

```
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
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
..      ...      ...      ...      ...      ...      ...
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
```

```
      T-upperExt-2  T-lowerExt-2  UCZAA  WhiteFlow-4  ...
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
..      ...      ...      ...      ...      ...
...
319    347.286      310.970  1.523      513.956  ...
61.141
320    399.135      319.576  1.451      570.058  ...
```

```

67.667
321      373.633      314.591  1.457      549.306  ...
66.446
322      364.081      308.559  1.523      504.852  ...
61.054
323      356.289      310.482  1.474      497.375  ...
58.247

      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
..      ...      ...      ...      ...
...
319      330.117      304.006      148.174      1027.201
1357.271
320      330.848      304.616      165.178      906.962
1311.177
321      330.226      304.686      160.841      887.125
1319.226
322      327.346      304.363      147.589      804.423
1320.225
323      328.092      304.093      144.218      828.328
1320.848

      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
..      ...      ...      ...      ...
319      381.643      45.264      252.947      30.86
320      25.494      50.528      252.092      30.70
321      0.638      45.549      252.438      NaN
322      0.000      43.725      253.176      31.13
323      1.276      43.840      253.216      NaN

[324 rows x 23 columns]>
data.describe()

```

	Y-Kappa	ChipRate	BF-CMratio	BlowFlow	ChipLevel4	\
count	324.000000	319.000000	307.000000	308.000000	323.000000	
mean	20.635370	14.347937	87.464456	1237.837614	258.164483	
std	3.070036	1.499095	7.995012	100.593735	87.987452	
min	12.170000	9.983000	68.645000	0.000000	0.000000	
25%	18.382500	13.358000	81.823000	1193.215250	213.527000	
50%	20.845000	14.308000	86.739000	1273.138500	271.792000	
75%	23.032500	15.517000	92.372000	1289.196000	321.680000	
max	27.600000	16.958000	121.717000	1351.240000	419.014000	
	T-upperExt-2	T-lowerExt-2	UCZAA	WhiteFlow-4		
AAWhiteSt-4	\					
count	322.000000	322.000000	299.000000	323.000000		
173.000000						
mean	356.904295	324.020180	1.492010	591.732260		
6.140410						
std	9.209290	7.621402	0.105923	67.016351		
0.081609						
min	339.168000	284.633000	1.182000	405.111000		
5.890000						
25%	350.241250	321.420000	1.431500	540.989500		
6.089000						
50%	356.843000	325.669000	1.498000	592.895000		
6.135000						
75%	362.242250	329.175000	1.560500	639.480500		
6.199000						
max	399.135000	337.012000	1.747000	731.394000		
6.340000						
	... SteamFlow-4	Lower-HeatT-3	Upper-HeatT-3	ChipMass-		
4 \						
count	...	323.000000	322.000000	322.000000	323.000000	
mean	...	66.668285	325.567820	300.525699	162.222322	
std	...	5.708587	4.609862	4.568484	14.160688	
min	...	48.568000	318.051000	293.312000	113.922000	
25%	...	62.518000	321.385500	296.513250	153.032500	
50%	...	67.429000	324.741000	299.126000	163.690000	
75%	...	71.522000	329.845250	304.244750	172.555000	
max	...	76.147000	333.854000	311.146000	189.268000	
	WeakLiquorF	BlackFlow-2	WeakWashF	SteamHeatF-3	T-Top-	
Chips-4	\					
count	323.000000	322.000000	323.000000	322.000000		

```

323.000000
mean      873.828941    1175.917016    263.543068      49.696907
251.240087
std       122.073521     149.334010    163.666942      4.551909
1.283432
min       486.938000     838.948000      0.000000     35.510000
248.359000
25%       792.019500    1044.817500    134.649000     46.389750
250.312000
50%       865.254000    1150.221500    269.193000     50.277000
251.380000
75%       965.286500    1319.021250    405.563000     53.294250
252.323500
max      1226.277000    1395.767000    715.715000     63.332000
254.122000

```

```

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

```

```
[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
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-upperExt-2 T-lowerExt-2 UCZAA WhiteFlow-4 ...						
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	...	
65.729						
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		
1344.588						

```

301      333.032      308.732      174.069      986.206
1348.747
307      328.699      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]
```

```
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-upperExt-2      T-lowerExt-2      UCZAA      WhiteFlow-4      ...
SteamFlow-4      \
0      False      False      False      False      ...
False

```

1	False	False	False	False	...
False					
2	False	False	False	False	...
False					
3	False	False	False	False	...
False					
4	False	False	True	False	...
False					
..
...					
298	False	False	False	False	...
False					
299	False	False	True	False	...
False					
300	False	False	True	False	...
False					
301	False	False	True	False	...
False					
307	False	False	False	False	...
False					
Lower-HeatT-3 Upper-HeatT-3 ChipMass-4 WeakLiquorF					
BlackFlow-2 \					
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	False	False	False
False					
300	False	False	False	False	False
False					
301	False	False	False	False	False
False					
307	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()
```

```

Observation      0
Y-Kappa          0
ChipRate         4
BF-CMratio      14
BlowFlow        13
ChipLevel4       1
T-upperExt-2     1
T-lowerExt-2     1
UCZAA           24
WhiteFlow-4      1
AAWhiteSt-4     141
AA-Wood-4        1
ChipMoisture-4   1
SteamFlow-4      1
Lower-HeatT-3    1
Upper-HeatT-3    1
ChipMass-4       1
WeakLiquorF      1
BlackFlow-2      1
WeakWashF        1
SteamHeatF-3     1
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	True	True
3	True	True	True	True	True	True

4	True	True	True	True	True	True
..
298	True	True	True	True	True	True
299	True	True	False	True	True	True
300	True	True	False	True	True	True
301	True	True	False	True	True	True
307	True	True	True	True	True	True
T-upperExt-2 T-lowerExt-2 UCZAA WhiteFlow-4 ...						
SteamFlow-4 \						
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	False	True	True	...
True						
..
...						
298	True	True	True	True	True	...
True						
299	True	True	False	True	True	...
True						
300	True	True	False	True	True	...
True						
301	True	True	False	True	True	...
True						
307	True	True	True	True	True	...
True						
Lower-HeatT-3 Upper-HeatT-3 ChipMass-4 WeakLiquorF						
BlackFlow-2 \						
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
True				
..
...				
298	True	True	True	True
True				
299	True	True	True	True
True				
300	True	True	True	True
True				
301	True	True	True	True
True				
307	True	True	True	True
True				

	WeakWashF	SteamHeatF-3	T-Top-Chips-4	SulphidityL-4
0	True	True	True	False
1	True	True	True	True
2	True	True	True	False
3	True	True	True	True
4	True	True	True	True
..
298	True	True	True	True
299	True	True	True	True
300	True	True	True	False
301	True	True	True	True
307	True	True	True	False

[301 rows x 23 columns]

```
data.isnull().sum().sum()
```

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	84.640	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-upperExt-2 T-lowerExt-2 UCZAA WhiteFlow-4 ...						
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	...	
65.729						
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
1344.588				
301	333.032	308.732	174.069	986.206
1348.747				
307	328.699	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]

data2.isnull().sum().sum()

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	84.640	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-upperExt-2	T-lowerExt-2	UCZAA	WhiteFlow-4	...
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	...
65.729					
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

```

1344.588
301      333.032      308.732      174.069      986.206
1348.747
307      328.699      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]
```

```

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-upperExt-2 T-lowerExt-2 UCZAA WhiteFlow-4 ...						
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	...	
65.729						
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		
1344.588						
301	333.032	308.732	174.069	986.206		
1348.747						

307	328.699	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-upperExt-2 SteamFlow-4 \	T-lowerExt-2	UCZAA	WhiteFlow-4	...
0 67.122	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	1.436	638.672 ...
..
...				
298 65.561	354.803	311.041	1.635	532.419 ...
299 65.729	357.723	321.387	1.522	520.365 ...
300 65.795	357.438	323.757	1.522	553.070 ...
301 71.456	361.365	322.689	1.522	590.199 ...
307 71.286	351.263	332.485	1.522	631.514 ...
Lower-HeatT-3 BlackFlow-2 \	Upper-HeatT-3	ChipMass-4	WeakLiquorF	
0 1319.039	329.432	303.099	175.964	1127.197
1 1297.317	330.823	304.879	163.202	665.975
2 1327.072	329.140	303.383	164.013	677.534
3 1324.461	328.875	302.254	181.487	767.853
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 1344.588	331.263	306.400	157.954	908.691
301 1348.747	333.032	308.732	174.069	986.206
307 1323.082	328.699	300.706	180.229	903.605

	WeakWashF	SteamHeatF-3	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	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
...
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	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
import matplotlib.pyplot as plt
from scipy import stats
```

data2.columns

```
Index(['Observation', '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')
```

```
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)
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
ChipMass-4      19.347
WeakLiquorF     180.613
BlackFlow-2     280.829
WeakWashF       267.219
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

```

	Y-Kappa	ChipRate	BF-CMratio	BlowFlow	ChipLevel4	T-upperExt-
2 \						
1	27.60	16.810	79.022	1328.360	341.327	
351.050						
2	23.19	16.709	79.562	1329.407	239.161	
350.022						
3	23.60	16.478	81.011	1334.877	213.527	
350.938						
5	14.23	15.350	85.518	1171.604	198.538	
344.014						
6	13.49	13.700	98.186	1243.688	116.275	
346.208						
..
..						
276	22.70	15.517	83.008	1288.010	306.886	
350.155						
296	20.50	13.358	97.662	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

T-lowerExt-2	UCZAA	WhiteFlow-4	AAWhiteSt-4	...
SteamFlow-4 \				
1	329.067	1.549	537.201	6.076 ...
60.012				
2	329.260	1.600	549.611	0.000 ...
61.304				
3	331.142	1.604	623.362	6.054 ...
68.496				
5	325.195	1.436	628.245	6.020 ...
65.225				
6	326.982	1.434	696.766	0.000 ...
72.989				
..
...				
276	322.485	1.590	568.752	6.170 ...
67.678				
296	313.147	1.546	496.460	6.340 ...
60.119				
297	315.558	1.515	491.374	0.000 ...
60.424				
298	311.041	1.635	532.419	6.340 ...
65.561				
307	332.485	1.522	631.514	0.000 ...
71.286				

Lower-HeatT-3	Upper-HeatT-3	ChipMass-4	WeakLiquorF
BlackFlow-2 \			
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			
5	322.103	298.517	165.814 826.243
907.641			
6	322.982	296.080	182.018 784.281
929.527			
..
...			
276	331.854	309.346	160.061 910.013
1381.389			
296	332.615	308.575	141.076 997.904
1334.703			
297	331.980	308.078	140.301 975.016
1344.835			
298	332.924	307.626	145.299 832.906
1344.708			

307	328.699	300.706	180.229	903.605
1323.082				

	WeakWashF	SteamHeatF-3	T-Top-Chips-4	SulphidityL-4
1	241.182	46.603	251.406	29.11
2	237.272	51.795	251.335	0.00
3	239.478	54.846	250.312	29.02
5	595.875	52.807	249.580	30.34
6	201.272	58.118	248.741	0.00
...
276	441.934	51.466	252.216	29.59
296	389.497	46.206	252.423	30.43
297	388.676	47.803	252.311	0.00
298	388.911	49.524	251.833	30.29
307	232.729	54.503	250.084	0.00

[226 rows x 22 columns]

data.describe()

	Y-Kappa	ChipRate	BF-CMratio	BlowFlow	ChipLevel4	\
count	301.000000	297.000000	287.000000	288.000000	300.000000	
mean	20.568605	14.338670	87.271564	1235.537278	259.365993	
std	2.990751	1.490121	7.839690	102.023065	85.643939	
min	12.170000	9.983000	68.645000	0.000000	0.000000	
25%	18.450000	13.358000	81.753500	1194.047250	215.369250	
50%	20.740000	14.417000	86.705000	1267.130000	271.845500	
75%	23.000000	15.492000	92.153500	1288.390000	321.285000	
max	27.600000	16.958000	121.717000	1351.240000	419.014000	

	T-upperExt-2	T-lowerExt-2	UCZAA	WhiteFlow-4
AAWhiteSt-4 \				
count	300.000000	300.000000	277.000000	300.000000
160.000000				
mean	356.907033	324.010783	1.490588	593.148090
6.143012				
std	8.954457	7.650502	0.108138	66.949732
0.082396				
min	339.168000	284.633000	1.182000	405.111000
5.890000				
25%	350.317000	321.534000	1.429000	543.137750
6.093000				
50%	357.178500	325.638500	1.498000	594.294000
6.140000				
75%	362.326250	329.129250	1.561000	643.567000
6.200000				
max	399.135000	337.012000	1.747000	731.394000
6.340000				

...	SteamFlow-4	Lower-HeatT-3	Upper-HeatT-3	ChipMass-
-----	-------------	---------------	---------------	-----------

4 \					
count	...	300.000000	300.000000	300.000000	300.000000
mean	...	66.834567	325.37041	300.381743	162.120610
std	...	5.643655	4.63735	4.647201	14.129462
min	...	48.568000	318.05100	293.312000	113.922000
25%	...	62.847250	321.23275	296.418250	153.089750
50%	...	67.751000	323.25150	298.493000	163.601000
75%	...	71.650250	329.81600	304.228250	172.286750
max	...	76.147000	333.85400	311.146000	189.268000

	WeakLiquorF	BlackFlow-2	WeakWashF	SteamHeatF-3	T-Top-
Chips-4 \					
count	300.000000	300.000000	300.000000	300.000000	300.000000
mean	875.491563	1170.387177	266.104633	49.664537	251.229687
std	123.182165	149.288972	163.222997	4.589876	1.293151
min	486.938000	838.948000	0.000000	35.510000	248.359000
25%	791.096750	1038.338500	141.560000	46.378500	250.298250
50%	869.552000	1144.513500	280.451500	50.192500	251.357500
75%	969.904000	1318.632750	405.887750	53.284750	252.332250
max	1226.277000	1395.767000	715.715000	63.332000	254.122000

	SulphidityL-4
count	160.000000
mean	30.463594
std	0.671066
min	29.010000
25%	30.107500
50%	30.395000
75%	30.838250
max	32.840000

[8 rows x 22 columns]