#### 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
     data = pd.read_csv("01.Data Cleaning and Preprocessing.csv")
[4]:
     type(data)
[4]: pandas.core.frame.DataFrame
     data.info
[5]:
[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
                         22.90
            31-04:00
                                  15.618
                                               93.244
                                                       1334.168
                                                                      243.131
                         23.75
     319
            10-16:00
                                  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
                                                       1192.879
                                  13.083
                                               88.910
                                                                      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
                                                       537.201
                                                                          60.012
                                          1.549
     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 St	eamHeatF-3 T-T	op-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	${\tt ChipRate}$	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	3.958000 121.7	17000 1351.	240000 419.0	14000
count mean std min 25% 50% 75% max	T-upperExt-2 322.000000 356.904295 9.209290 339.168000 350.241250 356.843000 362.242250 399.135000	T-lowerExt-2 322.000000 324.020180 7.621402 284.633000 321.420000 325.669000 329.175000 337.012000	UCZAA 299.000000 1.492010 0.105923 1.182000 1.431500 1.498000 1.560500 1.747000	323.000000 591.732260 67.016351 405.111000 540.989500 592.895000 639.480500	AAWhiteSt-4 173.000000 6.140410 0.081609 5.890000 6.089000 6.135000 6.199000 6.340000
count mean std min 25% 50% 75% max	SteamFlow-4 323.000000 66.668285 5.708587 48.568000 62.518000 67.429000 71.522000 76.147000	325.56782 4.60986 318.05100 321.38550 324.74100 329.84525	0 322.00 0 300.5 2 4.5 0 293.3 0 296.5 0 299.1 0 304.2	00000     323.00       25699     162.22       68484     14.16       12000     113.92       13250     153.03       26000     163.69       44750     172.55	0000 2322 0688 2000 2500 0000 5000
count mean std min 25% 50% 75% max	WeakLiquorF 323.000000 873.828941 122.073521 486.938000 792.019500 865.254000 965.286500 1226.277000	322.000000 3 1175.917016 2 149.334010 1 838.948000 1044.817500 1 1150.221500 2 1319.021250 4	eakWashF S-23.000000 63.543068 63.666942 0.000000 34.649000 69.193000 05.563000 15.715000	teamHeatF-3 322.000000 49.696907 4.551909 35.510000 46.389750 50.277000 53.294250 63.332000	T-Top-Chips-4 323.000000 251.240087 1.283432 248.359000 250.312000 251.380000 252.323500 254.122000
count mean std min 25% 50% 75% max	SulphidityL-4 173.000000 30.411671 0.701317 29.010000 29.970000 30.370000 30.820000 32.840000 rs x 22 columns]				

[7]: data = data.drop\_duplicates()

data

[7]:		Obgonistion	V Vonno	ChinData	DE CMmatia	DiarrElarr C	himIorral/ \	
[/]:	^		Y-Kappa	-	BF-CMratio		hipLevel4 \	
	0	31-00:00	23.10	16.520			169.805	
	1	31-01:00	27.60	16.810			341.327	
	2	31-02:00	23.19	16.709			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			251.120	
		T-upperExt-2	2 T-low	erExt-2	UCZAA Whit	teFlow-4	SteamFlow-4	\
	0	358.28	32	329.545	1.443	599.253	67.122	
	1	351.05	50	329.067	1.549	537.201	60.012	
	2	350.02	22	329.260	1.600	549.611	61.304	
	3	350.93		331.142		623.362	68.496	
	4	351.64		332.709		638.672	70.022	
	298	354.80	)3	311.041	1.635	532.419	65.561	
	299	357.72		321.387		520.365	65.729	
	300	357.43		323.757		553.070	65.795	
	301	361.36		322.689		590.199	71.456	
	307	351.26		332.485			71.436	
	307	331.20	03	332.403	1.522	631.514	71.200	
		Lower-HeatT-	-3 Upper	-HeatT-3	ChipMass-4	WeakLiquor	F BlackFlow-2	\
	0	329.43		303.099	-	-		
	1	330.82		304.879				
	2	329.14		303.383				
	3	328.87		302.254				
	4	328.35		300.954				
	_	020.00	, _	000.001	100.020	000.1	10 10 10 12	-
	 298	332.92	0/1	307.626	 145.299	 9 832.9	06 1344.70	Q
	299			307.169				
	300							
		331.26		306.400				
	301	333.03		308.732				
	307	328.69	99	300.706	180.229	903.6	05 1323.08	2
		WeakWashF	C+oomUoo	+F_2 T_	Ton-Ching-4	Culphidi+uI	_1	
	0		SteamHea			SulphidityL		
	0	257.325		64.612	252.077		NaN	
	1	241.182		6.603	251.406		.11 N- N	
	2	237.272		1.795	251.335		NaN	
	3	239.478		4.846	250.312		.02	
	4	215.372	5	4.186	249.916	29	.01	
	• •	•••		•••	•••	•••		
	298	388.911	4	9.524	251.833	30	.29	

30.47	251.614	48.135	418.979	299
NaN	251.197	54.373	462.712	300
30.46	251.324	53.194	457.313	301
NaN	250.084	54.503	232.729	307

۲ <u>۵</u> ٦	data.isnull	()
10	data Ishull	( )

[8]:	0 1 2 3 4  298 299 300	False False False False False False False False	False False False False False False False False False	ChipRate False False False False True True		False False False False False False False False	Fals Fals Fals Fals Fals Fals	e e e e e e e	False False False False False False False False	\	
	301 307	False False	False False	True False		False False	Fals Fals		False False		
	307	raise	raise	raise		raise	rais	e	raise		
		T-upperExt-2	T-lowe:	rExt-2	UCZAA	White	Flow-4	St	eamFlow-4	\	
	0	False		False	False		False	•••	False		
	1	False	9	False	False		False	•••	False		
	2	False	Э	False	False		False	•••	False		
	3	False	9	False	False		False	•••	False		
	4	False	Э	False	True		False	•••	False		
		•••		•••		•••	•••	•••			
	298	False	e	False	False		False	•••	False		
	299	False	9	False	True		False	•••	False		
	300	False	e	False	True		False	•••	False		
	301	False	e	False	True		False	•••	False		
	307	False	e	False	False		False		False		
		Lower-HeatT-3	3 Unner-	HeatT-3	ChinMa	ss-4	WeakLiq	uorF	BlackFlow	-2	\
	0	False		False	-	False	_	False		lse	`
	1	False		False		False		False		lse	
	2	False		False		False		False		lse	
	3	False		False		False		False		lse	
	4	False		False		False		False		lse	
		•••		•••	•••		•••		•••		
	298	False	e	False		False		False	Fa	lse	
	299	False	Э	False		False		False	Fa	lse	
	300	False	Э	False		False		False	Fa	lse	
	301	False	e	False		False		False	Fa	lse	
	307	False	e	False		False		False	Fa	lse	

	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

```
[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
     {\tt 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

```
BlowFlow
                           13
      ChipLevel4
                            1
      T-upperExt-2
                            1
      T-lowerExt-2
                            1
      UCZAA
                           24
                            1
      WhiteFlow-4
      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
                          23.19
                                    16.709
                                                79.562
             31-02:00
                                                         1329.407
                                                                        239.161
      3
             31-03:00
                          23.60
                                    16.478
                                                81.011
                                                         1334.877
                                                                        213.527
                          22.90
      4
             31-04:00
                                    15.618
                                                93.244
                                                         1334.168
                                                                        243.131
      298
             12-09:00
                          20.90
                                    15.167
                                                84.640
                                                         1283.706
                                                                        339.440
                          24.98
      299
             12-10:00
                                     0.000
                                                85.034
                                                         1278.345
                                                                        368.564
                          21.00
      300
             12-11:00
                                     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
                                            UCZAA
                                                                     SteamFlow-4
           T-upperExt-2
                           T-lowerExt-2
                                                   WhiteFlow-4
                                            1.443
                                                                            67.122
      0
                  358.282
                                   329.545
                                                         599.253
      1
                  351.050
                                   329.067
                                            1.549
                                                         537.201
                                                                  ...
                                                                            60.012
      2
                  350.022
                                   329.260
                                            1.600
                                                         549.611
                                                                            61.304
```

ChipRate

BF-CMratio

4

14

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		0.000	590.199	71.456	
307	351.263		1.522	631.514	71.286	
	0011200	0021100				
	Lower-HeatT-3	Upper-HeatT-3	ChipMass-4	WeakLiquorF	BlackFlow-2	\
0	329.432		175.964	_	1319.039	•
1	330.823		163.202	665.975	1297.317	
2	329.140		164.013	677.534	1327.072	
3	328.875		181.487	767.853	1324.461	
4	328.352		183.929	888.448	1343.424	
	***	•••				
298	332.924		145.299	832.906	1344.708	
299	332.523		151.544	905.639	1344.469	
300	331.263		157.954	908.691	1344.588	
301	333.032		174.069	986.206	1348.747	
307	328.699		180.229	903.605	1323.082	
	0201000		1001120		10201002	
	WeakWashF S	teamHeatF-3 T-7	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	202.123	04.000	200.004	0.00		

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

[13]: 0

[14]: data

```
Observation Y-Kappa ChipRate BF-CMratio BlowFlow
[14]:
                                                                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
4	31-04:00	22.90	15.616	93.244	1334.100	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
					<b></b>	G: 77 4 \
	T-upperExt-2				eFlow-4	SteamFlow-4 \
0	358.282	3	329.545	1.443	599.253	67.122
1	351.050	3	329.067	1.549	537.201	60.012
2	350.022		329.260	1.600	549.611	61.304
3	350.938	٤	331.142	1.604	623.362	68.496
4	351.640	3	332.709	NaN	638.672	70.022
	•••				•••	•••
298	354.803	5	311.041	1.635	E00 440	65.561
299	357.723	٤	321.387	NaN	520.365	65.729
300	357.438	3	323.757	NaN	553.070	65.795
301	361.365	3	322.689	NaN	590.199	71.456
307	351.263		332.485		201 511	71.286
301	331.203		32.400	1.522	631.514	71.200
	Lower-HeatT-3	Upper-He	eatT-3	ChipMass-4	WeakLiquor	FF BlackFlow-2 \
0	329.432	3	303.099	175.964	1127.1	1319.039
1	330.823		304.879	163.202	665.9	
2	329.140		303.383	164.013	677.5	
3	328.875	3	302.254	181.487	767.8	353 1324.461
4	328.352	3	300.954	183.929	888.4	1343.424
	•••					
298		-	307.626	145.299	832.9	1244 709
	332.924					
299	332.523		307.169	151.544	905.6	339 1344.469
300	331.263	3	306.400	157.954	908.6	391 1344.588
301	333.032	3	308.732	174.069	986.2	206 1348.747
307	328.699		300.706	180.229	903.6	
501	020.033		00.700	100.223	303.0	1020.002
						_
	WeakWashF S	teamHeatF-	-3 T-T	op-Chips-4	SulphidityI	4
0	257.325	54.6	312	252.077		NaN
1	241.182	46.6	503	251.406	29	9.11
2		51.7				NaN
	237.272			251.335		
3	239.478	54.8	346	250.312	29	0.02
4	215.372	54.1	186	249.916	29	9.01
	•••	•••		•••	•••	
298	388.911	49.5	524	251.833		).29
299	418.979	48.1		251.614	30	).47
300	462.712	54.3	373	251.197		NaN
301						
001	457.313	53.1	194	251.324	30	).46
	457.313	53.1		251.324 250.084	30	0.46 NaN
307	457.313 232.729	53.1 54.5		251.324 250.084	30	).46 NaN

dat							
	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		24.98	15.167	85.034	1278.345	368.564	
299 300		24.90	15.167	88.013		278.842	
300 301		21.40	15.167	85.490	1255.986	273.484	
301 307		20.89	14.308	94.172	1327.832	251.120	
	T-upperExt-2	) Т-1 от		UCZAA Whit	eFlow-4	SteamFlow-4	
0	358.28		329.545	1.443	500 050	27 40	
1	351.0		329.045	1.549			
	350.00		329.067	1.600			
2 3							
3 4	350.93 351.6		331.142 332.709	1.604 1.604		68.490 70.022	
		ŧU		1.604	030.072	70.025	_
 298	 354.80	)3	 311.041	 1.635	 532.419	65.56	1
299			321.387	1.635		65.729	
300			323.757	1.635	553.070	65.79	
301			322.689	1.635	590.199	71.450	
307			332.485	1.522	631.514	71.286	
	Lower-HeatT-	-3 Upper	-HeatT-3	ChipMass-4	WeakLiqu	orF BlackFlo	ı-2
0	329.43		303.099	175.964	-	. 197 1319	
1	330.82		304.879	163.202		5.975 1297	
2	329.14		303.383	164.013		7.534 1327	
3	328.87		302.254	181.487		.853 1324	
4	328.3		300.954	183.929		3.448 1343	
• •	•••		•••	•••	•••	•••	
298			307.626	145.299		2.906 1344	
299			307.169	151.544		1344	
300		53	306.400	157.954		3.691 1344	. 58
301	333.03	32	308.732	174.069	986	3.206 1348	.74
307	328.69	99	300.706	180.229	903	3.605 1323	. 08
	WeakWashF	SteamHea	.tF-3 T-1	Cop-Chips-4	Sulphidit	;yL-4	
0	257.325		4.612	252.077	•	NaN	

1	241.182	46.603	251.406	29.11
1	241.102	40.003	251.400	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

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

[16]:		Obgonistion	V Vonno	ChinData	DE CMma+ia	Dl ovell ove	Chin	Level4 \		
[10]:	0	Observation 31-00:00	Y-Kappa 23.10	16.520	BF-CMratio 121.717		CHIL	Level4 \ 169.805		
	1	31-01:00	27.60	16.810	79.022			341.327		
	2	31-02:00	23.19	16.709		1329.407		239.161		
	3									
		31-03:00	23.60	16.478	81.011			213.527		
	4	31-04:00	22.90	15.618	93.244	1334.168		243.131		
							•	000 440		
	298	12-09:00	20.90	15.167	84.640			339.440		
	299	12-10:00	24.98	14.308	85.034			368.564		
	300	12-11:00	21.00	14.308		1307.722		278.842		
	301	12-12:00	21.40	14.308	85.490			273.484		
	307	31-05:00	20.89	14.308	94.172	1327.832		251.120		
		Т 0	т 1		110744 111-2	+ - F3 4	CI+		`	
	^	T-upperExt-2				teFlow-4			\	
	0	358.28		329.545	1.443	599.253	•••	67.122		
	1	351.050 350.022		329.067	1.549	537.201	•••	60.012		
	2			329.260	1.600	549.611	•••	61.304		
	3	350.93		331.142	1.604	623.362	•••	68.496		
	4	351.64	.0	332.709	1.436	638.672	•••	70.022		
	• •		_				••			
	298	354.80		311.041		532.419	•••	65.561		
	299	357.72		321.387	1.522	520.365	•••	65.729		
	300	357.43		323.757	1.522	553.070	•••	65.795		
	301	361.36		322.689	1.522	590.199	•••	71.456		
	307	351.26	3	332.485	1.522	631.514	•••	71.286		
			0 11		C1 · M 4		_	D1 1 1 1 1		
	0	Lower-HeatT-			ChipMass-4	_		BlackFlow-2 1319.03		
	0	329.432		303.099	175.96					
	1	330.82		304.879	163.20		5.975	1297.3		
	2	329.14		303.383	164.01		7.534			
	3	328.87	5	302.254	181.48	7 767	7.853	1324.46	31	

```
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
              257.325
                              54.612
                                             252.077
                                                                29.11
      0
      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
                                                                30.47
      299
              418.979
                              48.135
                                             251.614
      300
              462.712
                              54.373
                                              251.197
                                                                30.46
                                                                30.46
      301
              457.313
                              53.194
                                             251.324
      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'],
```

4

328.352

300.954

183.929

888.448

1343.424

#### 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 Wh	WhiteFlow-4		AAWhiteSt-4		amFlow-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-Heat	T-3 Chip	Mass-4	WeakLi	quorF	BlackFlow-2	\
1	330.823	304	.879	163.202	63.202		1297.317	7
2	329.140	303	.383	164.013	677.534		1327.072	
3	328.875	302	302.254		7	67.853	1324.461	-
5	322.103	298	298.517		8	26.243	907.641	-
6	322.982	296	.080	182.018	7	84.281	929.527	7
	•••			•••				
276	331.854	309	.346	160.061	9	10.013	1381.389	)
296	332.615	308	.575	141.076	9	97.904	1334.703	3
297	331.980	308	.078	140.301	9	75.016	1344.835	5
298	332.924	307	.626	145.299	8	32.906	1344.708	3
307	328.699	300	.706	180.229	9	03.605	1323.082	2
		eamHeatF-3	T-Top-Ch	_	Sulphid	•		
1	241.182	46.603		251.406		29.11		
2	237.272	51.795	2	251.335		0.00		
3	239.478	54.846		250.312		29.02		
5	595.875	52.807	2	249.580		30.34		
6	201.272	58.118	2	248.741		0.00		
	***	•••	***					
276	441.934	51.466	2	252.216		29.59		
296	389.497	46.206		252.423		30.43		
297	388.676	47.803	2	52.311		0.00		
298	388.911	49.524	2	51.833	1.833 30.29			
307	232.729	54.503	2	50.084		0.00		

[226 rows x 22 columns]

# []: data2.describe()