Problem statement

Data collection

In [1]:

```
#to import libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [8]:

```
df=pd.read_csv(r"E:\Dataset\9_bottle.csv")[0:500]
df
```

```
C:\ProgramData\Anaconda3\lib\site-packages\IPython\core\interactiveshell.py:3165: Dt
ypeWarning: Columns (47,73) have mixed types.Specify dtype option on import or set l
ow_memory=False.
  has_raised = await self.run_ast_nodes(code_ast.body, cell_name,
```

Out[8]:

	Cst_Cnt	Btl_Cnt	Sta_ID	Depth_ID	Depthm	T_degC	Salnty	O2ml_L	STheta	O2Sat	...	R_PHAE
0	1	1	054.0 056.0	19-4903CR-HY-060-0930-05400560-0000A-3	0	10.50	33.440	NaN	25.649	NaN	...	Na
1	1	2	054.0 056.0	19-4903CR-HY-060-0930-05400560-0008A-3	8	10.46	33.440	NaN	25.656	NaN	...	Na
2	1	3	054.0 056.0	19-4903CR-HY-060-0930-05400560-0010A-7	10	10.46	33.437	NaN	25.654	NaN	...	Na
3	1	4	054.0 056.0	19-4903CR-HY-060-0930-05400560-0019A-3	19	10.45	33.420	NaN	25.643	NaN	...	Na
4	1	5	054.0 056.0	19-4903CR-HY-060-0930-05400560-0020A-7	20	10.45	33.421	NaN	25.643	NaN	...	Na
...	...	...	...	...	...	...	...	...	...	...	...	...
495	16	496	063.3 058.0	19-4903CR-HY-065-1030-06330580-0700A-7	700	4.90	34.269	NaN	27.114	NaN	...	Na
496	16	497	063.3 058.0	19-4903CR-HY-065-1030-06330580-0792A-3	792	4.50	34.310	NaN	27.191	NaN	...	Na
497	16	498	063.3 058.0	19-4903CR-HY-065-1030-06330580-0800A-7	800	4.48	34.311	NaN	27.194	NaN	...	Na
498	16	499	063.3 058.0	19-4903CR-HY-065-1030-06330580-0900A-7	900	4.21	34.319	NaN	27.230	NaN	...	Na
499	16	500	063.3 058.0	19-4903CR-HY-065-1030-06330580-1000A-7	1000	3.95	34.329	NaN	27.265	NaN	...	Na

5 rows × 74 columns

In [9]:

```
df.head()
```

Out[9]:

	Cst_Cnt	Btl_Cnt	Sta_ID	Depth_ID	Depthm	T_degC	Salnty	O2ml_L	STheta	O2Sat	...	R_PHAEO
0	1	1	054.0 056.0	19-4903CR-HY-060-0930-05400560-0000A-3	0	10.50	33.440	NaN	25.649	NaN	...	NaN
1	1	2	054.0 056.0	19-4903CR-HY-060-0930-05400560-0008A-3	8	10.46	33.440	NaN	25.656	NaN	...	NaN
2	1	3	054.0 056.0	19-4903CR-HY-060-0930-05400560-0010A-7	10	10.46	33.437	NaN	25.654	NaN	...	NaN
3	1	4	054.0 056.0	19-4903CR-HY-060-0930-05400560-0019A-3	19	10.45	33.420	NaN	25.643	NaN	...	NaN
4	1	5	054.0 056.0	19-4903CR-HY-060-0930-05400560-0020A-7	20	10.45	33.421	NaN	25.643	NaN	...	NaN

500 rows × 74 columns

In [10]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 500 entries, 0 to 499
Data columns (total 74 columns):
 #   Column               Non-Null Count  Dtype  
---  ------               --------------  -----  
 0   Cst_Cnt              500 non-null    int64  
 1   Btl_Cnt              500 non-null    int64  
 2   Sta_ID               500 non-null    object 
 3   Depth_ID             500 non-null    object 
 4   Depthm               500 non-null    int64  
 5   T_degC               499 non-null    float64
 6   Salnty               494 non-null    float64
 7   O2ml_L               0 non-null      float64
 8   STheta               493 non-null    float64
 9   O2Sat                0 non-null      float64
 10  Oxy_µmol/Kg          0 non-null      float64
 11  BtlNum               0 non-null      float64
 12  RecInd               500 non-null    int64  
 13  T_prec               499 non-null    float64
 14  T_qual               4 non-null      float64
 15  S_prec               494 non-null    float64
 16  S_qual               10 non-null     float64
 17  P_qual               500 non-null    float64
 18  O_qual               500 non-null    float64
 19  SThtaq               14 non-null     float64
 20  O2Satq               500 non-null    float64
 21  ChlorA               0 non-null      float64
 22  Chlqua               500 non-null    float64
 23  Phaeop               0 non-null      float64
 24  Phaqua               500 non-null    float64
 25  PO4uM                0 non-null      float64
 26  PO4q                 500 non-null    float64
 27  SiO3uM               0 non-null      float64
 28  SiO3qu               500 non-null    float64
 29  NO2uM                0 non-null      float64
 30  NO2q                 500 non-null    float64
 31  NO3uM                0 non-null      float64
 32  NO3q                 500 non-null    float64
 33  NH3uM                0 non-null      float64
 34  NH3q                 500 non-null    float64
 35  C14As1               0 non-null      float64
 36  C14A1p               0 non-null      float64
 37  C14A1q               500 non-null    float64
 38  C14As2               0 non-null      float64
 39  C14A2p               0 non-null      float64
 40  C14A2q               500 non-null    float64
 41  DarkAs               0 non-null      float64
 42  DarkAp               0 non-null      float64
 43  DarkAq               500 non-null    float64
 44  MeanAs               0 non-null      float64
 45  MeanAp               0 non-null      float64
 46  MeanAq               500 non-null    float64
 47  IncTim               0 non-null      object 
 48  LightP               0 non-null      float64
 49  R_Depth              500 non-null    float64
 50  R_TEMP               499 non-null    float64
 51  R_POTEMP             495 non-null    float64
 52  R_SALINITY           494 non-null    float64
 53  R_SIGMA              486 non-null    float64
 54  R_SVA                486 non-null    float64
 55  R_DYNHT              500 non-null    float64
 56  R_O2                 0 non-null      float64
 57  R_O2Sat              0 non-null      float64
 58  R_SIO3               0 non-null      float64
 59  R_PO4                0 non-null      float64
 60  R_NO3                0 non-null      float64
```

```
 61  R_NO2                 0 non-null      float64
 62  R_NH4                 0 non-null      float64
 63  R_CHLA                0 non-null      float64
 64  R_PHAEO               0 non-null      float64
 65  R_PRES                500 non-null    int64
 66  R_SAMP                0 non-null      float64
 67  DIC1                  0 non-null      float64
 68  DIC2                  0 non-null      float64
 69  TA1                   0 non-null      float64
 70  TA2                   0 non-null      float64
 71  pH2                   0 non-null      float64
 72  pH1                   0 non-null      float64
 73  DIC Quality Comment   0 non-null      object
dtypes: float64(65), int64(5), object(4)
memory usage: 289.2+ KB
```

In [11]:

```
#to display summary of statistics
df.describe()
```

Out[11]:

	Cst_Cnt	Btl_Cnt	Depthm	T_degC	Salnty	O2ml_L	STheta	O2Sat	Oxy_µn
count	500.000000	500.000000	500.000000	499.000000	494.000000	0.0	493.000000	0.0	
mean	8.548000	250.500000	341.490000	7.850421	33.628842	NaN	26.183400	NaN	
std	4.570062	144.481833	355.166886	2.911584	0.560411	NaN	0.846325	NaN	
min	1.000000	1.000000	0.000000	2.780000	32.630000	NaN	24.870000	NaN	
25%	5.000000	125.750000	55.000000	5.030000	33.071000	NaN	25.259000	NaN	
50%	9.000000	250.500000	200.000000	8.180000	33.799500	NaN	26.339000	NaN	
75%	12.250000	375.250000	598.500000	10.450000	34.130000	NaN	26.983000	NaN	
max	16.000000	500.000000	1352.000000	12.660000	34.450000	NaN	27.450000	NaN	

8 rows × 70 columns

In [12]:

```
#to display cloumn heading
df.columns
```

Out[12]:

```
Index(['Cst_Cnt', 'Btl_Cnt', 'Sta_ID', 'Depth_ID', 'Depthm', 'T_degC',
       'Salnty', 'O2ml_L', 'STheta', 'O2Sat', 'Oxy_µmol/Kg', 'BtlNum',
       'RecInd', 'T_prec', 'T_qual', 'S_prec', 'S_qual', 'P_qual', 'O_qual',
       'SThtaq', 'O2Satq', 'ChlorA', 'Chlqua', 'Phaeop', 'Phaqua', 'PO4uM',
       'PO4q', 'SiO3uM', 'SiO3qu', 'NO2uM', 'NO2q', 'NO3uM', 'NO3q', 'NH3uM',
       'NH3q', 'C14As1', 'C14A1p', 'C14A1q', 'C14As2', 'C14A2p', 'C14A2q',
       'DarkAs', 'DarkAp', 'DarkAq', 'MeanAs', 'MeanAp', 'MeanAq', 'IncTim',
       'LightP', 'R_Depth', 'R_TEMP', 'R_POTEMP', 'R_SALINITY', 'R_SIGMA',
       'R_SVA', 'R_DYNHT', 'R_O2', 'R_O2Sat', 'R_SIO3', 'R_PO4', 'R_NO3',
       'R_NO2', 'R_NH4', 'R_CHLA', 'R_PHAEO', 'R_PRES', 'R_SAMP', 'DIC1',
       'DIC2', 'TA1', 'TA2', 'pH2', 'pH1', 'DIC Quality Comment'],
      dtype='object')
```

EDA and VISUALIZATION

In [18]:

```
df1=df[['Cst_Cnt', 'Btl_Cnt', 'Sta_ID', 'Depth_ID', 'Depthm', 'T_degC','Salnty', 'O2ml_L', 'STheta
df1
```

Out[18]:

	Cst_Cnt	Btl_Cnt	Sta_ID	Depth_ID	Depthm	T_degC	Salnty	O2ml_L	STheta
0	1	1	054.0 056.0	19-4903CR-HY-060-0930-05400560-0000A-3	0	10.50	33.440	NaN	25.649
1	1	2	054.0 056.0	19-4903CR-HY-060-0930-05400560-0008A-3	8	10.46	33.440	NaN	25.656
2	1	3	054.0 056.0	19-4903CR-HY-060-0930-05400560-0010A-7	10	10.46	33.437	NaN	25.654
3	1	4	054.0 056.0	19-4903CR-HY-060-0930-05400560-0019A-3	19	10.45	33.420	NaN	25.643
4	1	5	054.0 056.0	19-4903CR-HY-060-0930-05400560-0020A-7	20	10.45	33.421	NaN	25.643
...	...	...	...	...	...	...	...	...	...
495	16	496	063.3 058.0	19-4903CR-HY-065-1030-06330580-0700A-7	700	4.90	34.269	NaN	27.114
496	16	497	063.3 058.0	19-4903CR-HY-065-1030-06330580-0792A-3	792	4.50	34.310	NaN	27.191
497	16	498	063.3 058.0	19-4903CR-HY-065-1030-06330580-0800A-7	800	4.48	34.311	NaN	27.194
498	16	499	063.3 058.0	19-4903CR-HY-065-1030-06330580-0900A-7	900	4.21	34.319	NaN	27.230
499	16	500	063.3 058.0	19-4903CR-HY-065-1030-06330580-1000A-7	1000	3.95	34.329	NaN	27.265

500 rows × 9 columns

In [21]:

```
df1.fillna(1)
```

Out[21]:

	Cst_Cnt	Btl_Cnt	Sta_ID	Depth_ID	Depthm	T_degC	Salnty	O2ml_L	STheta
0	1	1	054.0 056.0	19-4903CR-HY-060-0930-05400560-0000A-3	0	10.50	33.440	1.0	25.649
1	1	2	054.0 056.0	19-4903CR-HY-060-0930-05400560-0008A-3	8	10.46	33.440	1.0	25.656
2	1	3	054.0 056.0	19-4903CR-HY-060-0930-05400560-0010A-7	10	10.46	33.437	1.0	25.654
3	1	4	054.0 056.0	19-4903CR-HY-060-0930-05400560-0019A-3	19	10.45	33.420	1.0	25.643
4	1	5	054.0 056.0	19-4903CR-HY-060-0930-05400560-0020A-7	20	10.45	33.421	1.0	25.643
...	...	...	...	...	...	...	...	...	...
495	16	496	063.3 058.0	19-4903CR-HY-065-1030-06330580-0700A-7	700	4.90	34.269	1.0	27.114
496	16	497	063.3 058.0	19-4903CR-HY-065-1030-06330580-0792A-3	792	4.50	34.310	1.0	27.191
497	16	498	063.3 058.0	19-4903CR-HY-065-1030-06330580-0800A-7	800	4.48	34.311	1.0	27.194
498	16	499	063.3 058.0	19-4903CR-HY-065-1030-06330580-0900A-7	900	4.21	34.319	1.0	27.230
499	16	500	063.3 058.0	19-4903CR-HY-065-1030-06330580-1000A-7	1000	3.95	34.329	1.0	27.265

500 rows × 9 columns

In [37]:

```
df1.info()
```

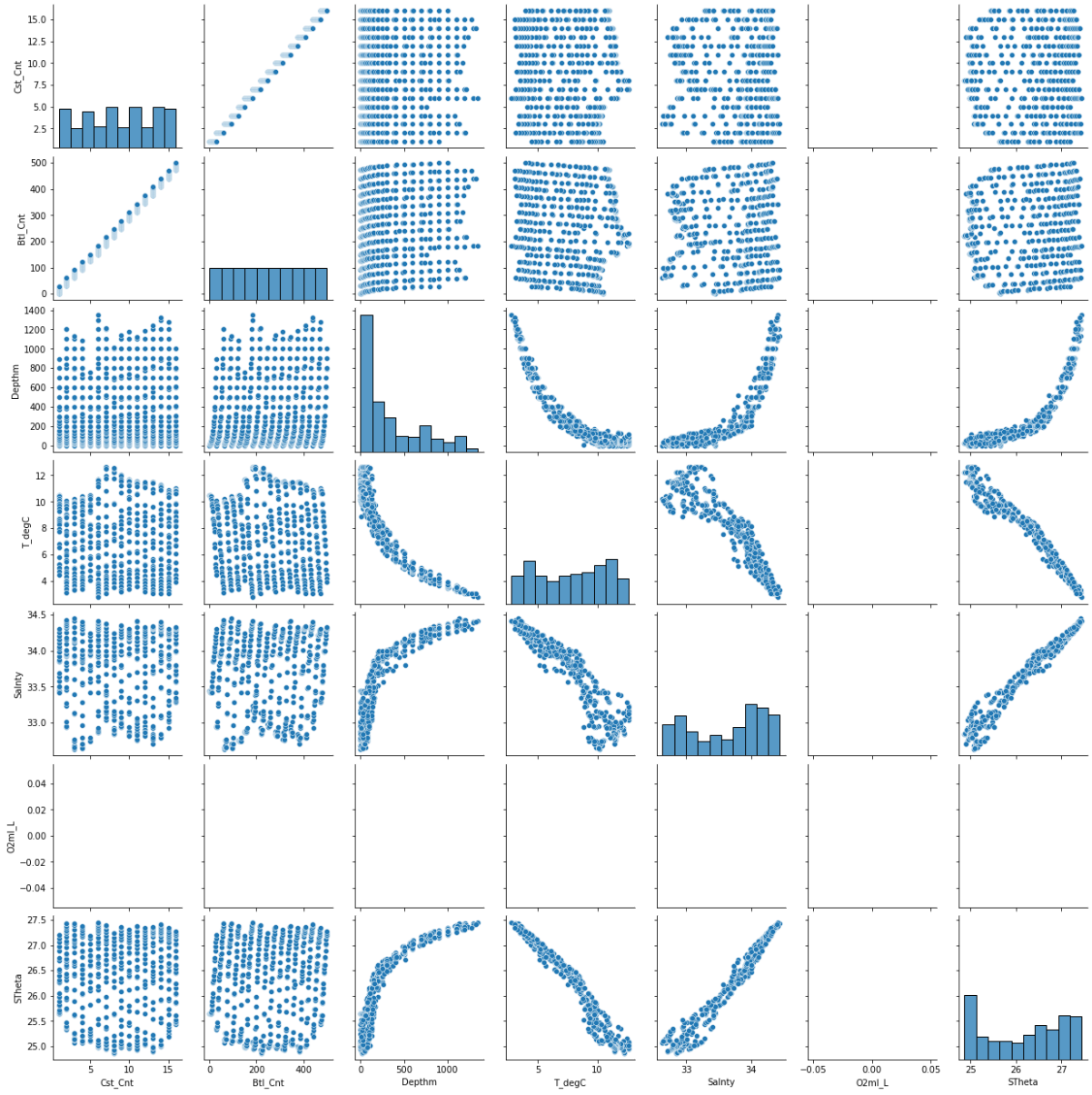
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 500 entries, 0 to 499
Data columns (total 7 columns):
 #   Column   Non-Null Count  Dtype  
---  ------   --------------  -----  
 0   Cst_Cnt  500 non-null    int64  
 1   Btl_Cnt  500 non-null    int64  
 2   Depthm   500 non-null    int64  
 3   T_degC   499 non-null    float64
 4   Salnty   494 non-null    float64
 5   O2ml_L   0 non-null      float64
 6   STheta   493 non-null    float64
dtypes: float64(4), int64(3)
memory usage: 27.5 KB
```

In [22]:

```
sns.pairplot(df1)
```

Out[22]:

```
<seaborn.axisgrid.PairGrid at 0x165b4552ac0>
```



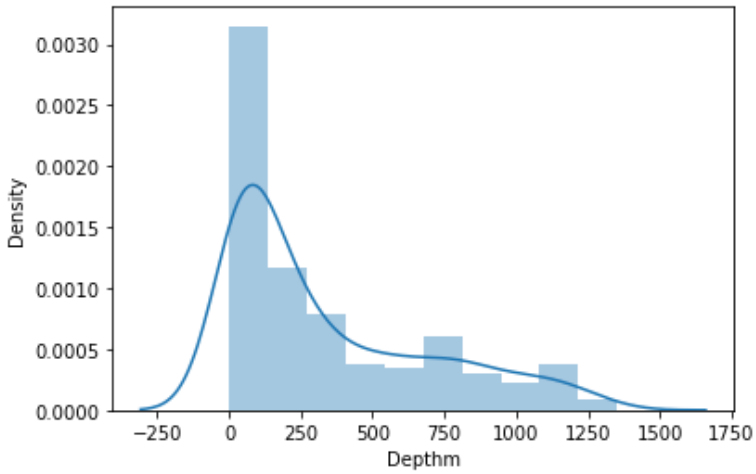
In [24]:

```
sns.distplot(df['Depthm'])
```

```
C:\ProgramData\Anaconda3\lib\site-packages\seaborn\distributions.py:2557: FutureWarn
ing: `distplot` is a deprecated function and will be removed in a future version. Pl
ease adapt your code to use either `displot` (a figure-level function with similar f
lexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```

Out[24]:

```
<AxesSubplot:xlabel='Depthm', ylabel='Density'>
```

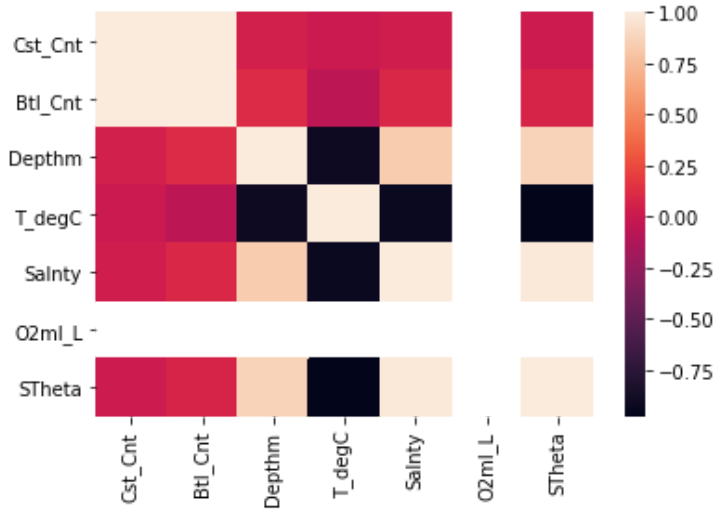


In [38]:

```
data=df1[['Cst_Cnt', 'Btl_Cnt', 'Depthm', 'T_degC','Salnty', 'O2ml_L', 'STheta']]
sns.heatmap(data.corr())
```

Out[38]:

```
<AxesSubplot:>
```



to Train the model-Model buliding

we are going to split our data into two variable where x is a independent and y is dependent on x

In [42]:

```
x=data[['Cst_Cnt', 'Btl_Cnt']]
y=data['Depthm']
```

In [43]:

```
# to split my dataset into test and train data
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test = train_test_split(x,y,test_size=0.3)
```

In [44]:

```
from sklearn.linear_model import LinearRegression

lr=LinearRegression()
lr.fit(x_train,y_train)
```

Out[44]:

```
LinearRegression()
```

In [45]:

```
print(lr.intercept_)
```

```
943.9171319840477
```

In [46]:

```
coeff=pd.DataFrame(lr.coef_,x.columns,columns=['Co-effecient'])
coeff
```

Out[46]:

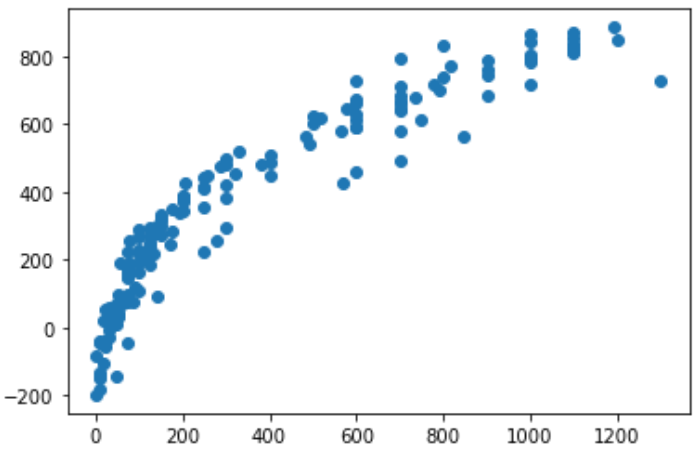
	Co-effecient
Cst_Cnt	-1055.885131
Btl_Cnt	33.632825

In [47]:

```
prediction=lr.predict(x_test)
plt.scatter(y_test,prediction)
```

Out[47]:

```
<matplotlib.collections.PathCollection at 0x165bba47040>
```



In [48]:

```
print(lr.score(x_test,y_test))
```

```
0.8370568055223808
```

In [ ]:

```

```