```
In [3]: | import pandas as pd
    df = pd.read_csv('C:\\Users\\jagad\\Downloads\\01.Data Cleaning and Preprocessing.csv')
    print("First few rows of the DataFrame:")
    print(df.head())
```

```
First few rows of the DataFrame:
 Observation Y-Kappa ChipRate BF-CMratio BlowFlow ChipLevel4
                                     121.717 1177.607
0
     31-00:00
                 23.10
                          16.520
                                                            169.805
                                      79.022 1328.360
1
     31-01:00
                 27.60
                          16.810
                                                            341.327
                                      79.562 1329.407
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
                                                       ... SteamFlow-4
  T-upperExt-2
                 T-lowerExt-2
                                 UCZAA WhiteFlow-4
0
        358.282
                                              599.253 ...
                                                                  67.122
                         329.545 1.443
        351.050
                         329.067 1.549
                                                                  60.012
1
                                              537.201 ...
        350.022
                                              549.611 ...
                                                                  61.304
2
                         329.260 1.600
3
        350.938
                         331.142 1.604
                                              623.362 ...
                                                                  68.496
4
        351.640
                         332.709
                                                                  70.022
                                    NaN
                                              638.672 ...
  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
                         300.954
                                      183.929
                                                                 1343.424
        328,352
                                                    888.448
  WeakWashF
               SteamHeatF-3
                             T-Top-Chips-4
                                              SulphidityL-4
                     54.612
0
     257.325
                                     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
```

[5 rows x 23 columns]

```
Filtered DataFrame:
 Observation Y-Kappa ChipRate BF-CMratio BlowFlow ChipLevel4
    31-00:00
                23.10
                                    121.717 1177.607
                         16.520
                                                           169.805
1
    31-01:00
                27.60
                         16.810
                                     79.022 1328.360
                                                           341.327
2
                23.19
                         16.709
    31-02:00
                                     79.562 1329.407
                                                           239.161
3
                23.60
                         16.478
                                     81.011 1334.877
    31-03:00
                                                           213.527
4
                22.90
                                     93.244 1334.168
    31-04:00
                         15.618
                                                           243.131
  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
                                 ChipMass-4
                                              WeakLiquorF
   Lower-HeatT-3 Upper-HeatT-3
                                                            BlackFlow-2
                                                                1319.039
0
                         303.099
                                     175.964
                                                  1127.197
        329.432
                                                   665.975
1
        330.823
                         304.879
                                     163.202
                                                                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
  WeakWashF
              SteamHeatF-3
                             T-Top-Chips-4
                                             SulphidityL-4
     257.325
                     54.612
                                    252.077
0
                                                        NaN
     241.182
                     46.603
                                    251.406
                                                      29.11
1
2
     237.272
                     51.795
                                    251.335
                                                        NaN
3
     239.478
                     54.846
                                    250.312
                                                      29.02
     215.372
                     54.186
                                    249.916
                                                      29.01
```

[5 rows x 23 columns]

In [7]: print(df_filled)

	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	
J _ J	3 22.00	23.73	13.11,	03.131	1100.312	210.512	
	T-upperExt-2	2 T-low	erExt-2	UCZAA White	eFlow-4 .	SteamFlo	w-4 \
0	358.28		329.545	1.443			'.122
1	351.05		329.067	1.549			0.012
2	350.02		329.260	1.600			304
3	350.93		331.142	1.604			3.496
4	351.64		332.709	0.000			.022
••			•••	•••		••	•••
319	347.28		310.970	1.523			.141
320	399.13		319.576	1.451			.667
321	373.63		314.591	1.457			.446
322	364.08		308.559	1.523			054
323	356.28		310.482	1.474			3.247
223	330.20		310.402	1.7/7	737.373	••	, • 2 ,
	Lower-HeatT-	2 Unnon	HootT 2	ChiM 4	Haald dawa	nE BlackEl	.ow-2 \
	Lower - neatr-	-2 obbei.	-HeatT-3	ChipMass-4	WeakLiquo	rF BlackFl	.OW 2 \
0	329.43		303.099	175.964	weakLiquo 1127.		.9.039
0 1		32		•		197 131	
	329.43	32 23	303.099	175.964	1127.	197 131 975 129	.9.039
1	329.43 330.82	32 23 40	303.099 304.879	175.964 163.202	1127. 665.	197 131 975 129 534 132	.9.039 07.317
1 2	329.43 330.82 329.14	32 23 40 75	303.099 304.879 303.383	175.964 163.202 164.013	1127. 665. 677.	197 131 975 129 534 132 853 132	.9.039 97.317 27.072
1 2 3	329.43 330.82 329.14 328.87	32 23 40 75 52	303.099 304.879 303.383 302.254	175.964 163.202 164.013 181.487	1127. 665. 677. 767.	197 131 975 129 534 132 853 132	.9.039 97.317 27.072 24.461
1 2 3 4	329.43 330.82 329.14 328.87 328.35	32 23 40 75 52	303.099 304.879 303.383 302.254 300.954	175.964 163.202 164.013 181.487 183.929	1127. 665. 677. 767.	197 131 975 129 534 132 853 132 448 134	.9.039 97.317 27.072 24.461 43.424
1 2 3 4	329.43 330.82 329.14 328.87 328.35	32 23 40 75 52	303.099 304.879 303.383 302.254 300.954	175.964 163.202 164.013 181.487 183.929	1127. 665. 677. 767. 888.	197 131 975 129 534 132 853 132 448 134 201 135 135	.9.039 07.317 27.072 24.461 13.424
1 2 3 4 319	329.43 330.82 329.14 328.87 328.35 	32 23 40 75 52 	303.099 304.879 303.383 302.254 300.954 304.006	175.964 163.202 164.013 181.487 183.929 148.174	1127. 665. 677. 767. 888.	197 131 975 129 534 132 853 134 448 134 201 962 131	.9.039 27.317 27.072 24.461 33.424 57.271
1 2 3 4 319 320	329.43 330.82 329.14 328.87 328.35 330.11	32 23 40 75 52 17 48	303.099 304.879 303.383 302.254 300.954 304.006 304.616	175.964 163.202 164.013 181.487 183.929 148.174 165.178	1127. 665. 677. 767. 888. 1027. 906. 887.	197 131 975 129 534 132 853 134 448 134 201 135 962 131 125 131	.9.039 97.317 27.072 24.461 43.424 67.271 11.177
1 2 3 4 319 320 321	329.43 330.82 329.14 328.87 328.35 330.11 330.84 330.22	32 23 40 75 52 17 48 26	303.099 304.879 303.383 302.254 300.954 304.006 304.616 304.686	175.964 163.202 164.013 181.487 183.929 148.174 165.178 160.841	1127. 665. 677. 767. 888. 1027. 906. 887.	197 131 975 129 534 132 853 132 448 134 201 135 962 131 125 131 423 132	.9.039 97.317 27.072 24.461 13.424 67.271 11.177 9.226
1 2 3 4 319 320 321 322	329.43 330.82 329.14 328.87 328.35 330.11 330.84 330.22 327.34	32 23 40 75 52 17 48 26	303.099 304.879 303.383 302.254 300.954 304.006 304.616 304.686 304.363	175.964 163.202 164.013 181.487 183.929 148.174 165.178 160.841 147.589	1127. 665. 677. 767. 888. 1027. 906. 887. 804.	197 131 975 129 534 132 853 132 448 134 201 135 962 131 125 423 132 328 132	.9.039 97.317 27.072 24.461 13.424 67.271 1.177 9.226 20.225
1 2 3 4 319 320 321 322	329.43 330.82 329.14 328.87 328.35 330.11 330.84 330.22 327.34 328.09	32 23 40 75 52 17 48 26 46 92 SteamHea	303.099 304.879 303.383 302.254 300.954 304.006 304.616 304.686 304.363 304.093	175.964 163.202 164.013 181.487 183.929 148.174 165.178 160.841 147.589 144.218	1127. 665. 677. 767. 888. 1027. 906. 887. 804. 828.	197 131 975 129 534 132 853 132 448 134 201 135 962 131 125 131 423 132 L-4	.9.039 97.317 27.072 24.461 13.424 67.271 1.177 9.226 20.225
1 2 3 4 319 320 321 322	329.43 330.82 329.14 328.87 328.35 330.11 330.84 330.22 327.34 328.09	32 23 40 75 52 17 48 26 46 92 SteamHea	303.099 304.879 303.383 302.254 300.954 304.006 304.616 304.686 304.363 304.093	175.964 163.202 164.013 181.487 183.929 148.174 165.178 160.841 147.589 144.218	1127. 665. 677. 767. 888. 1027. 906. 887. 804. 828.	197 131 975 129 534 132 853 132 448 134 201 135 962 131 125 131 423 132 L-4	.9.039 97.317 27.072 24.461 13.424 67.271 1.177 9.226 20.225
1 2 3 4 319 320 321 322 323	329.43 330.82 329.14 328.87 328.35 330.11 330.84 330.22 327.34 328.09	32 23 40 75 52 17 48 26 46 92 SteamHea 5	303.099 304.879 303.383 302.254 300.954 304.006 304.616 304.686 304.363 304.093	175.964 163.202 164.013 181.487 183.929 148.174 165.178 160.841 147.589 144.218	1127. 665. 677. 767. 888. 1027. 906. 887. 804. 828. Sulphidity	197 131 975 129 534 132 853 132 448 134 201 135 962 131 125 131 423 132 132 L-4 0.00 9.11	.9.039 97.317 27.072 24.461 13.424 67.271 1.177 9.226 20.225
1 2 3 4 319 320 321 322 323	329.43 330.82 329.14 328.87 328.35 330.11 330.84 330.22 327.34 328.09	32 23 40 75 52 17 48 26 46 92 SteamHea 5	303.099 304.879 303.383 302.254 300.954 304.006 304.616 304.686 304.363 304.093 tF-3 T-T	175.964 163.202 164.013 181.487 183.929 148.174 165.178 160.841 147.589 144.218	1127. 665. 677. 767. 888. 1027. 906. 887. 804. 828. Sulphidity	197 131 975 129 534 132 853 132 448 134 201 135 962 131 125 131 423 132 128 132	.9.039 97.317 27.072 24.461 13.424 67.271 1.177 9.226 20.225
1 2 3 4 319 320 321 322 323	329.43 330.82 329.14 328.87 328.35 330.11 330.84 330.22 327.34 328.09 WeakWashF 257.325 241.182	32 23 40 75 52 17 48 26 46 92 SteamHea 5 4	303.099 304.879 303.383 302.254 300.954 304.006 304.616 304.686 304.363 304.093 tF-3 T-T 4.612 6.603	175.964 163.202 164.013 181.487 183.929 148.174 165.178 160.841 147.589 144.218 op-Chips-4 252.077 251.406	1127. 665. 677. 767. 888. 1027. 906. 887. 804. 828. Sulphidity	197 131 975 129 534 132 853 132 448 134 201 135 962 131 125 131 423 132 132 L-4 0.00 9.11	.9.039 97.317 27.072 24.461 13.424 67.271 1.177 9.226 20.225
1 2 3 4 319 320 321 322 323	329.43 330.82 329.14 328.87 328.35 330.11 330.84 330.22 327.34 328.09 WeakWashF 257.325 241.182 237.272	32 23 40 75 52 17 48 26 46 92 SteamHea 5 4	303.099 304.879 303.383 302.254 300.954 304.006 304.616 304.686 304.363 304.093 tF-3 T-T 4.612 6.603 1.795	175.964 163.202 164.013 181.487 183.929 148.174 165.178 160.841 147.589 144.218 fop-Chips-4 252.077 251.406 251.335	1127. 665. 677. 767. 888. 1027. 906. 887. 804. 828. Sulphidity	197 131 975 129 534 132 853 132 448 134 201 135 962 131 125 131 423 132 1242 132 L-4 0.00 9.11 0.00	.9.039 97.317 27.072 24.461 13.424 67.271 1.177 9.226 20.225
1 2 3 4 319 320 321 322 323	329.43 330.82 329.14 328.87 328.35 330.11 330.84 330.22 327.34 328.09 WeakWashF 257.325 241.182 237.272 239.478 215.372	32 23 40 75 52 17 48 26 46 92 SteamHea 5 4 5	303.099 304.879 303.383 302.254 300.954 304.006 304.616 304.686 304.363 304.093 tF-3 T-T 4.612 6.603 1.795 4.846 4.186	175.964 163.202 164.013 181.487 183.929 148.174 165.178 160.841 147.589 144.218 op-Chips-4 252.077 251.406 251.335 250.312 249.916	1127. 665. 677. 767. 888. 1027. 906. 887. 804. 828. Sulphidity	197 131 975 129 534 132 853 132 448 201 135 962 131 125 131 423 132 8 132 8 L-4 0.00 9.11 0.00 9.02 9.01	.9.039 97.317 27.072 24.461 13.424 67.271 1.177 9.226 20.225
1 2 3 4 319 320 321 322 323	329.43 330.82 328.35 330.11 330.82 330.22 327.32 328.09 WeakWashF 257.325 241.182 237.272 239.478 215.372 381.643	32 23 40 75 52 17 48 26 46 92 SteamHea 5 4 5	303.099 304.879 303.383 302.254 300.954 304.006 304.616 304.686 304.363 304.093 tF-3 T-T 4.612 6.603 1.795 4.846 4.186	175.964 163.202 164.013 181.487 183.929 148.174 165.178 160.841 147.589 144.218 op-Chips-4 252.077 251.406 251.335 250.312 249.916	1127. 665. 677. 767. 888. 1027. 906. 887. 804. 828. Sulphidity	197 131 975 129 534 132 853 132 448 134 201 135 962 131 125 131 423 132 125 131 423 132 L-4 0.00 9.11 0.00 9.02 9.01 0.86	.9.039 97.317 27.072 24.461 13.424 67.271 1.177 9.226 20.225
1 2 3 4 319 320 321 322 323	329.43 330.82 329.14 328.87 328.35 330.11 330.84 330.22 327.34 328.09 WeakWashF 257.325 241.182 237.272 239.478 215.372	32 23 40 75 52 17 48 26 46 92 SteamHea 5 4 5	303.099 304.879 303.383 302.254 300.954 304.006 304.616 304.686 304.363 304.093 tF-3 T-T 4.612 6.603 1.795 4.846 4.186	175.964 163.202 164.013 181.487 183.929 148.174 165.178 160.841 147.589 144.218 op-Chips-4 252.077 251.406 251.335 250.312 249.916	1127. 665. 677. 767. 888. 1027. 906. 887. 804. 828. Sulphidity	197 131 975 129 534 132 853 132 448 134 201 135 962 131 125 131 423 132 125 131 420 132 132 L-4 0.00 9.11 0.00 9.02 9.01 0.86 0.70	.9.039 97.317 27.072 24.461 13.424 67.271 1.177 9.226 20.225
1 2 3 4 319 320 321 322 323 0 1 2 3 4 319	329.43 330.82 328.35 330.11 330.82 330.22 327.32 328.09 WeakWashF 257.325 241.182 237.272 239.478 215.372 381.643	32 23 40 75 52 17 48 26 46 92 SteamHea 5 4 5 5	303.099 304.879 303.383 302.254 300.954 304.006 304.616 304.686 304.363 304.093 tF-3 T-T 4.612 6.603 1.795 4.846 4.186 5.264	175.964 163.202 164.013 181.487 183.929 148.174 165.178 160.841 147.589 144.218 fop-Chips-4 252.077 251.406 251.335 250.312 249.916 252.947	1127. 665. 677. 767. 888. 1027. 906. 887. 804. 828. Sulphidity	197 131 975 129 534 132 853 132 448 134 201 135 962 131 125 131 423 132 125 131 423 132 L-4 0.00 9.11 0.00 9.02 9.01 0.86	.9.039 97.317 27.072 24.461 13.424 67.271 1.177 9.226 20.225
1 2 3 4 319 320 321 322 323 0 1 2 3 4 319 320	329.43 330.82 329.14 328.87 328.35 330.11 330.84 330.22 327.34 328.09 WeakWashF 257.325 241.182 237.272 239.478 215.372 381.643 25.494	32 23 40 75 52 17 48 26 46 92 SteamHea 5 4 5 5	303.099 304.879 303.383 302.254 300.954 304.006 304.616 304.686 304.363 304.093 tF-3 T-T 4.612 6.603 1.795 4.846 4.186 5.264 0.528	175.964 163.202 164.013 181.487 183.929 148.174 165.178 160.841 147.589 144.218 op-Chips-4 252.077 251.406 251.335 250.312 249.916 252.947 252.092	1127. 665. 677. 767. 888. 1027. 906. 887. 804. 828. Sulphidity	197 131 975 129 534 132 853 132 448 134 201 135 962 131 125 131 423 132 125 131 420 132 132 L-4 0.00 9.11 0.00 9.02 9.01 0.86 0.70	.9.039 97.317 27.072 24.461 13.424 67.271 1.177 9.226 20.225
1 2 3 4 319 320 321 322 323 0 1 2 3 4 319 320 321 322 323	329.43 330.82 329.14 328.87 328.35 330.11 330.84 330.22 327.34 328.09 WeakWashF 257.325 241.182 237.272 239.478 215.372 381.643 25.494 0.638	32 23 40 75 52 17 48 26 46 92 SteamHea 5 4 5 5	303.099 304.879 303.383 302.254 300.954 304.006 304.616 304.686 304.363 304.093 tF-3 T-T 4.612 6.603 1.795 4.846 4.186 5.264 0.528 5.549	175.964 163.202 164.013 181.487 183.929 148.174 165.178 160.841 147.589 144.218 fop-Chips-4 252.077 251.406 251.335 250.312 249.916 252.947 252.092 252.438	1127. 665. 677. 767. 888. 1027. 906. 887. 804. 828. Sulphidity 2 2 2	197 131 975 129 534 132 853 132 448 134 201 135 962 131 125 131 423 132 328 132 L-4 0.00 9.11 0.00 9.02 9.01 0.86 0.70 0.00	.9.039 97.317 27.072 24.461 13.424 67.271 1.177 9.226 20.225

[324 rows x 23 columns]

	Observation	Y-Kappa	ChipRate	BF-CMratio	BlowFlow	ChipLe	evel4 \	
1	31-01:00	27.60	16.810	79.022	1328.360	-	41.327	
3	31-03:00	23.60	16.478	81.011	1334.877		13.527	
5	1-08:00	14.23	15.350	85.518	1171.604		98.538	
7	31-06:00	22.65	14.100	91.887	1307.852		88.989	
9	31-08:00	24.70	13.850	96.208	1334.892		52.511	
		•••					•••	
312		24.40	14.117	85.998	1330.104	39	94.234	
317		17.80	16.625	78.367	1276.082		02.744	
319		23.75	12.667	93.450	1178.252		76.955	
320		19.80	12.558	94.352	1184.119		97.071	
322		24.32	13.083	88.910	1192.879		18.006	
	T-upperExt-2	2 T-low	erExt-2	UCZAA White	eFlow-4	St	teamFlow-4	\
1	351.05		329.067	1.549	537.201		60.012	
3	350.93	38	331.142	1.604	623.362		68.496	
5	344.03		325.195	1.436			65.225	
7	352.32		331.162	1.468			71.298	
9	352.37		327.358	1.515	553.172		64.249	
	• •							
312	348.08	39	319.027	1.429	540.558		62.179	
317	360.12	27	329.266	1.488	698.486		75.296	
319	347.28	36	310.970	1.523	513.956		61.141	
320	399.13	35	3 1 9.576	1.451	570.058		67.667	
322	364.08	31	308.559	1.523	504.852		61.054	
	Lower-HeatT	-3 Upper	-HeatT-3	ChipMass-4	WeakLiqu		BlackFlow-2	\
1	330.82	23	304.879	163.202		.975	1297.317	
3	328.87	75	302.254	181.487	767	.853	1324.461	
5	322.10	2 3	298.517	165.814	826	.243	907.641	
7	329.66		301.539	179.886		.178	1315.111	
9	332.26	54	305.419	166.120	909	.810	1318.725	
• •								
312		• •	• • •	• • •		• • •	• • •	
	329.83	31	302.652	163.258		.107	1312.372	
317	2 329.83 321.65	31 58	302.652 297.088	163.258 180.438	1017	.107 .333	1312.372 1052.785	
317 319	2 329.83 7 321.69 9 330.11	31 58 17	302.652 297.088 304.006	163.258 180.438 148.174	1017 1027	.107 .333 .201	1312.372 1052.785 1357.271	
317 319 320	2 329.83 7 321.65 9 330.12 9 330.84	31 58 17 48	302.652 297.088 304.006 304.616	163.258 180.438 148.174 165.178	1017 1027 906	.107 .333 .201 .962	1312.372 1052.785 1357.271 1311.177	
317 319	2 329.83 7 321.65 9 330.12 9 330.84	31 58 17 48	302.652 297.088 304.006	163.258 180.438 148.174	1017 1027 906	.107 .333 .201	1312.372 1052.785 1357.271	
317 319 320	2 329.83 7 321.65 9 330.12 9 330.84 2 327.34	31 58 17 48 46	302.652 297.088 304.006 304.616 304.363	163.258 180.438 148.174 165.178 147.589	1017 1027 906 804	.107 .333 .201 .962 .423	1312.372 1052.785 1357.271 1311.177	
317 319 320 322	2 329.83 7 321.69 9 330.12 9 330.84 2 327.34 WeakWashF	31 58 17 48 46 SteamHea	302.652 297.088 304.006 304.616 304.363 tF-3 T-T	163.258 180.438 148.174 165.178 147.589	1017 1027 906 804 Sulphidity	.107 .333 .201 .962 .423	1312.372 1052.785 1357.271 1311.177	
317 319 320 322	2 329.83 7 321.69 8 330.12 8 330.84 2 327.34 WeakWashF 241.182	31 58 17 48 46 SteamHea 4	302.652 297.088 304.006 304.616 304.363 tF-3 T-T	163.258 180.438 148.174 165.178 147.589 op-Chips-4 251.406	1017 1027 906 804 Sulphidity	.107 .333 .201 .962 .423 yL-4 9.110	1312.372 1052.785 1357.271 1311.177	
317 319 320 322 1 3	2 329.83 7 321.69 8 330.12 9 330.84 2 327.34 WeakWashF 241.182 239.478	31 58 17 48 46 SteamHea 4 5	302.652 297.088 304.006 304.616 304.363 tF-3 T-T 6.603 4.846	163.258 180.438 148.174 165.178 147.589 op-Chips-4 251.406 250.312	1017 1027 906 804 Sulphidity 29	.107 .333 .201 .962 .423 yL-4 9.110 9.020	1312.372 1052.785 1357.271 1311.177	
317 319 320 322 1 3	2 329.83 7 321.69 8 330.12 9 330.84 2 327.34 WeakWashF 241.182 239.478 595.875	31 58 17 48 46 SteamHea 4 5	302.652 297.088 304.006 304.616 304.363 tF-3 T-T 6.603 4.846 2.807	163.258 180.438 148.174 165.178 147.589 Top-Chips-4 251.406 250.312 249.580	1017 1027 906 804 Sulphidity 29 29	.107 .333 .201 .962 .423 yL-4 9.110 9.020 0.340	1312.372 1052.785 1357.271 1311.177	
317 319 320 322 1 3 5 7	2 329.83 321.69 330.12 330.84 2 327.34 WeakWashF 241.182 239.478 595.875 234.047	31 58 17 48 46 SteamHea 4 5 5	302.652 297.088 304.006 304.616 304.363 tF-3 T-T 6.603 4.846 2.807 3.805	163.258 180.438 148.174 165.178 147.589 Top-Chips-4 251.406 250.312 249.580 249.971	1017 1027 906 804 Sulphidity 29 29 30	.107 .333 .201 .962 .423 yL-4 9.110 9.020 0.340 9.220	1312.372 1052.785 1357.271 1311.177	
317 319 320 322 1 3 5 7	2 329.83 3 321.63 3 330.12 3 330.84 2 327.34 WeakWashF 241.182 239.478 595.875 234.047 180.375	31 58 17 48 46 SteamHea 4 5 5	302.652 297.088 304.006 304.616 304.363 tF-3 T-T 6.603 4.846 2.807 3.805 8.842	163.258 180.438 148.174 165.178 147.589 Top-Chips-4 251.406 250.312 249.580 249.971 251.121	1017 1027 906 804 Sulphidity 29 29 30	.107 .333 .201 .962 .423 yL-4 9.110 9.020 0.340 9.220 9.210	1312.372 1052.785 1357.271 1311.177	
317 319 320 322 1 3 5 7 9	2 329.83 321.69 330.12 330.84 2 327.34 WeakWashF 241.182 239.478 595.875 234.047 180.375	31 58 17 48 46 SteamHea 4 5 5 5	302.652 297.088 304.006 304.616 304.363 tF-3 T-T 6.603 4.846 2.807 3.805 8.842	163.258 180.438 148.174 165.178 147.589 Top-Chips-4 251.406 250.312 249.580 249.971 251.121	1017 1027 906 804 Sulphidit; 29 29 30 29	.107 .333 .201 .962 .423 yL-4 9.110 9.020 9.340 9.220 9.210	1312.372 1052.785 1357.271 1311.177	
317 319 320 322 1 3 5 7 9	2 329.83 321.69 330.12 330.84 327.34 WeakWashF 241.182 239.478 595.875 234.047 180.375 	31 58 17 48 46 SteamHea 4 5 5 4	302.652 297.088 304.006 304.616 304.363 tF-3 T-T 6.603 4.846 2.807 3.805 8.842 	163.258 180.438 148.174 165.178 147.589 Top-Chips-4 251.406 250.312 249.580 249.971 251.121 	1017 1027 906 804 Sulphidit; 29 30 29	.107 .333 .201 .962 .423 yL-4 9.110 9.020 0.340 9.220 9.210 	1312.372 1052.785 1357.271 1311.177	
317 319 320 322 1 3 5 7 9 312 317	2 329.83 321.69 330.12 330.84 327.34 WeakWashF 241.182 239.478 595.875 234.047 180.375 132.163 433.089	31 58 17 48 46 SteamHea 4 5 5 4	302.652 297.088 304.006 304.616 304.363 tF-3 T-T 6.603 4.846 2.807 3.805 8.842 9.446 4.675	163.258 180.438 148.174 165.178 147.589 Top-Chips-4 251.406 250.312 249.580 249.971 251.121 251.406 251.747	1017 1027 906 804 Sulphidit: 29 29 30 29 29	.107 .333 .201 .962 .423 yL-4 9.110 9.020 0.340 9.220 9.210 9.292	1312.372 1052.785 1357.271 1311.177	
317 319 320 322 1 3 5 7 9 312 317 319	2 329.83 321.69 330.12 330.84 327.34 WeakWashF 241.182 239.478 595.875 234.047 180.375 132.163 433.089 381.643	31 58 17 48 46 SteamHea 4 5 5 4 4 5	302.652 297.088 304.006 304.616 304.363 tF-3 T-T 6.603 4.846 2.807 3.805 8.842 9.446 4.675 5.264	163.258 180.438 148.174 165.178 147.589 Top-Chips-4 251.406 250.312 249.580 249.971 251.121 251.406 251.747 252.947	1017 1027 906 804 Sulphidity 29 29 29 29	.107 .333 .201 .962 .423 yL-4 9.110 9.020 0.340 9.220 9.210 9.292 0.320 0.860	1312.372 1052.785 1357.271 1311.177	
317 319 320 322 1 3 5 7 9 312 317 319 320	2 329.83 321.69 330.12 330.84 327.34 WeakWashF 241.182 239.478 595.875 234.047 180.375 2 132.163 433.089 381.643 25.494	31 58 17 48 46 SteamHea 4 5 5 4 4 5	302.652 297.088 304.006 304.616 304.363 tF-3 T-T 6.603 4.846 2.807 3.805 8.842 9.446 4.675 5.264 0.528	163.258 180.438 148.174 165.178 147.589 fop-Chips-4 251.406 250.312 249.580 249.971 251.121 251.406 251.747 252.947 252.092	1017 1027 906 804 Sulphidity 29 29 29 29 30 30 30 30	.107 .333 .201 .962 .423 yL-4 9.110 9.020 0.340 9.220 9.210 9.292 0.320 0.3860 0.700	1312.372 1052.785 1357.271 1311.177	
317 319 320 322 1 3 5 7 9 312 317 319	2 329.83 321.69 330.12 330.84 327.34 WeakWashF 241.182 239.478 595.875 234.047 180.375 2 132.163 433.089 381.643 25.494	31 58 17 48 46 SteamHea 4 5 5 4 4 5	302.652 297.088 304.006 304.616 304.363 tF-3 T-T 6.603 4.846 2.807 3.805 8.842 9.446 4.675 5.264	163.258 180.438 148.174 165.178 147.589 Top-Chips-4 251.406 250.312 249.580 249.971 251.121 251.406 251.747 252.947	1017 1027 906 804 Sulphidity 29 29 29 29 30 30 30 30	.107 .333 .201 .962 .423 yL-4 9.110 9.020 0.340 9.220 9.210 9.292 0.320 0.860	1312.372 1052.785 1357.271 1311.177	

[141 rows x 23 columns]

```
In [9]: 

summary_stats = df.describe()
print("\nSummary statistics:")
print(summary_stats)
```

```
Summary statistics:
                      ChipRate
                                BF-CMratio
                                                           ChipLevel4
          Y-Kappa
                                                 BlowFlow
count 324.000000
                    319.000000
                                307.000000
                                              308.000000
                                                            323.000000
                     14.347937
                                  87.464456
                                             1237.837614
mean
        20.635370
                                                            258.164483
                      1.499095
                                  7.995012
                                              100.593735
std
         3.070036
                                                             87.987452
                      9.983000
min
        12.170000
                                  68.645000
                                                 0.000000
                                                              0.000000
25%
        18.382500
                     13.358000
                                  81.823000
                                             1193.215250
                                                            213.527000
50%
        20.845000
                     14.308000
                                  86.739000
                                                            271.792000
                                             1273.138500
75%
        23.032500
                     15.517000
                                  92.372000
                                             1289.196000
                                                            321.680000
        27.600000
                     16.958000
                                121.717000
                                             1351.240000
                                                            419.014000
max
                       T-lowerExt-2
                                             UCZAA
                                                    WhiteFlow-4
                                                                    AAWhiteSt-4
       T-upperExt-2
count
          322.000000
                           322.000000
                                        299.000000
                                                       323.000000
                                                                      173.000000
                           324.020180
mean
          356.904295
                                          1.492010
                                                       591.732260
                                                                        6.140410
std
            9.209290
                             7.621402
                                          0.105923
                                                        67.016351
                                                                        0.081609
          339.168000
                           284.633000
                                          1.182000
                                                       405.111000
                                                                        5.890000
min
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
              323.000000
                                                             323.000000
                              322.000000
                                               322.000000
count
       . . .
               66.668285
                              325.567820
                                               300.525699
                                                             162.222322
mean
       . . .
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
         323.000000
                        322.000000
                                     323.000000
                                                     322.000000
                                                                      323.000000
count
mean
         873.828941
                       1175.917016
                                     263.543068
                                                      49.696907
                                                                      251.240087
         122.073521
                        149.334010
                                     163.666942
                                                       4.551909
                                                                        1.283432
std
                                       0.000000
         486.938000
                        838.948000
                                                      35.510000
                                                                      248.359000
min
25%
         792.019500
                                     134.649000
                       1044.817500
                                                      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]

```
In [12]:

    | column_stats = df['ChipRate'].describe()

             print("\nSummary statistics for a specific column:")
             print(column_stats)
             Summary statistics for a specific column:
             count
                      319.000000
             mean
                       14.347937
                        1.499095
             std
                        9.983000
             min
             25%
                       13.358000
             50%
                       14.308000
             75%
                       15.517000
             max
                       16.958000
             Name: ChipRate, dtype: float64
In [ ]:
```