In [10]:
```
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeRegressor
from sklearn.linear_model import LinearRegression
from sklearn.ensemble import RandomForestRegressor
from sklearn.metrics import mean_absolute_error, r2_score
from scipy.stats import pearsonr
```

In [11]:
```
df = pd.read_csv("C:/Users/91974/Desktop/Yokogawa/Model dataset/training/TRAIN-1(Copy).c
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 900 entries, 0 to 899
Data columns (total 23 columns):
 #   Column                  Non-Null Count  Dtype  
---  ------                  --------------  -----  
 0   Date                    900 non-null    object 
 1   Time                    900 non-null    object 
 2   Date & Time             900 non-null    object 
 3   -45 MINS PAST           900 non-null    object 
 4   Grade                   900 non-null    object 
 5   Section                 900 non-null    object 
 6   MFI gm/10 min           900 non-null    float64
 7   PL25_HDMFI_XI1400A      900 non-null    float64
 8   PL25_HDMFI_XI1401A      900 non-null    float64
 9   PL25_HDMFI_XI1403A      900 non-null    float64
 10  PL25_HDMFI_XI1430       900 non-null    float64
 11  PL25_HDMFI_TIC1090A     900 non-null    float64
 12  PL25_HDMFI_PI1111A      900 non-null    float64
 13  PL25_HDMFI_KPI_DP_ADS   900 non-null    float64
 14  PL25_HDMFI_TI1112       900 non-null    float64
 15  PL25_HDMFI_XI1440B      900 non-null    float64
 16  PL25_HDMFI_XI1440F      900 non-null    float64
 17  PL25_HDMFI_TDI1129      900 non-null    float64
 18  PL25_HDMFI_TDI1108C     900 non-null    float64
 19  PL25_HDMFI_XI1428       900 non-null    float64
 20  PL25_HDMFI_XI1405A      900 non-null    float64
 21  PL25_HDMFI_XI1406A      900 non-null    float64
 22  PL25_HDMFI_KPI_FB1_FLW  900 non-null    float64
dtypes: float64(17), object(6)
memory usage: 161.8+ KB
```

In [12]:
```
print(df.columns)
```

```
Index(['Date', 'Time ', 'Date & Time', '-45 MINS PAST', 'Grade', 'Section ',
       'MFI gm/10 min', 'PL25_HDMFI_XI1400A', 'PL25_HDMFI_XI1401A',
       'PL25_HDMFI_XI1403A', 'PL25_HDMFI_XI1430', 'PL25_HDMFI_TIC1090A',
       'PL25_HDMFI_PI1111A', 'PL25_HDMFI_KPI_DP_ADS', 'PL25_HDMFI_TI1112',
       'PL25_HDMFI_XI1440B', 'PL25_HDMFI_XI1440F', 'PL25_HDMFI_TDI1129',
       'PL25_HDMFI_TDI1108C', 'PL25_HDMFI_XI1428', 'PL25_HDMFI_XI1405A',
       'PL25_HDMFI_XI1406A', 'PL25_HDMFI_KPI_FB1_FLW'],
      dtype='object')
```

In [13]:
```
columns_to_drop = ['Date','Time ','Date & Time','-45 MINS PAST','Section ','Grade','MFI
X = df.drop(columns_to_drop, axis=1)  # Features
y = df['MFI gm/10 min']  # Target variable
```

In [14]:
```
#X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=4
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=60
```

In [15]:
```
# Define models
models = [
```

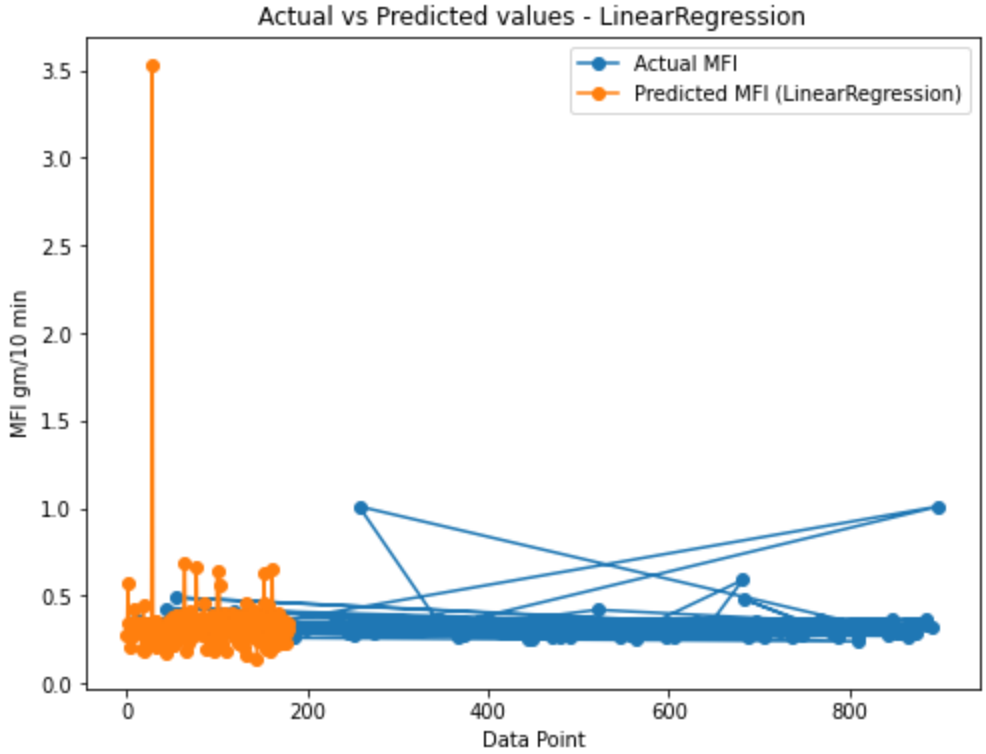
```
    LinearRegression(),
    DecisionTreeRegressor(),
    RandomForestRegressor(n_estimators=200)
]
```

In [16]:
```
# Dataframe to store actual and predicted values
comparison_df = pd.DataFrame()
```

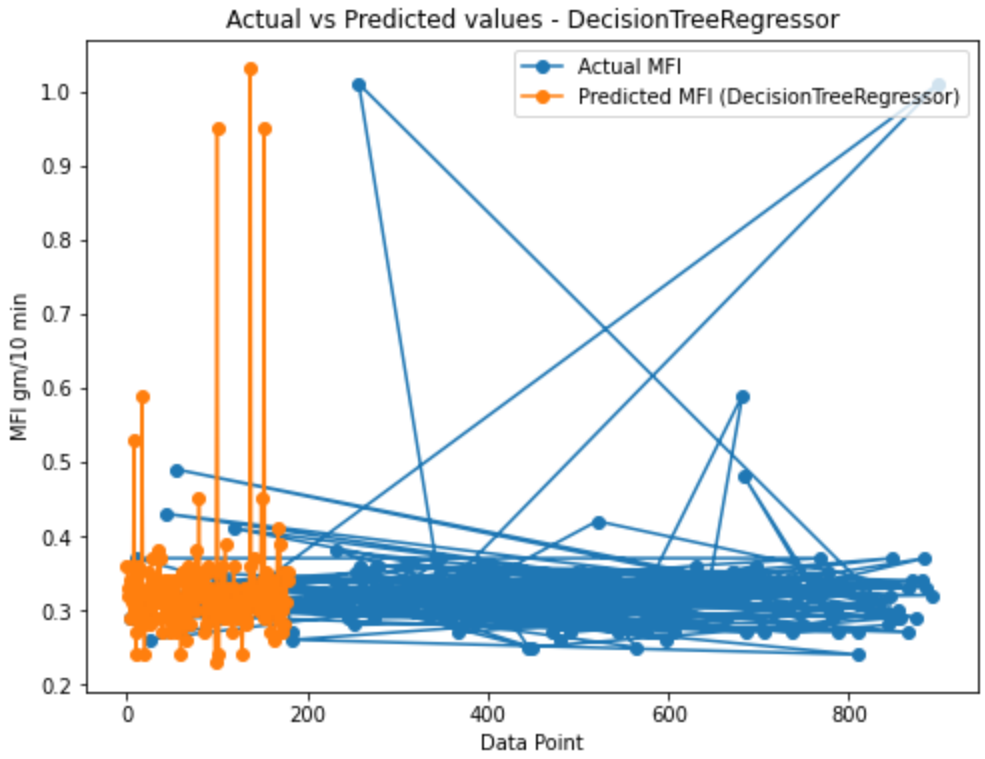
In [18]:
```
for model in models:
    # Train the model
    model.fit(X_train, y_train)

    # Make predictions for training set
    y_train_pred = model.predict(X_train)

    # Make predictions for testing set
    y_test_pred = model.predict(X_test)

    # Evaluate the model on training set
    mae_train = mean_absolute_error(y_train, y_train_pred)
    r2_train = r2_score(y_train, y_train_pred)

    # Evaluate the model on testing set
    mae_test = mean_absolute_error(y_test, y_test_pred)
    r2_test = r2_score(y_test, y_test_pred)

    # Print model performance
    print(f"\nModel: {type(model).__name__}")
    print(f"MAE (Training): {mae_train}")
    print(f"R-squared (Training): {r2_train}")
    print(f"MAE (Testing): {mae_test}")
    print(f"R-squared (Testing): {r2_test}")

    # Add actual and predicted values to the comparison dataframe
    comparison_df[f'Actual {type(model).__name__}'] = y_test
    comparison_df[f'Predicted {type(model).__name__}'] = y_test_pred

    # Displaying the DataFrame
    print(comparison_df.head())

    # Plotting the comparison graph as a line plot
    plt.figure(figsize=(8, 6))
    plt.plot(y_test, label='Actual MFI', marker='o')
    plt.plot(y_test_pred, label=f'Predicted MFI ({type(model).__name__})', marker='o')
    plt.title(f"Actual vs Predicted values - {type(model).__name__}")
    plt.xlabel("Data Point")
    plt.ylabel("MFI gm/10 min")
    plt.legend()
    plt.show()
```

```
Model: LinearRegression
MAE (Training): 0.10640435214207102
R-squared (Training): 0.1929968952758485
MAE (Testing): 0.0919684932703897
R-squared (Testing): -9.432860656928094
     Actual LinearRegression  Predicted LinearRegression  \
258                     0.36                    0.273161
557                     0.28                    0.573779
651                     0.33                    0.341453
241                     0.32                    0.340759
87                      0.33                    0.210829

     Actual DecisionTreeRegressor  Predicted DecisionTreeRegressor  \
258                          0.36                             0.36
557                          0.28                             0.32
```

```
651                          0.33                                0.33
241                          0.32                                0.34
87                           0.33                                0.28

     Actual RandomForestRegressor  Predicted RandomForestRegressor
258                          0.36                          0.35220
557                          0.28                          0.41315
651                          0.33                          0.33410
241                          0.32                          0.31215
87                           0.33                          0.31560
```




```
Model: DecisionTreeRegressor
MAE (Training): 9.251858538542971e-19
R-squared (Training): 1.0
MAE (Testing): 0.04311111111111111
R-squared (Testing): -0.4980975008485322
     Actual LinearRegression  Predicted LinearRegression  \
258                      0.36                    0.273161
557                      0.28                    0.573779
651                      0.33                    0.341453
241                      0.32                    0.340759
87                       0.33                    0.210829

     Actual DecisionTreeRegressor  Predicted DecisionTreeRegressor  \
258                          0.36                             0.36
557                          0.28                             0.32
651                          0.33                             0.33
241                          0.32                             0.34
87                           0.33                             0.29

     Actual RandomForestRegressor  Predicted RandomForestRegressor
258                          0.36                          0.35220
557                          0.28                          0.41315
651                          0.33                          0.33410
241                          0.32                          0.31215
87                           0.33                          0.31560
```

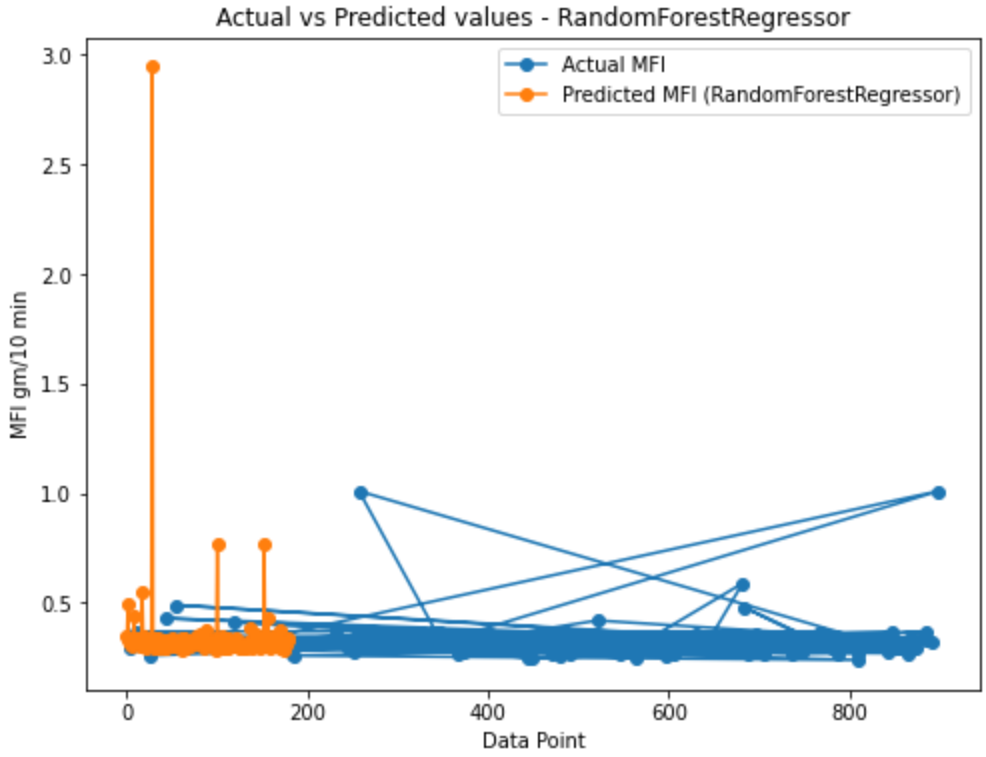


Model: RandomForestRegressor
MAE (Training): 0.031843125
R-squared (Training): 0.7703049013040588
MAE (Testing): 0.046941111111111086
R-squared (Testing): -5.533526281730639

	Actual LinearRegression	Predicted LinearRegression
258	0.36	0.273161
557	0.28	0.573779
651	0.33	0.341453
241	0.32	0.340759
87	0.33	0.210829

	Actual DecisionTreeRegressor	Predicted DecisionTreeRegressor
258	0.36	0.36
557	0.28	0.32
651	0.33	0.33
241	0.32	0.34
87	0.33	0.29

	Actual RandomForestRegressor	Predicted RandomForestRegressor
258	0.36	0.34770
557	0.28	0.49810
651	0.33	0.33395
241	0.32	0.31755
87	0.33	0.31490



In [9]:
```
# Save the comparison dataframe to an Excel sheet
comparison_df.to_excel("C:/Users/91974/Desktop/Yokogawa/Model dataset/comparison_train1.
```

In [73]:
```
#comparison_df = pd.DataFrame({'Actual MFI': y_test, 'Predicted MFI': y_test_pred})
#print("\nActual vs Predicted MFI for Testing Set:")
#print(comparison_df.head())
```

In [ ]:
```

```