REPORT ON STEP RESPONSE TEST

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Test : Step response of pressure sensor in the Artificial muscle (TIM)

Categories : 20 psi and 30 psi

No of trails : 10 in total, 5 each

To determine the PID gains for the valve cotroller, Step response test has been done on one muscle.

10 trails in total have been performed. 5 trails with a step of 20 psi and 5 with a step of 30 psi.

The sensor response has been plotted against time.

At t=0 sec, plotting is started, valve is in off position.

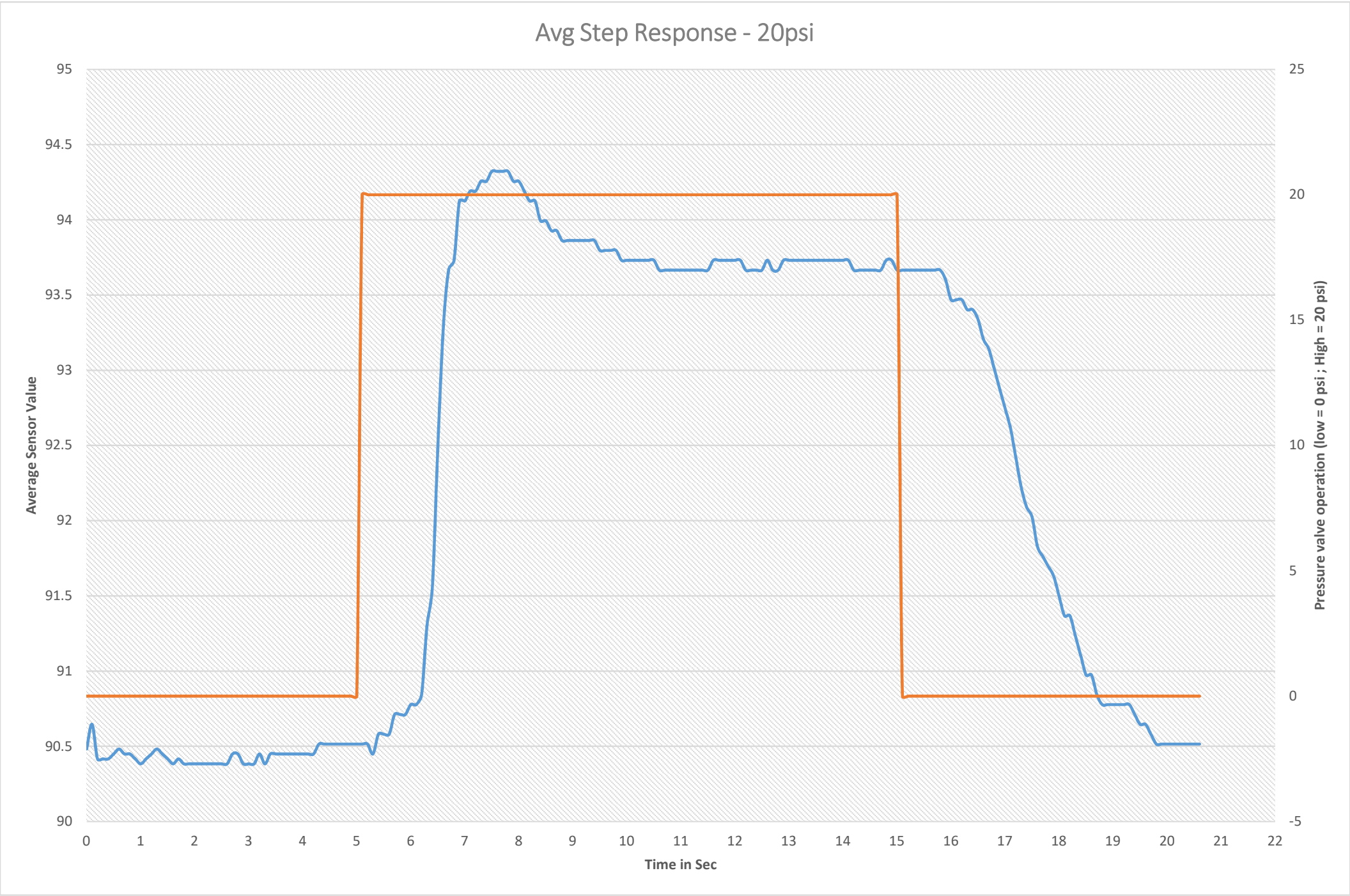
At t=5 sec, Valve is turned ON (0 to 20 psi) (0 to 30 psi)

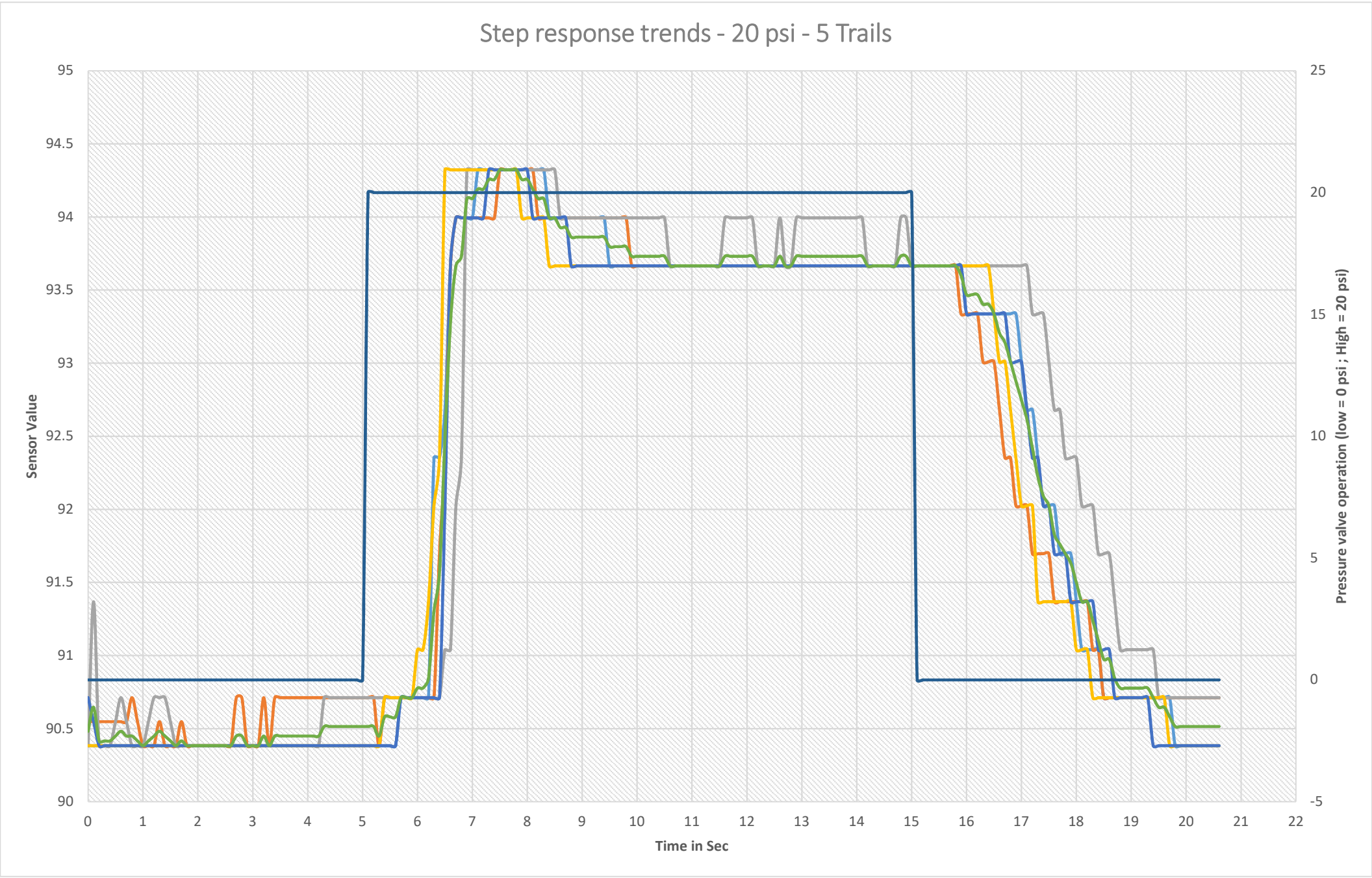
At t=15 sec, Valve is turned OFF (20 psi to 0) (30 psi to 0)

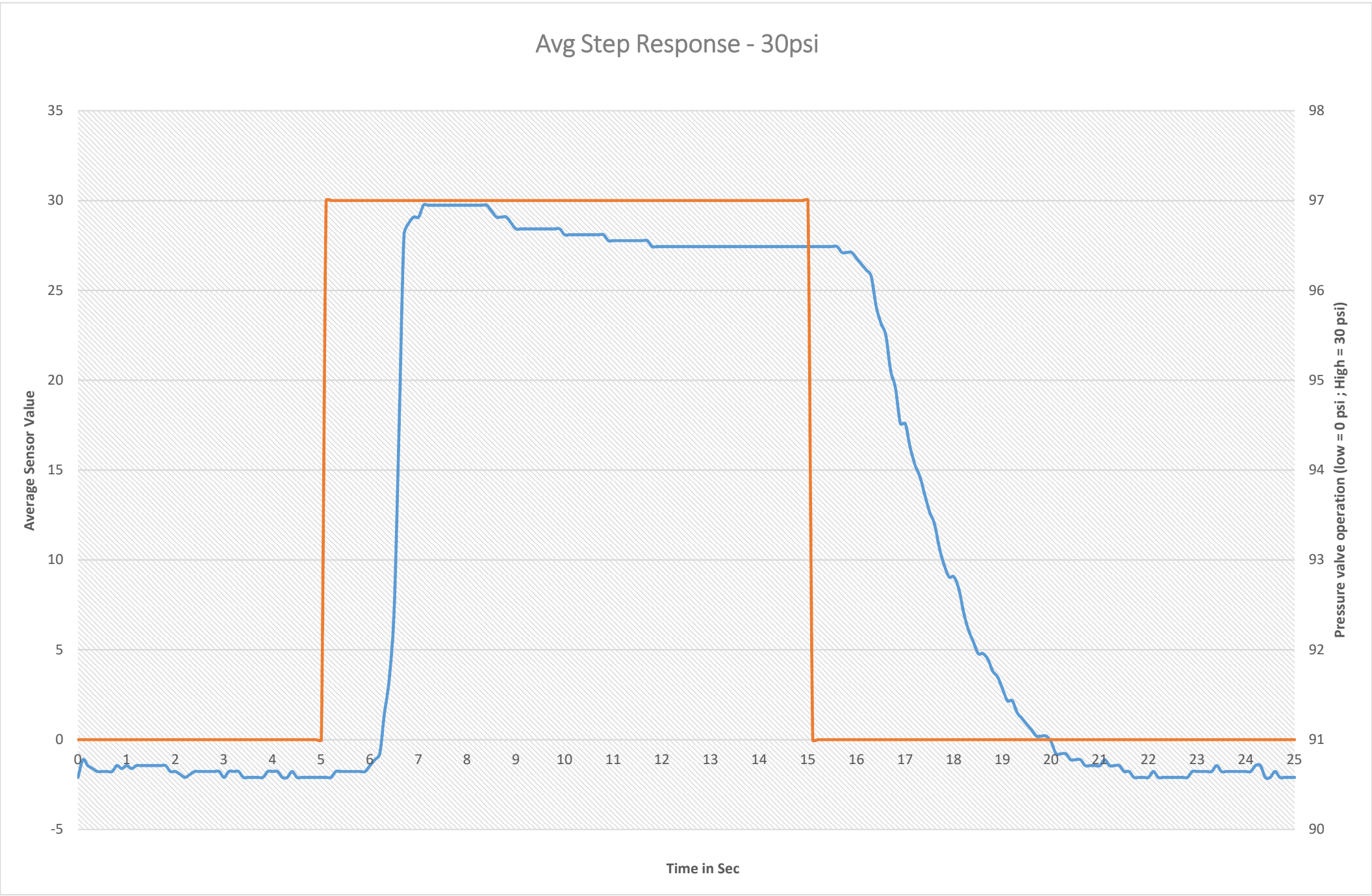
At t=20 sec, plotting is stopped (for 20 psi category)

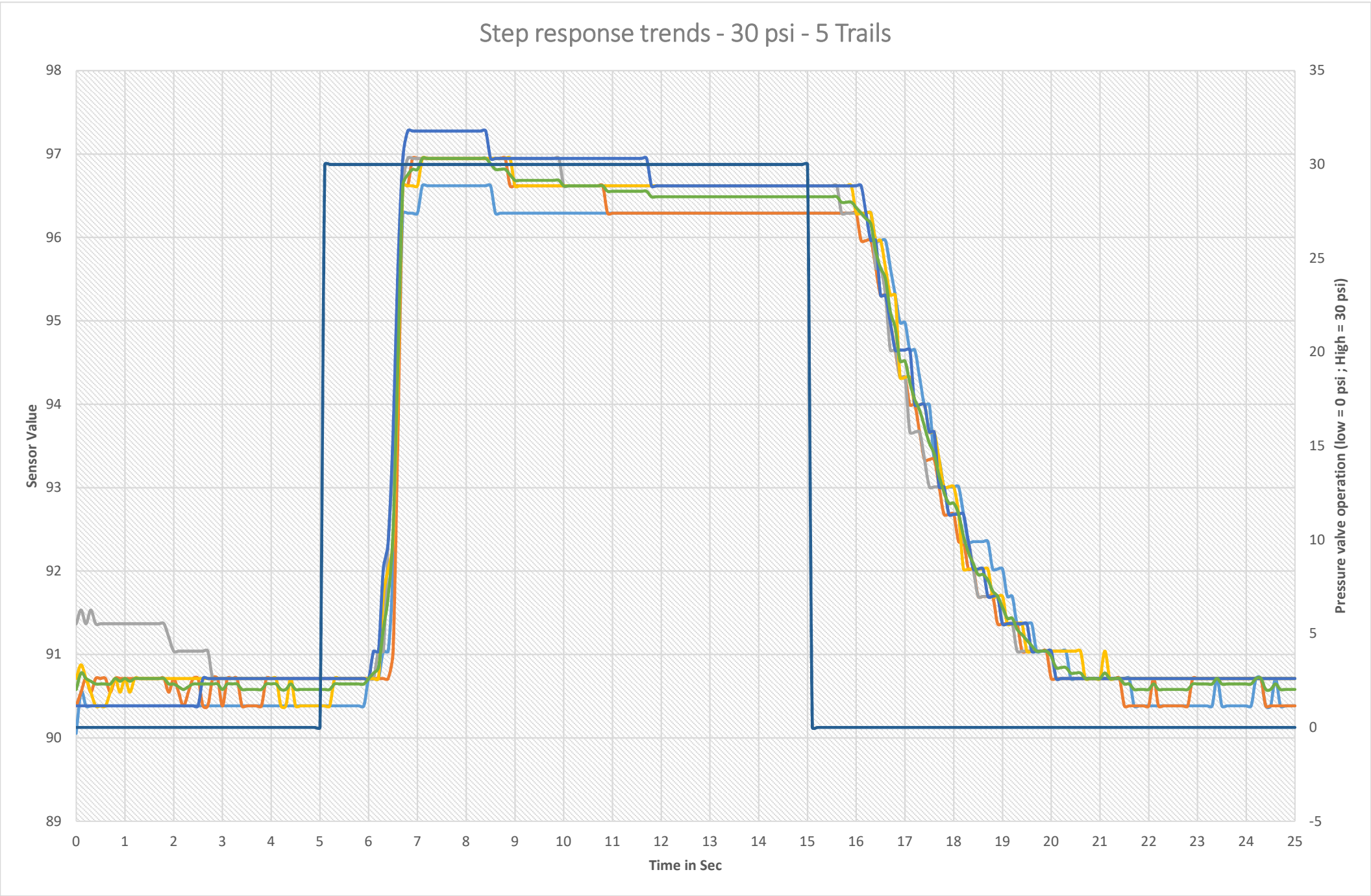
At t=20 sec, plotting is stopped (for 30 psi category).

Graphs have been attached below. (both the Average response and the Individual trails)


Avg Step Response - 20psi
Average Sensor Value
Pressure valve operation (low = 0 psi ; High = 20 psi)
Time in Sec
95
94.5
94
93.5
93
92.5
92
91.5
91
90.5
90
25
20
15
10
5
0
-5
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22


Step response trends - 20 psi - 5 Trails
Sensor Value
Pressure valve operation (low = 0 psi ; High = 20 psi)
Time in Sec
95
94.5
94
93.5
93
92.5
92
91.5
91
90.5
90
25
20
15
10
5
0
-5
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22


Avg Step Response - 30psi
Average Sensor Value
Pressure valve operation (low = 0 psi ; High = 30 psi)
Time in Sec
35
30
25
20
15
10
5
0
-5
98
97
96
95
94
93
92
91
90
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25


Step response trends - 30 psi - 5 Trails
Sensor Value
Pressure valve operation (low = 0 psi ; High = 30 psi)
Time in Sec
98
97
96
95
94
93
92
91
90
89
35
30
25
20
15
10
5
0
-5
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

Observations :

1. There is a consistent overshoot in the sensor valve (10 – 15 % of the change in pressure for a period of about 2.5 sec)
2. There is a consistent delay in the sensor reaction when the value rises. (about 2 seconds)
3. There is a consistent delay in the sensor reaction when the value drops. (about 5 seconds)