

```

print (' - Val MSE : ', round(mse, 2), ' || Val RMSE : ', round(np.sqrt(mse), 2))
plt.title('Prediction - Validation - Col:' + col + ' (RMSE:' + str(round(np.sqrt(mse), 2)) + ')')
plt.show()

det_anom_lit = model_val.resid[model_val.resid > threshold]
ind = []
TP = 0
FP = 0
for index, a in det_anom_lit.items():
    ind.append(index)
    if df_val['ATT_FLAG'][index] == 1 : TP += 1
    else : FP += 1

print (' -- TP : ', TP, ' || FP : ', FP)

return model_train_best, model_val

except:
    pass

if __name__ == "__main__":
    for i,col in enumerate(df_train.columns):
        if i >= 11:
            doARIMA(df_train, df_val, col)

"""
- plot the ATT_FLAG=1 on the residual errors
- Add all values to a dataframe and print towards the end
"""

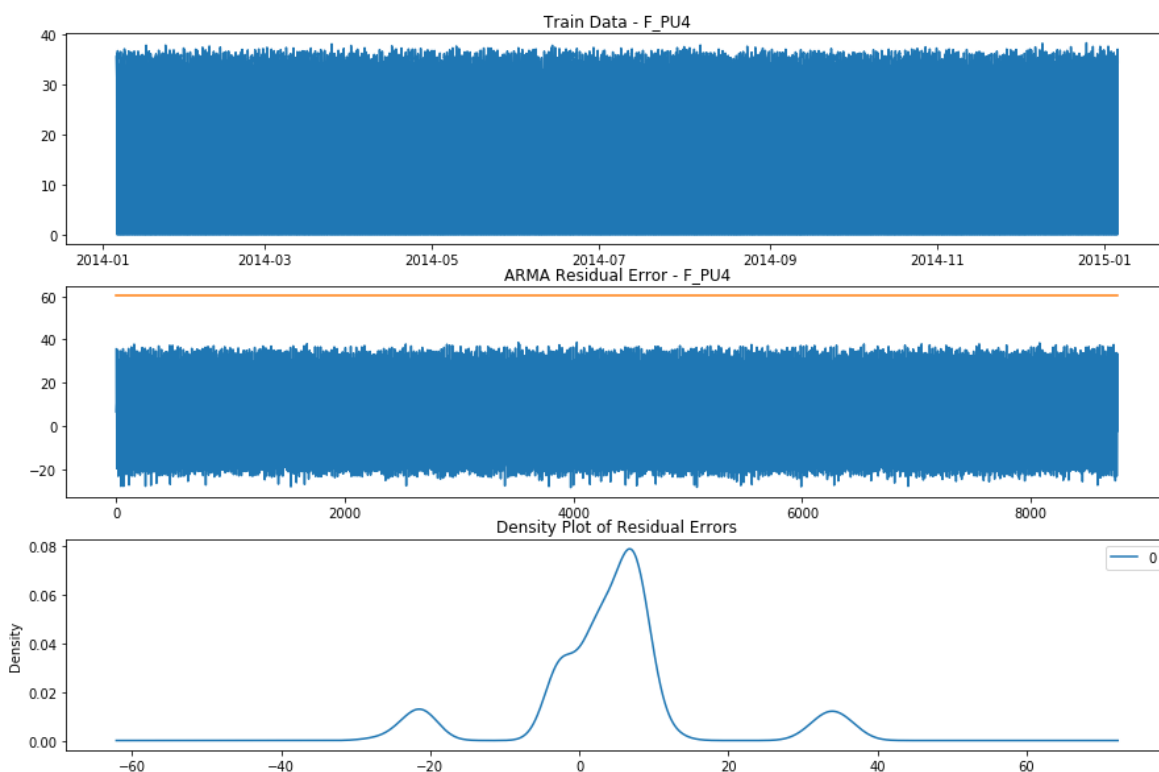
```

executed in 11m 54s, finished 00:38:54 2019-05-24

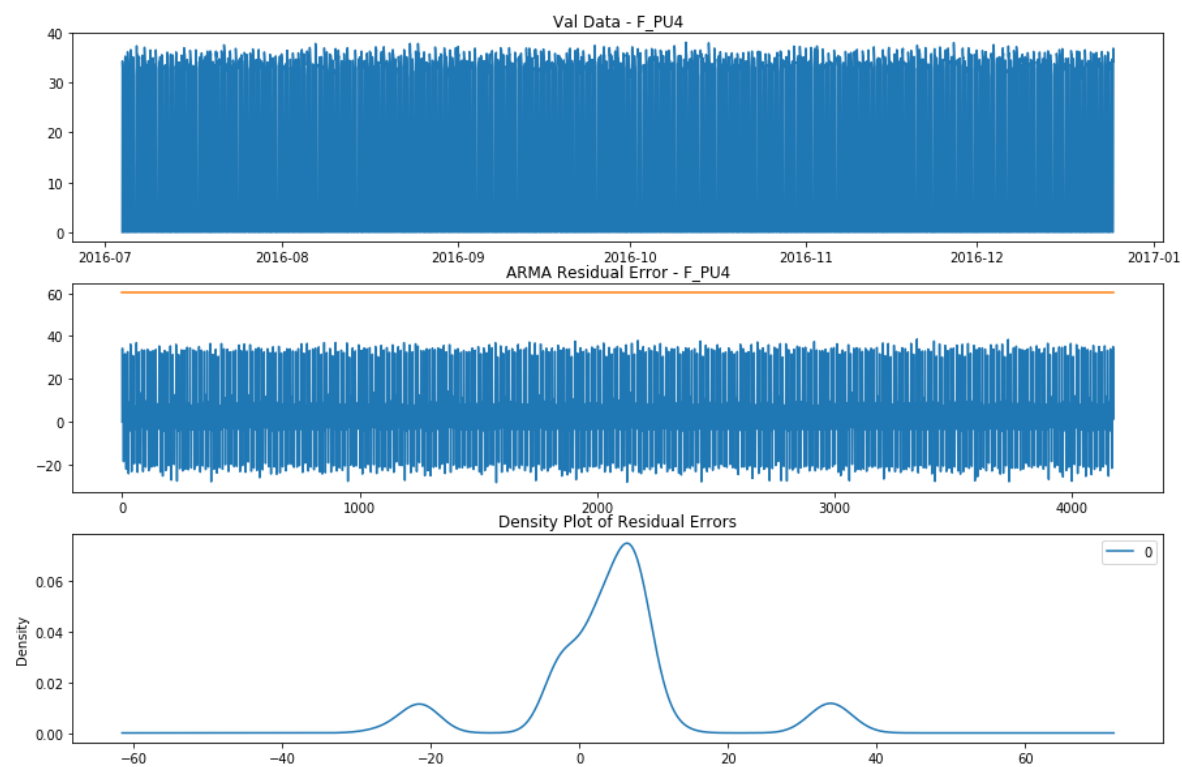
```

----- col : F_PU4 -----
- ARIMA Results : 2 3 || AIC : 69539.78979120243 (Time : 20.25
s)
-- Threshold Train : 60.107

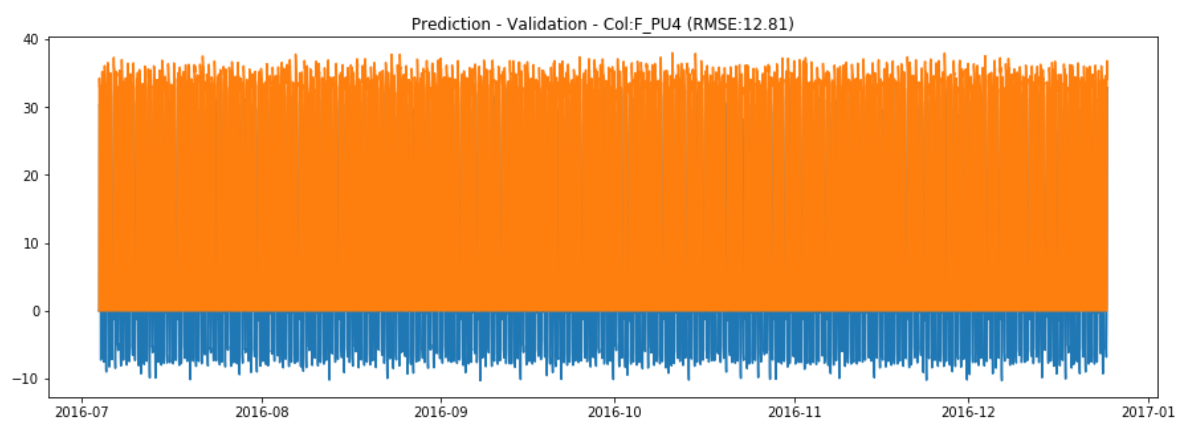
```



```
-- Threshold Val: 60.112
```

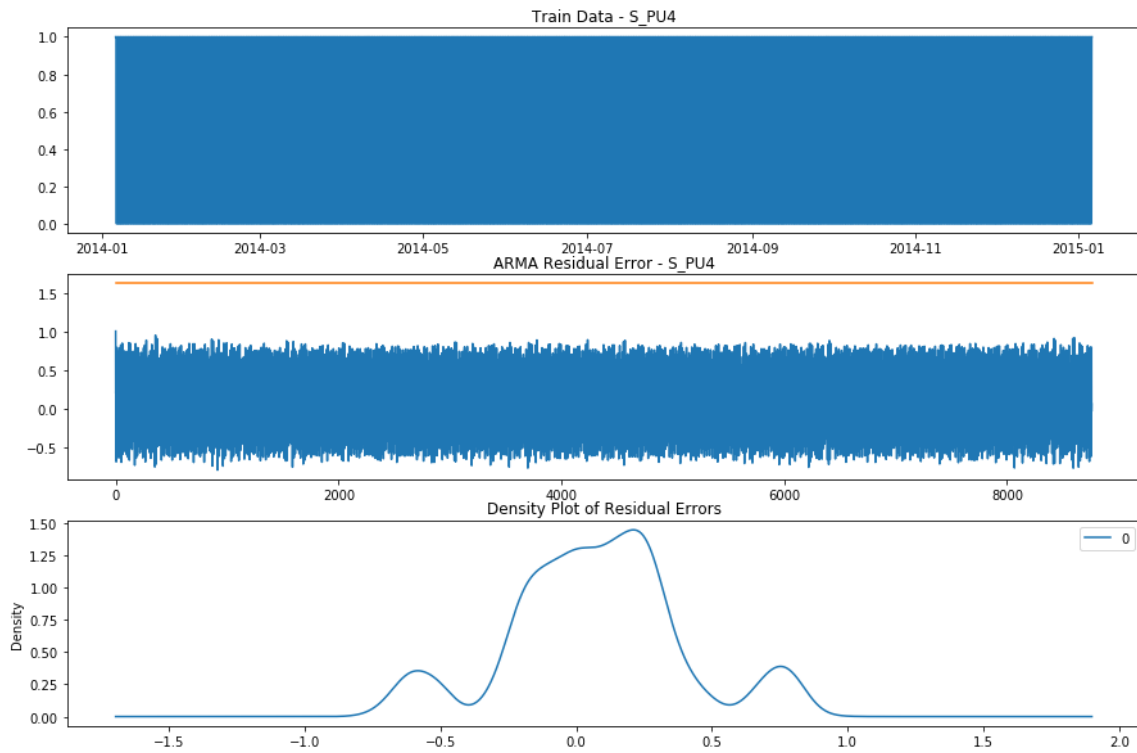


- Val MSE : 164.11 || Val RMSE : 12.81



-- TP : 17 || FP : 332

----- col : S\_PU4 -----  
- ARIMA Results : 3 2 || AIC : 5564.043785740148 (Time : 20.16 s)  
-- Threshold Train : 1.619



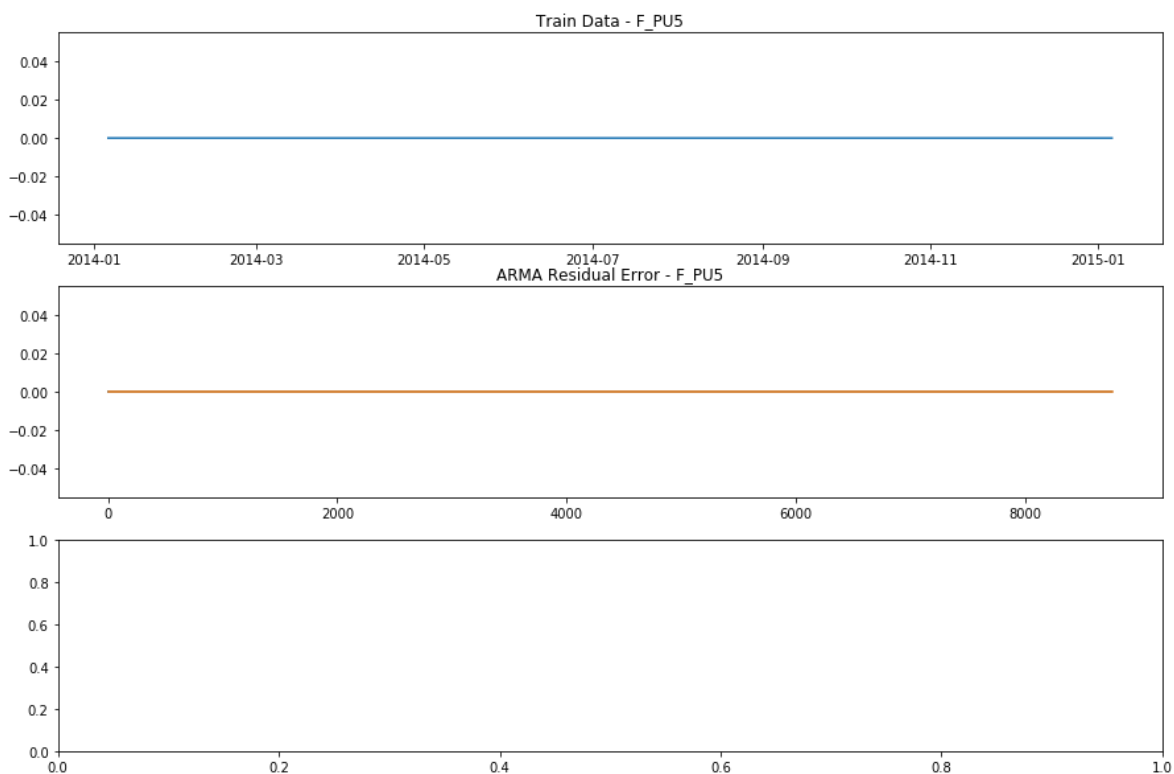
```

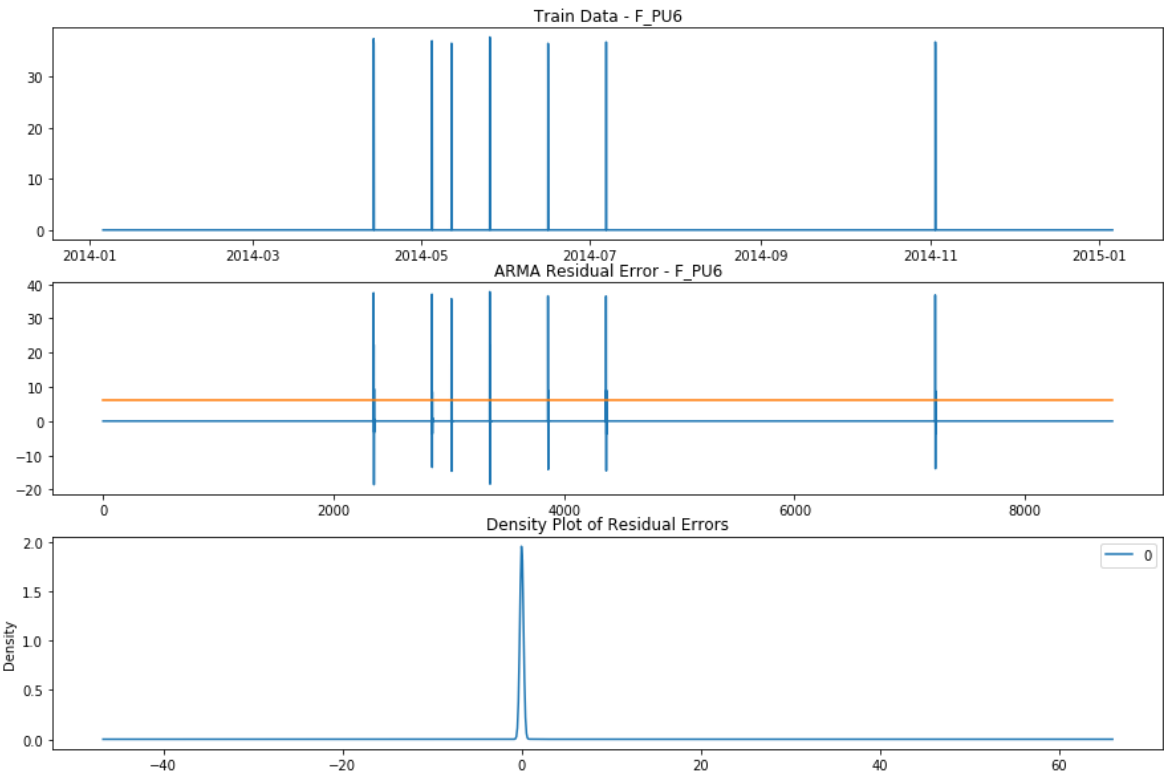
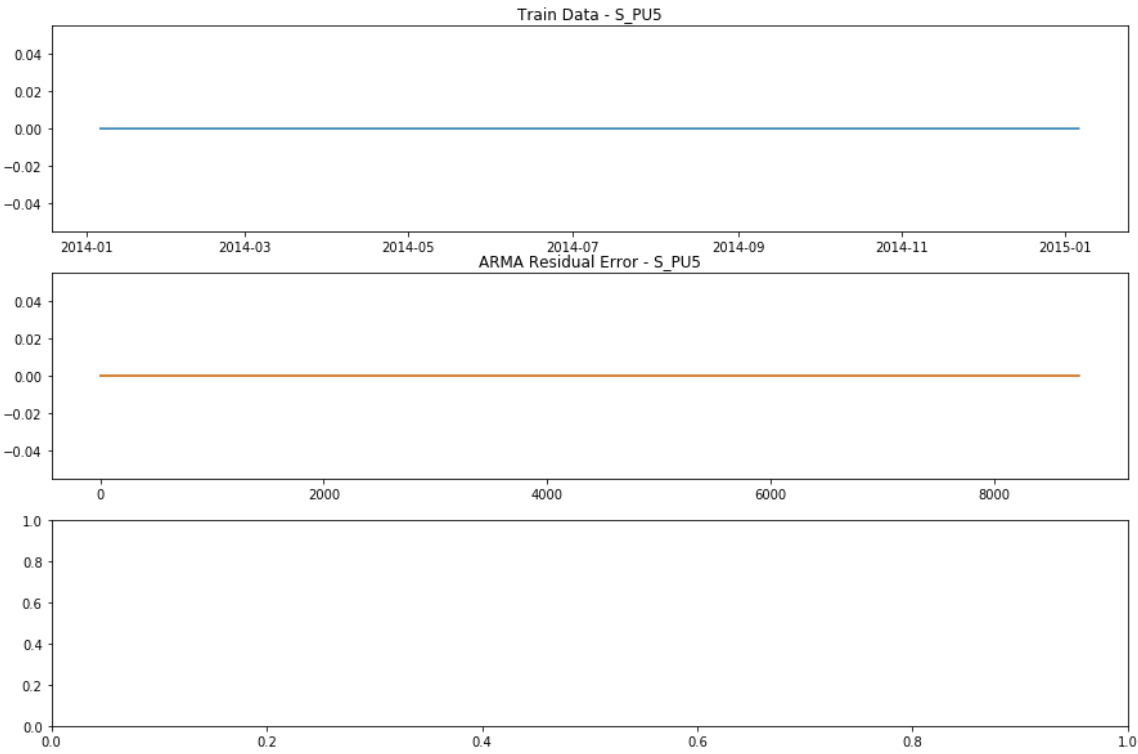
----- col : F_PU5 -----
- ARIMA Results : 1 1 || AIC : -inf (Time : 9.32 s)
-- Threshold Train : 0.0

----- col : S_PU5 -----
- ARIMA Results : 1 1 || AIC : -inf (Time : 10.14 s)
-- Threshold Train : 0.0

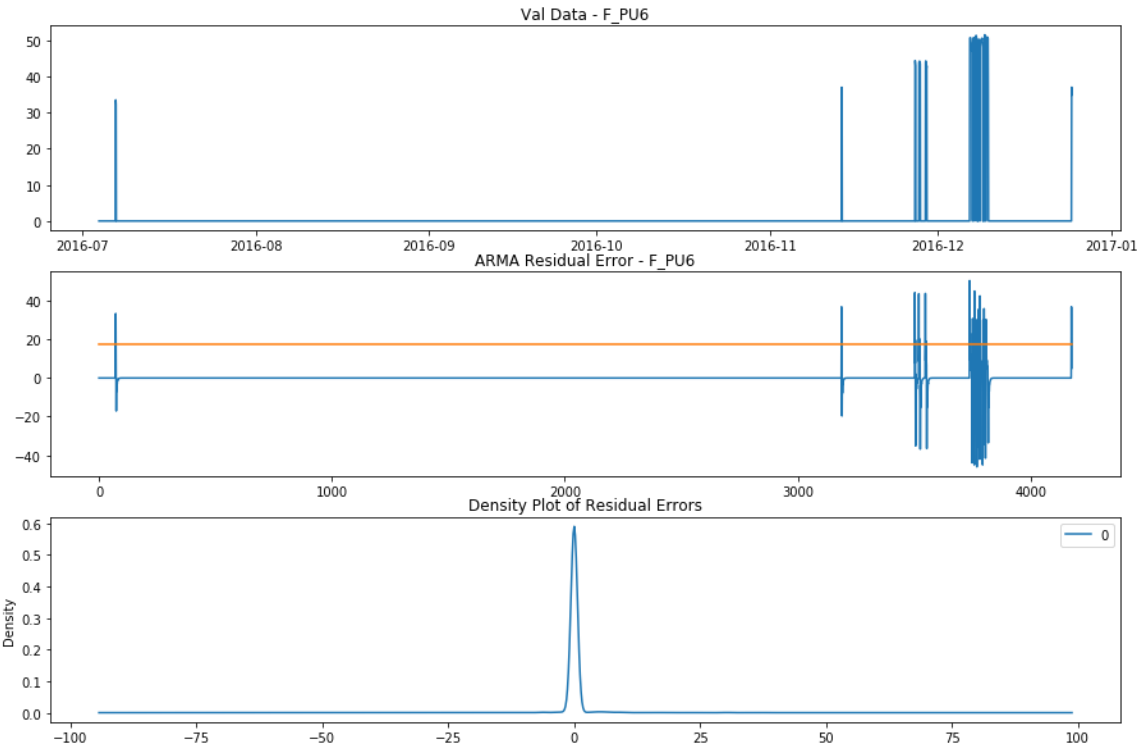
----- col : F_PU6 -----
- ARIMA Results : 1 2 || AIC : 28590.579698764253 (Time : 16.45
s)
-- Threshold Train : 6.18

```

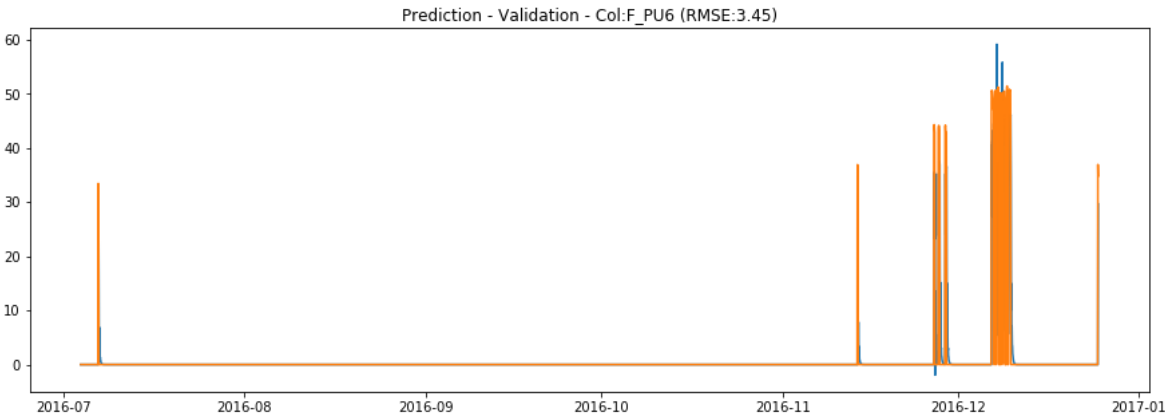




-- Threshold Val: 17.259

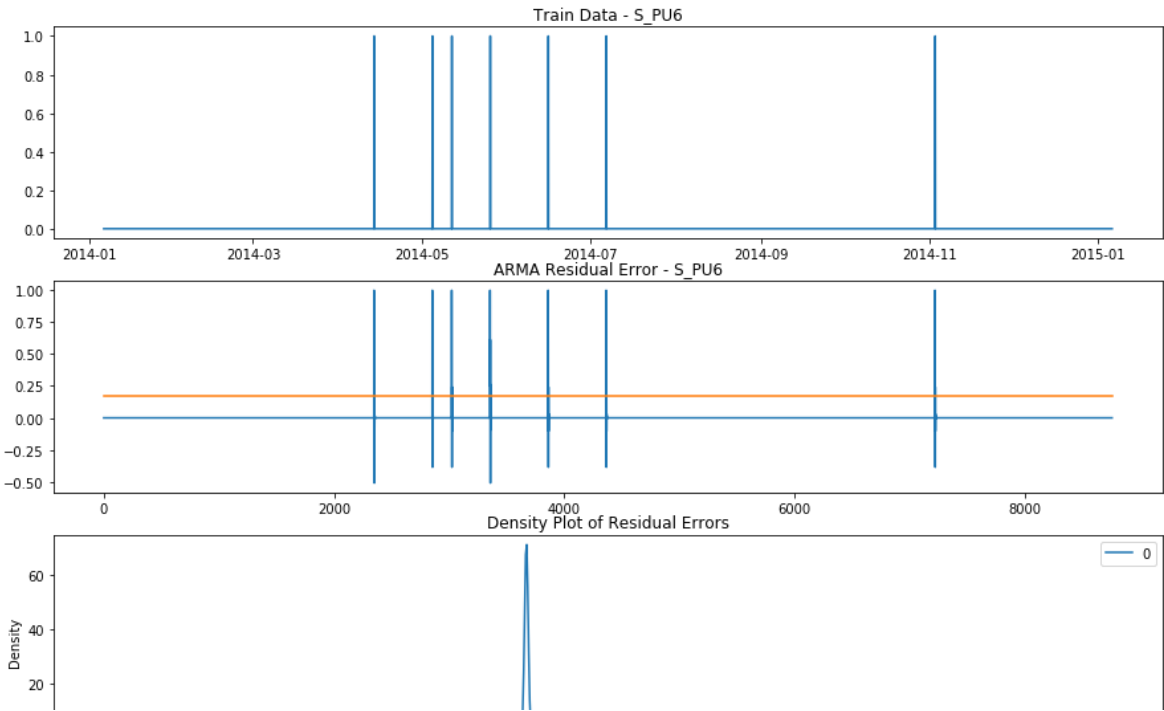


- Val MSE : 11.92 || Val RMSE : 3.45

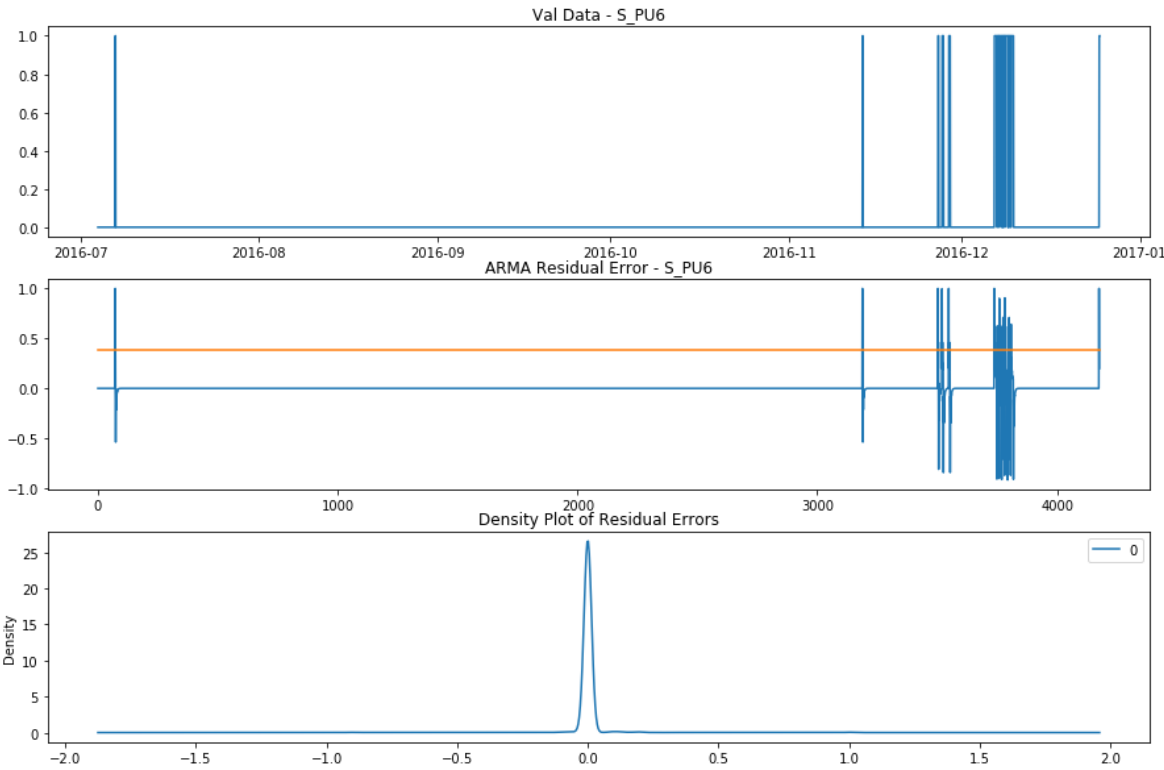


-- TP : 8 || FP : 7

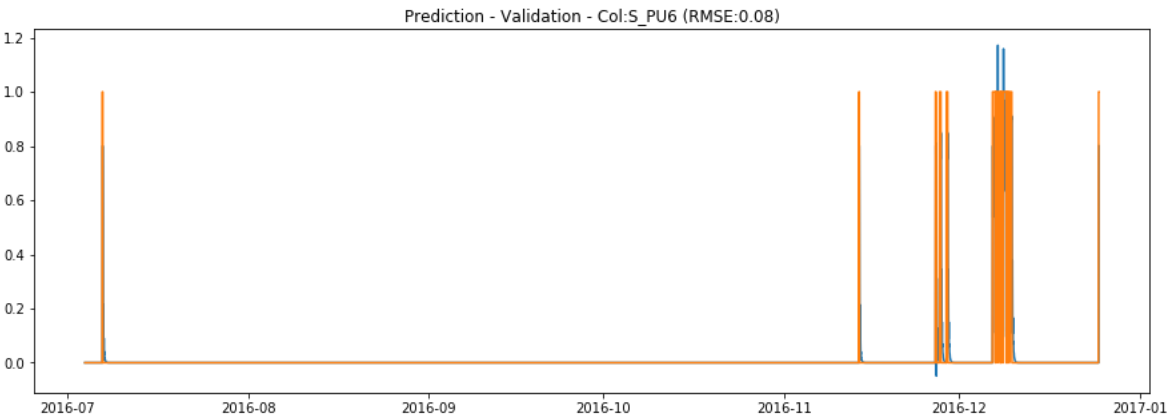
----- col : S\_PU6 -----  
- ARIMA Results : 1 2 || AIC : -34526.35637504015 (Time : 17.79 s)  
-- Threshold Train : 0.168



-- Threshold Val: 0.38

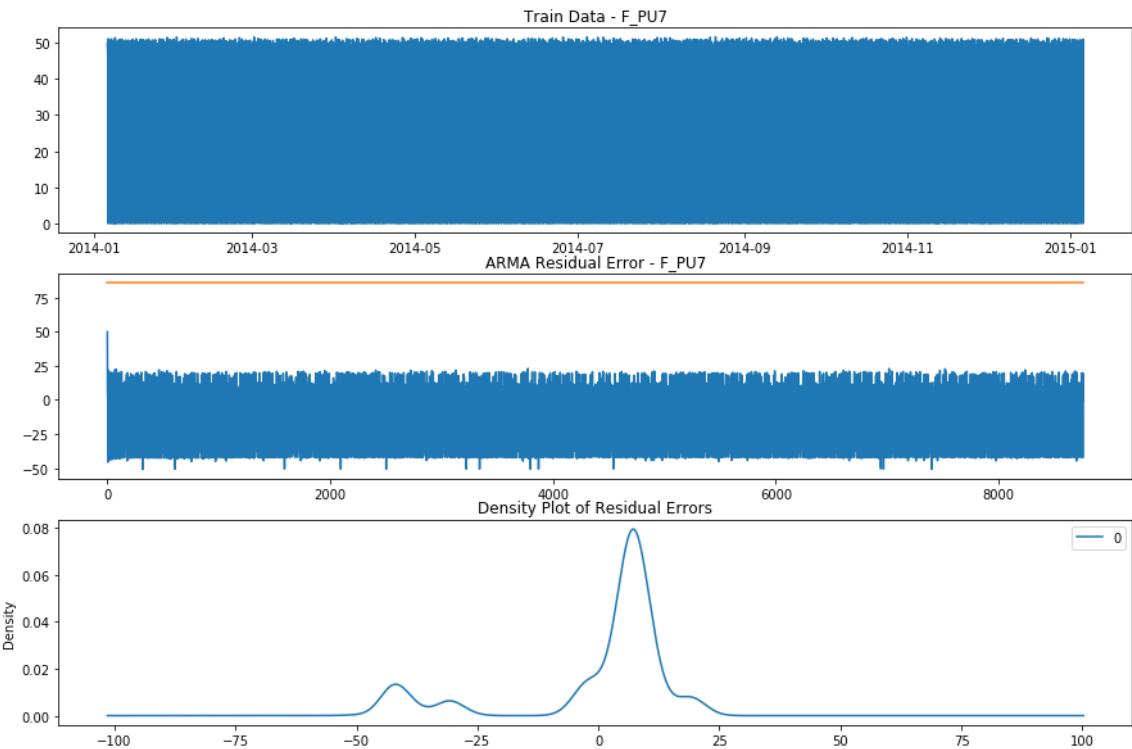


- Val MSE : 0.01 || Val RMSE : 0.08

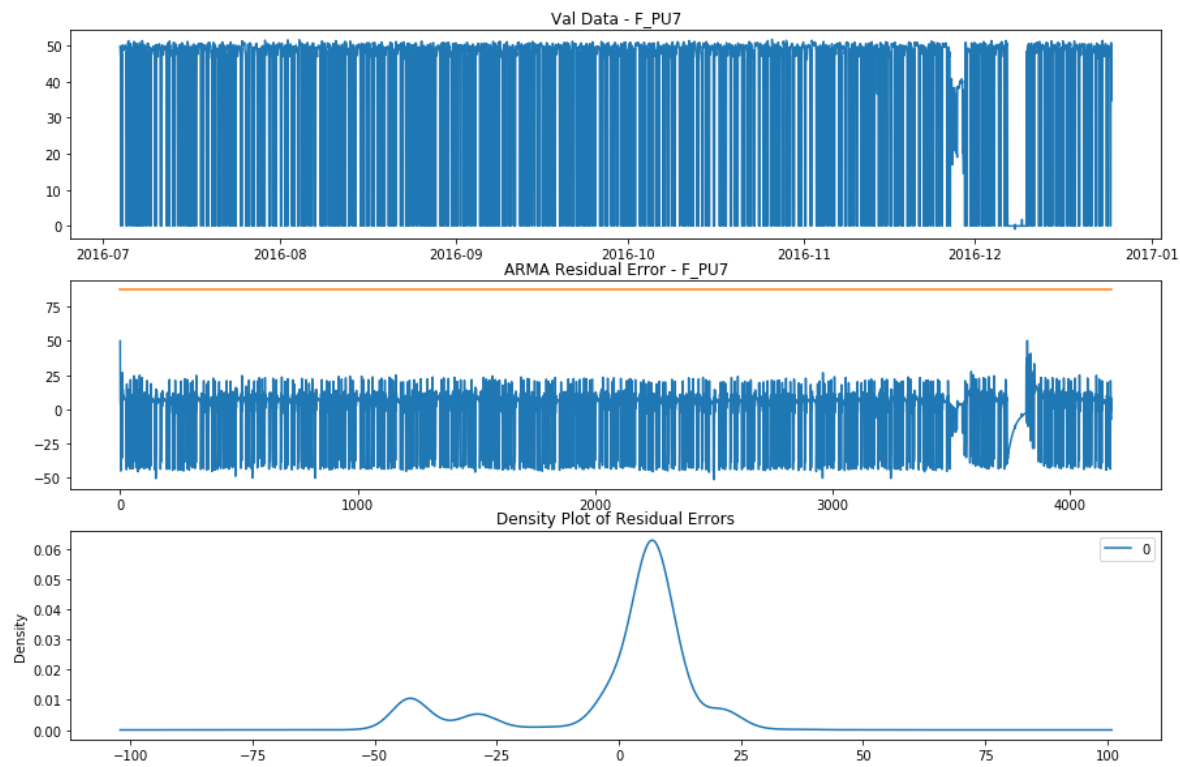


-- TP : 0 || FP : 0

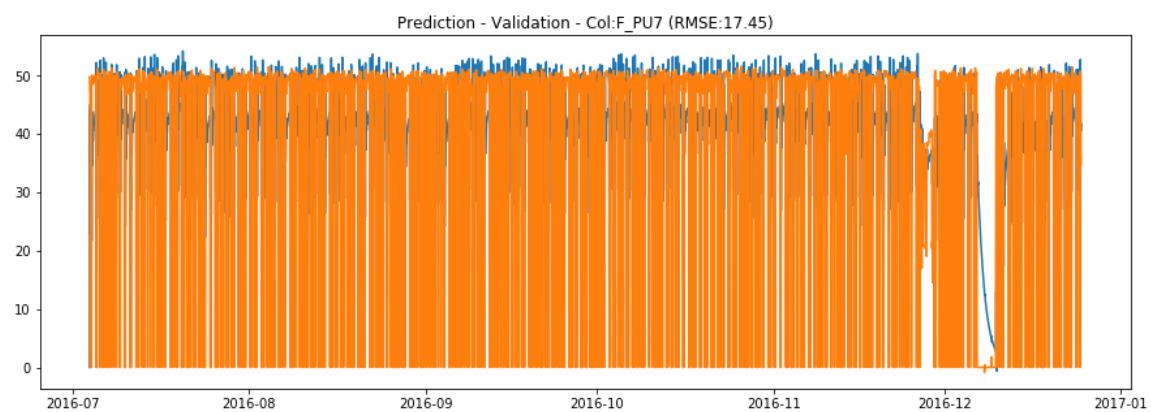
----- col : F\_PU7 -----  
- ARIMA Results : 3 3 || AIC : 74626.17124679718 (Time : 27.27 s)  
-- Threshold Train : 85.541



-- Threshold Val: 87.247



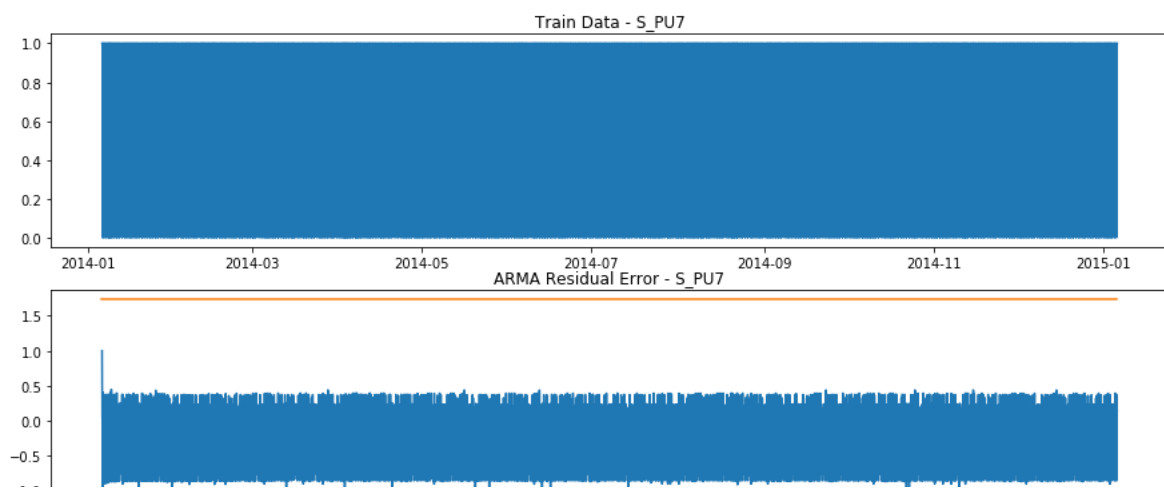
- Val MSE : 304.51 || Val RMSE : 17.45



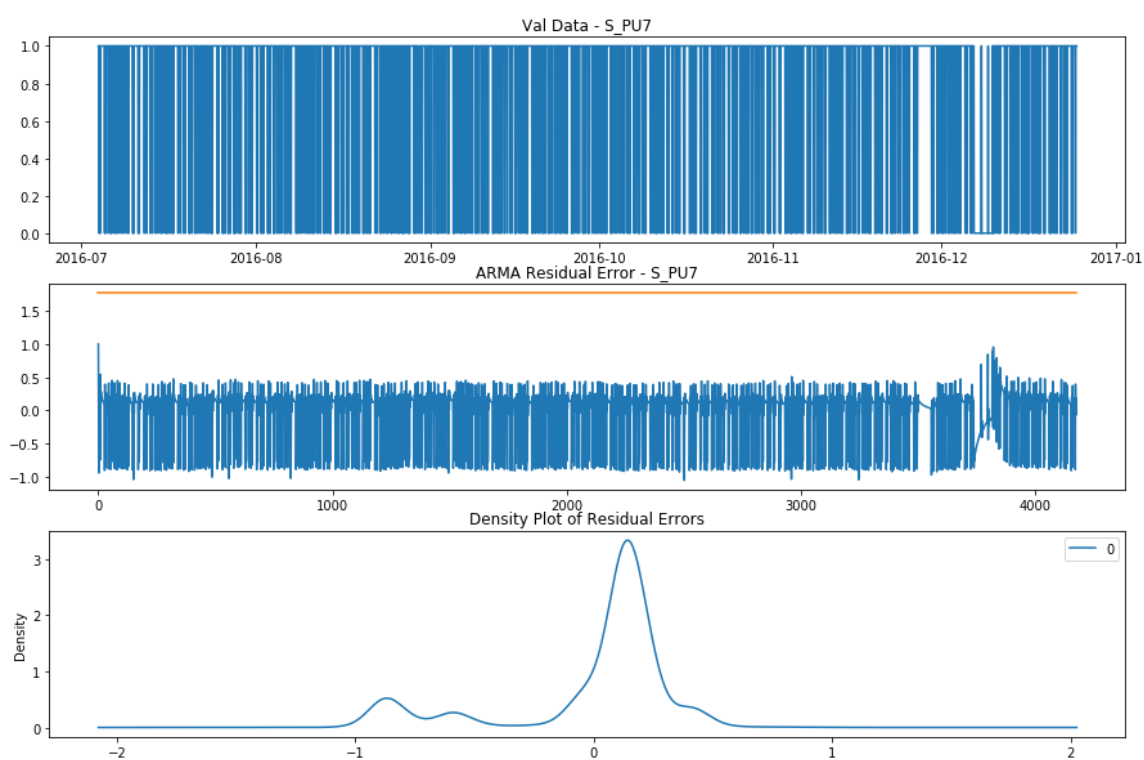
-- TP : 0 || FP : 31

----- col : S\_PU7 -----  
 - ARIMA Results : 3 3 || AIC : 6289.992701872678 (Time : 28.62 s)  
 -- Threshold Train : 1.731

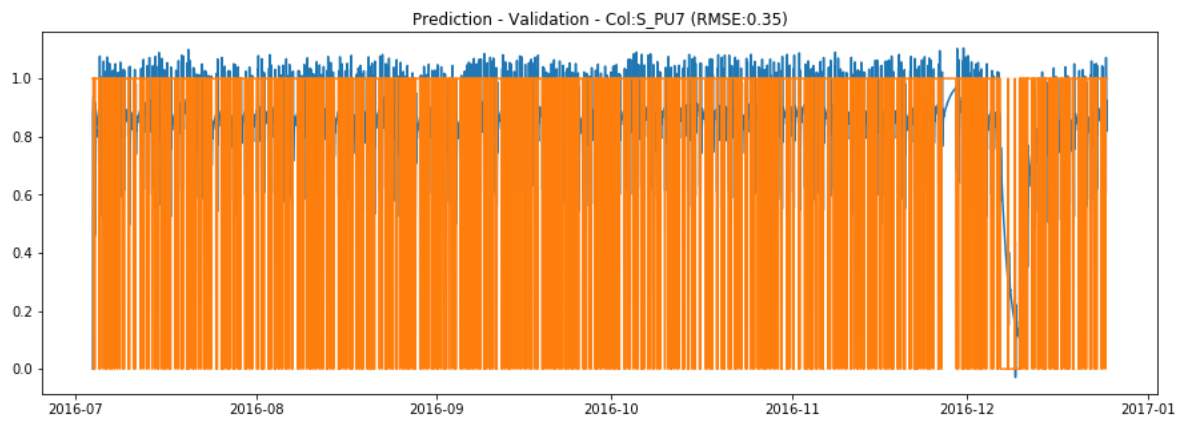




-- Threshold Val: 1.767

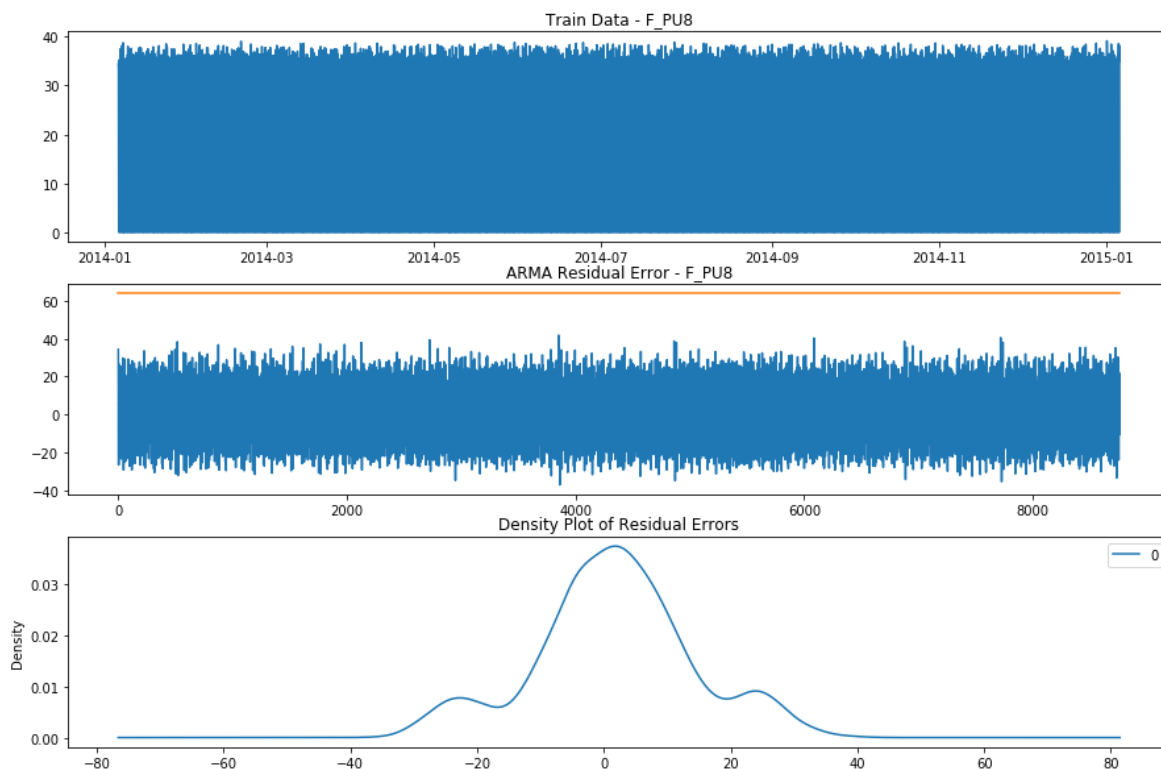


- Val MSE : 0.12 || Val RMSE : 0.35

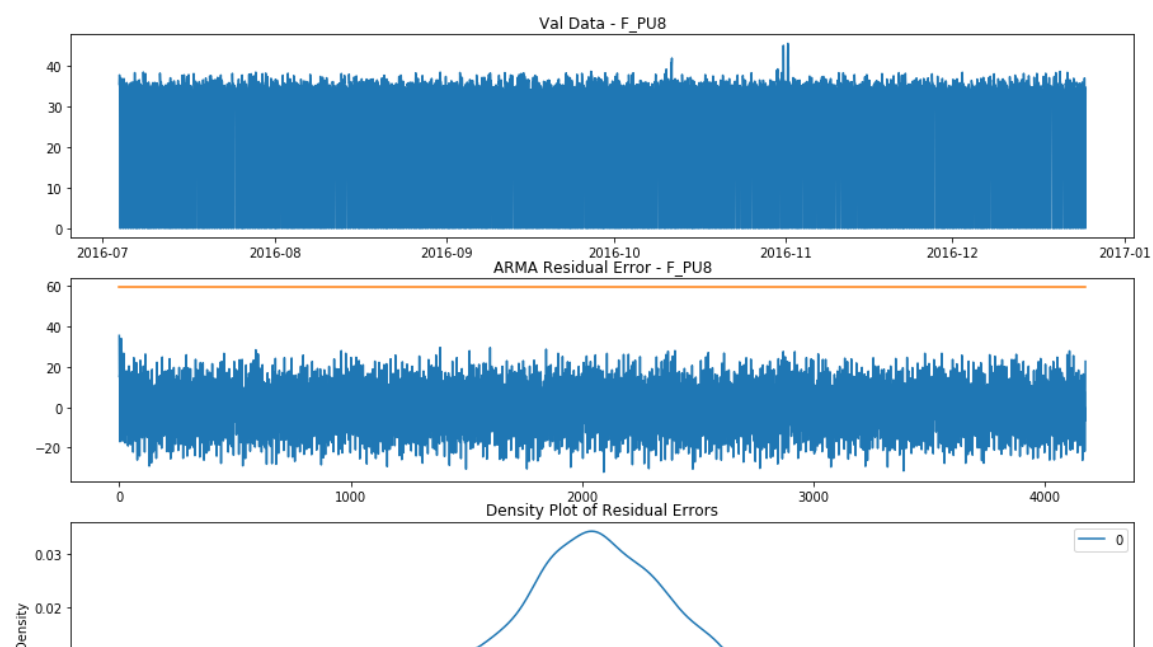


```
-- TP : 0 || FP : 0
```

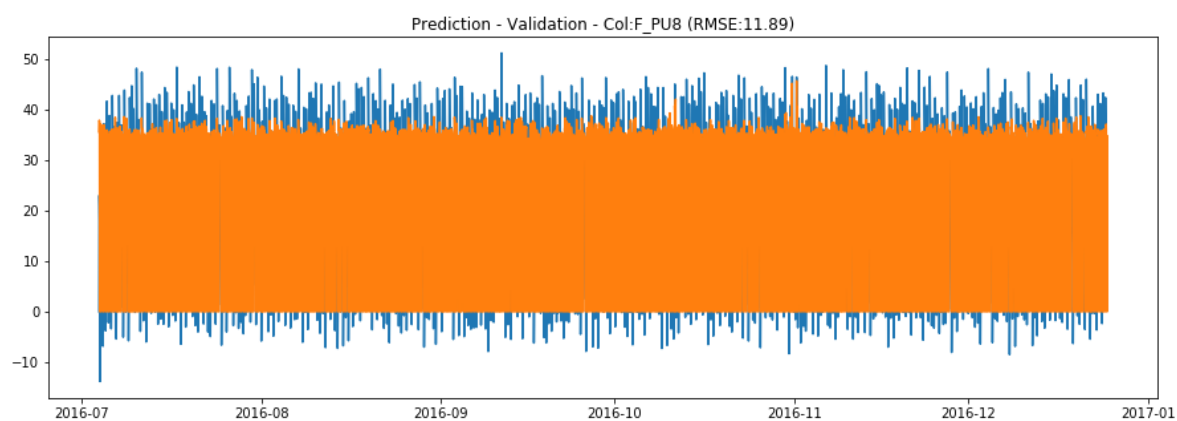
```
----- col : F_PU8 -----
- ARIMA Results : 3 2 || AIC : 69651.72404123224 (Time : 15.9 s)
-- Threshold Train : 63.903
```



```
-- Threshold Val: 59.463
```

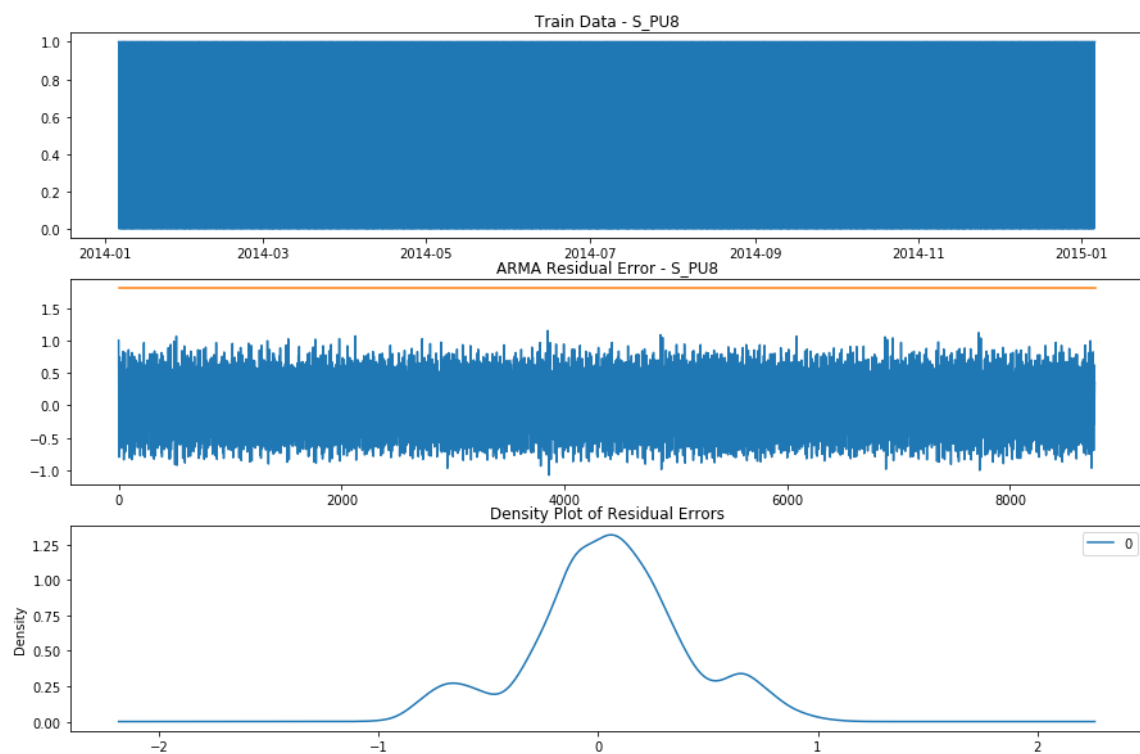


- Val MSE : 141.48 || Val RMSE : 11.89

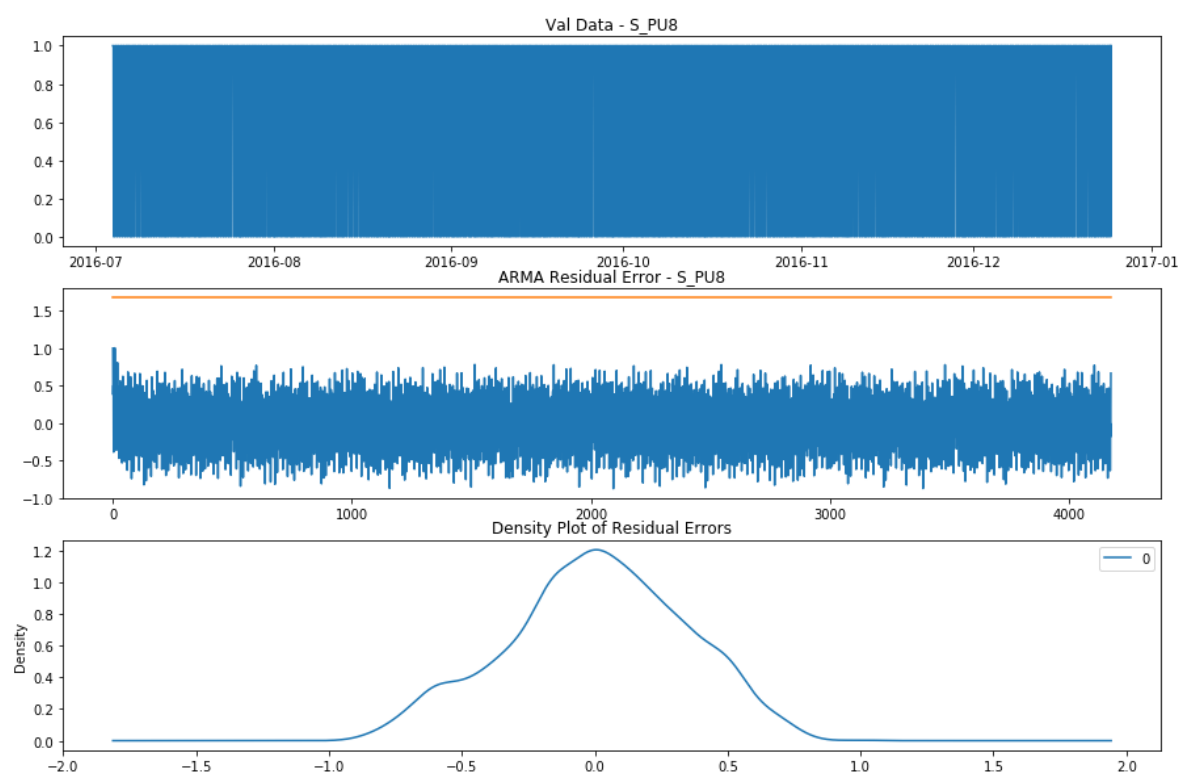


-- TP : 7 || FP : 44

----- col : S\_PU8 -----  
- ARIMA Results : 3 2 || AIC : 7115.172418845417 (Time : 16.4 s)  
-- Threshold Train : 1.801



-- Threshold Val: 1.674



- Val MSE : 0.11 || Val RMSE : 0.33

Prediction - Validation - Col:S\_PU8 (RMSE:0.33)

```
-- TP : 0 || FP : 0
```

```
----- col : F_PU9 -----
```

```
- ARIMA Results : 1 1 || AIC : -inf (Time : 9.65 s)
```

```
-- Threshold Train : 0.0
```

```
----- col : S_PU9 -----
```

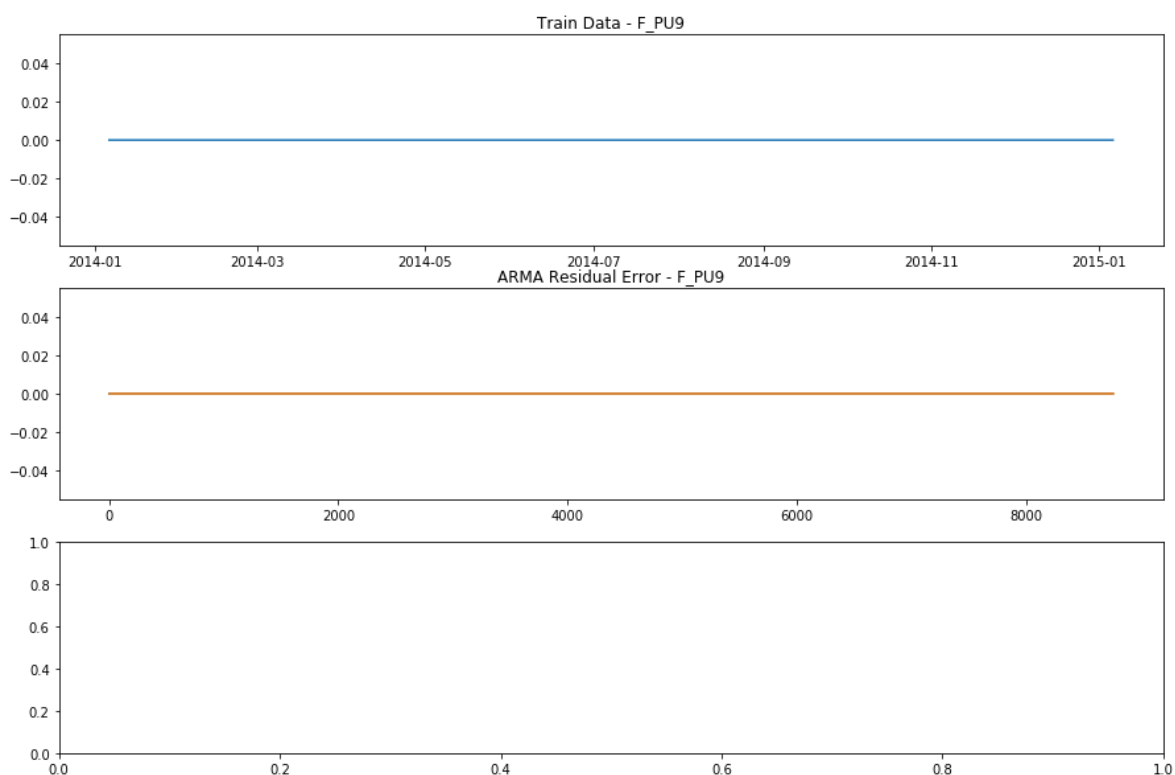
```
- ARIMA Results : 1 1 || AIC : -inf (Time : 8.77 s)
```

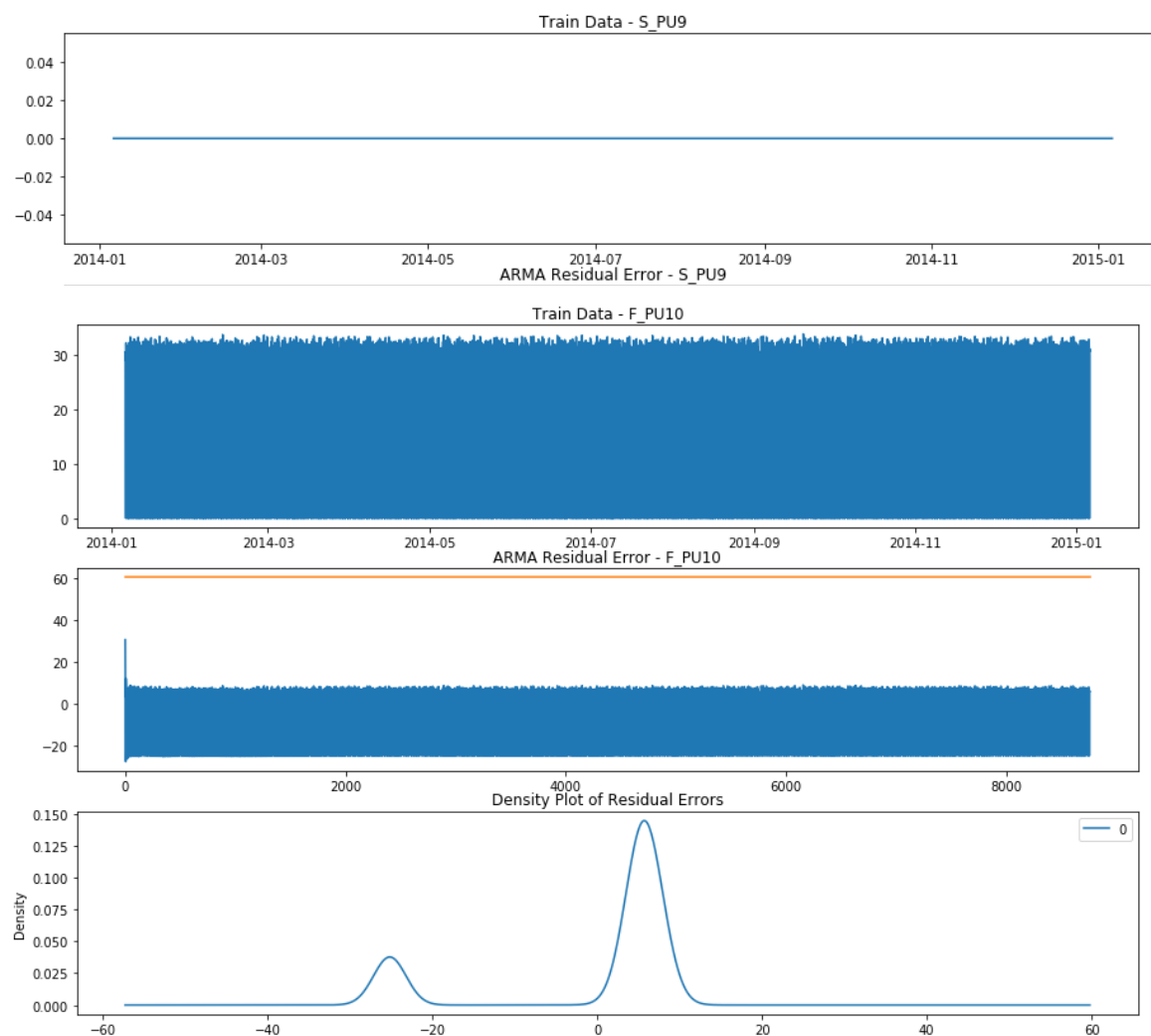
```
-- Threshold Train : 0.0
```

```
----- col : F_PU10 -----
```

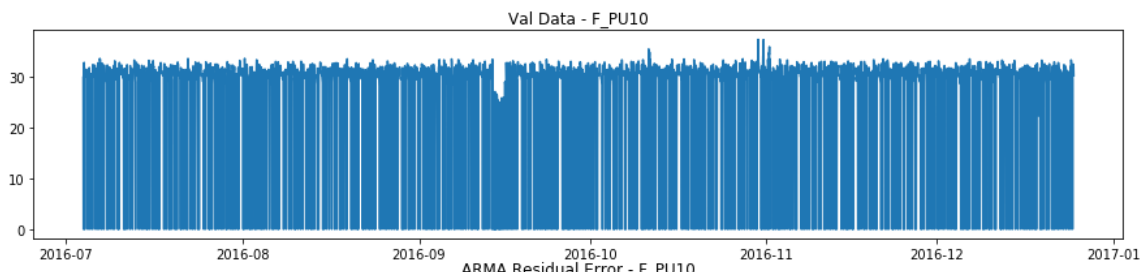
```
- ARIMA Results : 1 1 || AIC : 68538.46947413725 (Time : 13.46 s)
```

```
-- Threshold Train : 60.454
```

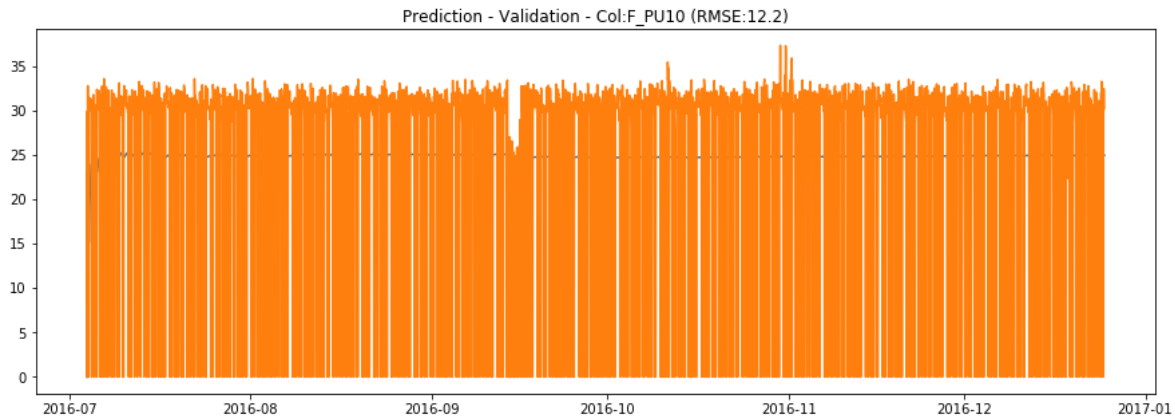




-- Threshold Val: 60.992



- Val MSE : 148.81 || Val RMSE : 12.2

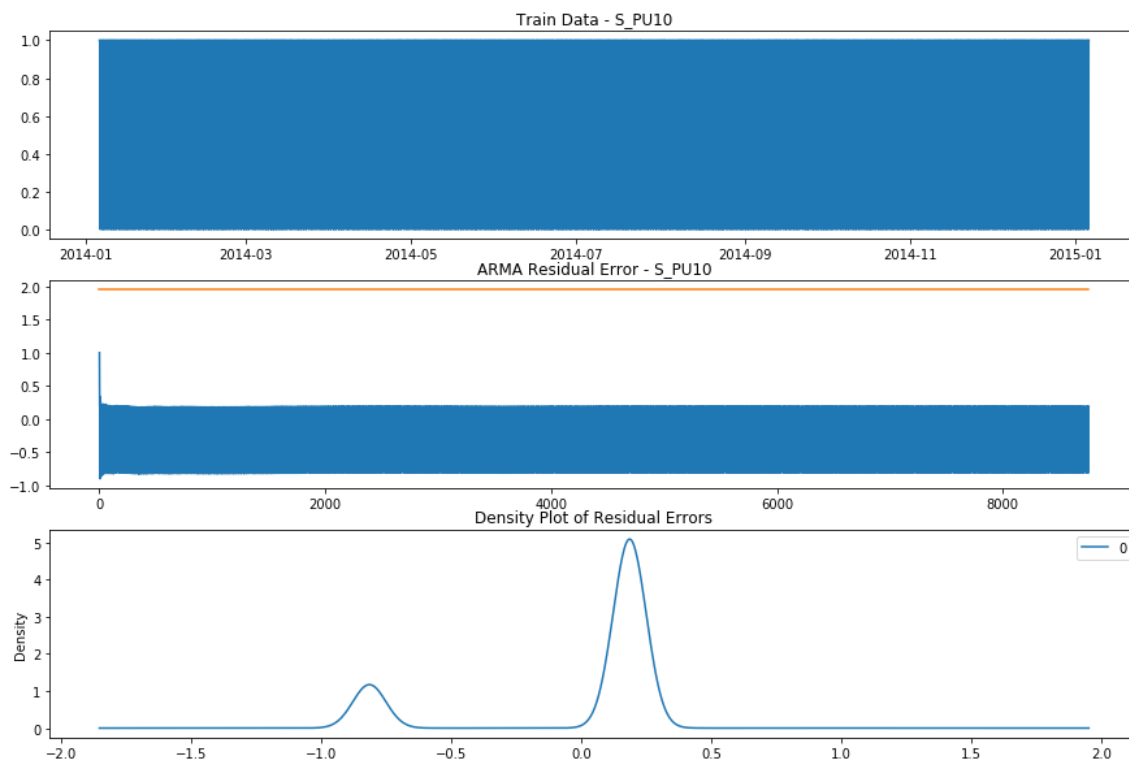


-- TP : 0 || FP : 1

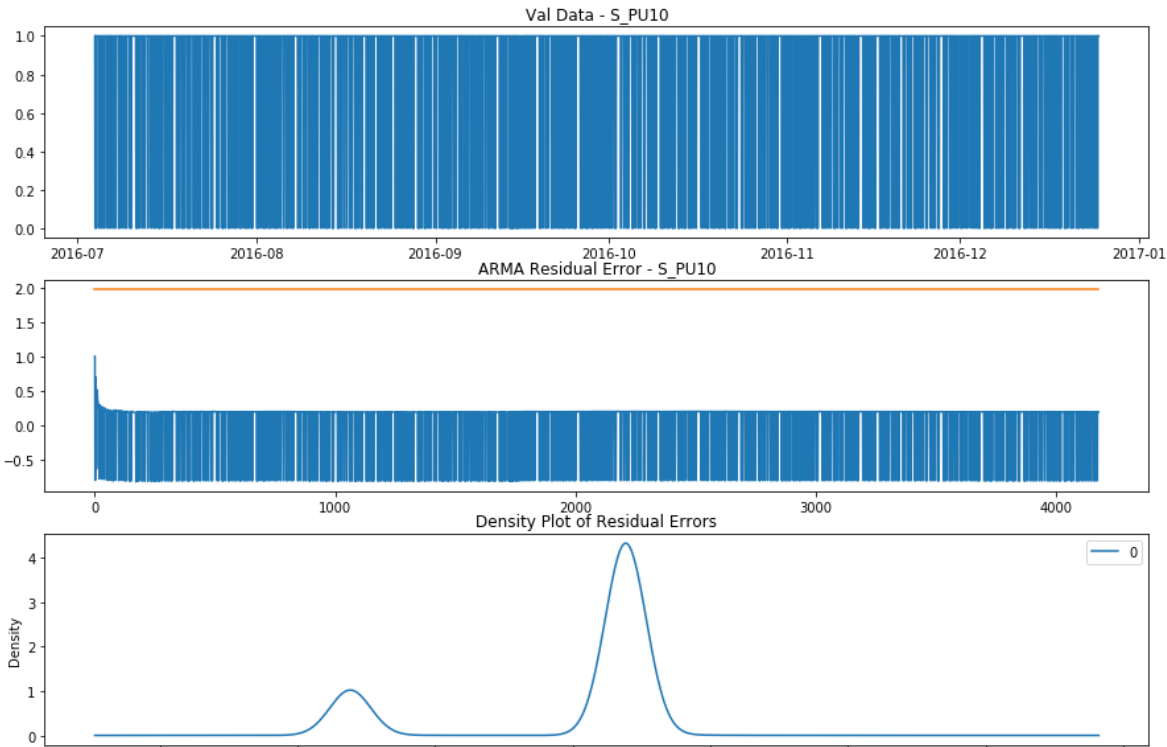
----- col : S\_PU10 -----

- ARIMA Results : 1 1 || AIC : 8376.83049898913 (Time : 14.62 s)

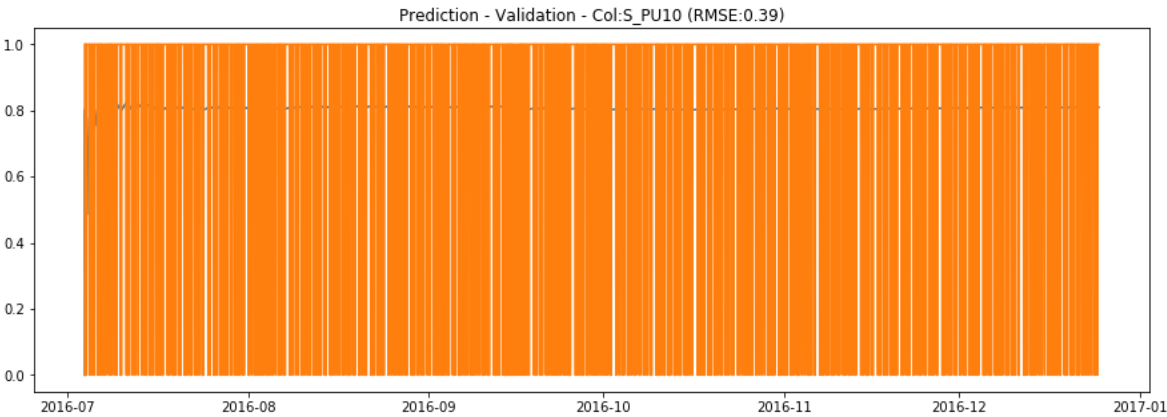
-- Threshold Train : 1.951



-- Threshold Val: 1.969



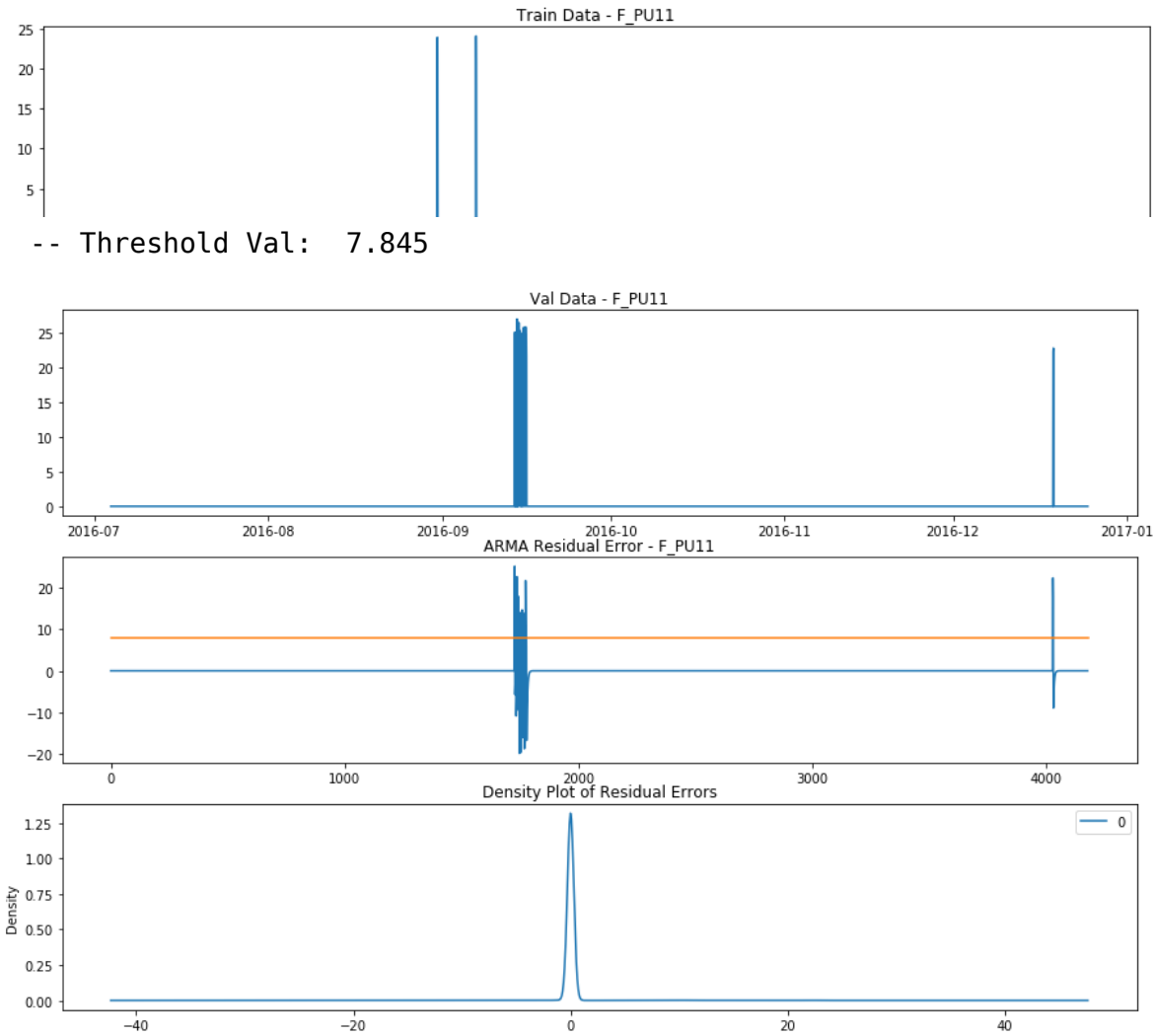
- Val MSE : 0.16 || Val RMSE : 0.39



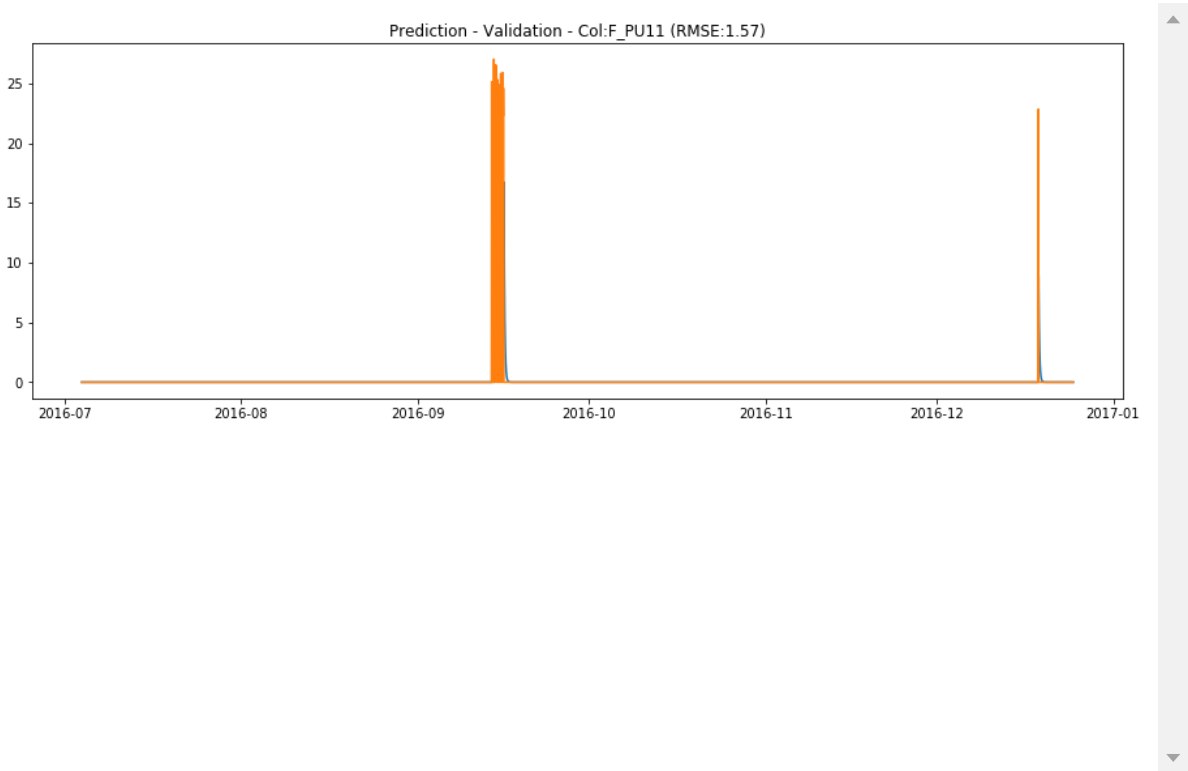
-- TP : 0 || FP : 0

----- col : F\_PU11 -----  
- ARIMA Results : 1 1 || AIC : 7081.514647902466 (Time : 20.35 s)  
-- Threshold Train : 1.811





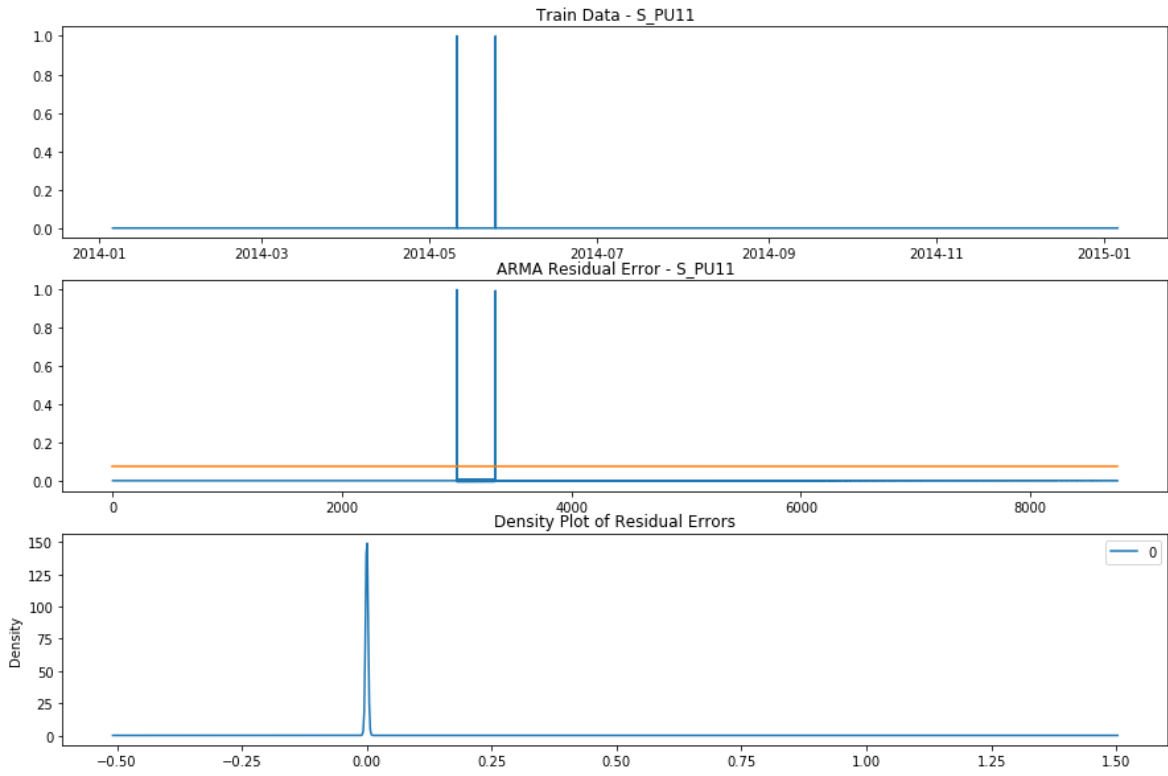
- Val MSE : 2.46 || Val RMSE : 1.57



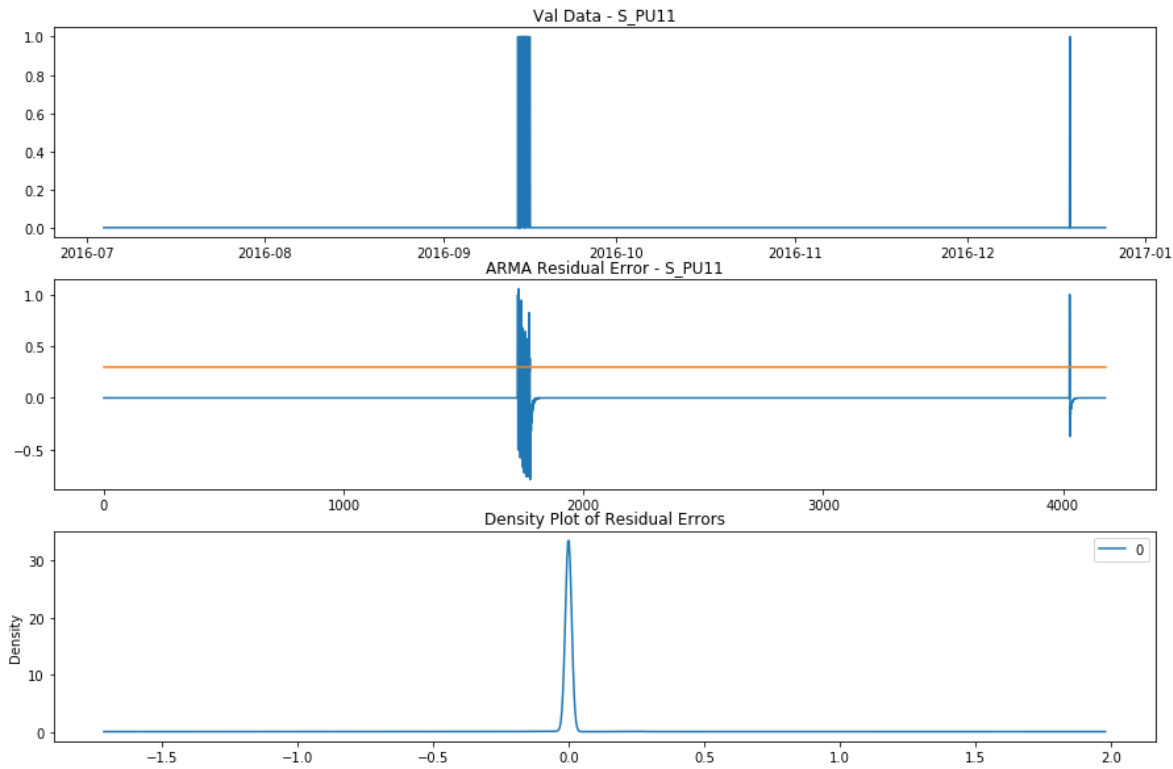
-- TP : 0 || FP : 1

----- col : S\_PU11 -----  
- ARIMA Results : 2 3 || AIC : -48600.18591531503 (Time : 38.05

s)

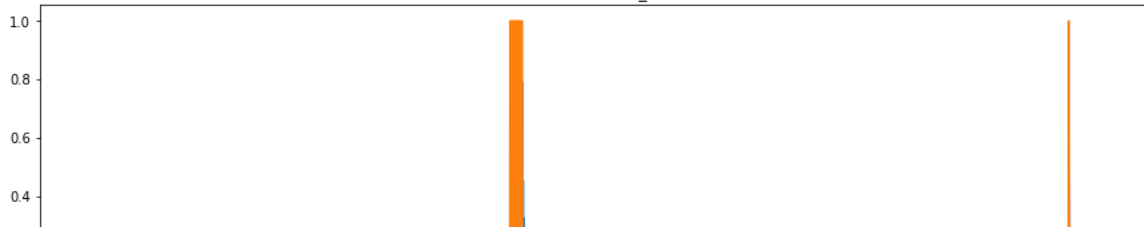


-- Threshold Val: 0.305



- Val MSE : 0.0 || Val RMSE : 0.06

Prediction - Validation - Col:S\_PU11 (RMSE:0.06)



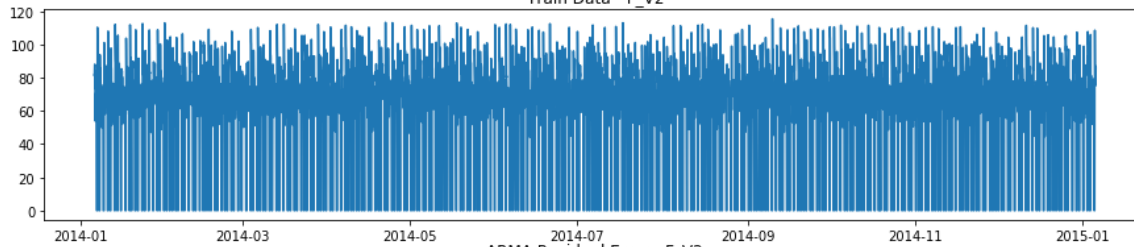
-- TP : 0 || FP : 0

----- col : F\_V2 -----

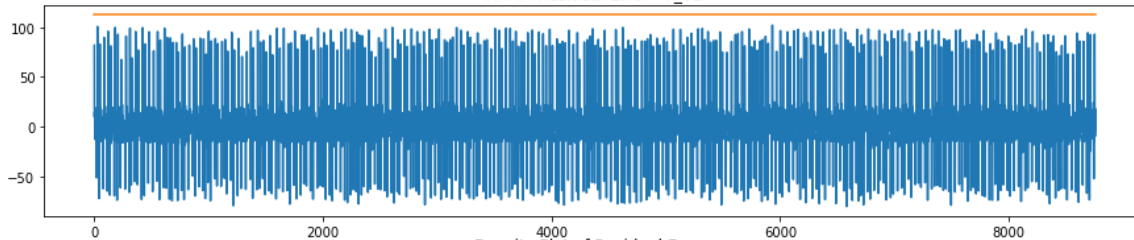
- ARIMA Results : 2 3 || AIC : 79363.64230803952 (Time : 22.46 s)

-- Threshold Train : 112.129

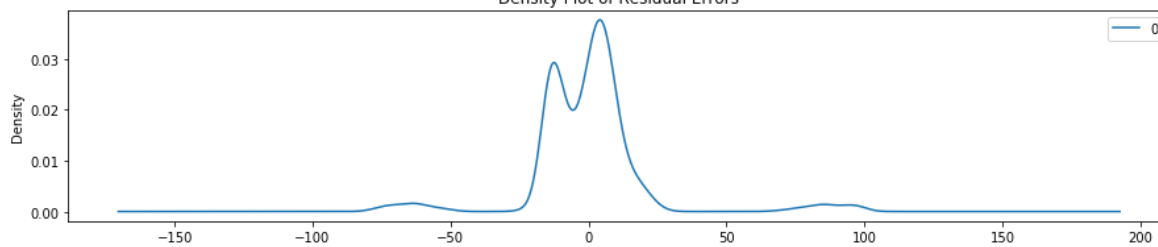
Train Data - F\_V2



ARMA Residual Error - F\_V2



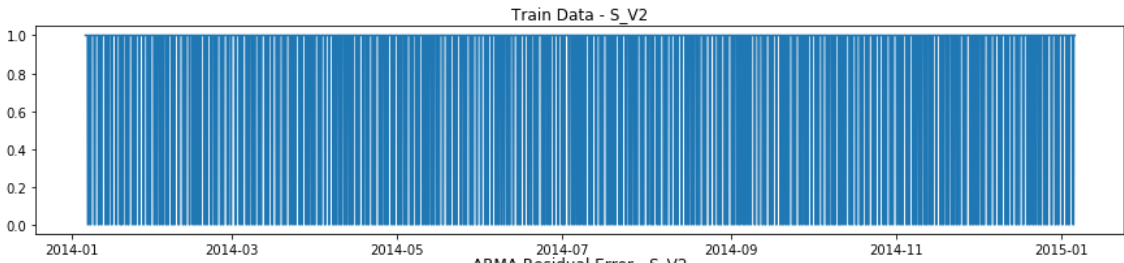
Density Plot of Residual Errors



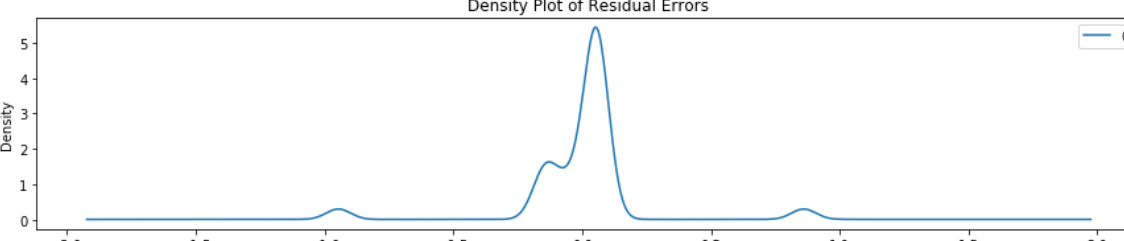
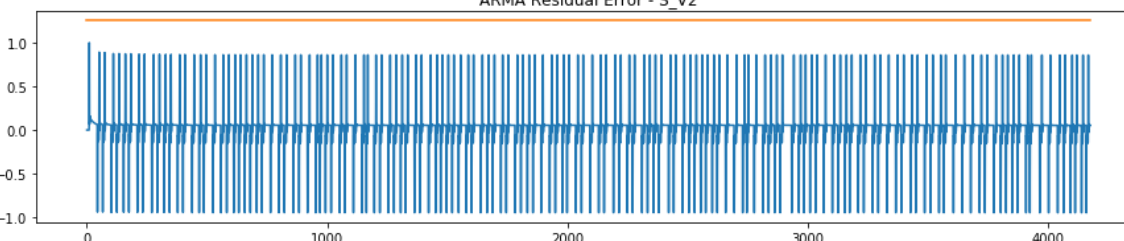
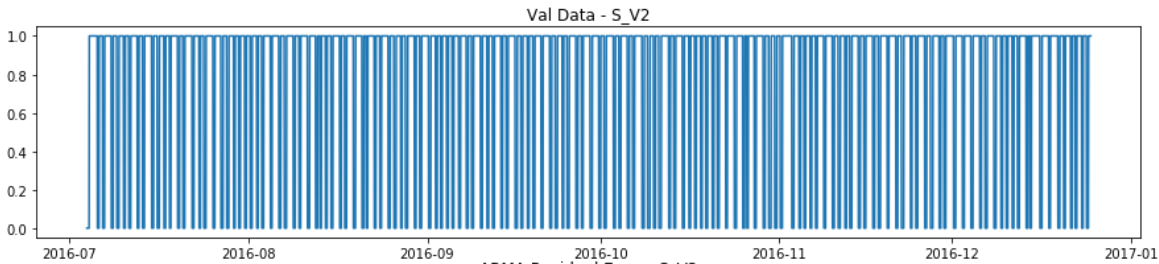
----- col : S\_V2 -----

- ARIMA Results : 2 3 || AIC : 558.0192560257856 (Time : 38.08 s)

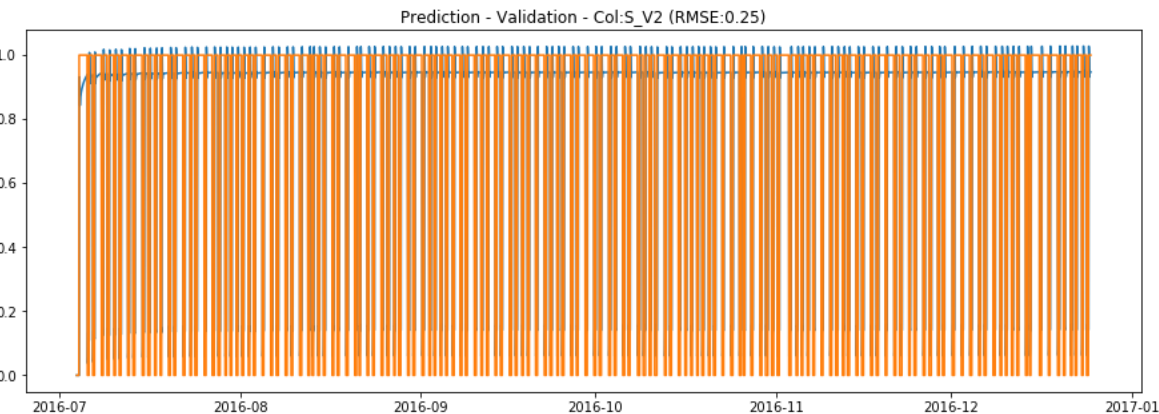
-- Threshold Train : 1.249



-- Threshold Val: 1.253



- Val MSE : 0.06 || Val RMSE : 0.25

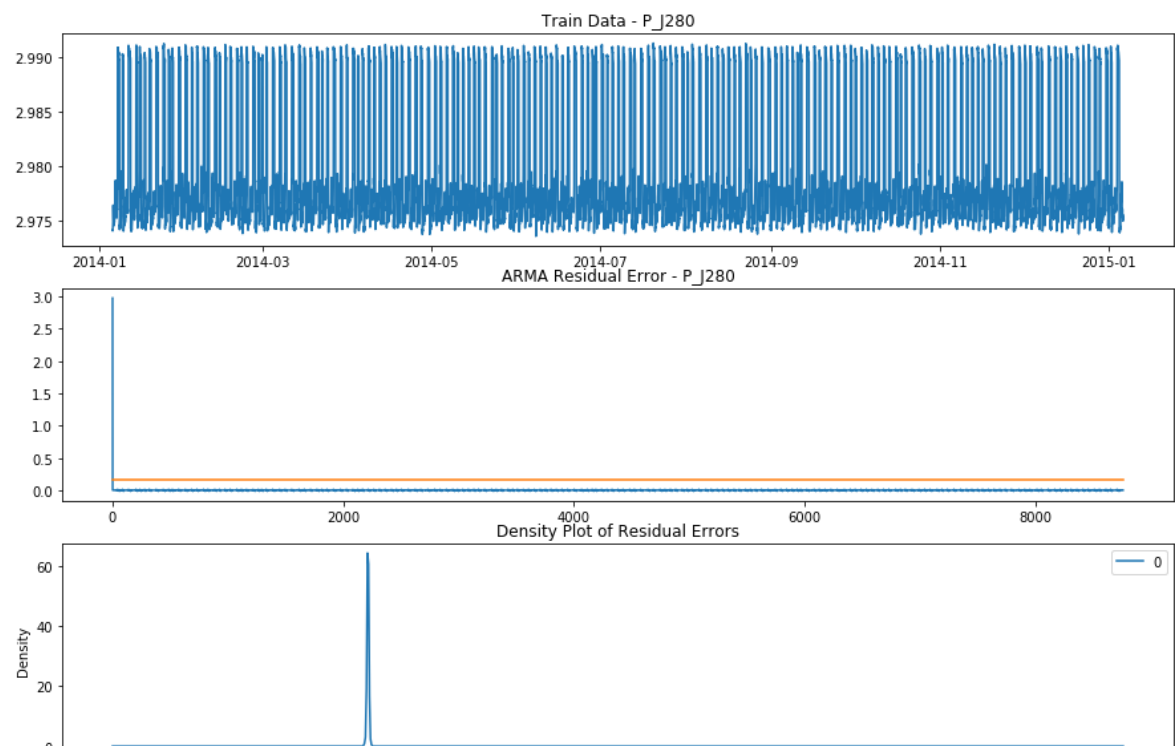


-- TP : 0 || FP : 0

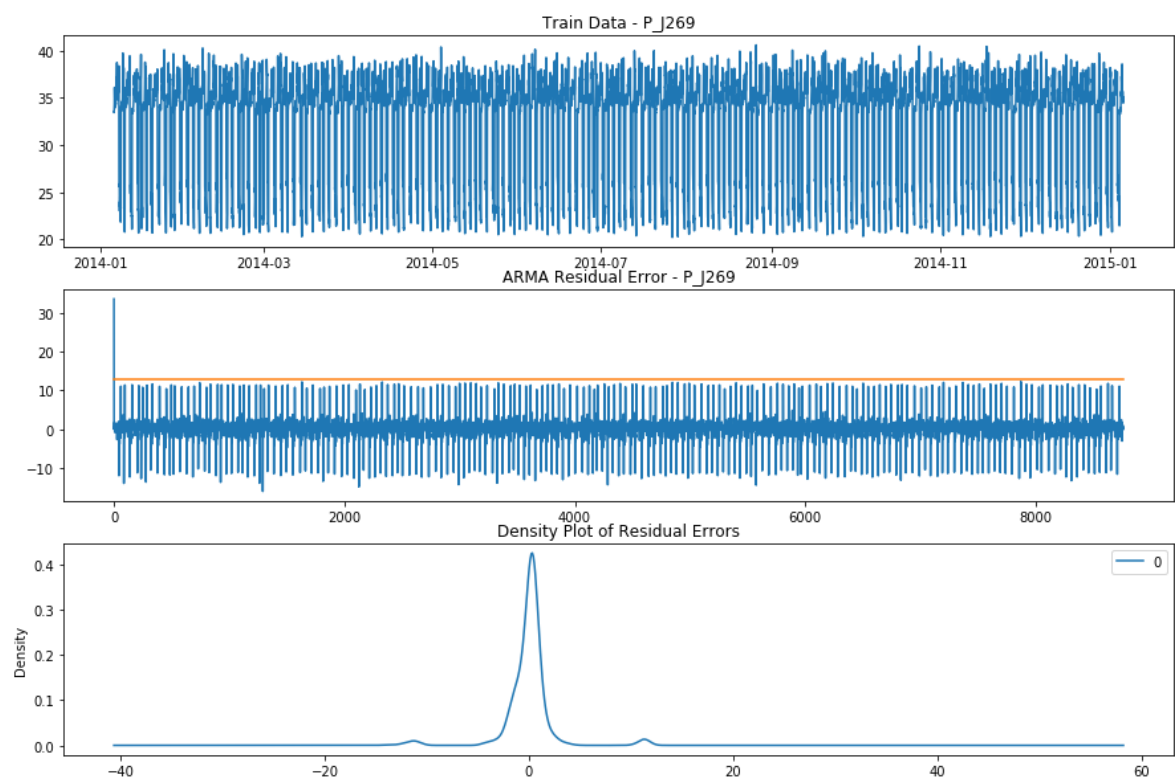
----- col : P\_J280 -----

- ARIMA Results : 1 1 || AIC : -77557.26245388955 (Time : 11.73 s)

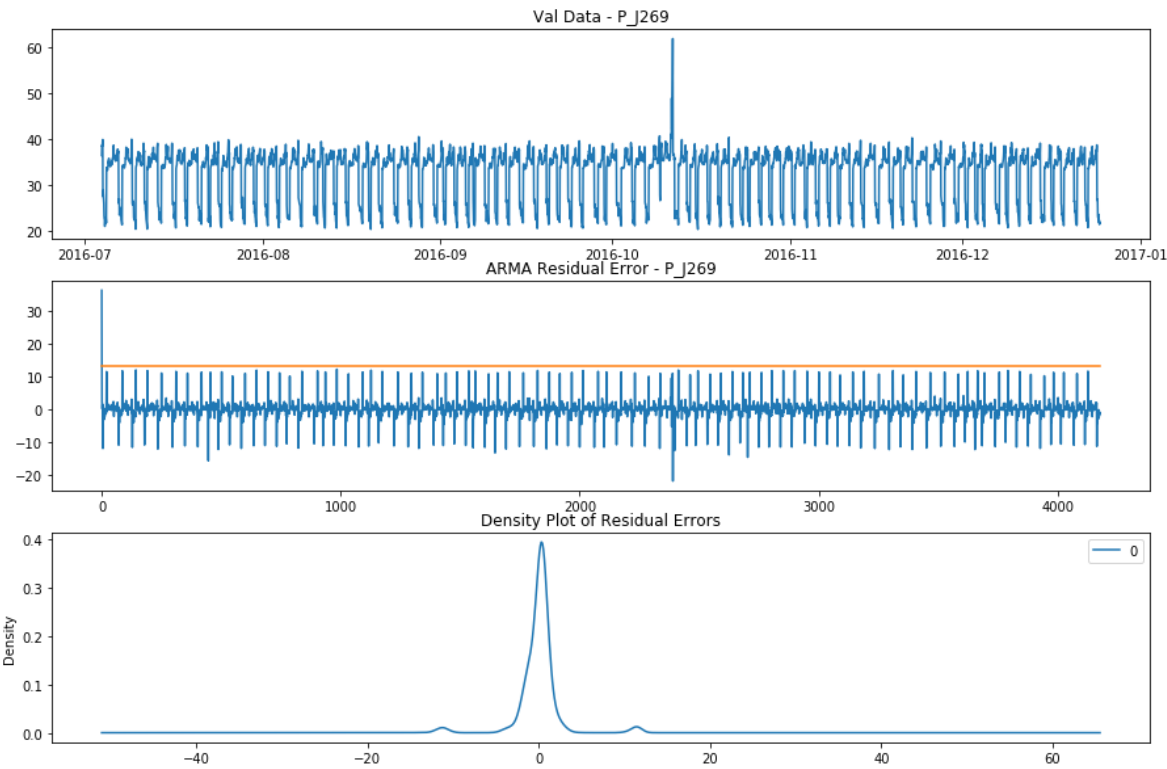
-- Threshold Train : 0.16



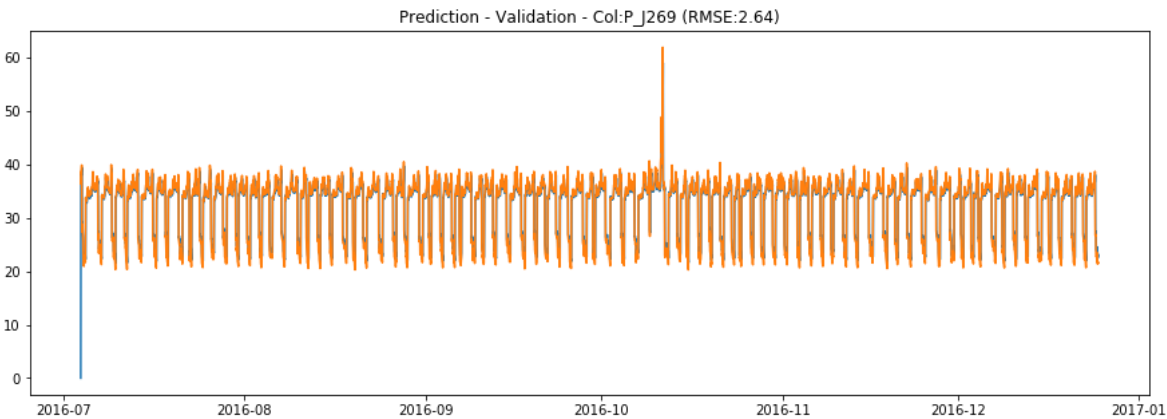
```
----- col : P_J269 -----  
- ARIMA Results : 3 3 || AIC : 41233.37173849765 (Time : 22.96  
s)  
-- Threshold Train : 12.837
```



-- Threshold Val: 13.203

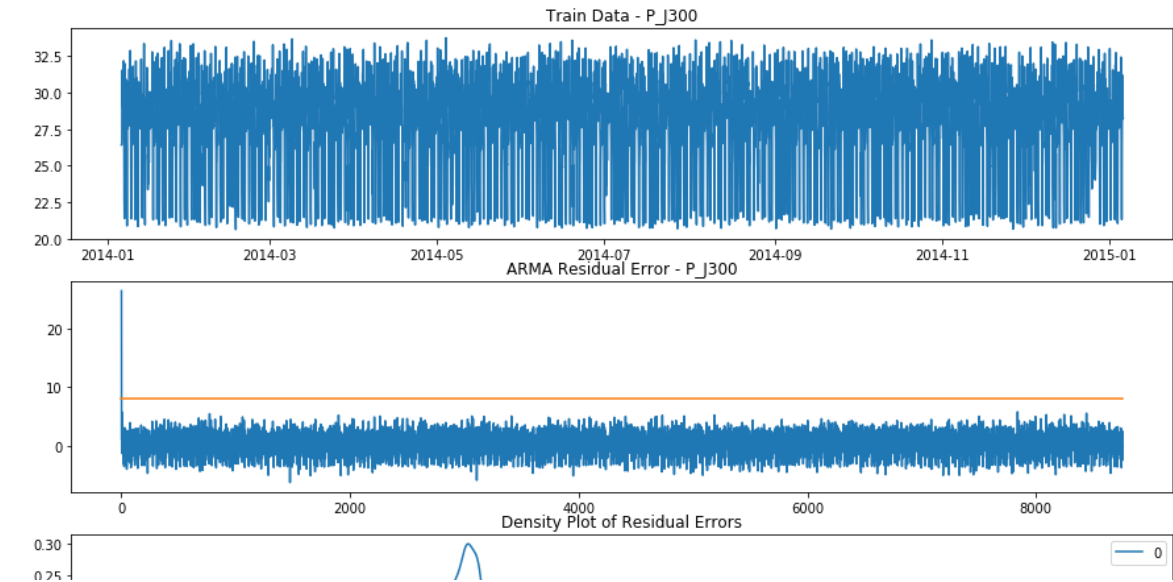


- Val MSE : 6.97 || Val RMSE : 2.64

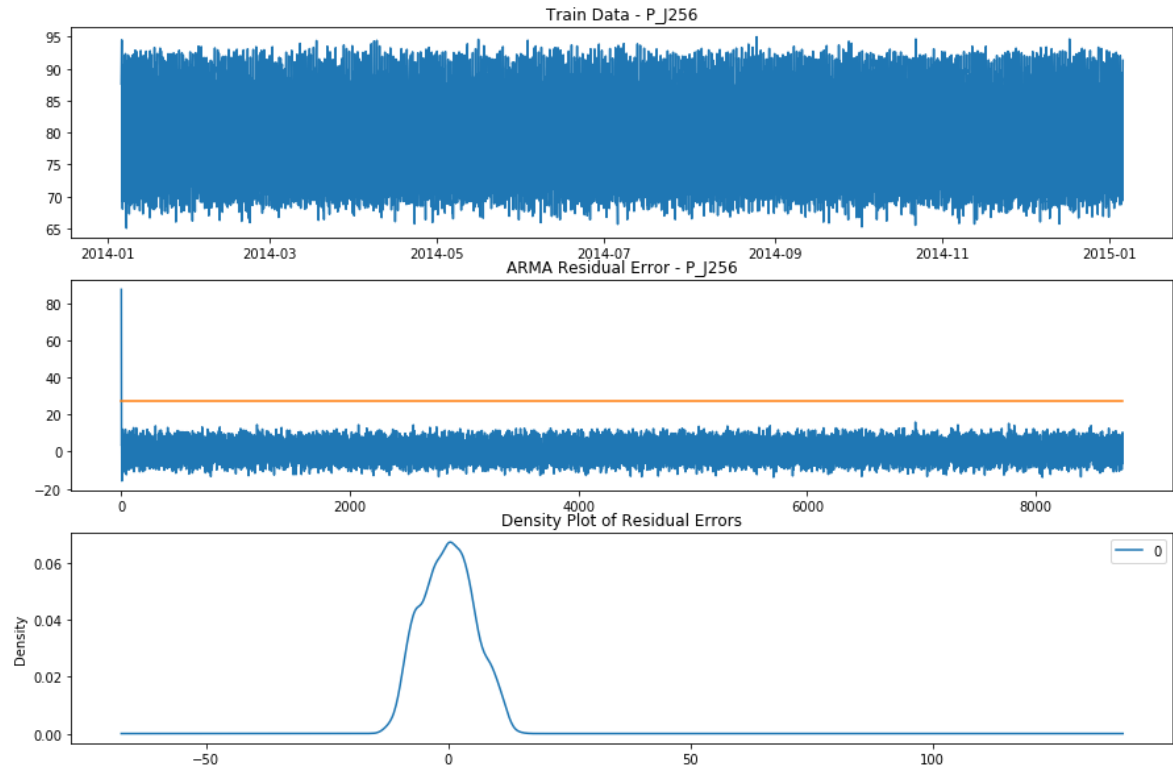


-- TP : 0 || FP : 1

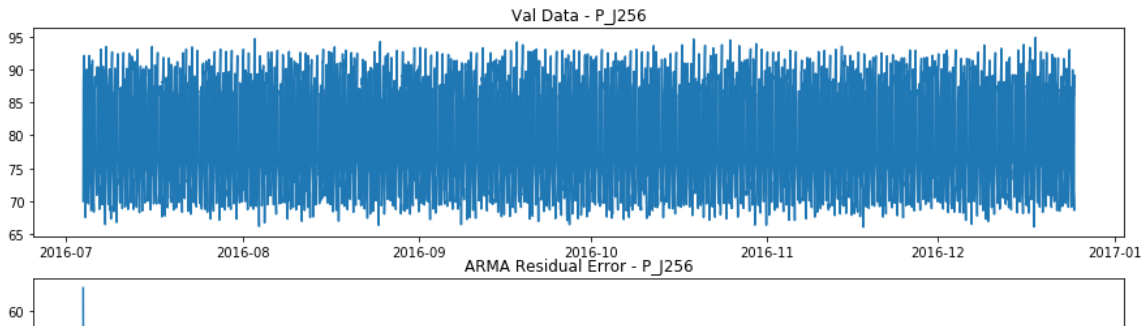
----- col : P\_J300 -----  
- ARIMA Results : 3 3 || AIC : 33068.103252975576 (Time : 36.6  
1 s)  
-- Threshold Train : 8.093



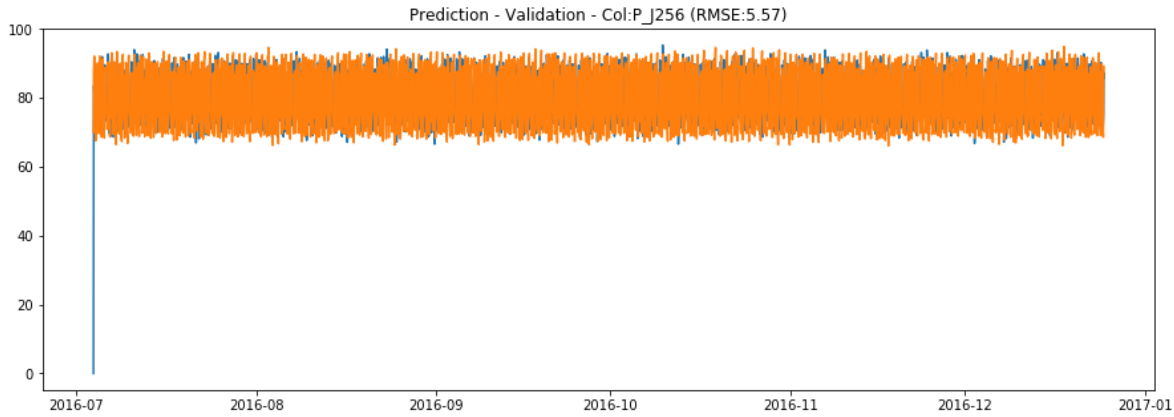
```
----- col : P_J256 -----  
- ARIMA Results : 3 2 || AIC : 54562.55574623511 (Time : 27.27  
s)  
-- Threshold Train : 27.602
```



```
-- Threshold Val: 27.865
```



- Val MSE : 31.06 || Val RMSE : 5.57

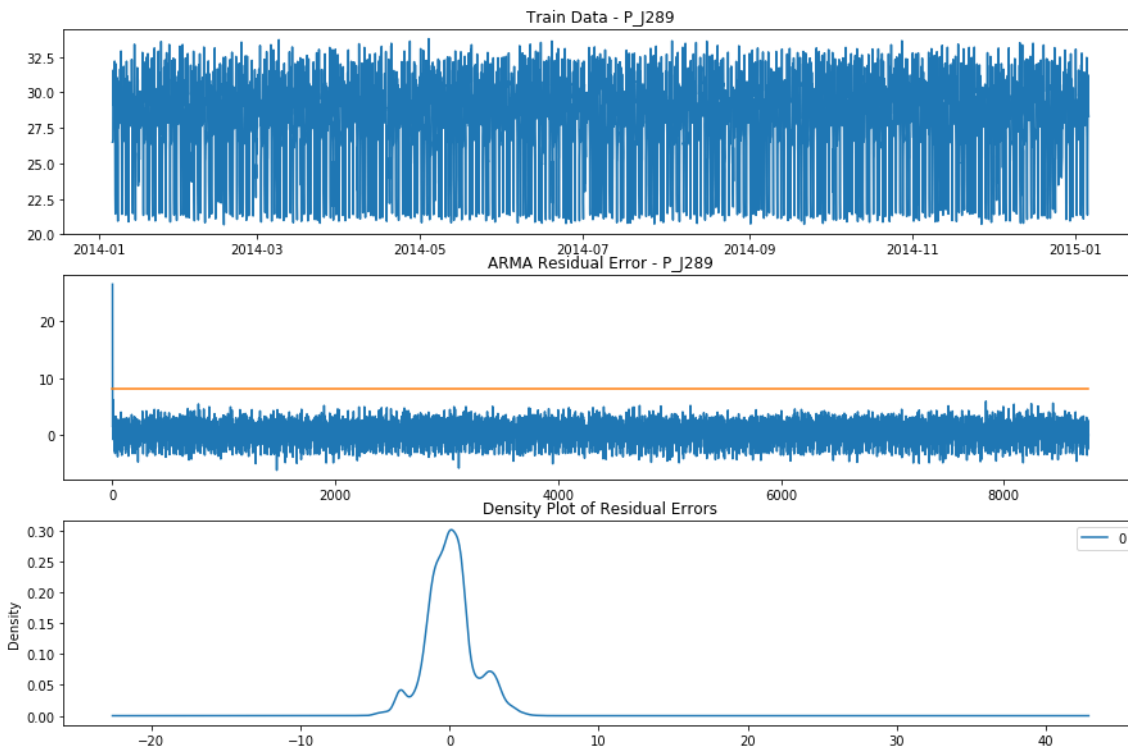


-- TP : 0 || FP : 1

----- col : P\_J289 -----

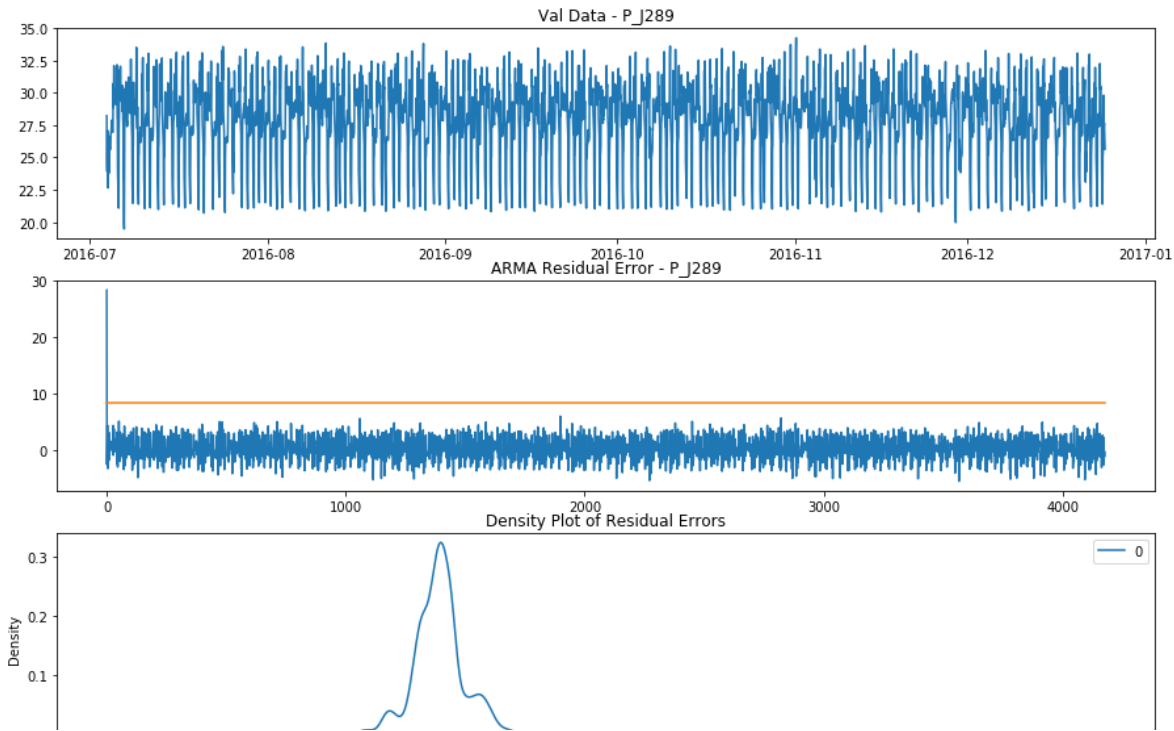
- ARIMA Results : 3 3 || AIC : 33006.912736432285 (Time : 20.12 s)

-- Threshold Train : 8.062

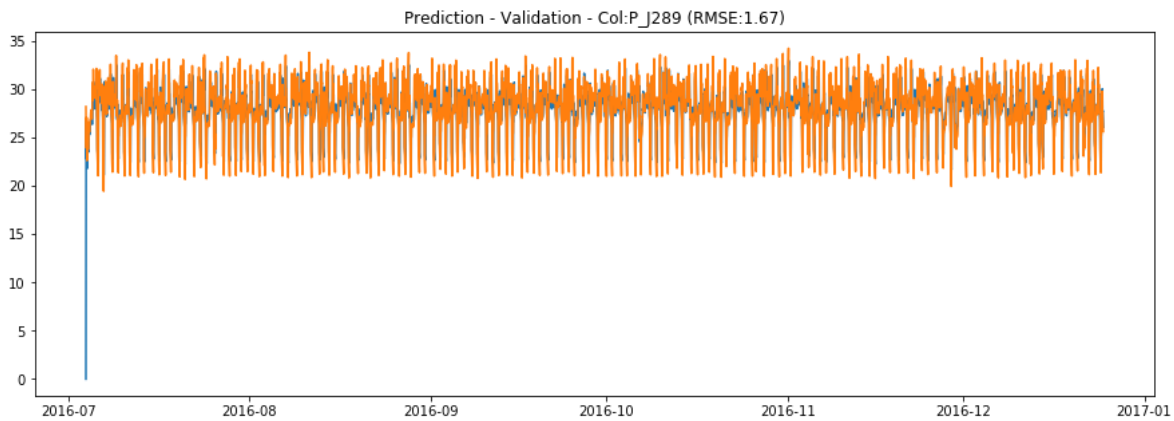


-- Threshold Val: 8.351





- Val MSE : 2.79 || Val RMSE : 1.67

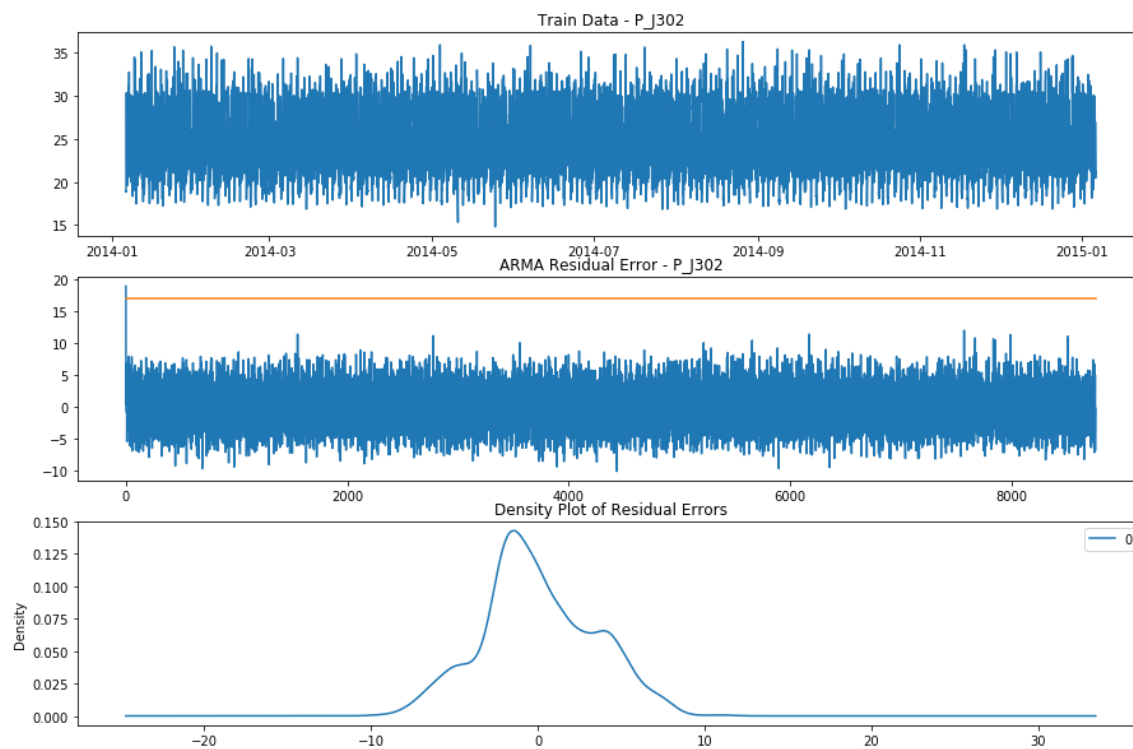


-- TP : 0 || FP : 1

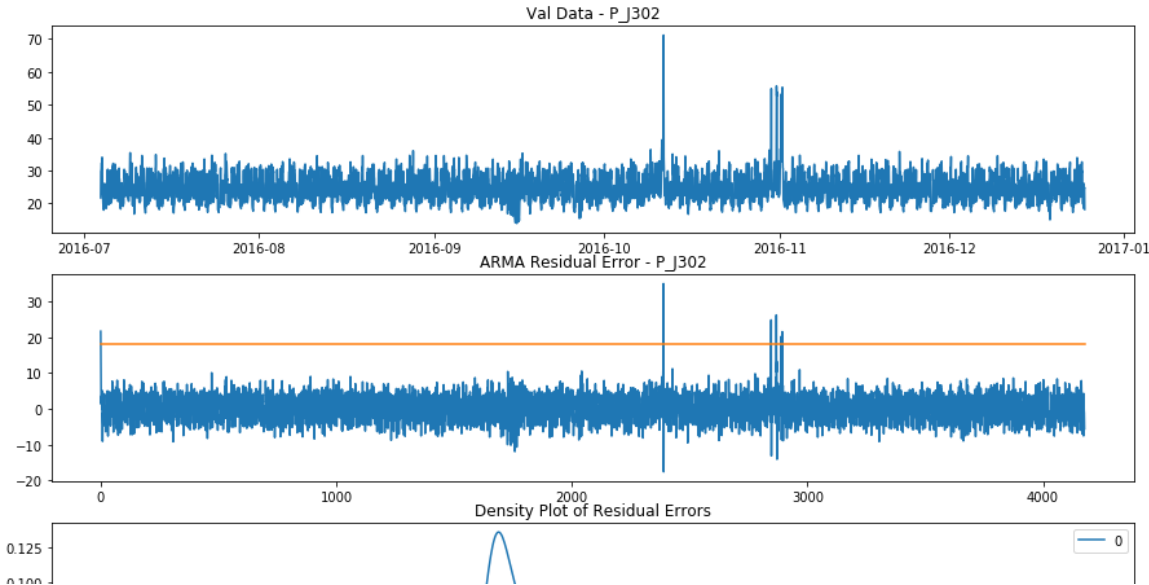
----- col : P\_J415 -----  
- ARIMA Results : 3 2 || AIC : 59491.037824442115 (Time : 18.82  
s)  
-- Threshold Train : 36.321



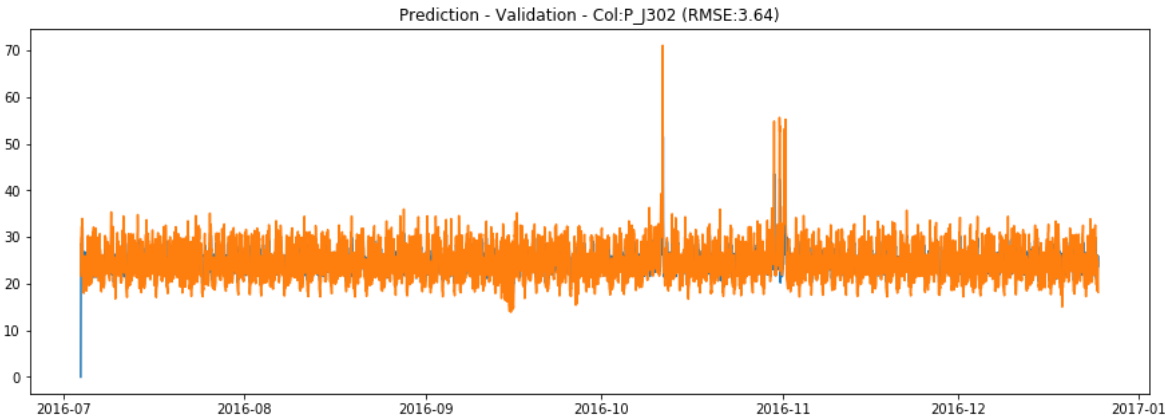
```
----- col : P_J302 -----  
- ARIMA Results : 1 3 || AIC : 46153.619783432165 (Time : 17.6  
s)  
-- Threshold Train : 16.869
```



```
-- Threshold Val: 18.222
```

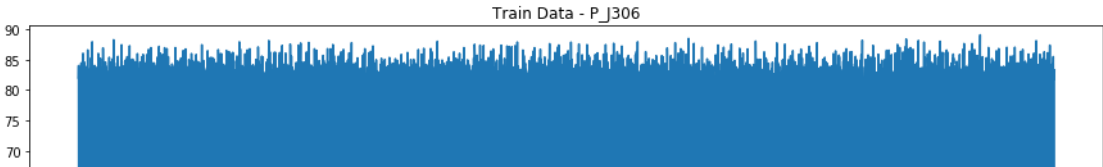


- Val MSE : 13.28 || Val RMSE : 3.64

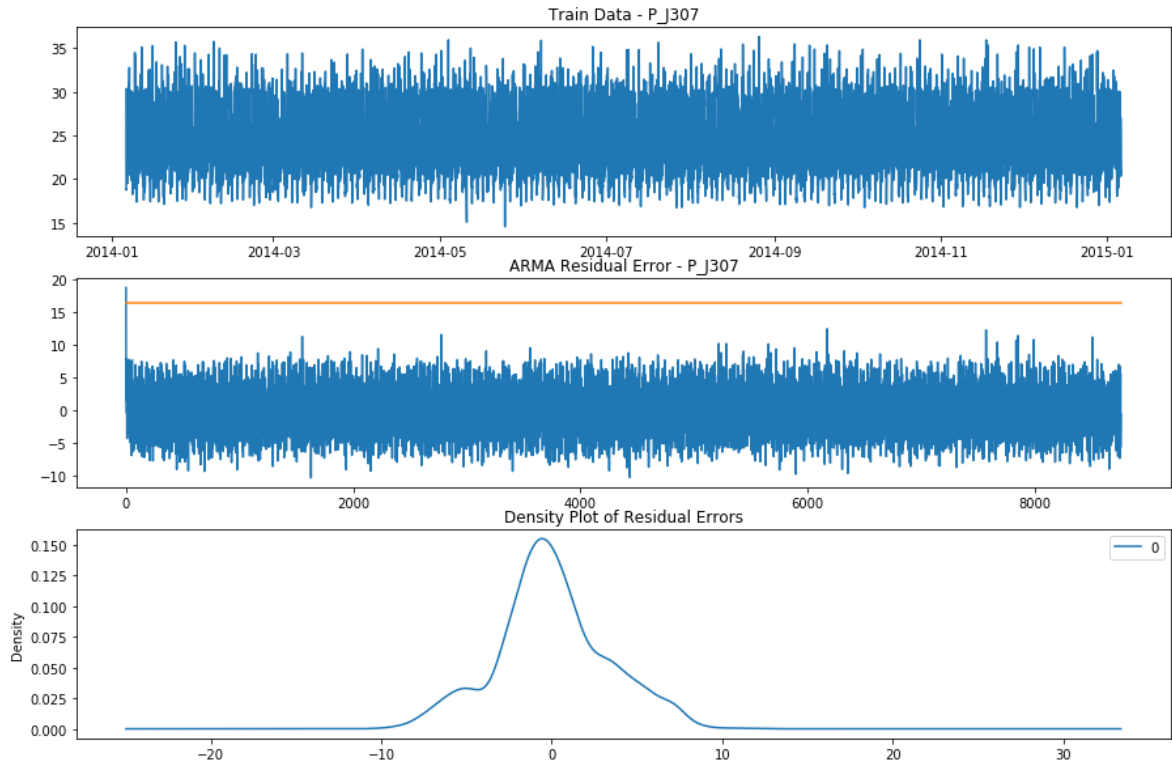


-- TP : 2 || FP : 1

----- col : P\_J306 -----  
- ARIMA Results : 3 2 || AIC : 58625.6053665347 (Time : 15.46 s)  
-- Threshold Train : 34.563

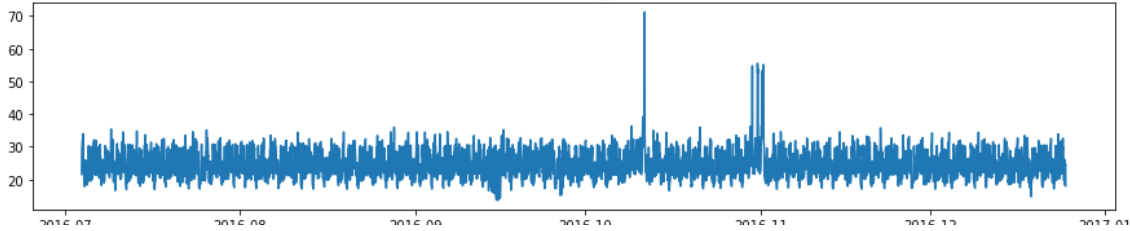


```
----- col : P_J307 -----  
- ARIMA Results : 3 2 || AIC : 45735.75300341871 (Time : 27.79  
s)  
-- Threshold Train : 16.47
```



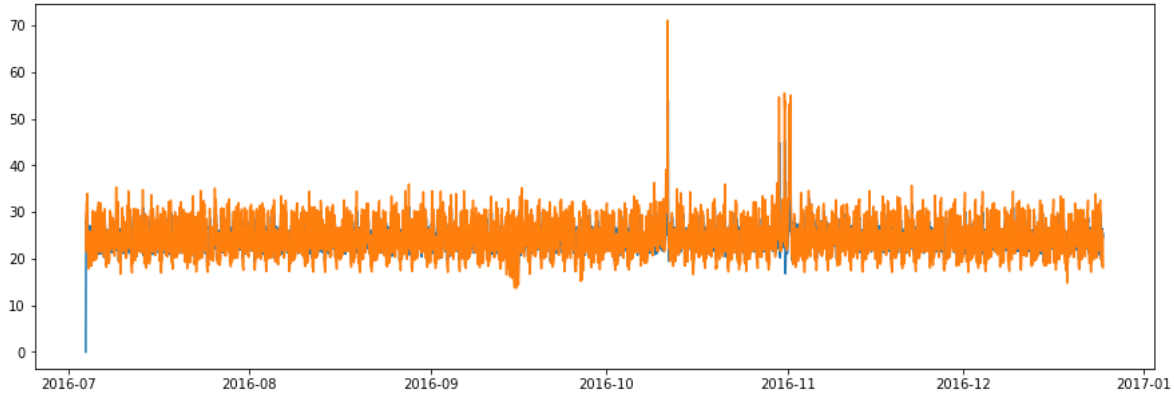
```
-- Threshold Val: 17.927
```

Val Data - P\_J307



- Val MSE : 12.85 || Val RMSE : 3.59

Prediction - Validation - Col:P\_J307 (RMSE:3.59)



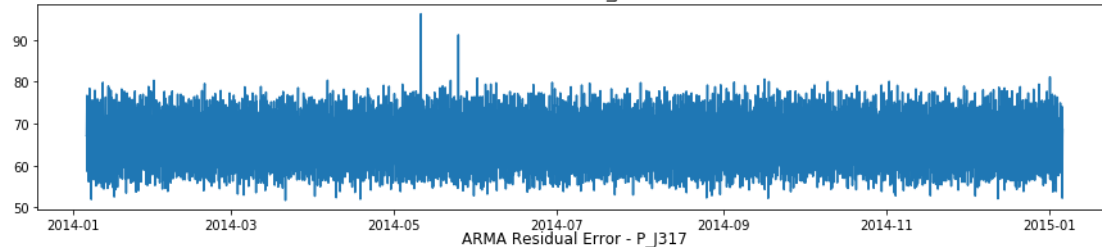
-- TP : 2 || FP : 1

----- col : P\_J317 -----

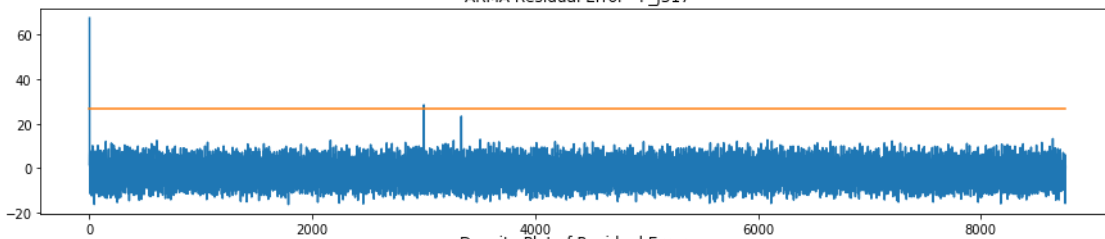
- ARIMA Results : 1 1 || AIC : 54177.59082820872 (Time : 13.85 s)

-- Threshold Train : 26.863

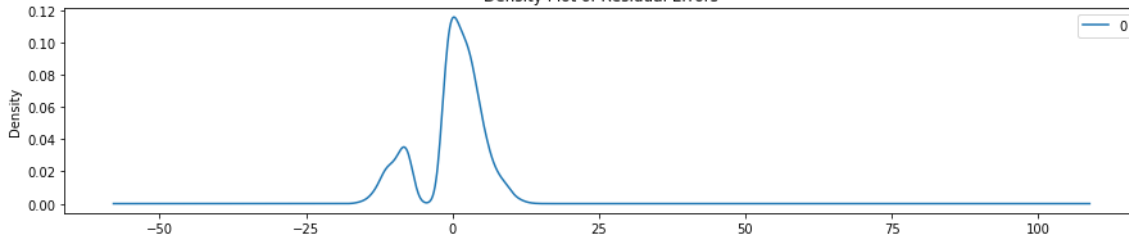
Train Data - P\_J317



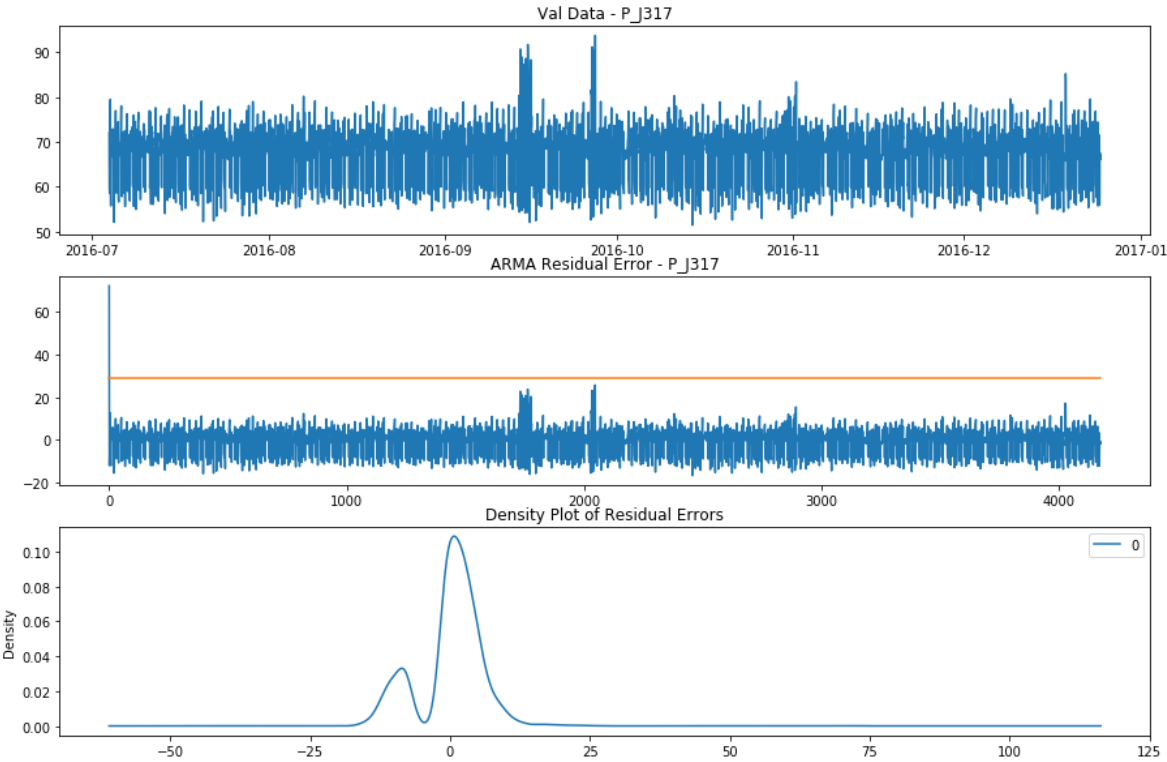
ARMA Residual Error - P\_J317



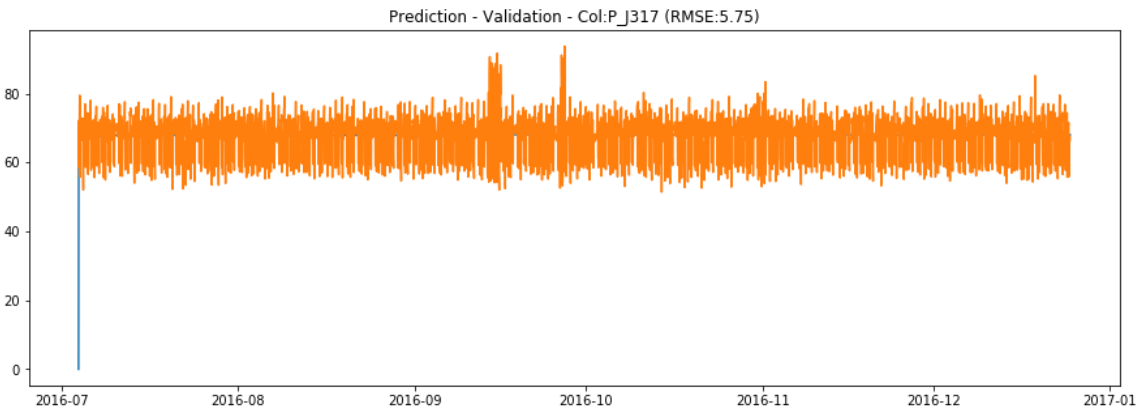
Density Plot of Residual Errors



-- Threshold Val: 28.732



- Val MSE : 33.03 || Val RMSE : 5.75

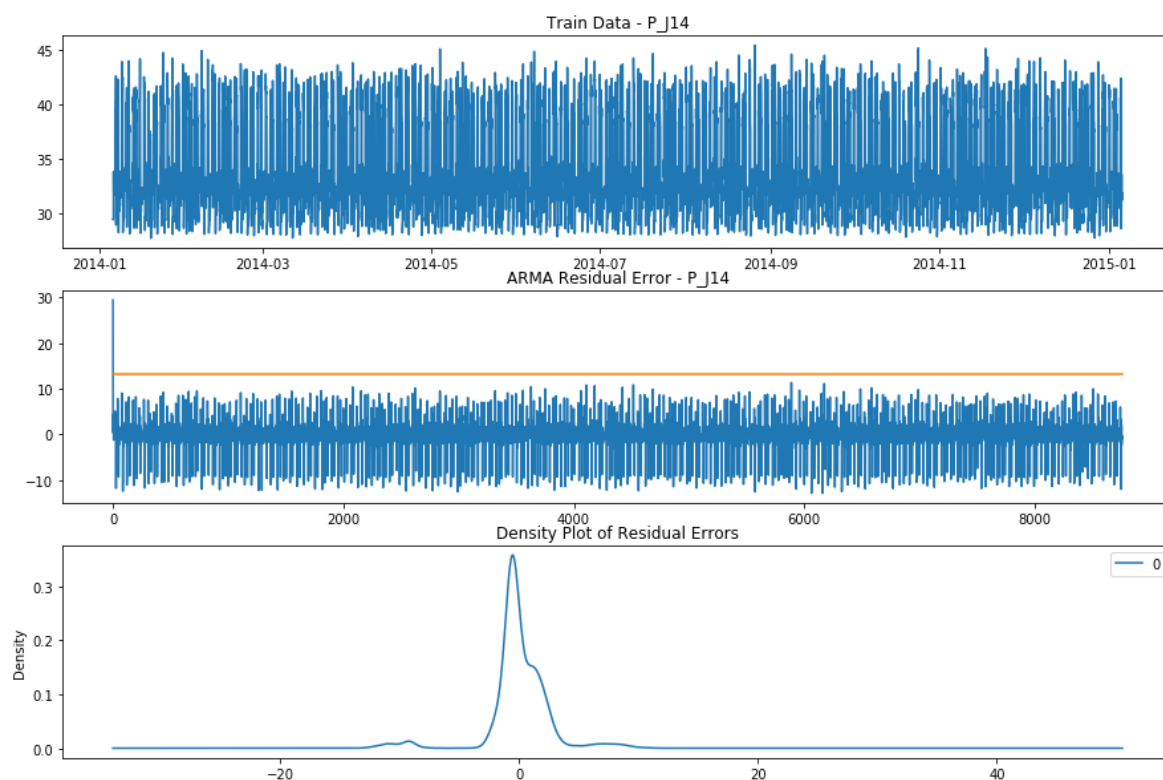


-- TP : 0 || FP : 2

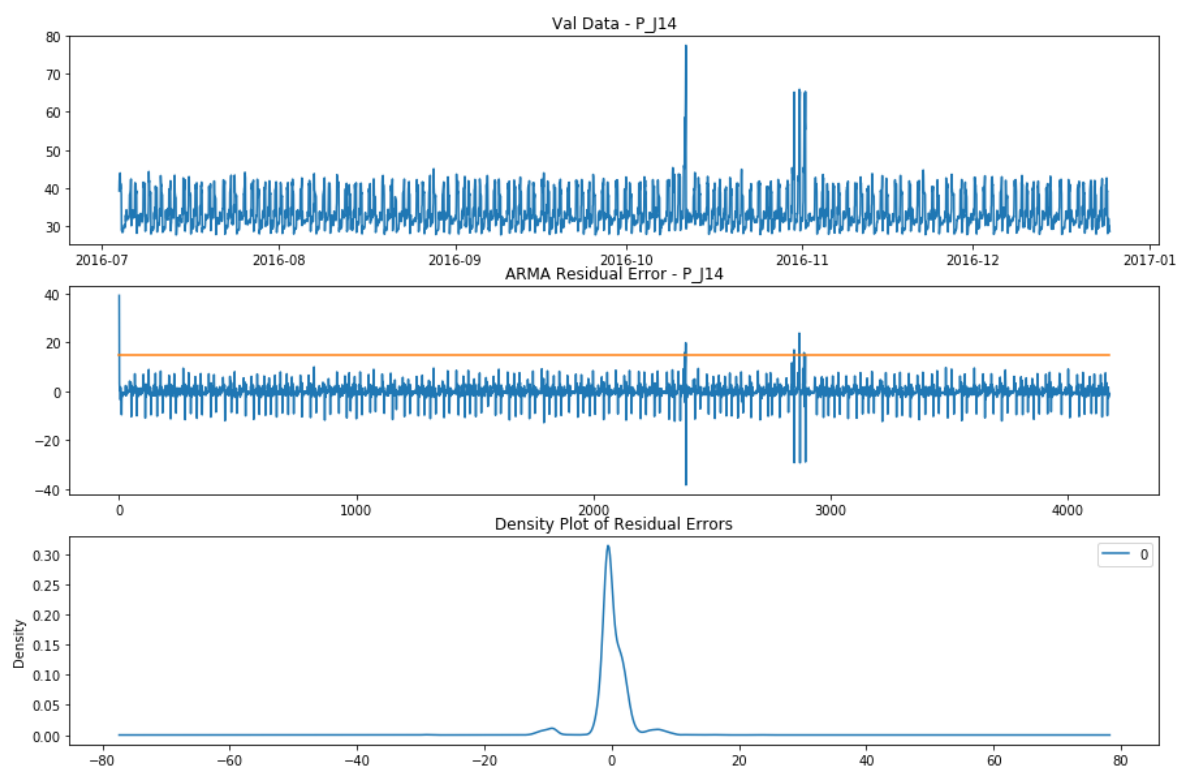
----- col : P\_J14 -----

- ARIMA Results : 2 2 || AIC : 41876.79206510154 (Time : 34.66 s)

-- Threshold Train : 13.283

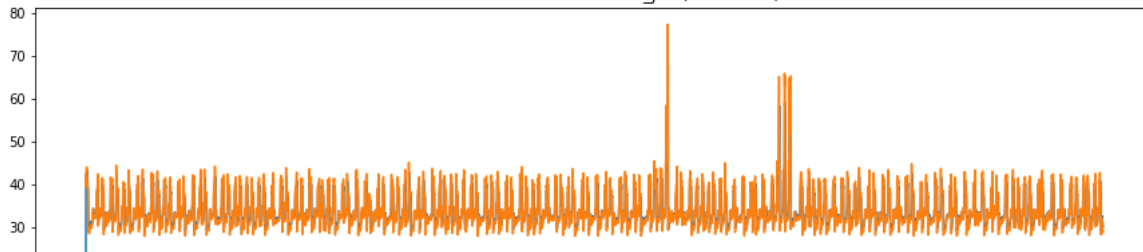


-- Threshold Val: 14.808



- Val MSE : 8.77 || Val RMSE : 2.96

Prediction - Validation - Col:P\_J14 (RMSE:2.96)



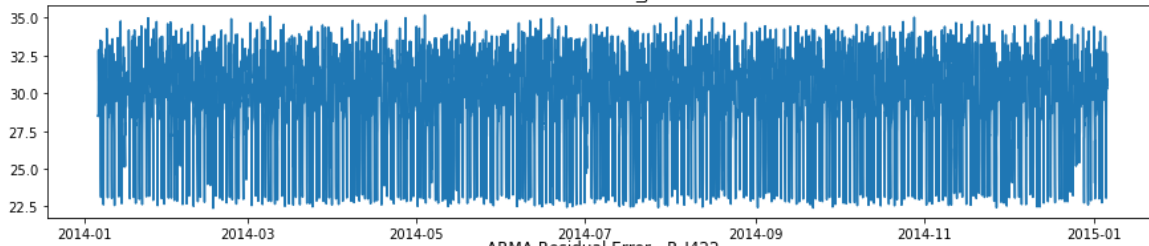
-- TP : 0 || FP : 1

----- col : P\_J422 -----

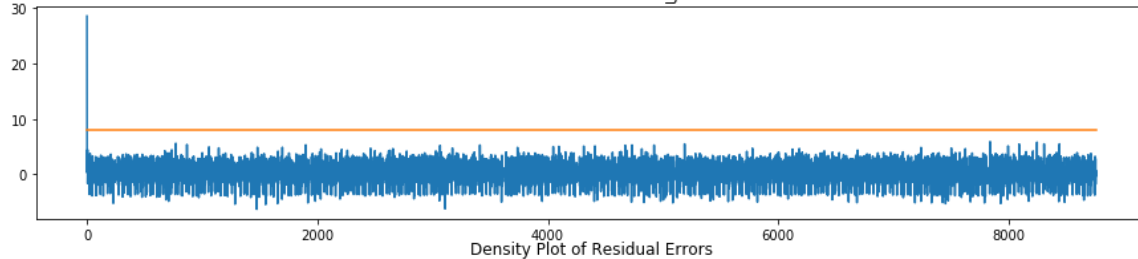
- ARIMA Results : 2 3 || AIC : 32627.656087558913 (Time : 20.79 s)

-- Threshold Train : 7.925

Train Data - P\_J422



ARMA Residual Error - P\_J422



Density Plot of Residual Errors

