TASK-2

June 5, 2024

```
import pandas as pd
[2]: data = pd.read_csv("C:\\Users\\91880\\Downloads\\01.Data Cleaning and_
      ⇔Preprocessing.csv")
    type(data)
[3]:
[3]: pandas.core.frame.DataFrame
     pd.core.frame.DataFrame
[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
                                               79.022
                                                       1328.360
                                                                      341.327
                                  16.810
     2
                         23.19
                                  16.709
            31-02:00
                                               79.562
                                                       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
            10-16:00
                         23.75
                                  12.667
                                               93.450
                                                       1178.252
                                                                      276.955
     319
     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
                         24.32
             9-21:00
                                  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 S	teamHeatF-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	3	
	std	3.070036	1.499095	7.995012	100.593735	87.987452	2	
	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-lowerE	Sxt-2	UCZAA White	Flow-4 AAV	NhiteSt-4	\
	count	322.0000	00 322.	000000 299.	000000 323	.000000 1	.73.000000	
	mean	356.9042	95 324.	020180 1.	492010 591	.732260	6.140410	

```
9.209290
                                   7.621402
                                                0.105923
                                                              67.016351
                                                                               0.081609
     std
                                 284.633000
                                                             405.111000
     min
                339.168000
                                                1.182000
                                                                               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
                399.135000
                                 337.012000
                                                1.747000
                                                             731.394000
                                                                               6.340000
     max
                SteamFlow-4
                               Lower-HeatT-3
                                               Upper-HeatT-3
                                                                 ChipMass-4
                                                                               \
                                                    322.000000
                                                                  323.000000
                  323.000000
                                  322.000000
     count
                                  325.567820
     mean
                   66.668285
                                                    300.525699
                                                                  162.222322
     std
                    5.708587
                                    4.609862
                                                      4.568484
                                                                   14.160688
            •••
                   48.568000
                                  318.051000
                                                    293.312000
     min
                                                                  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
               323.000000
                              322.000000
                                           323.000000
                                                           322.000000
                                                                             323.000000
     count
               873.828941
                                                                             251.240087
     mean
                             1175.917016
                                           263.543068
                                                            49.696907
     std
               122.073521
                              149.334010
                                           163.666942
                                                             4.551909
                                                                               1.283432
               486.938000
                              838.948000
                                             0.000000
                                                            35.510000
                                                                             248.359000
     min
     25%
               792.019500
                             1044.817500
                                           134.649000
                                                            46.389750
                                                                             250.312000
     50%
               865.254000
                             1150.221500
                                           269.193000
                                                            50.277000
                                                                             251.380000
               965.286500
     75%
                             1319.021250
                                           405.563000
                                                            53.294250
                                                                             252.323500
              1226.277000
                             1395.767000
                                           715.715000
                                                            63.332000
                                                                             254.122000
     max
             SulphidityL-4
     count
                 173.000000
                  30.411671
     mean
     std
                   0.701317
                  29.010000
     min
     25%
                  29.970000
     50%
                  30.370000
     75%
                  30.820000
                  32.840000
     max
     [8 rows x 22 columns]
[7]: data = data.drop_duplicates()
     data
                                            {\tt BF-CMratio}
         Observation
                       Y-Kappa
                                 ChipRate
                                                         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
```

79.562

81.011

1329.407

1334.877

239.161

213.527

23.19

23.60

16.709

16.478

31-02:00

31-03:00

[7]:

2

3

4	31-04:00	22.90 15.6	S18 9	3.244 133	4.168	243.131
• •	•••	•••	•••	•••	•••	
298	12-09:00	20.90 15.1			3.706	339.440
299	12-10:00				8.345	368.564
300	12-11:00				7.722	278.842
301	12-12:00	21.40 N	JaN 8	5.490 125	5.986	273.484
307	31-05:00	20.89 14.3	308 9	4.172 132	7.832	251.120
	T-upperExt-2	T-lowerExt-2	2 UCZAA	WhiteFlo	w-4 S	SteamFlow-4 \
0	358.282	329.5	45 1.443	599	. 253	67.122
1	351.050	329.0	67 1.549	537	.201	60.012
2	350.022	329.2	260 1.600	549	.611	61.304
3	350.938	331.1	42 1.604	623	.362	68.496
4	351.640	332.7	709 NaN	638	.672	70.022
• •	•••	•••	•••			•••
298	354.803				.419	65.561
299	357.723				.365	65.729
300	357.438	323.7	757 NaN	553	.070	65.795
301	361.365	322.6	889 NaN	590	.199	71.456
307	351.263	332.4	1.522	631	.514	71.286
	Lower-HeatT-3	Upper-HeatT-	-3 ChipM	ass-4 We	akLiguorF	BlackFlow-2 \
0	329.432		_	75.964	1127.197	
1	330.823			63.202	665.975	
2	329.140			64.013	677.534	
3	328.875			81.487	767.853	
4	328.352			83.929	888.448	
	•••	•••	•••		•••	•••
298	332.924	307.6	326 1	45.299	832.906	1344.708
299	332.523			51.544	905.639	
300	331.263			57.954	908.691	1344.588
301	333.032			74.069	986.206	
307	328.699	300.7		80.229	903.605	
		teamHeatF-3	T-Top-Chi	ps-4 Sul	phidityL-4	<u> </u>
0	257.325	54.612	25	2.077	Na	ıN
1	241.182	46.603	25	1.406	29.1	.1
2	237.272	51.795	25	1.335	Na	ıN
3	239.478	54.846	25	0.312	29.0)2
4	215.372	54.186	24	9.916	29.0)1
	•••	•••	•••		•••	
298	388.911	49.524	25	1.833	30.2	29
299	418.979	48.135	25	1.614	30.4	.7
300	462.712	54.373	25	1.197	Na	ıN
301	457.313	53.194	25	1.324	30.4	:6
307	232.729	54.503	25	0.084	Na	ıN

[8]: data.isnull()

[8]:		Observation	Y-Kappa	ChipRate	BF-CMratio	o BlowFlow	ChipLevel4 \	
	0	False	False	False			False	
	1	False	False	False	False	e False	False	
	2	False	False	False	False	e False	False	
	3	False	False	False	False	e False	False	
	4	False	False	False	False	e False	False	
		•••	•••	•••				
	298	False	False	False	False	e False	False	
	299	False	False	True	False	e False	False	
	300	False	False	True	False	e False	False	
	301	False	False	True	False	e False	False	
	307	False	False	False	False	e False	False	
		T-upperExt-2	T-lowe	rExt-2	IICZAA Whid	teFlow-4	SteamFlow-4 \	
	0	False		False		False		
	1	False		False		False		
	2	False		False		False		
	3	False			False	False		
	4	False		False	True	False		
		•••					•••	
	298	False	9	False	False	False	False	
	299	False	9	False	True	False	False	
	300	False	9	False	True	False	False	
	301	False	9	False	True	False	False	
	307	False	e	False	False	False	False	
		I ours Hont T-3	llnnor-	Шор+Т-2	ChipMass-4	WeakLiquo	rF BlackFlow-2 \	
	0	Lower-HeatT-3		False	False	_	lse False	\
	1	False		False	False		lse False	
	2	False		False	False		lse False	
	3	False		False	False		lse False	
	4	False		False	False		lse False	
	298	False		False	False		lse False	
	299	False		False	False		lse False	
	300	False		False	False		lse False	
	301	False		False	False		lse False	
	307	False		False	False		lse False	
			, 	n	an	a 1 1 1 1 1 1		
	^		SteamHeat -		op-Chips-4	Sulphidity		
	0	False		alse	False		True	
	1	False		alse	False		alse	
	2	False	ł	alse	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 0 Y-Kappa 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.notnull()

[10]: 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

298 299 300 301 307	True True True True True	True True True True True	True False False False True		True True True True True	Tru Tru Tru Tru Tru	e e e	True True True True True	
	T-upperExt-2			UCZAA		eFlow-4		eamFlow-4	
0	True	е	True	True		True	•••	True	
1	True	е	True	True		True	•••	True	
2	True	е	True	True		True	•••	True	
3	True	е	True	True		True	•••	True	
4	True	е	True	False		True	•••	True	
	•••				•••	•••			
298	True	е	True	True		True	•••	True	
299	True	е	True	False		True	•••	True	
300	True	е	True	False		True	•••	True	
301	True	е	True	False		True	•••	True	
307	True	е	True	True		True	•••	True	
	Lower-HeatT-3	3 Upper-Heat	-T-3	ChipMa	.ss-4	WeakLiq	norF	BlackFlow-2	\
0	True		True	ompile	True	Wounding	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	
		-	iiuc		11 uc	•••	11 40		•
298	 True	• •	 True	•••	True	•••	True	 True	ž
299	True		True		True		True	True	
300	True		True		True		True	True	
301	True		True		True		True	True	
307	True		True		True		True	True	
									•
		SteamHeatF-3		op-Chip		Sulphidi			
0	True	True			True		False		
1	True	True			True		True		
2	True	True	Э		True		False		
3	True	True	Э		True		True		
4	True	True	9		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	Э		True		False		

```
[11]: data.isnull(). sum(). sum()
[11]: 352
[12]: data2 = data.fillna(value=0)
      data2
[12]:
          Observation Y-Kappa ChipRate
                                            BF-CMratio
                                                         BlowFlow
                                                                    ChipLevel4
                          23.10
      0
              31-00:00
                                    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
              31-02:00
                                    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
      . .
                          20.90
      298
              12-09:00
                                    15.167
                                                 84.640
                                                         1283.706
                                                                         339.440
                          24.98
                                                 85.034
      299
              12-10:00
                                     0.000
                                                         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
                                             UCZAA
                                                                      SteamFlow-4
           T-upperExt-2
                           T-lowerExt-2
                                                    WhiteFlow-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
                                   311.041
                  354.803
                                             1.635
                                                         532.419
                                                                             65.561
      299
                  357.723
                                   321.387
                                             0.000
                                                          520.365
                                                                             65.729
      300
                                                                             65.795
                  357.438
                                   323.757
                                             0.000
                                                          553.070
      301
                  361.365
                                   322.689
                                             0.000
                                                          590.199
                                                                             71.456
      307
                  351.263
                                   332.485
                                                          631.514
                                                                             71.286
                                             1.522
           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
                                                                677.534
                  329.140
                                   303.383
                                                 164.013
                                                                              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
                                                                905.639
                                                                              1344.469
                                   307.169
                                                 151.544
      300
                  331.263
                                   306.400
                                                 157.954
                                                                908.691
                                                                              1344.588
      301
                  333.032
                                   308.732
                                                 174.069
                                                                986.206
                                                                              1348.747
      307
                  328.699
                                   300.706
                                                 180.229
                                                                903.605
                                                                              1323.082
```

T-Top-Chips-4

SulphidityL-4

WeakWashF

SteamHeatF-3

0	257.325	54.612	252.077		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
	407.313	55.134	201.024		30.40

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

[13]: 0

[14]: data

11].	aava								
4]:		Observation	Y-Kappa	ChipRate	BF-CMratio	BlowFlow	ChipLeve	e14 \	
	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	2 T-low	erExt-2	UCZAA Whi	teFlow-4	SteamF	Flow-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	38	331.142	1.604	623.362		68.496	
	4	351.64	10	332.709	NaN	638.672		70.022	
		•••					•••		
	298	354.80)3	311.041	1.635	532.419		65.561	
	299	357.72	23	321.387	NaN	520.365		65.729	
	300	357.43	38	323.757	NaN	553.070		65.795	
	301	361.36	35	322.689	NaN	590.199		71.456	
	307	351.26	33	332.485	1.522	631.514	•••	71.286	
		Lower-HeatT-	-3 Upper	-HeatT-3	ChipMass-4	WeakLigu	ıorF Bla	ackFlow-1	2 \

	0	329.4	32	303.09	9 175.964	1127.19	7 1319.039
	1	330.8	23	304.87	9 163.202	665.97	5 1297.317
	2	329.1	40	303.38	3 164.013	677.53	4 1327.072
	3	328.8	75	302.25	4 181.487	767.85	3 1324.461
	4	328.3	52	300.95	4 183.929	888.44	8 1343.424
	• •	•••		•••	•••	•••	
	298	332.9		307.62			
	299	332.5	23	307.16	9 151.544	905.63	9 1344.469
	300	331.2	63	306.40	0 157.954	908.69	1 1344.588
	301	333.0	32	308.73	2 174.069	986.20	6 1348.747
	307	328.6	99	300.70	6 180.229	903.60	5 1323.082
	W	/eakWashF	SteamHea	tF-3 T	-Top-Chips-4	SulphidityL-	4
	0	257.325		4.612	252.077	-	aN
	1	241.182		6.603	251.406	29.	
	2	237.272		1.795	251.335		aN
	3	237.272		1.795 4.846	250.312	29.	
	4	215.372		4.186	249.916	29.	01
							00
	298	388.911		9.524	251.833	30.	
	299	418.979		8.135	251.614	30.	
	300	462.712		4.373	251.197		aN
	301	457.313		3.194	251.324	30.	
	307	232.729	5	4.503	250.084	N	aN
	[301 r	ows x 23 c	olumns]				
51 · [data3	= data.fil	lna(metho	d='nad')			
	data3	uava:111	- 1110 (mo 0110	a paa ,			
.5]:	Ob	servation	Y-Kappa	ChipRat	e BF-CMratio	BlowFlow Ch	ipLevel4 \
	0	31-00:00	23.10	16.52		1177.607	169.805
	1	31-01:00	27.60	16.81	0 79.022	1328.360	341.327
	2	31-02:00	23.19	16.70		1329.407	239.161
	3	31-03:00	23.60	16.47		1334.877	213.527
	4	31-04:00	22.90	15.61		1334.168	243.131
						10011100	2101101
	298	 12-09:00	 20.90	 15.16	7 84.640	1283.706	339.440
						1278.345	368.564
	299	12-10.00				しんしいょいせい	
	299	12-10:00	24.98	15.16			
	300	12-11:00	21.00	15.16	7 88.013	1307.722	278.842
	300 301	12-11:00 12-12:00	21.00 21.40	15.16 15.16	7 88.013 7 85.490	1307.722 1255.986	278.842 273.484
	300	12-11:00	21.00	15.16	7 88.013 7 85.490	1307.722	278.842
	300 301 307	12-11:00 12-12:00	21.00 21.40 20.89	15.16 15.16 14.30	7 88.013 7 85.490 8 94.172	1307.722 1255.986 1327.832	278.842 273.484
	300 301 307	12-11:00 12-12:00 31-05:00	21.00 21.40 20.89 2 T-low	15.16 15.16 14.30	7 88.013 7 85.490 8 94.172 UCZAA White	1307.722 1255.986 1327.832	278.842 273.484 251.120
	300 301 307	12-11:00 12-12:00 31-05:00 '-upperExt-	21.00 21.40 20.89 2 T-low	15.16 15.16 14.30 erExt-2	7 88.013 7 85.490 8 94.172 UCZAA White 5 1.443	1307.722 1255.986 1327.832 eFlow-4	278.842 273.484 251.120 SteamFlow-4

3	350.938	331.14	2 1.604	623.362	68.496	
4	351.640	332.70	9 1.604	638.672	70.022	
	•••	•••			•	
298	354.803	311.04	1 1.635	532.419	65.561	
299	357.723	321.38	37 1.635	520.365	65.729	
300	357.438	323.75	7 1.635	553.070	65.795	
301				590.199	71.456	
307		332.48	85 1.522	631.514	71.286	
	Lower-HeatT-3	Upper-HeatT-3	ChipMass-4	${\tt WeakLiquorF}$	BlackFlow-2	\
0	329.432	303.09	9 175.964	1127.197	1319.039	
1	330.823	304.87	9 163.202	665.975	1297.317	
2	329.140	303.38	164.013	677.534	1327.072	
3	328.875	302.25	181.487	767.853	1324.461	
4	328.352	300.95	183.929	888.448	1343.424	
	•••	•••	•••	•••	•••	
298	332.924	307.62	26 145.299	832.906	1344.708	
299	332.523	307.16	151.544	905.639	1344.469	
300	331.263	306.40	00 157.954	908.691	1344.588	
301	333.032	308.73	174.069	986.206	1348.747	
307	328.699	300.70	180.229	903.605	1323.082	
	WeakWashF S	teamHeatF-3 I	-Top-Chips-4	SulphidityL-4		
0	257.325	54.612	252.077	NaN	J	
1	241.182	46.603	251.406	29.11	L	
2	237.272	51.795	251.335	29.11	L	
3	239.478	54.846	250.312	29.02	2	
4	215.372	54.186	249.916	29.01	L	
	•••	•••	•••	•••		
298	388.911	49.524	251.833	30.29	9	
299	418.979	48.135	251.614	30.47	7	
300	462.712	54.373	251.197	30.47	7	
301	457.313	53.194	251.324	30.46	3	
307	232.729	54.503	250.084	30.46	3	
[30	1 rows x 23 col	umns]				
	a4 = data.filln	a(method='bfill	.')			
dat	a4					
	Obgossos + d	Vonne (II-iD)	DE CM+-	DlowEler Or	- I ove 14	
:		-Kappa ChipRat		-	Level4 \	
0	31-00:00	23.10 16.52		1177.607	169.805	
1	31-01:00	27.60 16.81		1328.360	341.327	
2 3	31-02:00	23.19 16.70		1329.407	239.161	
	31-03:00	23.60 16.47		1334.877	213.527	
4	31-04:00	22.90 15.61	.8 93.244	1334.168	243.131	

[16]

[16]

200	10 00.00	20 00 15	167	94 6	10	1002 706		220 440	
298 299	12-09:00 12-10:00	20.90 15. 24.98 14.		84.64		1283.706 1278.345		339.440	
	12-10:00			85.00				368.564	
300		21.00 14.		88.0		1307.722		278.842	
301	12-12:00	21.40 14.		85.49		1255.986		273.484	
307	31-05:00	20.89 14.	308	94.1	/2	1327.832		251.120	
	T-upperExt-2	T-lowerExt-	2	UCZAA WI	nite	eFlow-4	S	teamFlow-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			ChipMass-	-4	WeakLiq	uorF	BlackFlow-2	\
0	329.432	303.	099	175.9	964	112	7.197	1319.03	9
1	330.823	304.	879	163.3	202	66	5.975	1297.31	7
2	329.140	303.	383	164.0	013	67	7.534	1327.07	2
3	328.875	302.	254	181.4	187	76	7.853	1324.46	1
4	328.352	300.	954	183.9	929	88	8.448	1343.42	4
			606		200		0 000		0
298	332.924			145.2			2.906	1344.70	
299	332.523			151.5			5.639	1344.46	
300	331.263			157.9			8.691	1344.58	
301	333.032			174.0			6.206	1348.74	
307	328.699	300.	706	180.2	229	90	3.605	1323.08	2
	WeakWashF S	teamHeatF-3	T-T	op-Chips-4	1	Sulphidi	tyL-4		
0	257.325	54.612		252.0	77		29.1	1	
1	241.182	46.603		251.40	06		29.1	1	
2	237.272	51.795		251.33	35		29.0	2	
3	239.478	54.846		250.3	12		29.0	2	
4	215.372	54.186		249.9	16		29.0	1	
	•••								
298	388.911	49.524		251.83			30.29		
299	418.979	48.135		251.6			30.4		
300	462.712	54.373		251.19	97		30.4		
301	457.313	53.194		251.3	24		30.4	6	
307	232.729	54.503		250.08	34		Nal	N	

```
[17]: import numpy as np
      import matplotlib.pyplot as plt
      import scipy as stats
[18]: 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	ChipRat	e BF-	-CMratio	BlowF	low Ch	nipLevel	4 T-	upperExt-2	\
	1	27.60	16.81	0	79.022	1328.3	360	341.3	27	351.050	
	2	23.19	16.70	9	79.562	1329.	407	239.1	61	350.022	
	3	23.60	16.47	8	81.011	1334.8	877	213.5	27	350.938	
	5	14.23	15.35	0	85.518	1171.	604	198.5	38	344.014	
	6	13.49	13.70	0	98.186	1243.	688	116.2	75	346.208	
		•••	•••		•••	•••			•••		
	276	22.70	15.51	7	83.008	1288.	010	306.8	86	350.155	
	296	20.50	13.35		97.662	1304.		377.6	78	347.672	
	297	20.40	14.23	3	89.790	1278.	006	379.4	58	354.290	
	298	20.90	15.16	7	84.640	1283.	706	339.4	40	354.803	
	307	20.89	14.30	8	94.172	1327.	832	251.1	20	351.263	
		T-lowerE		UCZAA	WhiteFl		AAWhit	teSt-4		eamFlow-4	\
	1			1.549		7.201		6.076	•••	60.012	
	2			1.600		9.611		0.000	•••	61.304	
	3			1.604		3.362		6.054	•••	68.496	
	5			1.436		8.245		6.020	•••	65.225	
	6	3:		1.434	69	6.766		0.000	•••	72.989	
	• •	0.					•••		•••		
	276			1.590		8.752		6.170	•••	67.678	
	296			1.546		6.460		6.340	•••	60.119	
	297			1.515		1.374		0.000	•••	60.424	
	298			1.635		2.419		6.340	•••	65.561	
	307		32.485	1.522	63	1.514		0.000	•••	71.286	
		Lower-He	atT-3 U	pper-H	HeatT-3	ChipMa	ass-4	WeakLi	auorF	BlackFlow-	-2 \
	1		0.823	FF	304.879	_	63.202		65.975		
	2		9.140		303.383		64.013		77.534		
	3		3.875		302.254		81.487		67.853		
	5		2.103		298.517		65.814		26.243		
	6		2.982		296.080		82.018		84.281		
			•••		•••			•••		•••	
	276	33	1.854		309.346	10	60.061	9	10.013	1381.3	389
	296	33:	2.615		308.575	14	41.076	9	97.904	1334.7	703
	297	33	1.980		308.078	14	40.301	9	75.016	1344.8	335
	298	33:	2.924		307.626	14	45.299	8	32.906	1344.7	708
	307	328	3.699		300.706	18	80.229	9	03.605	1323.0)82

	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]

[22]: data2.describe()

		•										
[22]:		Y-Kappa	Chi	ipRate	BF-CMr	atio	Blo	wFlow	ChipLev	el4	\	
	count	226.000000	226.0	00000	226.00	0000	226.0	00000	226.00	0000		
	mean	20.690487	14.6	573491	85.88	2181	1255.2	88916	264.66	4912		
	std	2.982916	1.2	297369	7.03	3155	47.8	96055	74.34	5135		
	min	12.480000	10.8	333000	68.64	5000	1084.0	00088	61.78	3000		
	25%	18.457500	13.8	350000	80.98	4000	1221.9	26000	220.35	6000		
	50%	20.775000	14.7	729000	84.96	7000	1280.2	91500	270.96	5000		
	75%	23.010000	15.7	708000	91.17	8750	1289.2	254000	322.49	2000		
	max	27.600000	16.9	958000	108.10	4000	1351.2	240000	419.01	4000		
		T-upperExt-	2 T-	-lowerE	xt-2		UCZAA	White	Flow-4	AAWh	iteSt-4	\
	count	226.0000	00	226.	000000	226.	000000	226	.000000	22	6.000000	
	mean	356.8616	81	325.	341124	1.	487146	603	. 242482		3.098164	
	std	7.4668	97	5.	557537	0.	108054	61	.052197		3.078138	
	min	340.2220	00	310.	421000	1.	182000	468	.841000		0.000000	
	25%	350.7042	:50	322.	355500	1.	429000	549	.611000		0.000000	
	50%	357.5605	00	326.	508500	1.	492000	602	.508000		5.904500	
	75%	361.5550	00	329.	264500	1.	556000	653	.358500		6.140000	
	max	375.0470	00	337.	012000	1.	712000	731	.394000		6.340000	
		SteamFlo			HeatT-3	- 1	er-Heat		${ t ChipMass}$		\	
	count	226.00			.000000		226.00		226.000			
	mean	67.54	5478	324	.752212		299.65	5420	164.220	102		
	std	4.91			.526481			3788	11.423			
	min	52.96	2000	318	.051000		293.31	.2000	133.878	000		
	25%	63.95	4000	321	.179500		296.33	8500	156.091	000		
	50%	68.14			.380000		297.63		164.333			
	75%	71.76			.575000		303.77		172.555			
	max	75.97	4000	333	.223000		309.85	4000	189.268	000		

	${\tt WeakLiquorF}$	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]

[25]: import os print(os.environ['PATH'])

C:\Users\91880\anaconda3;C:\Users\91880\anaconda3\Library\mingww64\bin; C:\Users\91880\anaconda3\Library\usr\bin; C:\Users\91880\anaconda3\Librar y\bin;C:\Users\91880\anaconda3\Scripts;C:\Program Files\Common Files\Oracle\Java \javapath; C:\WINDOWS\system32; C:\WINDOWS\C:\WINDOWS\System32\Wbem; C:\WINDOWS\Sys tem32\WindowsPowerShell\v1.0\;C:\WINDOWS\System32\OpenSSH\;C:\Program Files (x86)\Microsoft SQL Server\160\DTS\Binn\;C:\Program Files\Azure Data Studio\bin; C:\Program Files (x86)\Microsoft SQL Server\160\Tools\Binn\;C:\Program Files\Microsoft SQL Server\160\Tools\Binn\;C:\Program Files\Microsoft SQL Server\Client SDK\ODBC\170\Tools\Binn\;C:\Program Files\Microsoft SQL Server\160\DTS\Binn\;C:\Program Files\nodejs\;C:\Program Files\Git\cmd;C:\Program Files\Microsoft SQL Server\150\Tools\Binn\;C:\Program Files\dotnet\;C:\Program Files\HP\HP One Agent;C:\Users\91880\AppData\Local\Prog on311\;C:\Users\91880\AppData\Local\Microsoft\WindowsApps;;C:\Users\91880\AppDat a\Local\Programs\Microsoft VS Code\bin;C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2022.3\bin\IntelliJ IDEA Community Edition 2022.3\bin;;C:\PyCharm 2022.3.2\bin;;C:\Program Files\Azure Data Studio\bin;C:\Program Files\JetBrains\PyCharm Community Edition 2022.3.3\bin;;C: \Users\91880\AppData\Roaming\npm;C:\Users\91880\AppData\Local\Programs\Microsoft VS Code Insiders\bin;C:\Users\91880\.dotnet\tools

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