

task-2

May 19, 2024

```
[1]: #Task-2
'''Load a CSV file into a Pandas DataFrame.
Perform operations like filtering data based on conditions,
handlingmissing values, and calculating summary statistics.'''

[1]: 'Load a CSV file into a Pandas DataFrame.\nPerform operations like filtering
data based on conditions,\nhandlingmissing values, and calculating summary
statistics.'
```

```
[2]: import pandas as pd

[3]: data = pd.read_csv("01.Data Cleaning and Preprocessing.csv")

[4]: type(data)

[4]: pandas.core.frame.DataFrame

[5]: data.info
```

```
[5]: <bound method DataFrame.info of      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
..      ...      ...      ...      ...      ...      ...
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]>

```
[6]: data.describe()
```

```
[6]:
```

	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
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	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]

```
[7]: data = data.drop_duplicates()
data
```

```

[7]:      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]

```
[8]: data.isnull()
```

```
[8]:
```

	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	
1	False	False	False	False	False	
2	False	False	False	False	False	
3	False	False	False	False	False	
4	False	False	False	False	False	
..	
298	False	False	False	False	False	
299	False	False	False	False	False	
300	False	False	False	False	False	
301	False	False	False	False	False	
307	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]

```
[9]: data.isnull().sum()
```

```
[9]: 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
```

```
[10]: data.isnull().sum()
```

```
[10]: 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

```

```
[11]: data.isnull().sum().sum()
```

```
[11]: 352
```

```
[12]: data2 = data.fillna(value=0)
data2
```

```
[12]:
```

	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	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	

	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	0.000	638.672	...	70.022
..
298	354.803	311.041	1.635	532.419	...	65.561
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	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	0.00
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
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	0.00
301	457.313	53.194	251.324	30.46
307	232.729	54.503	250.084	0.00

[301 rows x 23 columns]

```
[13]: data2.isnull().sum().sum()
```

```
[13]: 0
```

```
[14]: data
```

```
[14]:
```

	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]

```
[15]: data3 = data.fillna(method='pad')
data3
```

```
[15]:
```

	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-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	1.604	638.672	...	70.022	
..	
298	354.803	311.041	1.635	532.419	...	65.561	
299	357.723	321.387	1.635	520.365	...	65.729	
300	357.438	323.757	1.635	553.070	...	65.795	
301	361.365	322.689	1.635	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	29.11
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	30.47
301	457.313	53.194	251.324	30.46
307	232.729	54.503	250.084	30.46

[301 rows x 23 columns]

```
[16]: data4 = data.fillna(method='bfill')
data4
```

```
[16]:
```

	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	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	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	361.365	322.689	1.522	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	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]

```
[17]: import numpy as np
import matplotlib.pyplot as plt
import scipy as stats
```

```
[18]: #detecting the outliers using IQR
data2.columns
```

```
[18]: 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')
```

```
[19]: data2.drop(['Observation'], axis=1, inplace=True)
data2.columns
```

```
[19]: 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')
```

```
[20]: 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
```

```
[21]: data2=data2[~((data2<(Q1-1.5*IQR))|(data2>(Q3+1.5*IQR))).any(axis=1)]
      data2
```

```
[21]:
```

	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]

```
[ ]: data2.describe()
```