Cooling with Binary Ice

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Binary Ice (trade name of Cooltech, Germany)

Commonly called Slush Ice, Slurry Ice, Liquid Ice, or Pumpable Ice

Consists of small ice crystals (less than 1 mm diameter) suspended in water at about -3°C.

Typically ~25% ice in water with alcohol added (8%) to prevent the water freezing.

Uses the latent heat of ice (334 J/g) to cool as opposed to using cold water or ice slabs.

It is a Bingham Fluid.

A **Bingham plastic or fluid** is a viscoplastic material that behaves as a rigid body at low stresses but flows as a viscous fluid at high stress. It is named after Eugene C. Bingham who proposed its mathematical form. It is used as a common mathematical model of mud flow in drilling engineering and in the handling of slurries. A common example is toothpaste which will not be extruded until a certain pressure is applied to the tube. It then is pushed out as a solid plug.

Main Use

- Rapid cooling of fish in big trawlers using MW size machines and smaller units in shrimp fishing – produces a better product and premium prices.
- Cooling food quickly.
- Cooling display cases in large supermarkets.
- Air conditioning large areas.

OUR Interest

Cooling Targets and possibly Magnets.

A good coolant to use if low or no temperature rise is required.

We have purchased a machine from Cooltech in Germany.

It has been installed at the back of R65 next to the ISIS target test area.

Many thanks to Andrew Woods and his men for all their help.

We are currently learning how to operate the machine.


Ice making capacity 1 ton per day: 1000kg per day / 24 hour per day = 42 kg per hour

The Binary Ice Machine. The circulation pump and storage tank are not visible.


BINARY ICE PROJECT

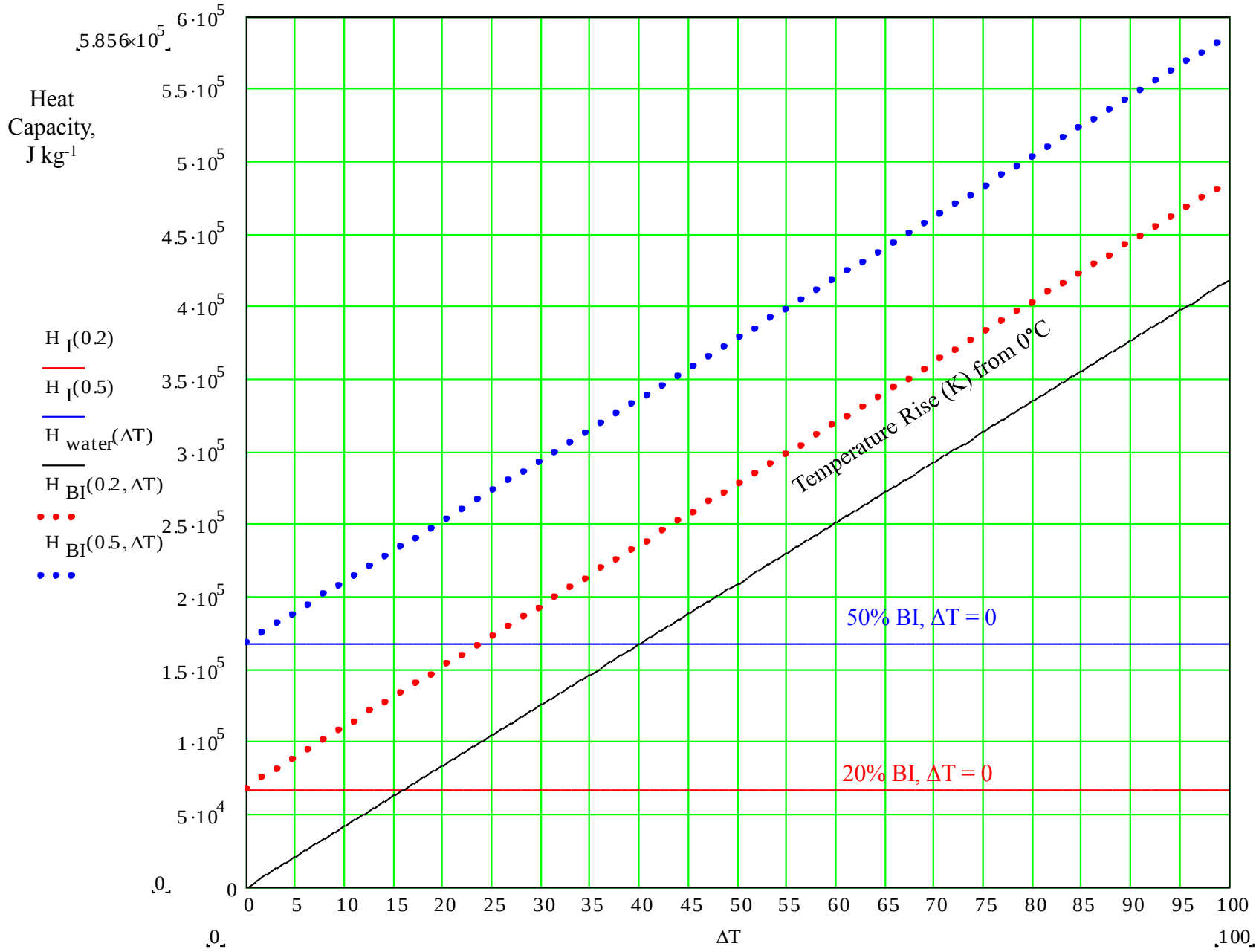


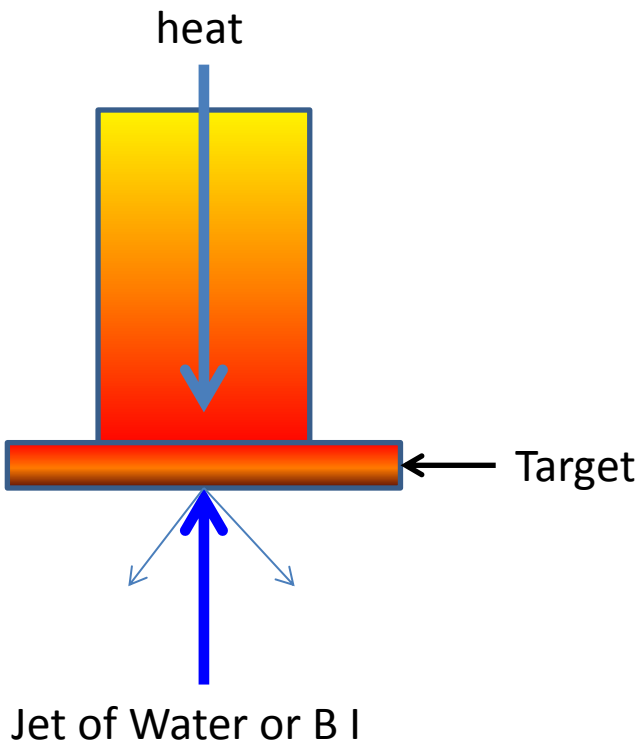
Figure 1. Heat capacity versus temperature rise.

The Tests at Cooltech on a submerged Jet Target for BNCT

We made tests at Cooltech using one of their Binary Ice machines.

The results showed no gain in cooling over the use of water.

WHY?



The Tests

1. How long does it take for the ice crystals to melt?
2. Try to change the geometry of the BNCT target to give the theoretical gain that is expected with Binary Ice.
3. Test for improvement with the ISIS Kicker Magnet.
4. Would Binary Ice be an advantage for other magnets?