

### Performance Evaluation on Esco CO<sub>2</sub> Incubator with Suppressed O<sub>2</sub> in Low Ambient Temperature

**Test date** : 23 February – 11 March

**Tested by** : Rosi Destiani and Dian Susanti

**Objective** :

- To know whether the CO<sub>2</sub> incubator able to perform well in low ambient temperature
- To ensure that the CO<sub>2</sub> incubator will not have condensation in low ambient temperature

**Result** :

#### 1. 20°C Ambient Temperature

##### 1) Performance Test

Time (minutes)	RH (%)	CO <sub>2</sub> (%)	O <sub>2</sub> (%)	Temperature (°C)
0	53,5	3,5	16,5	36,7
5	64,0	5,0	8,5	37,1
10	75,3	4,9	5,0	37,3
15	80,6	5,0	5,0	37,2
20	82,3	5,0	5,0	37,0
25	84,5	5,0	5,0	37,0
30	85,4	5,0	5,0	37,0
35	86,3	5,0	5,0	37,0
40	86,8	5,0	5,0	37,0
45	87,5	5,0	5,0	37,0
50	88,1	5,0	5,0	37,0
55	88,9	5,0	5,0	37,0
60	89,5	5,0	5,0	37,0

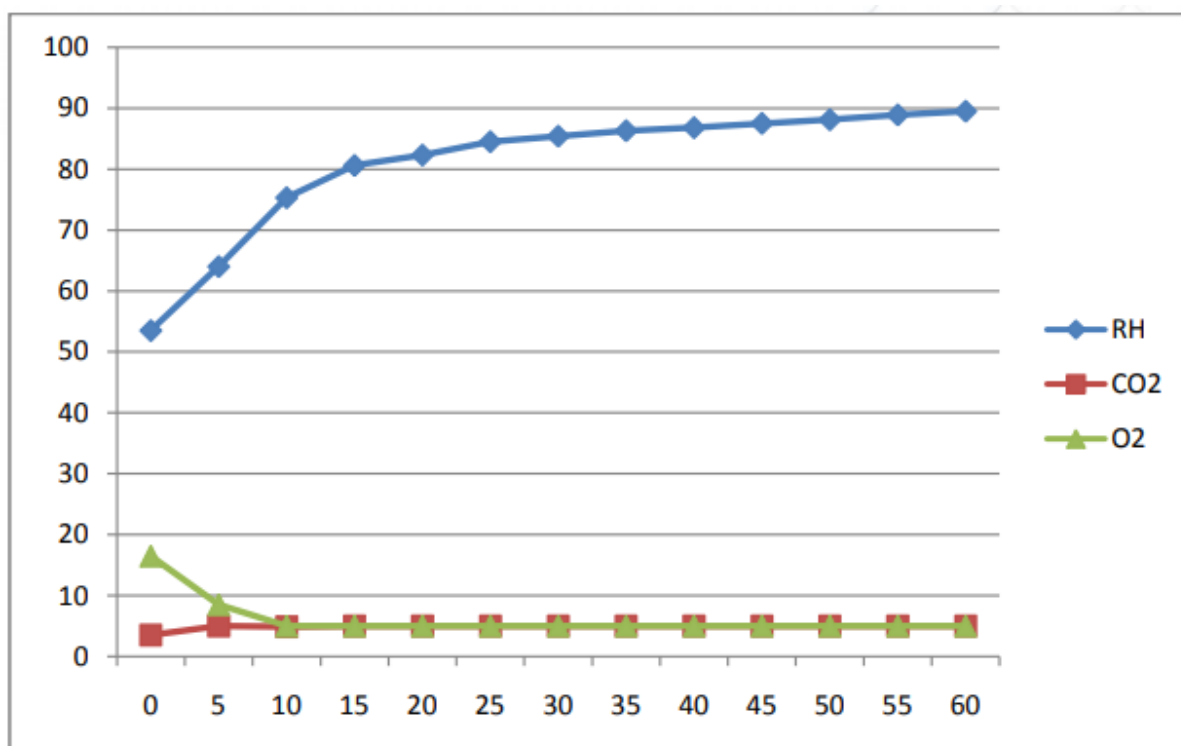


Figure 1. Performance test of Esco CO<sub>2</sub> Incubator with Suppressed O<sub>2</sub> in 20°C ambient temperature

2) Recovery Test

Table 1. 30 second door opening recovery in 20°C ambient temperature

Time (minutes)	RH (%)	CO <sub>2</sub> (%)	O <sub>2</sub> (%)	Temperature (°C)
Initial	99,0	5,0	5,0	37,0
0	55,5	4,5	16,3	36,0
5	74,3	4,9	8,4	36,6
10	83,5	5,1	5,0	37,1
15	88,6	5,0	5,0	37,4
20	90,8	5,0	5,0	37,3
25	91,9	5,0	5,0	37,1
30	92,8	5,0	5,0	37,0
35	93,7	5,0	5,0	37,0
40	94,2	5,0	5,0	37,0

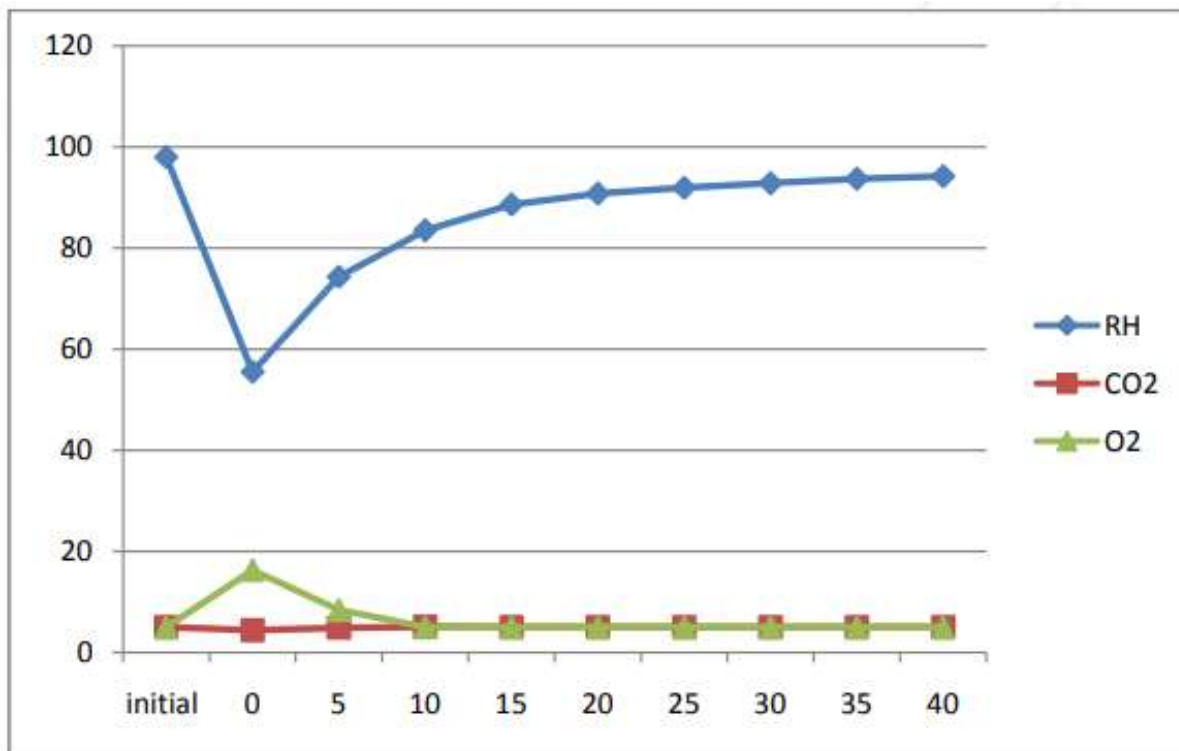


Figure 2. Recovery pattern of RH, CO<sub>2</sub> and O<sub>2</sub> after 30s door opening in 20°C ambient temperature

3) Condensation Test



Note: The CO<sub>2</sub> incubator run for 2 days and no condensation found

**2. 15°C Ambient Temperature**

1) Performance Test

Time (minutes)	RH (%)	CO <sub>2</sub> (%)	O <sub>2</sub> (%)	Temperature (°C)
0	59,5	3,8	14,5	36,0
5	74,8	4,6	7,8	36,6
10	80,7	5,0	5,0	37,0
15	85,1	5,0	5,0	37,1
20	85,9	5,0	5,0	37,0
25	86,6	5,0	5,0	37,0
30	87,3	4,9	5,0	37,2
35	88,2	5,0	5,1	37,1
40	88,8	5,0	5,0	37,0
45	89,3	5,0	5,0	37,0
50	89,8	5,0	5,0	37,0
60	90,1	5,0	5,0	37,0

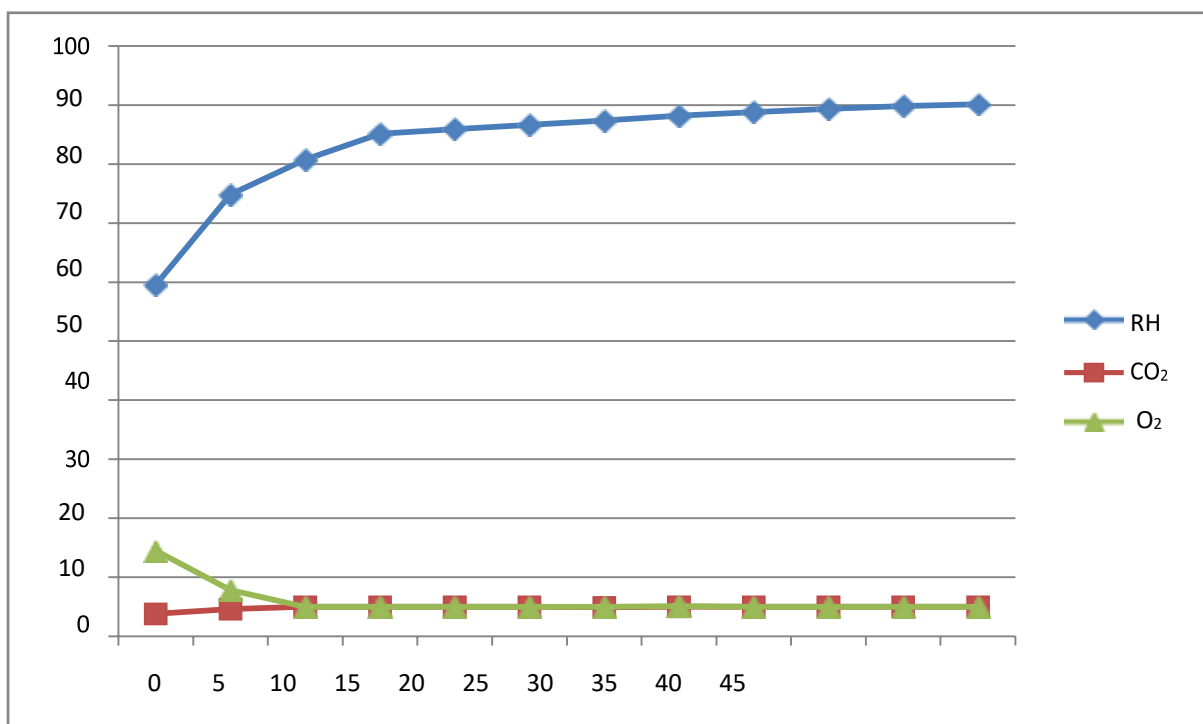


Figure 3. Performance test of Esco CO<sub>2</sub> Incubator with Suppressed O<sub>2</sub> in 15°C ambient temperature

2) Recovery Test

Table 2. 30 second door opening recovery in 15°C ambient temperature

Time (minutes)	RH (%)	CO <sub>2</sub> (%)	O <sub>2</sub> (%)	Temperature (°C)
Initial	91	5,0	5,0	37,0
0	46,4	4,5	16,5	36,5
5	64,9	5,0	8,7	36,8
10	74,4	5,0	5,0	37,1
15	80,0	5,0	5,0	37,3
20	83,2	5,0	5,0	37,1
25	85,3	5,0	5,0	36,9
30	87,1	5,0	5,0	37,0
35	88,2	5,0	5,0	37,0
40	88,9	5,0	5,0	37,0
45	90,0	5,0	5,0	37,0

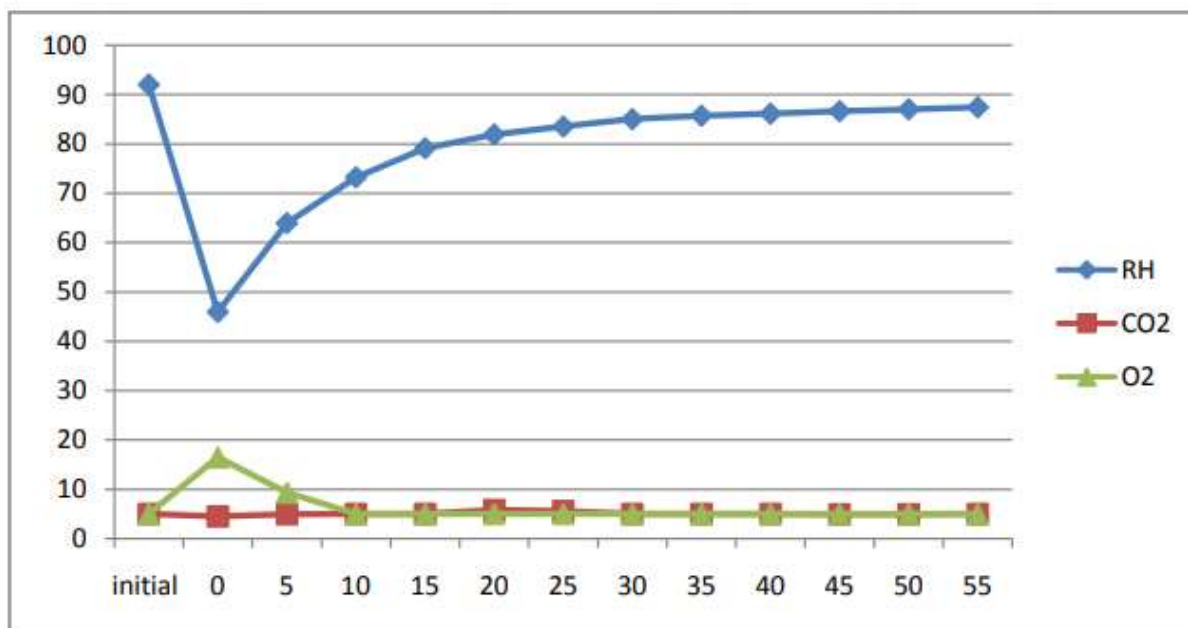


Figure 4. Recovery pattern of RH, CO<sub>2</sub>, and O<sub>2</sub> after 30s door opening in 15°C ambient temperature

3) Condensation Test



Note: The CO<sub>2</sub> incubator run for 2 days and no condensation found

3. 10°C Ambient Temperature

1) Performance test

Time (minutes)	RH (%)	CO <sub>2</sub> (%)	O <sub>2</sub> (%)	Temperature (°C)
0	43,5	4,5	15,8	36,2
5	61,5	4,9	8,2	36,6
10	69,9	5,0	5,0	37,1
15	74,9	5,0	5,0	37,1
20	77,6	5,0	5,1	37,2
25	79,4	5,0	5,0	36,9
30	81,0	5,0	5,0	37,0
35	82,0	5,0	5,1	37,1
40	82,6	5,0	5,0	37,0
45	83,5	5,0	5,1	37,0
50	84,1	5,0	5,0	37,0
60	85,5	5,0	5,0	37,0

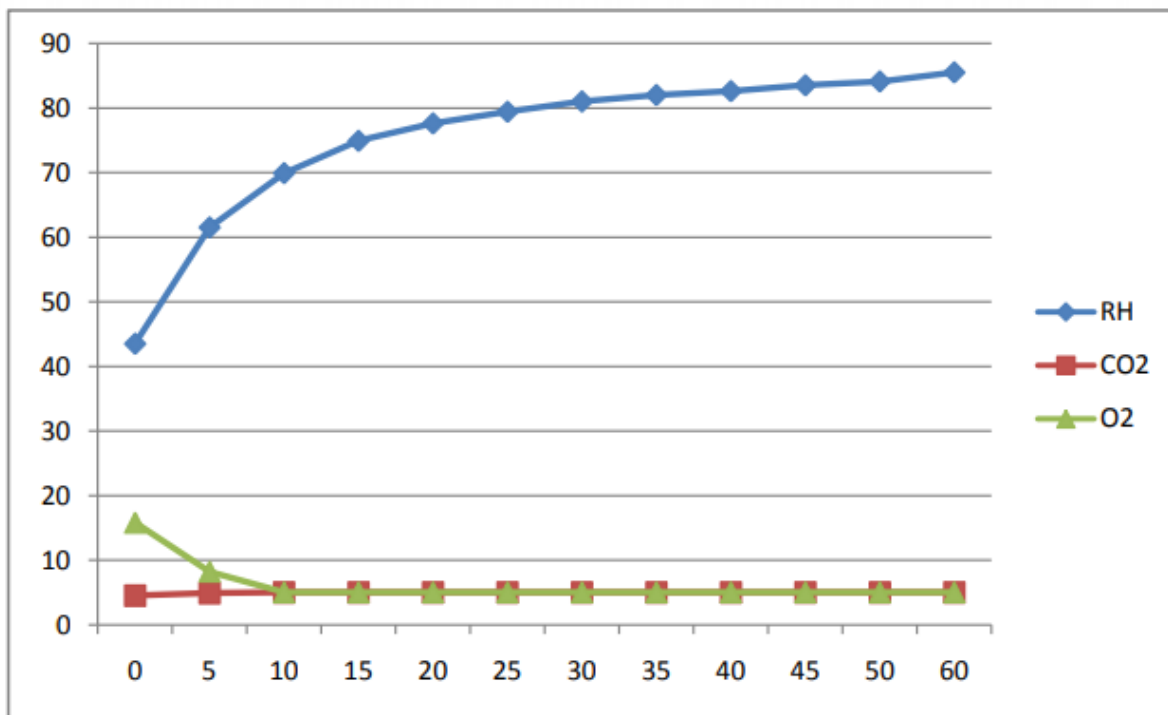


Figure 5. Performance test of Esco CO<sub>2</sub> Incubator with Suppressed O<sub>2</sub> in 10°C ambient temperature

2) Recovery Test

Table 3. 30 second door opening recovery in 10°C ambient temperature

Time (minutes)	RH (%)	CO <sub>2</sub> (%)	O <sub>2</sub> (%)	Temperature (°C)
Initial	92,0	5,0	5,0	37,0
0	45,9	4,5	16,5	36,8
5	63,9	4,9	9,3	37,1
10	73,2	5,0	5,0	37,0
15	79,1	5,0	5,0	37,1
20	81,9	5,8	5,0	36,8
25	83,5	5,6	5,0	37,0
30	85,0	5,0	5,0	37,0
35	85,7	5,0	5,0	37,0
40	86,1	5,0	5,0	37,0
45	86,6	4,9	5,0	37,1
50	87,0	4,9	5,0	37,0
55	87,3	5,0	5,0	37,0

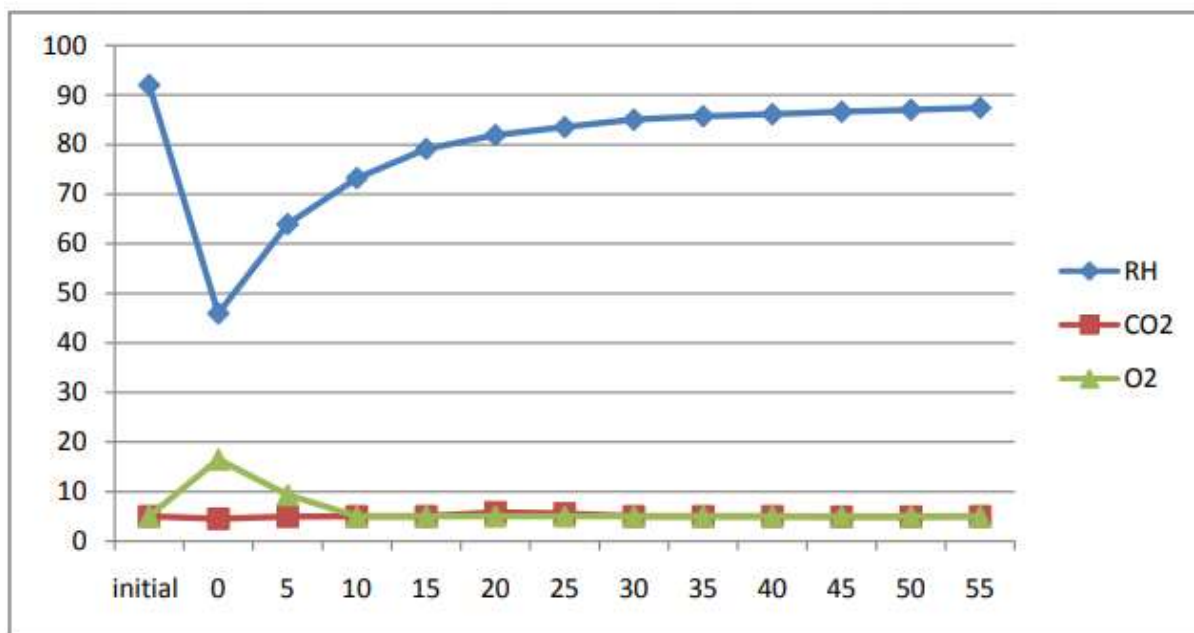


Figure 6. Recovery pattern of RH, CO<sub>2</sub>, and O<sub>2</sub> after 30s door opening in 10°C ambient temperature

3) Recovery Test



Note: The CO<sub>2</sub> incubator run for 3 days and no condensation found



**Summary :**

1. CO<sub>2</sub> Incubator does not show any condensation in low ambient temperature (the lowest temperature in this test was 10°C).
2. Recovery time for Humidity, CO<sub>2</sub>, and O<sub>2</sub> in 20°C ambient temperature is 40 minutes, 5 minutes, and 10 minutes respectively.
3. Recovery time in 15°C ambient temperature is 35 minutes for Humidity, 5 minutes for CO<sub>2</sub> and 10 minutes for O<sub>2</sub>.
4. Recovery time in 10°C ambient temperature is 35 minutes for Humidity, 5 minutes for CO<sub>2</sub> and 10 minutes for O<sub>2</sub>.
5. Overall, Esco CO<sub>2</sub> Incubator with Suppressed O<sub>2</sub> is able to perform well in low ambient temperature.