Batch	Agent1	Agent2
1	7.7	8.5
2	9.2	9.6
3	6.8	6.4
4	9.5	9.8
5	8.7	9.3
6	6.9	7.6
7	7.5	8.2
8	7.1	7.7
9	8.7	9.4
10	9.4	8.9
11	9.4	9.7
12	8.1	9.1

t-Test: Paired Two Sample for Means

	Agent1	Agent2
Mean	8.250000	8.683333
Variance	1.059091	1.077879
Observations	12	12
Pearson Correlation	0.901055812	
Hypothesized Mean Difference	0	
df	11	
t Stat	-3.263938591	
P(T<=t) one-tail	0.003772997	
t Critical one-tail	1.795884819	
P(T<=t) two-tail	0.007545995	
t Critical two-tail	2.20098516	

Difference in Means	-0.433333

Interpretation

This paired t-test compares Filter Agent 1 and Filter Agent 2 using data from 12 batches. Agent 1 has an average score of about 8.250, whereas Agent 2's average is roughly 8.683, resulting in a mean difference (Agent 1 – Agent 2) of about -0.433. In the two-tailed test, the p-value is approximately 0.0075, which is below the usual 0.05 threshold, indicating a statistically significant difference. Because Agent 2 has a higher average, it appears to perform better overall. If the focus were on a one-tailed test to see if Agent 1 is more effective, the results would not support that claim, as Agent 2's mean consistently exceeds that of Agent 1.

DATA SET G (Filtration.xlsx)

The final process in the production of a chemical product involves filtration to remove impurities in the form of unwanted side products. The production manager wished to compare the effectiveness of two possible filter agents, Agent 1 and Agent 2. Each of 12 batches of the product were prepared, and half of each batch was filtered using Agent 1, and the other half using Agent 2. Following filtration, the amount of impurity (in parts per 1000 by weight) still present in the product was determined.

Variable	Description
Batch	Batch identification number (1 – 12)
Agent1	Impurities present after filtration with Agent 1 (parts per 1000)
Agent2	Impurities present after filtration with Agent 2 (parts per 1000)

The data are as follows:

Batch	Agent1	Agent2
1	7.7	8.5
2	9.2	9.6
3	6.8	6.4
4	9.5	9.8
5	8.7	9.3
6	6.9	7.6
7	7.5	8.2
8	7.1	7.7
9	8.7	9.4
10	9.4	8.9
11	9.4	9.7
12	8.1	9.1