Initial Motor Test Results and Analysis

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```
clear
close all
% Import transcribed results from video (data/vids/20230810_011619.mp4)
T = readtable("data\vids\motorTestData_20230810_011619.csv");
T.omega = (2*pi/60).*T.RPM;
T.P_in_W = T.Voltage_V .* T.Current_A;
T.P_out_W = T.Torque_Nm .* T.omega;
T.eta = T.P_out_W ./ T.P_in_W
```

T = 13×9 table

...

	Time_s	Voltage_V	Current_A	Torque_Nm	RPM	omega	P_in_W	P_out_W
1	30	24.0100	0.4100	0.3000	87	9.1106	9.8441	2.7332
2	40	24.0100	0.5000	0.4000	78	8.1681	12.0050	3.2673
3	50	24.0100	0.4900	0.4000	78	8.1681	11.7649	3.2673
4	60	24.0100	0.4700	0.4000	78	8.1681	11.2847	3.2673
5	70	24.0100	0.4700	0.4000	76	7.9587	11.2847	3.1835
6	80	24.0100	0.5000	0.4000	74	7.7493	12.0050	3.0997
7	90	24.0100	0.4800	0.4000	71	7.4351	11.5248	2.9740
8	100	24.0100	0.4800	0.4000	71	7.4351	11.5248	2.9740
9	110	24.0100	0.4800	0.4000	70	7.3304	11.5248	2.9322
10	120	24.0100	0.5300	0.4000	67	7.0162	12.7253	2.8065
11	130	24.0100	0.5300	0.4000	64	6.7021	12.7253	2.6808
12	140	24.0100	0.5000	0.4000	62	6.4926	12.0050	2.5970
13	150	24.0100	0.5000	0.4000	61	6.3879	12.0050	2.5552

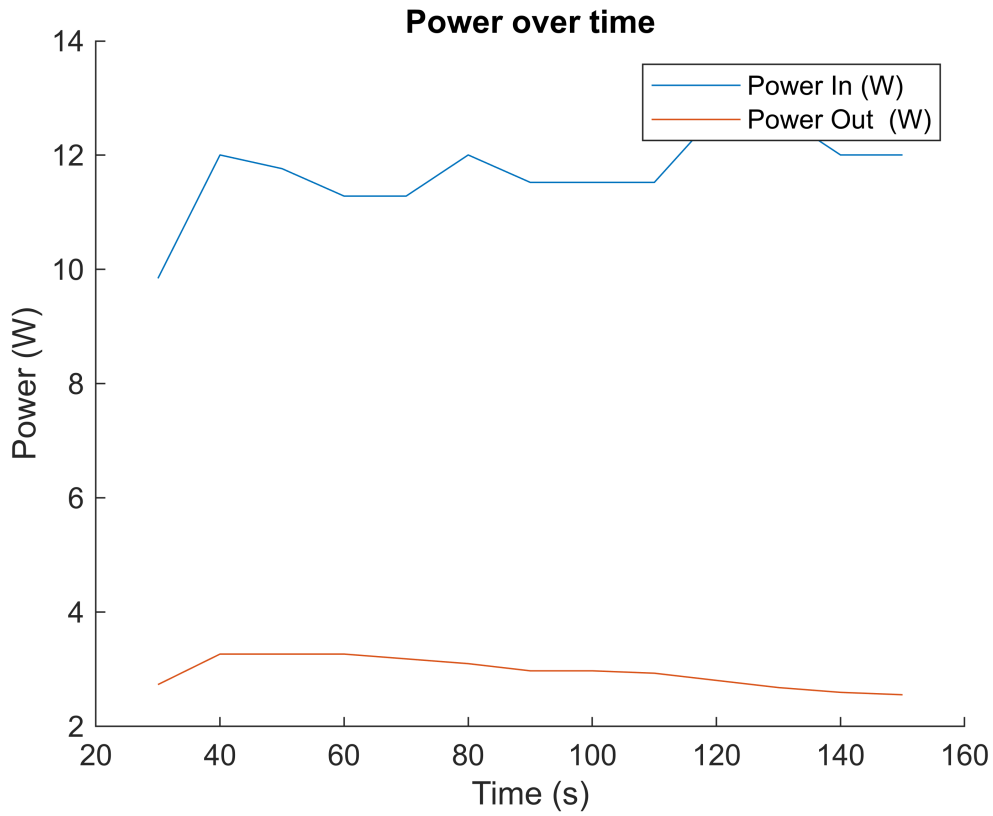
```
% Energy (J) = Power (W) * Time (s)
E_total_in = sum(10*T.P_in_W);
E_total_out = sum(10*T.P_out_W);
eta_total = E_total_out/E_total_in;
fprintf('Total Energy In: %0d W\n',round(E_total_in)); fprintf('Total Energy Out:
%0d W\n',round(E_total_out)); fprintf('Total Efficiency: %.2f%%',100*eta_total)
```

```
Total Energy In: 1522 W
Total Energy Out: 383 W
Total Efficiency: 25.19%
```

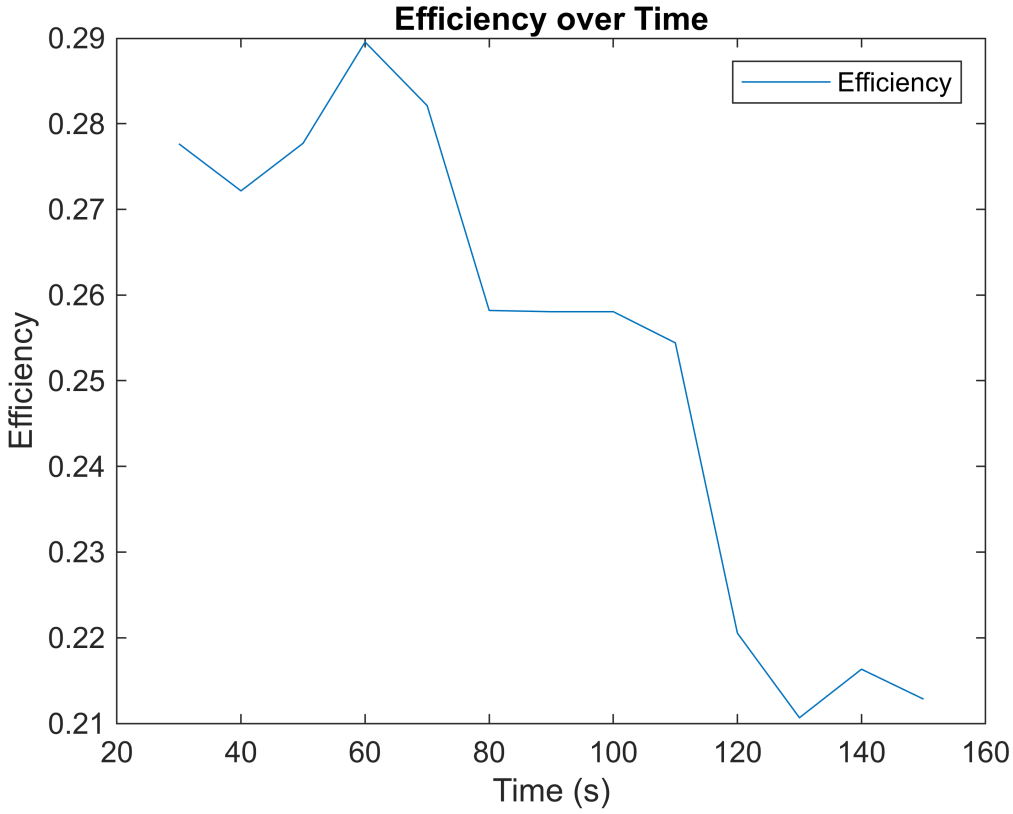
Plots

```
figure
```

```
hold on
plot(T.Time_s, T.P_in_W, DisplayName = "Power In (W)")
plot(T.Time_s, T.P_out_W, DisplayName = "Power Out  (W)")
title('Power over time')
xlabel('Time (s)')
ylabel('Power (W)')
legend
```




```
figure
plot(T.Time_s, T.eta, DisplayName="Efficiency")
title('Efficiency over Time')
xlabel('Time (s)')
ylabel('Efficiency')
legend
```


Efficiency over Time
Efficiency
0.29
0.28
0.27
0.26
0.25
0.24
0.23
0.22
0.21
Efficiency
20
40
60
80
100
120
140
160
Time (s)