import pandas as pd

 $\label{local_csv} \mbox{data} = \mbox{pd.read_csv(r"C:\Users\Raman\Downloads\01.Data} \ \mbox{Cleaning and Preprocessing.csv")}$

type(data)

pandas.core.frame.DataFrame

data.info

data.info								
	method Data atio BlowFlo			Observation	Y-Kappa	ChipRate		
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		
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		
322	9-21:00	24.32	13.083	88.910	1192.879	318.006		
323	9-22:00	25.75	13.417	85.451	1186.342	248.312		
	-upperExt-2	T-lower	Ext-2	UCZAA White	eFlow-4			
0	low-4 \ 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	350.938		331.142	1.604	623.362			
68.496 4	351.640		332.709	NaN	638.672			
70.022								
 319	347.286		310.970	1.523	513.956			
313	547.200		510.570	1.323	313.330			

61.141 320	399.135	319.576	1.451	570.058
67.667				
321 66.446	373.633	314.591	1.457	549.306
322	364.081	308.559	1.523	504.852
61.054 323	356.289	310.482	1.474	497.375
58.247	5501200	5201162		
Lowe BlackFlow		pper-HeatT-3	ChipMass-4	WeakLiquorF
0	329.432	303.099	175.964	1127.197
1319.039 1 1297.317	330.823	304.879	163.202	665.975
2 1327.072	329.140	303.383	164.013	677.534
3	328.875	302.254	181.487	767.853
1324.461 4	328.352	300.954	183.929	888.448
1343.424				
	•••	• • • • • • • • • • • • • • • • • • • •		
319 1357.271	330.117	304.006	148.174	1027.201
320	330.848	304.616	165.178	906.962
1311.177 321 1319.226	330.226	304.686	160.841	887.125
322	327.346	304.363	147.589	804.423
1320.225 323	328.092	304.093	144.218	828.328
1320.848				
	WashF Stea 57.325	mHeatF-3 T-To 54.612	op-Chips-4 252.077	SulphidityL-4 NaN
	41.182 37.272	46.603 51.795	251.406 251.335	29.11 NaN
	39.478	54.846	250.312	NaN 29.02
	15.372	54.186	249.916	29.01
	81.643	45.264	252.947	30.86
320 2 321	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 [324 rows	1.276 x 23 column	43.840 s]>	253.216	NaN

data.de	scribe()	# descrip	tive stat	ictics				
count mean std min 25% 50% 75% max	Y-Kap 324.0006 20.6353 3.0706 12.1706 18.3825 20.8456 23.0325 27.6006	319.00 370 14.34 336 1.49 300 9.98 300 13.35 300 14.30 300 15.51	0000 307 7937 87 9095 7 3000 68 8000 81 8000 92	CMratic 7.000000 7.464456 7.995012 8.645006 8.823006 8.739006 8.372006	308.00 1237.83 100.59 0.00 1193.21 1273.13 1289.19	0000 7614 3735 0000 5250 8500 6000	ChipLevel4 323.000000 258.164483 87.987452 0.000000 213.527000 271.792000 321.680000 419.014000	\
	T-upperE	xt-2 T-l	owerExt-2		UCZAA	WhiteF1	l ow - 4	
AAWhite:	St-4 \							
count		000000	322.0000	000 299	0.000000	323.0	000000	
173.0000 mean		04295	324.0201	.80 1	.492010	591.7	732260	
6.14041	0							
std 0.08160	_	209290	7.6214	02 0	0.105923	67.0	916351	
min		.68000	284.6330	000 1	.182000	405.3	111000	
5.89000								
25% 6.08900		241250	321.4200	000 1	1.431500	540.9	989500	
50%		343000	325.6690	000 1	.498000	592.8	395000	
6.13500		40050	220 1750		560500	620	100500	
75% 6.19900		242250	329.1750	100 1	1.560500	639.4	180500	
max		35000	337.0120	000 1	.747000	731.3	394000	
6.34000	0							
	Ste	eamFlow-4	Lower-He	atT-3	Upper-Hea	tT-3	ChipMass-	
4 \ count	3	323.000000	322.0	00000	322.0	90000	323.000000	
mean		66.668285	325.5	67820	300.5	25699	162.222322	
std		5.708587	4.6	09862	4.5	68484	14.160688	
min		48.568000	318.0	51000	293.3	12000	113.922000	
25%		62.518000		85500	296.5		153.032500	
50%		67.429000	324.7	41000	299.1	26000	163.690000	
75%		71.522000	329.8	45250	304.2	44750	172.555000	
max		76.147000	333.8	54000	311.1	46000	189.268000	
ı	WeakLiqu	orF Blac	kFlow-2	WeakWa	shF Ste	amHeat	-3 T-Top-	

Chips-4	\			
	323.000000	322.000000	323.000000	322.000000
323.00000	00			
mean	873.828941	1175.917016	263.543068	49.696907
251.24008	37			
std	122.073521	149.334010	163.666942	4.551909
1.283432				
min	486.938000	838.948000	0.000000	35.510000
248.35900	_			
25%	792.019500	1044.817500	134.649000	46.389750
250.31200	00			
50%	865.254000	1150.221500	269.193000	50.277000
251.38000	00			
75%	965.286500	1319.021250	405.563000	53.294250
252.32350	_			
max 1	1226.277000	1395.767000	715.715000	63.332000
254.12200	00			
C	المنطقات المنطقات المناسلة			

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

[8 rows x 22 columns]

for removing the duplicate values in a Data

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
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
	-upperExt-2	T-lowe	rExt-2	UCZAA Whit	eFlow-4	
SteamF	•		220 545	1.443	500 252	
0 67.122	358.282		329.545	1.443	599.253	
1	351.050		329.067	1.549	537.201	
60.012	3311030		323.007	11313	3371201 111	
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	354.005		311.041	1.055	332.413	
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	251 262		222 405	1 522	621 514	
307 71.286	351.263		332.485	1.522	631.514	
71.200						
Lo	ower-HeatT-3	Upper-	HeatT-3	ChipMass-4	WeakLiquorF	
BlackF	low-2 \	•		•	•	
0	329.432		303.099	175.964	1127.197	
1319.03			204 070	160.000	665 675	
1	330.823		304.879	163.202	665.975	
1297.32 2	329.140		202 202	164 012	677 524	
1327.0			303.383	164.013	677.534	
3	328.875		302.254	181.487	767.853	
1324.40			3021231	1011107	7071033	
4	328.352		300.954	183.929	888.448	
1343.42						
	222 224		207 626	145 000	222 222	
298	332.924		307.626	145.299	832.906	
1344.70	00					

299 1344	332.523	307.169	151.544	905.639
300	331.263	306.400	157.954	908.691
1344 301	333.032	308.732	174.069	986.206
1348 307	328.699	300.706	180.229	903.605
1323				
0	WeakWashF Steam 257.325	nHeatF-3 T-Top 54.612	-Chips-4 S 252.077	SulphidityL-4 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
301 307	457.313 232.729	53.194 54.503	251.324 250.084	30.46 NaN
207	232.729	24.202	230.004	IValv

[301 rows x 23 columns]

data.isnull()

	Observation	Y-Kappa	ChipRate	BF-CMratio	BlowFlow	ChipLevel4
0	False	False	False	False	False	False
1	False	False	False	False	False	False
2	False	False	False	False	False	False
3	False	False	False	False	False	False
4	False	False	False	False	False	False
298	False	False	False	False	False	False
299	False	False	True	False	False	False
300	False	False	True	False	False	False
301	False	False	True	False	False	False
307	False	False	False	False	False	False

T-upper SteamFlow-4	Ext-2	T-lowerExt-2	UCZAA	WhiteFlo)w-4	
0	False	False	False	F	alse	
False 1	False	False	False	F	alse	
False 2	False	False	False	F	alse	
False 3	False	False	False	F	alse	
False 4	False	False	True	F	alse	
False 						
 298	False	False	False	F	alse	
False 299	False	False	True	F	alse	
False 300	False	False	True	F	alse	
False 301	False	False	True	F	alse	
False 307	False	False	False	F	alse	
False						
Lower-H BlackFlow-2	eatT-3 \	Upper-HeatT-3	ChipMa	ss-4 We	eakLio	uorF
BlackFlow-2	eatT-3 \ False	Upper-HeatT-3 False		ss-4 We False	eakLiq	uorF False
BlackFlow-2) False L	\				eakLiq	
BlackFlow-2 B False I False 2	\ False	False		False	eakLiq	False
BlackFlow-2 D False 1 False 2 False	\ False False	False False		False False	eakLiq	False False
BlackFlow-2 0 False 1 False 2 False 3 False	\ False False False	False False False		False False False	eakLiq	False False False
BlackFlow-2 False False False False False False False False	\ False False False False	False False False False		False False False False	eakLiq	False False False
BlackFlow-2 False I False S False B False B False I False I False I False	\ False False False False	False False False False		False False False False	eakLiq	False False False
BlackFlow-2 False I False STATE STAT	False False False False False	False False False False False		False False False False	eakLiq	False False False False
BlackFlow-2 False I False S False B False S False False False False S False S False S False	False False False False False False	False False False False False False False		False False False False False False	eakLiq	False False False False False False
Lower-H BlackFlow-2 0 False 1 False 2 False 3 False 4 False 298 False 299 False 300 False 301 False	False False False False False False False	False False False False False False False False False		False False False False False False	eakLiq	False False False False False False
lackFlow-2 alse alse alse alse alse alse alse olse olse olse ol	False False False False False False False False False	False		False False False False False False False False False	eakLiq	False False False False False False False False

```
WeakWashF
                  SteamHeatF-3
                                  T-Top-Chips-4
                                                    SulphidityL-4
0
                                            False
           False
                           False
                                                              True
1
           False
                           False
                                            False
                                                             False
2
           False
                           False
                                            False
                                                              True
3
           False
                           False
                                            False
                                                             False
4
           False
                           False
                                            False
                                                             False
                             . . .
             . . .
                                                                . . .
298
           False
                           False
                                            False
                                                             False
299
           False
                           False
                                            False
                                                             False
300
           False
                           False
                                            False
                                                              True
301
           False
                           False
                                            False
                                                             False
307
           False
                           False
                                            False
                                                              True
[301 rows x 23 columns]
data.isnull().sum()
                      0
Observation
Y-Kappa
                      0
                      4
ChipRate
BF-CMratio
                     14
BlowFlow
                     13
ChipLevel4
                      1
T-upperExt-2
                      1
T-lowerExt-2
                      1
                     24
UCZAA
WhiteFlow-4
                      1
AAWhiteSt-4
                    141
AA-Wood-4
                       1
ChipMoisture-4
                       1
                      1
SteamFlow-4
Lower-HeatT-3
                      1
Upper-HeatT-3
                      1
ChipMass-4
                       1
WeakLiquorF
                       1
BlackFlow-2
                       1
                      1
WeakWashF
                      1
SteamHeatF-3
T-Top-Chips-4
                      1
SulphidityL-4
                    141
dtype: int64
data.notnull()
     Observation 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	Tru	е	True
3	True	True	True		True	Tru	е	True
4	True	True	True		True	Tru	е	True
298	True	True	True		True	Tru	е	True
299	True	True	False		True	Tru	е	True
300	True	True	False		True	Tru	е	True
301	True	True	False		True	Tru	е	True
307	True	True	True		True	Tru	е	True
T-uppe SteamFlow-4	erExt-2	T-lowerE	xt-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 								
 298	True		True	True		True		
True 299	True			False		True		
True								
300 True	True		True	False		True		
301 True	True		True	False		True		
307 True	True		True	True		True		
	HeatT-3	Upper-He	a+T 2	ChipMa	cc 1	WeakLiq	ıorE	
BlackFlow-2	? \	opper-ne		Сптрпа		weakLiq		
0 True	True		True		True		True	
1 True	True		True		True		True	
TTUC								

2	Tru	ıe	True	True		True		
True 3	Tru	ıe	True	True		True		
True 4	Trı	10	True	True		True		
4 True	111	ie	True	True		True		
298	Tru	ıe	True	True		True		
True 299	Trı	10	True	True		True		
True	110	ie.	True	True		True		
300 True	Tru	ıe	True	True	,	True		
301	Tru	ıe	True	True		True		
True 307	Trı	IΔ	True	True		True		
True	110	16	True	True		ii ue		
0 1 2 3 4 298 299	WeakWashF True True True True True True	SteamHea	tF-3 T-T True True True True True True True Tru	op-Chips-4 True True True True True True True True		yL-4 False True False True True True True True True		
300 301 307	True True True		True True True	True True True		False True False		
[301	rows x 23 co	olumns]						
data.	isnull().sum	n().sum()						
352	(,	()						
data2	<pre>data2 = data.fillna(value=0) data2</pre>							
)bservation	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	0.000	85.034	1278.345	368.564
300	12-11:00	21.00	0.000	88.013	1307.722	278.842
301	12-12:00	21.40	0.000	85.490	1255.986	273.484
307	31-05:00	20.89	14.308	94.172	1327.832	251.120
SteamF 0 67.122 1	358.282 351.050	T-low	erExt-2 329.545 329.067	UCZAA White 1.443 1.549	eFlow-4 599.253 537.201	
60.012	350.022		329.260	1.600	549.611	
61.304	350.938		331.142	1.604	623.362	
68.496 4 70.022	351.640		332.709	0.000	638.672	
298 65.561	354.803		311.041	1.635	532.419	
299	357.723		321.387	0.000	520.365	
65.729 300	357.438		323.757	0.000	553.070	
65.795 301	361.365		322.689	0.000	590.199	
71.456 307 71.286	351.263		332.485	1.522	631.514	
L BlackF	ower-HeatT-3 low-2 \	Upper	-HeatT-3	ChipMass-4	WeakLiquorF	
0 1319.0	329.432		303.099	175.964	1127.197	
1	330.823		304.879	163.202	665.975	
1297.3	329.140		303.383	164.013	677.534	
1327.0 3 1324.4	328.875		302.254	181.487	767.853	

4	328.3	52	300.9	954	183.929		888.448
1343.42	4						
298	332.9	24	307.	626	145.299		832.906
1344.70			207	1.00	151 544		005 600
299	332.5	23	307.	169	151.544		905.639
1344.469 300	_	62	306.4	400	157.954		908.691
1344.58	331.2	.03	300.4	400	157.954		900.091
301	333.0	132	308.	732	174.069		986.206
1348.74°		J2	500.	152	174.003		300.200
307	328.6	99	300.	706	180.229		903.605
1323.08	2						
_	akWashF	SteamHeat	_	T-Top-C	Chips-4	Sulphi	dityL-4
0	257.325		1.612		252.077		0.00
1	241.182		6.603		251.406		29.11
2	237.272		1.795		251.335		0.00
3 4	239.478	_	1.846		250.312		29.02
4	215.372	54	1.186		249.916		29.01
298	388.911	40).524		251.833		30.29
299	418.979	_	3.135		251.633		30.47
300	462.712		1.373		251.197		0.00
301	457.313		3.194		251.324		30.46
307	232.729		1.503		250.084		0.00

[301 rows x 23 columns]

forward Filling

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

	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	15.167	85.034	1278.345	368.564
300	12-11:00	21.00	15.167	88.013	1307.722	278.842
301	12-12:00	21.40	15.167	85.490	1255.986	273.484
307	31-05:00	20.89	14.308	94.172	1327.832	251.120
	_					
T SteamF	-upperExt-2 low-4 \	T - Lowe	erExt-2	UCZAA Whit	eFlow-4	
0 67.122	358.282		329.545	1.443	599.253	
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	330.930		331.142	1.004	623.362	
4	351.640		332.709	1.604	638.672	
70.022						
	254 222		211 241	1 625	522 410	
298 65.561	354.803		311.041	1.635	532.419	
299	357.723		321.387	1.635	520.365	
65.729 300	357.438		323.757	1.635	553.070	
65.795	337.430		323.737	1.055	553.070	
301	361.365		322.689	1.635	590.199	
71.456 307	351.263		332.485	1.522	631.514	
71.286	331.203		332.403	1.322	031.314	
	aven Haatt 2	llanaa	Uss±T 2	ChinMaga 4	المعادلة عددها	
	ower-HeatT-3 low-2 \	upper-	·HeatT-3	ChipMass-4	WeakLiquorF	
0	329.432		303.099	175.964	1127.197	
1319.03 1	39 330.823		304.879	163.202	665.975	
1297.3			304.079	103.202	003.973	
2	329.140		303.383	164.013	677.534	
1327.0°	72 328.875		302.254	181.487	767.853	
1324.40			302.234	101.407	707.055	
4	328.352		300.954	183.929	888.448	
1343.47	24					
298	332.924		307.626	145.299	832.906	
1344.70	ชช					

299 1344.46	332.523	307.169	151.544	905.639
300	331.263	306.400	157.954	908.691
1344.58 301	333.032	308.732	174.069	986.206
1348.74 307	328.699	300.706	180.229	903.605
1323.08	2			
We 0 1 2 3 4 298 299 300 301 307	akWashF Stea 257.325 241.182 237.272 239.478 215.372 388.911 418.979 462.712 457.313 232.729	MHeatF-3 T-Top 54.612 46.603 51.795 54.846 54.186 49.524 48.135 54.373 53.194 54.503	-Chips-4 Su 252.077 251.406 251.335 250.312 249.916 251.833 251.614 251.197 251.324 250.084	NaN 29.11 29.11 29.02 29.01 30.29 30.47 30.47 30.46 30.46
[301 ro	ws x 23 column	s]		
# backw	ard filling			

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

	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	perExt-2	T-lowerExt-2	UCZAA White	eFlow-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 70.022	351.640	332.709	1.436	638.672
298 65.561	354.803	311.041	1.635	532.419
299	357.723	321.387	1.522	520.365
65.729 300	357.438	323.757	1.522	553.070
65.795 301	361.365	322.689	1.522	590.199
71.456 307	351.263	332.485	1.522	631.514
71.286				
Lowe BlackFlow	r-HeatT-3	Upper-HeatT-3	ChipMass-4	WeakLiquorF
Θ	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 1343.424	328.352	300.954	183.929	888.448
298 1344.708	332.924	307.626	145.299	832.906
299 1344.469	332.523	307.169	151.544	905.639
300	331.263	306.400	157.954	908.691
1344.588 301	333.032	308.732	174.069	986.206
1348.747 307	328.699	300.706	180.229	903.605

```
1323.082
                              T-Top-Chips-4
                                             SulphidityL-4
    WeakWashF
                SteamHeatF-3
0
       257.325
                      54.612
                                     252.077
                                                      29.11
1
                      46.603
                                     251.406
                                                      29.11
       241.182
2
       237.272
                      51.795
                                     251.335
                                                      29.02
3
       239.478
                      54.846
                                     250.312
                                                      29.02
4
       215.372
                      54.186
                                     249.916
                                                      29.01
       388.911
                      49.524
                                     251.833
                                                      30.29
298
299
       418.979
                      48.135
                                     251.614
                                                      30.47
                      54.373
                                     251.197
300
       462.712
                                                      30.46
301
       457.313
                      53.194
                                     251.324
                                                      30.46
307
       232,729
                      54.503
                                     250.084
                                                        NaN
[301 rows x 23 columns]
import numpy as np
from scipy import stats
#detect the outliers using the IOR
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 '],
     dtype='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)
Q3 = data2.quantile(0.75)
```

```
IOR = 03-01
print(IQR)
Y-Kappa
                                                                    4.550
ChipRate
                                                                    2.233
BF-CMratio
                                                                 10.912
BlowFlow
                                                                 96.766
ChipLevel4
                                                              105.868
T-upperExt-2
                                                                 11.994
                                                                    7.609
T-lowerExt-2
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
ChipMass-4
                                                                 19.347
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[\sim((data2<(Q1-1.5*IQR))) | (data2>(Q3 + Q3)) | (data2 + Q3)) | 
1.5*IQR))).any(axis =1)]
data2
                Y-Kappa
                                             ChipRate
                                                                              BF-CMratio
                                                                                                                     BlowFlow
                                                                                                                                                     ChipLevel4 T-upperExt-
2
                                                    16.810
                                                                                           79.022
1
                       27.60
                                                                                                                     1328.360
                                                                                                                                                                  341.327
351.050
                                                    16.709
                                                                                           79.562
                       23.19
                                                                                                                     1329.407
                                                                                                                                                                  239.161
350.022
                       23.60
                                                    16.478
                                                                                           81.011
                                                                                                                     1334.877
                                                                                                                                                                  213.527
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
 . .
                      22.70
                                                    15.517
                                                                                           83.008
                                                                                                                     1288.010
                                                                                                                                                                   306.886
276
350.155
                      20.50
                                                    13.358
                                                                                           97.662
                                                                                                                     1304.597
                                                                                                                                                                   377.678
296
347.672
                                                                                                                                                                   379.458
297
                                                    14.233
                                                                                           89.790
                                                                                                                     1278.006
                       20.40
```

254 222							
354.290 298 20.9	00 15 1	167	04 640	1202	706	220 4	40
298 20.9 354.803	90 15.1	107	84.640	1283.	700	339.4	40
307 20.8	89 14.3	308	94.172	1327.8	832	251.1	20
351.263				_		_	
т 1	T 1	110744	\.//a ≟ ± a □1 .	1	A A \ . /	-C+ 1	
۱-۱٥we SteamFlow-4	erExt-2	UCZAA	WhiteFlo	OW - 4	AAWNIT	eSt-4	
1	329.067	1.549	53	7.201		6.076	
60.012	0_0.00.						
2	329.260	1.600	549	9.611		0.000	
61.304	221 142	1 604	63.	2 262		6 054	
3 58.496	331.142	1.604	02.	3.362		6.054	
5	325.195	1.436	628	8.245		6.020	
65.225							
6	326.982	1.434	690	6.766		0.000	
72.989							
276	322.485	1.590	568	8.752		6.170	
67.678							
296 50.119	313.147	1.546	490	6.460		6.340	
297	315.558	1.515	49	1.374		0.000	
60.424	515.550	1.010		,		0.000	
298	311.041	1.635	532	2.419		6.340	
55.561	222 405	1 522	63.	1 514		0 000	
307 71.286	332.485	1.522	03.	1.514		0.000	
11200							
	-HeatT-3	Upper-H	leatT-3	ChipMa	ass-4	WeakLi	quorF
BlackFlow-2 -	330.823		304.879	1	63.202	6	65.975
.297.317	330.023		JUT 10/3	1,	03.202	U	55.575
2	329.140		303.383	10	64.013	6	77.534
1327.072	220 075		202 254	1.0	01 407	7	67 050
3 1324.461	328.875		302.254	16	81.487	/	67.853
)	322.103		298.517	10	65.814	8	26.243
907.641							
)	322.982		296.080	18	82.018	7	84.281
929.527							
276	331.854		309.346	10	60.061	9	10.013
1381.389	222 615		200 575	1	41 076	0	07 004
296 1334.703	332.615		308.575	14	41.076	9	97.904
_55 , 55							

331.980 308.078 140.301 975.016 344.708 332.924 307.626 145.299 832.906 344.708 308.699 300.706 180.229 903.605 323.082						
298		331.980	308.078	140.301	975.016	
307 328.699 300.706 180.229 903.605 WeakWashF	298	332.924	307.626	145.299	832.906	
WeakWashF	307	328.699	300.706	180.229	903.605	
1 241.182	1323.082					
298	1 2 2 2 3 2 5 5 6 2 276 4 296 3	41.182 37.272 39.478 95.875 01.272 41.934 89.497	46.603 51.795 54.846 52.807 58.118 51.466 46.206	251.406 251.335 250.312 249.580 248.741 252.216 252.423	29.11 0.00 29.02 30.34 0.00 29.59 30.43	
Carrier Carr	298 3	88.911	49.524	251.833	30.29	
data2.describe() Y-Kappa ChipRate BF-CMratio BlowFlow ChipLevel4 \ count 226.000000 226.000000 226.000000 226.000000 226.000000 226.000000	307 2	32.729	54.503	250.084	0.00	
Y-Kappa ChipRate BF-CMratio BlowFlow ChipLevel4 \ count 226.000000 226.000000 226.000000 226.000000 226.000000	[226 rows	x 22 column	s]			
count 226.000000 </td <td>data2.des</td> <td>cribe()</td> <td></td> <td></td> <td></td> <td></td>	data2.des	cribe()				
AAWhiteSt-4 \ count	mean 2 std min 1 25% 1 50% 2 75% 2	6.000000 22 0.690487 1 2.982916 2.480000 1 8.457500 1 0.775000 1	6.000000 226.00 4.673491 85.88 1.297369 7.03 0.833000 68.64 3.850000 80.98 4.729000 84.96 5.708000 91.17	0000 226.006 2181 1255.288 3155 47.896 5000 1084.083 4000 1221.926 7000 1280.291 8750 1289.254	20000 226.000000 3916 264.664912 5055 74.345135 6000 61.783000 5000 220.356000 2500 270.965000 4000 322.492000	\
count 226.000000 226.000000 226.000000 226.000000 mean 356.861681 325.341124 1.487146 603.242482 3.098164 5.557537 0.108054 61.052197 3.078138 min 340.222000 310.421000 1.182000 468.841000 0.000000 25% 350.704250 322.355500 1.429000 549.611000 50% 357.560500 326.508500 1.492000 602.508000 5.904500 75% 361.555000 329.264500 1.556000 653.358500			T-lowerExt-2	UCZAA V	/hiteFlow-4	
mean 356.861681 325.341124 1.487146 603.242482 3.098164 7.466897 5.557537 0.108054 61.052197 3.078138 min 340.222000 310.421000 1.182000 468.841000 0.000000 25% 350.704250 322.355500 1.429000 549.611000 0.000000 357.560500 326.508500 1.492000 602.508000 5.904500 361.555000 329.264500 1.556000 653.358500	count	226.000000	226.000000	226.000000	226.000000	
std 7.466897 5.557537 0.108054 61.052197 3.078138 min 340.222000 310.421000 1.182000 468.841000 0.000000 25% 350.704250 322.355500 1.429000 549.611000 0.000000 357.560500 326.508500 1.492000 602.508000 5.904500 361.555000 329.264500 1.556000 653.358500	mean		325.341124	1.487146	603.242482	
min 340.222000 310.421000 1.182000 468.841000 0.000000 25% 350.704250 322.355500 1.429000 549.611000 0.000000 50% 357.560500 326.508500 1.492000 602.508000 5.904500 75% 361.555000 329.264500 1.556000 653.358500	std	7.466897	5.557537	0.108054	61.052197	
25% 350.704250 322.355500 1.429000 549.611000 0.000000 50% 357.560500 326.508500 1.492000 602.508000 5.904500 75% 361.555000 329.264500 1.556000 653.358500	min	340.222000	310.421000	1.182000	468.841000	
50% 357.560500 326.508500 1.492000 602.508000 5.904500 361.555000 329.264500 1.556000 653.358500	25%	350.704250	322.355500	1.429000	549.611000	
5.904500 75% 361.555000 329.264500 1.556000 653.358500		357.560500	326.508500	1.492000	602.508000	
	5.904500 75%					

max 375 6.340000	5.047000	337.012000	1.712000 7	31.394000
	SteamFlow-4	Lower-HeatT-3	Upper-HeatT-	3 ChipMass-
4 \ count	226.000000	226.000000	226.0000	00 226.000000
mean	67.545478	324.752212	299.6554	20 164.220102
std	4.914301	4.526481	4.3837	88 11.423269
min	52.962000	318.051000	293.3120	00 133.878000
25%	63.954000	321.179500	296.3385	00 156.091000
50%	68.147000	322.380000	297.6365	00 164.333000
75%	71.760750	329.575000	303.7770	00 172.555000
max	75.974000	333.223000		
	70.01.1000	333122333	300.00.0	
	iquorF Blac	kFlow-2 Weak	WashF SteamH	eatF-3 T-Top-
	.000000 22	6.000000 226.	000000 226	.000000
226.000000 mean 874	. 123035 114	9.895257 273.	739403 49	.810239
251.177779 std 120	. 259977 15	0.321416 163.	452307 4	. 143153
1.221296				
min 596. 248.359000	. 446000 83	8.948000 0.	000000 38	.283000
25% 784	.366750 101	4.977000 149.	331750 46	.639750
250.290750 50% 866	.170000 112	6.513500 283.	079500 50	.128500
251.233000	.170000 112	0.515500 205.	079300 30	.120300
	.683250 130	2.847000 414.	599750 52	.889250
	. 181000 139	2.868000 715.	715000 59	.564000
254.122000				
count 22 mean 5 std 6 min 25% 50% 22 75% 3	idityL-4 26.000000 15.391987 15.297984 0.000000 0.000000 29.065000 30.437500			

[8 rows x 22 columns]