



Performance of  
Various Forms of  
Dry Ice

**Jeff Russell**

## **Question:**

- Which dry ice lasts longer pellet block or HD dry ice?
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## **Hypothesis:**

- I think that the pellet dry ice will last the longest.
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## **Equipment and Material List:**

- 10 Temperature Data Loggers w/ Software (TempTale 4 - Sensitech)
- 9 Insulative Containers (Thermosafe #326)
- 9 Payload Boxes (Tharco M-497)
- 36 lbs Dry Ice Pellets (Airgas)
- 36 lbs Dry Ice Blocks (Airgas)
- 36 lbs High Density Dry Ice Blocks (Pacific Dry Ice)
- 1 Data Log Sheet
- 1 Scale (gram)

# Procedure

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1. Collect all materials.
2. Assemble all payload boxes and place temperature probes in same position in each box. Place inside insulative container.
3. Put equal amounts of dry ice (approx. 12 lbs) in each insulative container, close container, start temperature data logger.
4. Start ambient temperature logger.
5. Weigh each container and record the weight & temperature.
6. Repeat step (5) two times a day until temperature of all containers reaches the same temperature as the ambient temperature logger.
7. Analyze data.

## Results

- The data showed that the pellets had the lowest temperature, but dispersed (sublimated) the fastest, the HD dry ice blocks lasted longer than the pellets but not as long as the large dry ice block, and the large dry ice block lasting the longest.

## Conclusion

- I learned that the only variable between the different types of dry ice was the amount of surface area on each type tested. The more surface area you have the more heat energy can be transferred. The pellet ice had the most surface area so it melted (sublimated) faster than the blocks. The HD dry ice blocks had more surface area than the large dry ice block. The large dry ice block had the least amount of surface area.

## Follow-up Question:

- Which kind of dry ice will last longest in water?

# Payload



Test Probe



Placement in Container





# Pack Out



# Process



# Starting

Description	Supplier	Box #	Temp Probe #	Amount (Kg)	Box #	Temp Probe #	Amount (Kg)	Box #	Temp Probe #	Amount (Kg)
Pellet Dry Ice	Airgas	1	3740756289	5.07	2	3740756313	5.065	3	3740756315	5.06
12 lbs block Dry Ice	Airgas	4	3740756282	5.21	5	3740756263	5.055	6	3740756318	5.04
HD small block dry ice	Pacific Dry Ice	7	3740756244	5.075	8	3740756325	5.05	9	3740756288	5.07

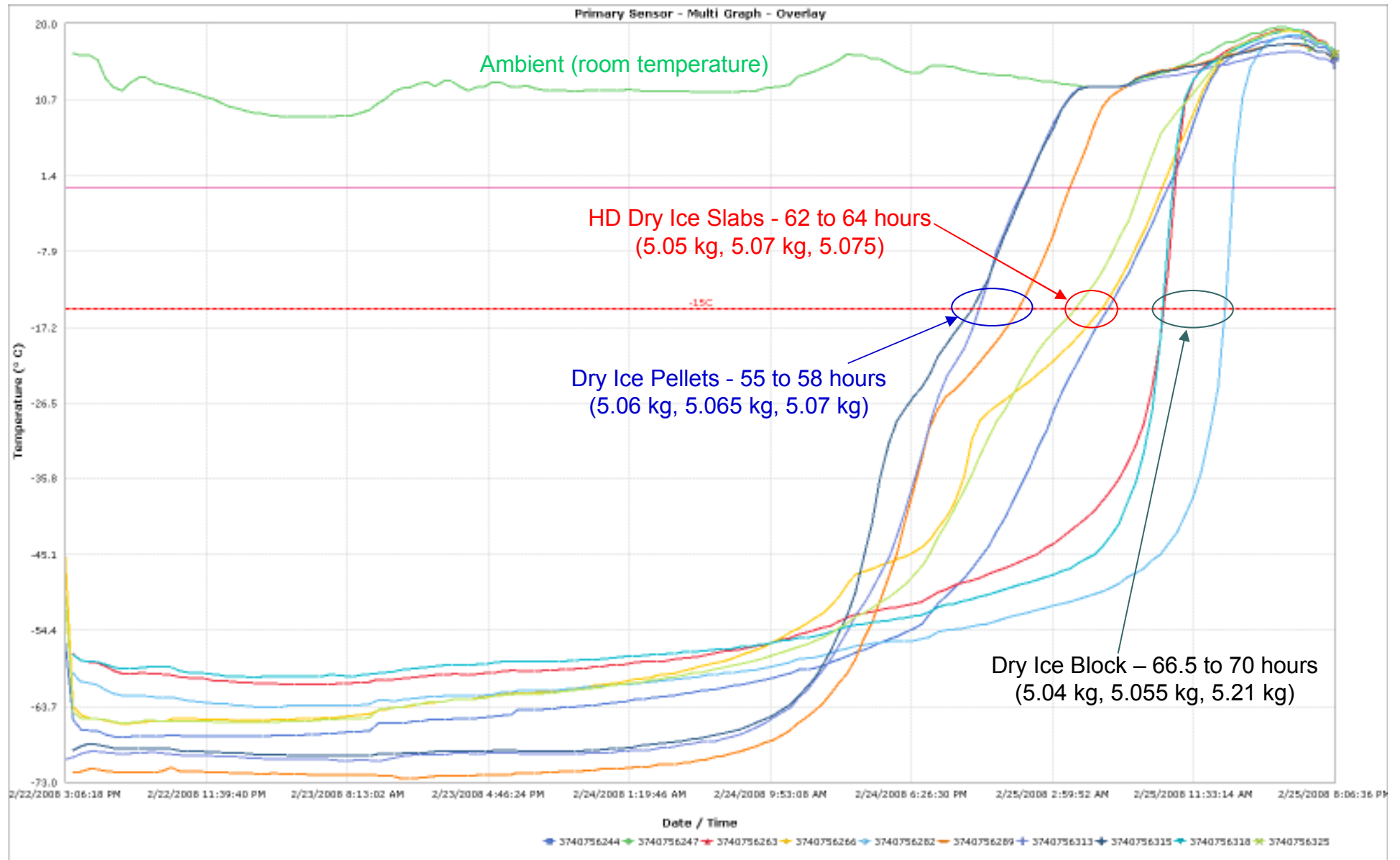
Test Setup



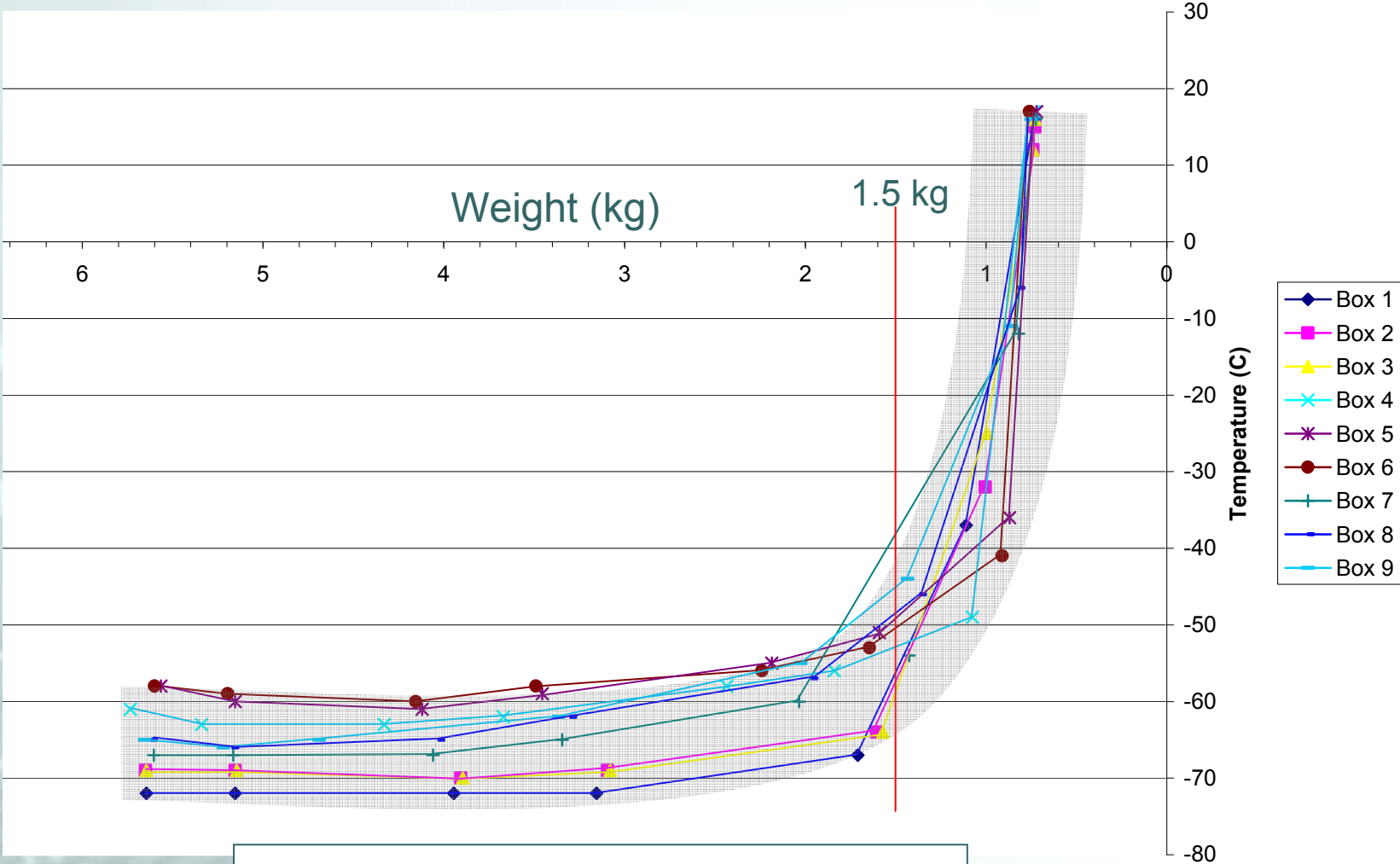


Test Payload: Tharco Mailer M-497  
Test Container: Thermosafe 326 (foam only)  
Temperature Probe: TempTale 4 - Sensitech

Date Range: Feb 22 – 25, 2008  
Technician: Jeffrey Russell  
Lab: Russell House



### Weight Loss to Temperature Change



All forms of Dry Ice loose their cooling performance around 1.5 kg