	16.810	79.022	1328.360	341.327
2	31-02:00	23.19	16.709	79.562	1329.407	239.161
3	31-03:00	23.60	16.478	81.011	1334.877	213.527
4	31-04:00	22.90	15.618	93.244	1334.168	243.131
298	12-09:00	20.90	15.167	84.640	1283.706	339.440
299	12-10:00	24.98	14.308	85.034	1278.345	368.564
300	12-11:00	21.00	14.308	88.013	1307.722	278.842
301	12-12:00	21.40	14.308	85.490	1255.986	273.484
307	31-05:00	20.89	14.308	94.172	1327.832	251.120

T-upp SteamFlow-	erExt-2 4 \	T-lowerExt-2	UCZAA White	eFlow-4
0 67.122	358.282	329.545	1.443	599.253
1 60.012	351.050	329.067	1.549	537.201
2	350.022	329.260	1.600	549.611
61.304	350.938	331.142	1.604	623.362
68.496 4	351.640	332.709	1.436	638.672
70.022 				
298	354.803	311.041	1.635	532.419
65.561 299	357.723	321.387	1.522	520.365
65.729 300	357.438	323.757	1.522	553.070
65.795 301 71.456	361.365	322.689	1.522	590.199
71.430 307 71.286	351.263	332.485	1.522	631.514
71.200				
Lower	U00+T 2	Unnor HoatT 2	ChipMacc 4	Wookl i guarE
BlackFlow-	-	Upper-HeatT-3	•	•
BlackFlow-)		Upper-HeatT-3 303.099	ChipMass-4 175.964	•
BlackFlow- 9 1319.039 1	2 \		•	•
BlackFlow- 0 1319.039 1 1297.317 2	2 \ 329.432	303.099	175.964	1127.197
BlackFlow- 0 1319.039 1 1297.317 2 1327.072	2 329.432 330.823	303.099	175.964 163.202	1127.197 665.975
BlackFlow- 0 1319.039 1 1297.317 2 1327.072 3 1324.461	2 329.432 330.823 329.140	303.099 304.879 303.383	175.964 163.202 164.013	1127.197 665.975 677.534
BlackFlow- 0 1319.039 1 1297.317 2 1327.072 3 1324.461 4	2 329.432 330.823 329.140 328.875	303.099 304.879 303.383 302.254	175.964 163.202 164.013 181.487	1127.197 665.975 677.534 767.853
BlackFlow- 0 1319.039 1 1297.317 2 1327.072 3 1324.461 4 1343.424	2 329.432 330.823 329.140 328.875	303.099 304.879 303.383 302.254	175.964 163.202 164.013 181.487	1127.197 665.975 677.534 767.853
BlackFlow- 0 1319.039 1 1297.317 2 1327.072 3 1324.461 4 1343.424 298 1344.708	2 \ 329.432 330.823 329.140 328.875 328.352	303.099 304.879 303.383 302.254 300.954	175.964 163.202 164.013 181.487 183.929	1127.197 665.975 677.534 767.853 888.448
BlackFlow- 9 1319.039 1 1297.317 2 1327.072 3 1324.461 4 1343.424 298 1344.708 299 1344.469 300	2 \ 329.432 330.823 329.140 328.875 328.352 332.924	303.099 304.879 303.383 302.254 300.954 	175.964 163.202 164.013 181.487 183.929 	1127.197 665.975 677.534 767.853 888.448
BlackFlow-0 1319.039 1 1297.317 2 1327.072 3 1324.461 4 1343.424 298 1344.708 299 1344.469 300 1344.588 301	2 \ 329.432 330.823 329.140 328.875 328.352 332.924 332.523	303.099 304.879 303.383 302.254 300.954 307.626 307.169	175.964 163.202 164.013 181.487 183.929 145.299 151.544	1127.197 665.975 677.534 767.853 888.448 832.906 905.639
BlackFlow-0 1319.039 1 1297.317 2 1327.072 3 1324.461 4 1343.424 298 1344.708 299 1344.469 300 1344.588	2 \ 329.432 330.823 329.140 328.875 328.352 332.924 332.523 331.263	303.099 304.879 303.383 302.254 300.954 307.626 307.169 306.400	175.964 163.202 164.013 181.487 183.929 145.299 151.544 157.954	1127.197 665.975 677.534 767.853 888.448 832.906 905.639 908.691

```
SteamHeatF-3
    WeakWashF
                              T-Top-Chips-4
                                             SulphidityL-4
0
       257.325
                       54.612
                                     252.077
                                                      29.11
1
       241.182
                       46.603
                                     251.406
                                                      29.11
2
                                                      29.02
       237.272
                       51.795
                                     251.335
3
       239.478
                       54.846
                                     250.312
                                                      29.02
4
       215.372
                       54.186
                                     249.916
                                                      29.01
       388.911
                                                      30.29
298
                       49.524
                                     251.833
                       48.135
                                     251.614
                                                      30.47
299
       418.979
300
       462.712
                       54.373
                                     251.197
                                                      30.46
       457.313
                       53.194
                                     251.324
                                                      30.46
301
                                     250.084
307
       232.729
                       54.503
                                                        NaN
[301 rows x 23 columns]
import numpy as np
import matplotlib.pyplot as plt
from scipy import stats
data2.columns
'WhiteFlow-4', 'AAWhiteSt-4', 'AA-Wood-4', 'ChipMoisture-4
       'SteamFlow-4', 'Lower-HeatT-3', 'Upper-HeatT-3', 'ChipMass-4
       'WeakLiquorF ', 'BlackFlow-2 ', 'WeakWashF ', 'SteamHeatF-3 ',
       'T-Top-Chips-4 ', 'SulphidityL-4 '],
     dtvpe='object')
data2.drop(['Observation'],axis=1,inplace=True)
data2.columns
Index(['Y-Kappa', 'ChipRate', 'BF-CMratio', 'BlowFlow', 'ChipLevel4',
       'T-upperExt-2 ', 'T-lowerExt-2 ', 'UCZAA', 'WhiteFlow-4 ',
       'AAWhiteSt-4', 'AA-Wood-4', 'ChipMoisture-4', 'SteamFlow-4
      'Lower-HeatT-3', 'Upper-HeatT-3', 'ChipMass-4', 'WeakLiquorF
       'BlackFlow-2 ', 'WeakWashF ', 'SteamHeatF-3 ', 'T-Top-Chips-4
       'SulphidityL-4 '],
     dtype='object')
Q1=data2.quantile(0.25)
03 = data2.quantile(0.75)
IQR=Q3-Q1
print(IQR)
```

```
Y-Kappa
                     4.550
ChipRate
                     2.233
BF-CMratio
                     10.912
BlowFlow
                    96,766
ChipLevel4
                   105.868
T-upperExt-2
                     11.994
T-lowerExt-2
                     7.609
UCZAA
                     0.152
WhiteFlow-4
                   100.098
AAWhiteSt-4
                     6.143
AA-Wood-4
                     1.486
ChipMoisture-4
                     2.186
SteamFlow-4
                     8.840
Lower-HeatT-3
                     8.585
Upper-HeatT-3
                     7.852
                    19.347
ChipMass-4
WeakLiquorF
                   180.613
BlackFlow-2
                   280.829
                   267.219
WeakWashF
SteamHeatF-3
                     6.903
T-Top-Chips-4
                     2.044
SulphidityL-4
                    30.420
dtype: float64
data2=data2[-((data2<(Q1-1.5*IQR)))|(data2>(Q3+1.5*IQR))).any(axis=1)]
data2
                                     BlowFlow
     Y-Kappa
              ChipRate
                         BF-CMratio
                                               ChipLevel4 T-upperExt-
2
       27.60
1
                16.810
                             79.022
                                     1328.360
                                                    341.327
351.050
                                                    239.161
       23.19
                16.709
                             79.562
                                     1329.407
350.022
       23.60
                16.478
                             81.011
                                                    213.527
                                     1334.877
350.938
       14.23
                15.350
                             85.518
                                     1171.604
                                                    198.538
344.014
       13.49
                13.700
                             98.186
                                     1243.688
                                                    116.275
346.208
                15.517
                                     1288.010
276
       22.70
                             83.008
                                                    306.886
350.155
                             97.662
296
       20.50
                13.358
                                     1304.597
                                                    377.678
347.672
297
       20.40
                14.233
                             89.790
                                     1278.006
                                                    379.458
354.290
298
       20.90
                15.167
                             84.640
                                     1283.706
                                                    339.440
354.803
307
       20.89
                14.308
                             94.172
                                     1327.832
                                                    251.120
```

351.263							
	erExt-2	UCZAA	WhiteFl	ow-4	AAWhit	eSt-4	
SteamFlow- 1 60.012	4 \ 329.067	1.549	53	7.201		6.076	
2 61.304	329.260	1.600	54	9.611		0.000	
3 68.496	331.142	1.604	62	3.362		6.054	
5 65.225	325.195	1.436	62	8.245		6.020	
6 72.989	326.982	1.434	69	6.766		0.000	
276 67.678	322.485	1.590	56	8.752		6.170	
296 60.119	313.147	1.546	49	6.460		6.340	
297 60.424	315.558	1.515	49	1.374		0.000	
298 65.561	311.041	1.635	53	2.419		6.340	
307 71.286	332.485	1.522	63	1.514		0.000	
Lower BlackFlow-		Upper-H	eatT-3	ChipMa	ass-4	WeakL	iquorF
1 1297.317	330.823		304.879	10	63.202	(665.975
2 1327.072	329.140		303.383	10	64.013	(577.534
3 1324.461	328.875		302.254	18	81.487	-	767.853
5 907.641	322.103		298.517		65.814		326.243
6 929.527	322.982		296.080	18	82.018		784.281
276 1381.389	331.854		309.346		60.061		910.013
296 1334.703	332.615		308.575		41.076		997.904
297 1344.835	331.980		308.078		40.301		975.016
298 1344.708	332.924		307.626	14	45.299	8	332.906

307	328.699	300	. 706	180.229	90	3.605	
1323.082							
Wea 1 2 3 5 6	akWashF S ⁻ 241.182 237.272 239.478 595.875 201.272	teamHeatF-3 46.603 51.795 54.846 52.807 58.118	2 2 2	ips-4 51.406 51.335 50.312 49.580 48.741	Sulphidi	tyL-4 29.11 0.00 29.02 30.34 0.00	
276 296 297 298 307	441.934 389.497 388.676 388.911 232.729	51.466 46.206 47.803 49.524 54.503	2 2 2	52.216 52.423 52.311 51.833 50.084		29.59 30.43 0.00 30.29 0.00	
[226 row	ıs x 22 colı	umns]					
data.des	scribe()						
count 3 mean std min 25% 50% 75% max	Y-Kappa 801.000000 20.568605 2.990751 12.170000 18.450000 20.740000 23.000000 27.600000	ChipRate 297.000000 14.338670 1.490121 9.983000 13.358000 14.417000 15.492000 16.958000	BF-CMrati 287.00000 87.27156 7.83969 68.64500 81.75350 86.70500 92.15350 121.71700	0 288. 4 1235. 0 102. 0 0. 0 1194. 0 1267. 0 1288.	owFlow 000000 537278 023065 000000 047250 130000 390000 240000	ChipLevel4 300.000000 259.365993 85.643939 0.000000 215.369250 271.845500 321.285000 419.014000	\
	-upperExt-2	2 T-lowerE	xt-2	UCZAA	WhiteF	low-4	
AAWhiteS count	300.0000	90 300.	000000 27	7.000000	300.	000000	
160.0000 mean	356.90703	324.	010783	1.490588	593.	148090	
6.143012 std	? 8.9544!	57 7.0	650502	0.108138	66.	949732	
0.082396 min	339.16800	90 284.0	633000	1.182000	405.	111000	
5.890000 25%) 350.3170	90 321.	534000	1.429000	543.	137750	
6.093000 50%) 357.17850	90 325.0	638500	1.498000	594.	294000	
6.140000 75%	362.3262!	50 329.	129250	1.561000	643.	567000	
6.200000 max 6.340000	399.13500			1.747000		394000	
	SteamF	low-4 Lowe	r-HeatT-3	Upper-H	eatT-3	ChipMass-	

4 \ count		300.000	900	300.	00000	300.000000	300.000000
mean		66.8345	567	325.	37041	300.381743	162.120610
std		5.6436	555	4.	63735	4.647201	14.129462
min		48.5680	900	318.	05100	293.312000	113.922000
25%		62.8472	250	321.	23275	296.418250	153.089750
50%		67.7510	900	323.	25150	298.493000	163.601000
75%		71.6502	250	329.	81600	304.228250	172.286750
max		76.1470	900	333.	85400	311.146000	189.268000
Chips-	WeakLi 4 \	iquorF [BlackFlo	w-2	WeakWashF	SteamHeat	3 T-Top-
count 300.00	300.	.000000	300.00	0000	300.00000	300.000	0000
mean 251.22	875.	491563	1170.38	7177	266.104633	3 49.664	1537
std 1.2931	123.	182165	149.28	8972	163.222997	7 4.589	9876
min	486.	938000	838.94	8000	0.00000	35.510	0000
248.35 25%	791.	096750	1038.33	8500	141.56000	9 46.378	3500
250.29 50%	869.	552000	1144.51	3500	280.451500	50.192	2500
251.35 75%	969.	904000	1318.63	2750	405.887750	53.284	1750
252.33 max		277000	1395.76	7000	715.715000	9 63.332	2000
254.12	2000						
count mean std min 25% 50% 75% max	16 3 2 3	ddityL-4 60.000000 80.463594 0.671066 29.010000 80.107500 80.395000 80.838250 82.840000					
[8 row	s x 22	columns]					