```
import pandas as pd

data = pd.read_csv(r"C:\Users\Raman\Downloads\01.Data Cleaning and
Preprocessing.csv")

type(data)

pandas.core.frame.DataFrame

data.info

<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]>
```

```
data.describe() # descriptive statictics
```

```
          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]
```

```
# 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


     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
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]
```

```
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
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            True  False          True  ...
True
300            True            True  False          True  ...
True
301            True            True  False          True  ...
True
307            True            True   True          True  ...
True

     Lower-HeatT-3  Upper-HeatT-3   ChipMass-4   WeakLiquorF
BlackFlow-2   \
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          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)
data2

    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]
```

```
# 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-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]
```

```
# 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-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]
```

```
import numpy as np
from scipy import stats

#detect the outliers using the IQR

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]
```

```
data2.describe()
```

```
          Y-Kappa    ChipRate  BF-CMratio     BlowFlow  ChipLevel4   \
count  226.000000  226.000000  226.000000   226.000000   226.000000
mean    20.690487   14.673491   85.882181  1255.288916   264.664912
std      2.982916    1.297369    7.033155    47.896055    74.345135
min     12.480000   10.833000   68.645000  1084.083000    61.783000
25%     18.457500   13.850000   80.984000  1221.926000   220.356000
50%     20.775000   14.729000   84.967000  1280.291500   270.965000
75%     23.010000   15.708000   91.178750  1289.254000   322.492000
max     27.600000   16.958000  108.104000  1351.240000   419.014000

       T-upperExt-2   T-lowerExt-2         UCZAA  WhiteFlow-4
AAWhiteSt-4   \
count     226.000000      226.000000  226.000000    226.000000
226.000000
mean      356.861681      325.341124    1.487146    603.242482
3.098164
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
50%       357.560500      326.508500    1.492000    602.508000
5.904500
75%       361.555000      329.264500    1.556000    653.358500
6.140000
```

```
max       375.047000      337.012000    1.712000    731.394000
6.340000

       ...  SteamFlow-4   Lower-HeatT-3  Upper-HeatT-3   ChipMass-
4   \
count  ...    226.000000     226.000000      226.000000   226.000000

mean   ...     67.545478     324.752212      299.655420   164.220102

std    ...      4.914301       4.526481        4.383788    11.423269

min    ...     52.962000     318.051000      293.312000   133.878000

25%    ...     63.954000     321.179500      296.338500   156.091000

50%    ...     68.147000     322.380000      297.636500   164.333000

75%    ...     71.760750     329.575000      303.777000   172.555000

max    ...     75.974000     333.223000      309.854000   189.268000


       WeakLiquorF   BlackFlow-2   WeakWashF   SteamHeatF-3   T-Top-
Chips-4   \
count    226.000000    226.000000  226.000000     226.000000
226.000000
mean     874.123035   1149.895257  273.739403      49.810239
251.177779
std      120.259977    150.321416  163.452307       4.143153
1.221296
min      596.446000    838.948000    0.000000      38.283000
248.359000
25%      784.366750   1014.977000  149.331750      46.639750
250.290750
50%      866.170000   1126.513500  283.079500      50.128500
251.233000
75%      968.683250   1302.847000  414.599750      52.889250
252.240000
max     1132.181000   1392.868000  715.715000      59.564000
254.122000

       SulphidityL-4
count      226.000000
mean        15.391987
std         15.297984
min          0.000000
25%          0.000000
50%         29.065000
75%         30.437500
max         32.840000
```

```
[8 rows x 22 columns]
```