

TDS – Depth Calculation

1. Calculation of Depth of Sensors with Pressure Sensors:-

Sea level pressure – 1 bar

Pressure Change per 10 Meters: Rate of pressure change with respect to depth, expressed in bars per 10 meters (customarily set to 1.0 bar/10m)

$$\text{Depth} = \text{Pressure} * 10$$

Where:

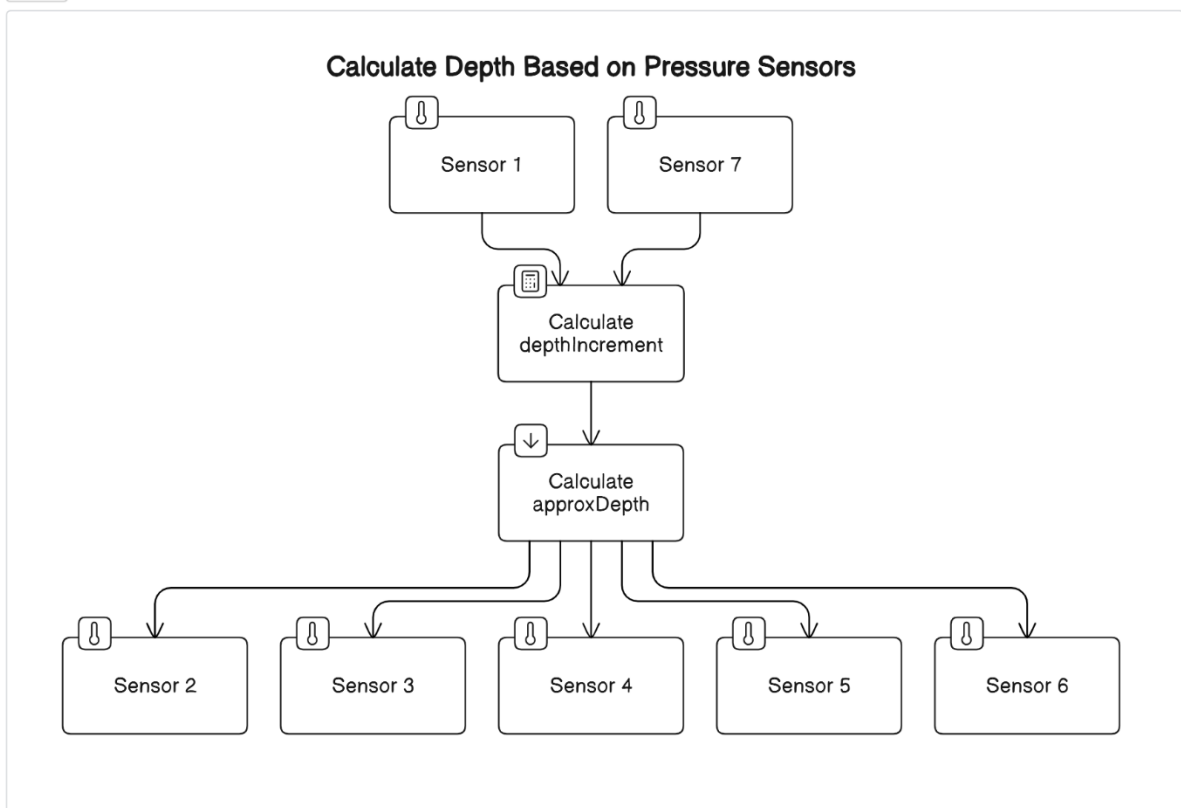
Depth: Depth in meters

Pressure: Pressure reading from the sensor in bars

Atmospheric Pressure: Atmospheric pressure in bars (typically around 1.01325 bars)

2. Calculation of Depth of Senors without Pressure Senosrs:-

Figure 1



Depth Increment Calculation:

Depth Increment = (ending Depth – starting Depth) / (number of Sensors Between + 1)

Approximate Depth Calculation:

approxDepth = startingDepth + (depthIncrement * j) // j -> slave index

endingDepth = depth of 2nd pressure sensor

startingDepth = depth of 1st pressure sensor

Examples:-

Case-A:

Sensors are in Straight line:

Total Distance Between sensor 1 and sensor 25 is 65 meters

For sensors between 1st and 7th:

Starting depth: Let's say the starting depth is X = 1 meter.

Ending depth: Let's say the ending depth is Y = 16 meters.

Number of sensors between 1st and 7th = 5 sensors

Depth increment: $(Y - X) / (5 + 1) = (16 - 1) / (5 + 1) = 15 / 6 = 2.5$ meters

Approximate depths for sensors 2 to 6:

Sensor 2: $1 + 2.5 = 3.5$ meters

Sensor 3: $3.5 + 2.5 = 6$ meters

Sensor 4: $6 + 2.5 = 8.5$ meters

Sensor 5: $8.5 + 2.5 = 11$ meters

Sensor 6: $11 + 2.5 = 13.5$ meters

This gives us the approximate depths for sensors 2 to 6 between sensor 1 and sensor 7.

For sensors between 7th and 13th:

Starting depth: 16 meters

Ending depth: Let's say the ending depth is 32 meters.

Number of sensors between: $13 - 7 - 1 = 5$ sensors

Depth increment: $(32 - 16) / (5 + 1) = 16 / 6 = 2.67$ meters

Approximate depths for sensors 8 to 12:

Sensor 8: $16 + 2.67 = 18.67$ meters

Sensor 9: $18.67 + 2.67 = 21.34$ meters

Sensor 10: $21.34 + 2.67 = 24.01$ meters

Sensor 11: $24.01 + 2.67 = 26.68$ meters

Sensor 12: $26.68 + 2.67 = 29.35$ meters

For sensors between 13th and 19th:

Starting depth: Let's say the starting depth is 32 meters.

Ending depth: Let's say the ending depth is 48 meters.

Number of sensors between: $19 - 13 - 1 = 5$ sensors

Depth increment: $(48 - 32) / (5 + 1) = 16 / 6 = 2.67$ meters

Approximate depths for sensors 14 to 18:

Sensor 14: $32 + 2.67 = 34.67$ meters

Sensor 15: $34.67 + 2.67 = 37.34$ meters

Sensor 16: $37.34 + 2.67 = 40.01$ meters

Sensor 17: $40.01 + 2.67 = 42.68$ meters

Sensor 18: $42.68 + 2.67 = 45.35$ meters

For sensors between 19th and 25th:

Starting depth: Let's say the starting depth is 48 meters.

Ending depth: Let's say the ending depth is 65 meters.

Number of sensors between: $25 - 19 - 1 = 5$ sensors

Depth increment: $(65 - 48) / (5 + 1) = 17 / 6 \approx 2.83$ meters

Approximate depths for sensors 20 to 24:

Sensor 20: $48 + 2.83 = 50.83$ meters

Sensor 21: $50.83 + 2.83 = 53.66$ meters

Sensor 22: $53.66 + 2.83 = 56.49$ meters

Sensor 23: $56.49 + 2.83 = 59.32$ meters

Sensor 24: $59.32 + 2.83 = 62.15$ meters

These calculations give us approximate depths for each sensor within the specified ranges.

Case-B:

Sensors are inclined:-

Distance between sensor 1 and sensor 25 is 50 meters

For sensors between 1st and 7th:

Starting depth(X): 1 meter

Ending depth(Y): 12.5 meters

Number of sensors between 1st and 7th : $7 - 1 - 1 = 5$ sensors

Depth increment: $(Y - X) / (5 + 1) = (12.5 - 1) / (5 + 1) = 11.5 / 6 \approx 1.9167$ meters

Approximate depths for sensors 2 to 6:

Sensor 2: $1 + 1.9167 \approx 2.9167$ meters

Sensor 3: $2.9167 + 1.9167 \approx 4.8334$ meters

Sensor 4: $4.8334 + 1.9167 \approx 6.75$ meters

Sensor 5: $6.75 + 1.9167 \approx 8.6667$ meters

Sensor 6: $8.6667 + 1.9167 \approx 10.5834$ meters

For sensors between 7th and 13th:

Starting depth: 12.5 meters

Ending depth: 25 meters

Number of sensors between: $13 - 7 - 1 = 5$ sensors

Depth increment: $(25 - 12.5) / (5 + 1) = 12.5 / 6 \approx 2.0833$ meters

Approximate depths for sensors 8 to 12:

Sensor 8: $12.5 + 2.0833 \approx 14.5833$ meters

Sensor 9: $14.5833 + 2.0833 \approx 16.6666$ meters

Sensor 10: $16.6666 + 2.0833 \approx 18.75$ meters

Sensor 11: $18.75 + 2.0833 \approx 20.8333$ meters

Sensor 12: $20.8333 + 2.0833 \approx 22.9166$ meters

For sensors between 13th and 19th:

Starting depth: 25 meters

Ending depth: 37.5 meters

Number of sensors between: $19 - 13 - 1 = 5$ sensors

Depth increment: $(37.5 - 25) / (5 + 1) = 12.5 / 6 \approx 2.0833$ meters

Approximate depths for sensors 14 to 18:

Sensor 14: $25 + 2.0833 \approx 27.0833$ meters

Sensor 15: $27.0833 + 2.0833 \approx 29.1666$ meters

Sensor 16: $29.1666 + 2.0833 \approx 31.25$ meters

Sensor 17: $31.25 + 2.0833 \approx 33.3333$ meters

Sensor 18: $33.3333 + 2.0833 \approx 35.4166$ meters

For sensors between sensor 19th and sensor 25th:

Starting depth: 37.5 meters

Ending depth: 50 meters

Number of sensors between: $25 - 19 - 1 = 5$ sensors

Depth increment: $(50 - 37.5) / (5 + 1) = 12.5 / 6 \approx 2.0833$ meters

Approximate depths for sensors 20 to 24:

Sensor 20: $37.5 + 2.0833 \approx 39.5833$ meters

Sensor 21: $39.5833 + 2.0833 \approx 41.6666$ meters

Sensor 22: $41.6666 + 2.0833 \approx 43.75$ meters

Sensor 23: $43.75 + 2.0833 \approx 45.8333$ meters

Sensor 24: $45.8333 + 2.0833 \approx 47.9166$ meters

These calculations give us the approximate depths for sensors between each pair of sensors.