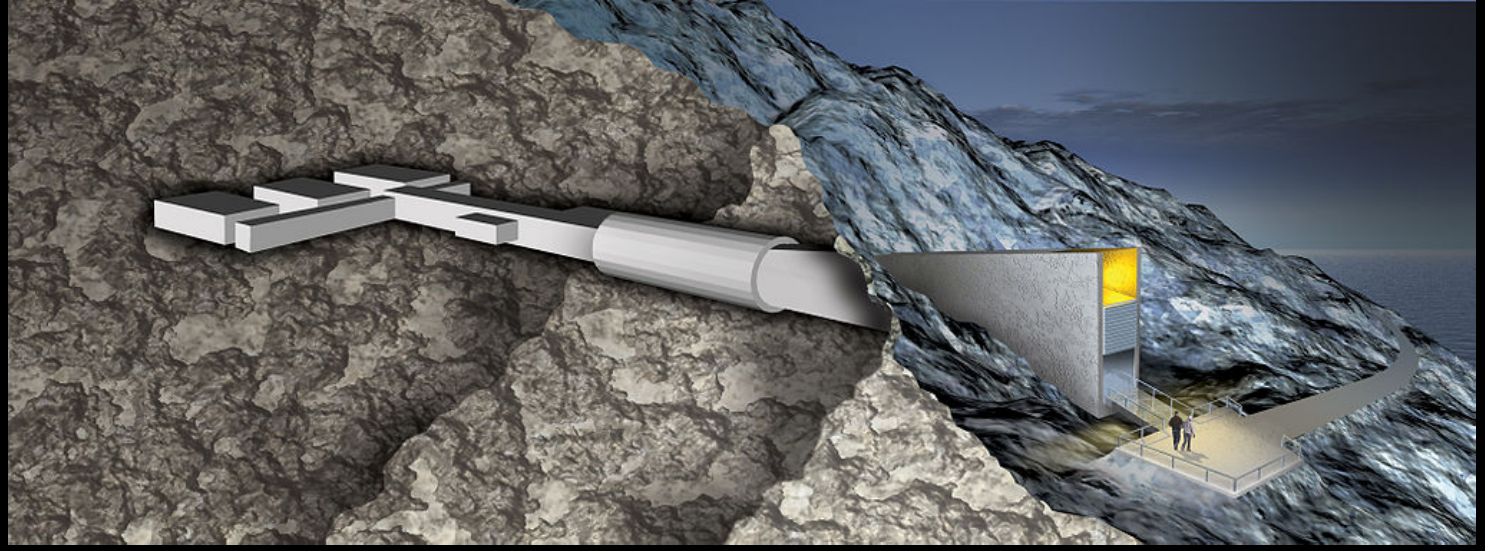
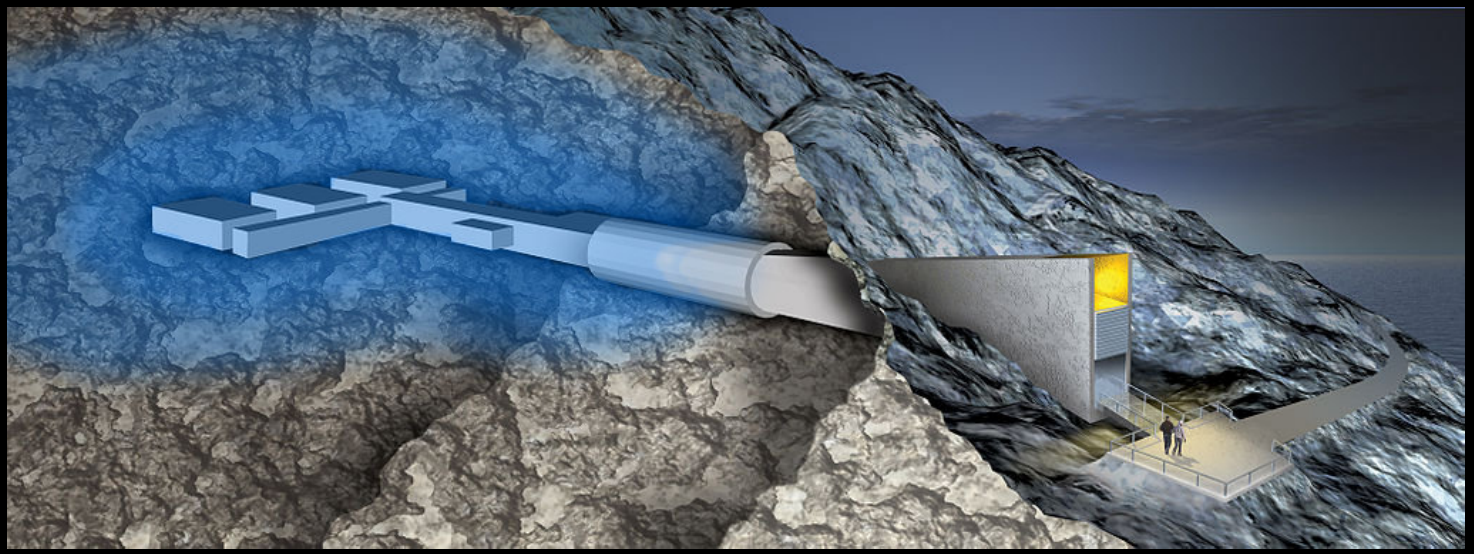

Cold storage


Svalbard
Global Seed Vault

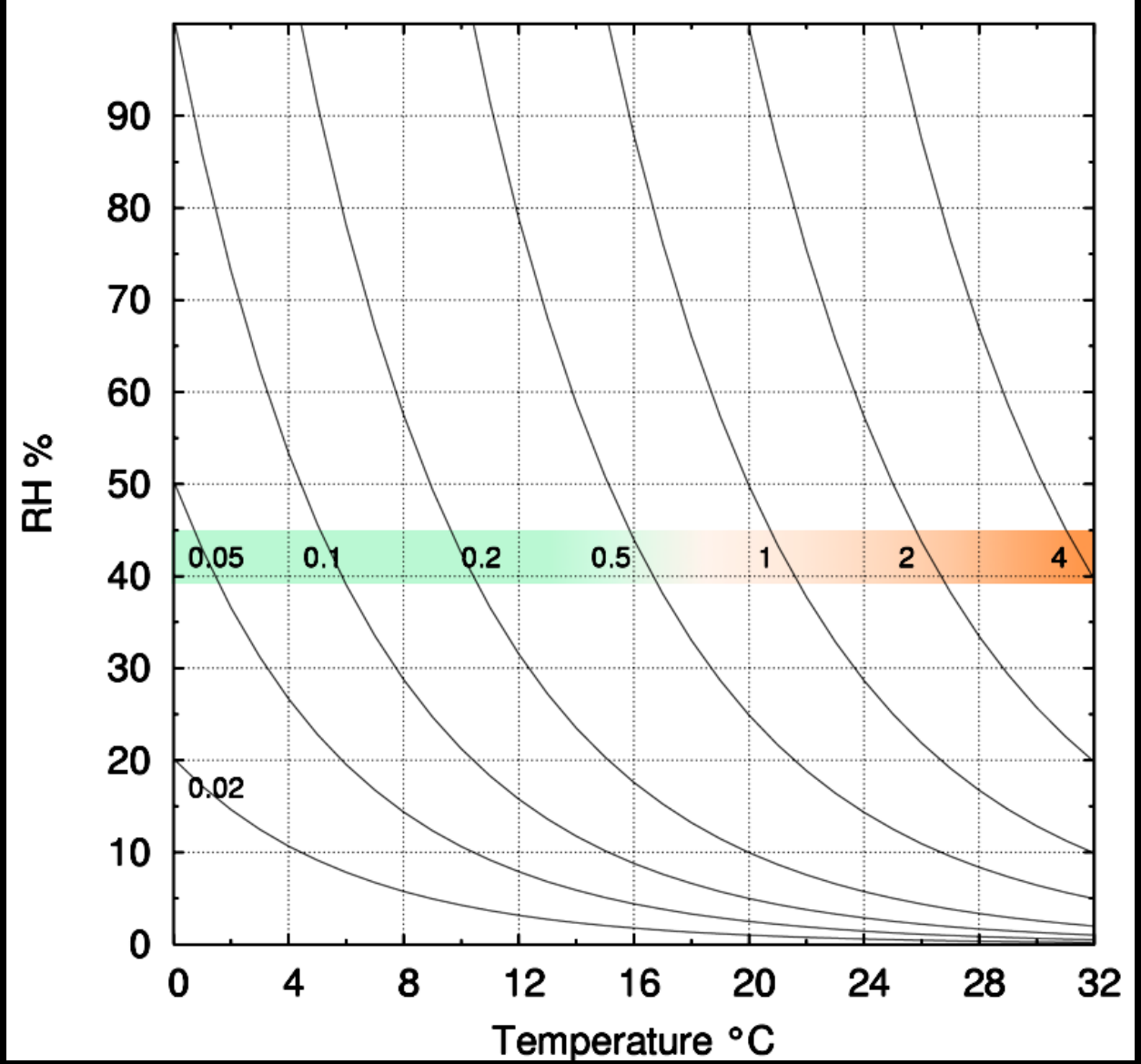


The ground is about -3 C. The vault is cooled to -18 C. After several years the temperature gradient is so small that there is little heat loss, even though there is no thermal insulation



The British Film Institute cold store at Gaydon

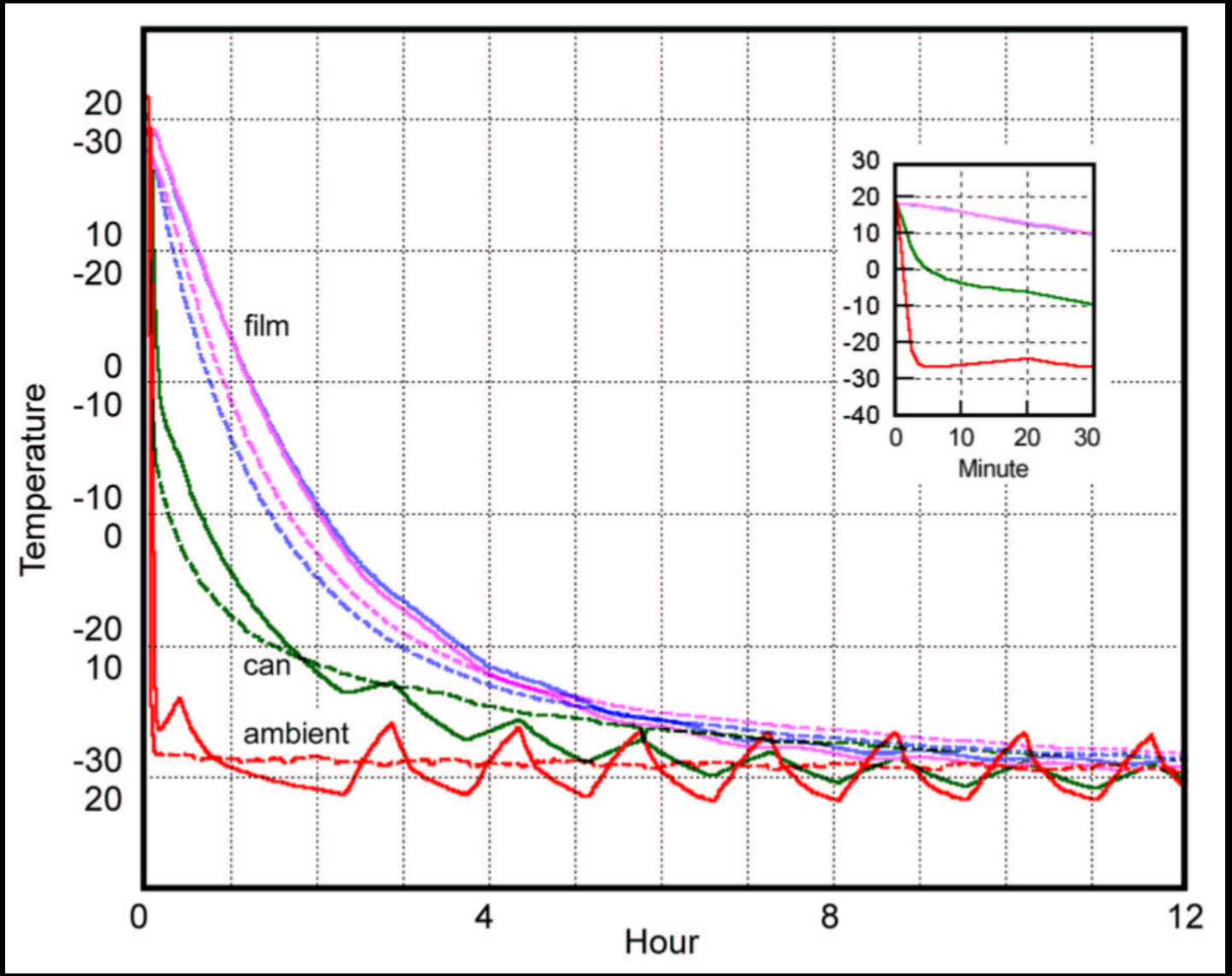
Unlike Svalbard, the BFI rests on a pile of gravel to avoid permafrost. These are the nitrate cells, with blow - out walls



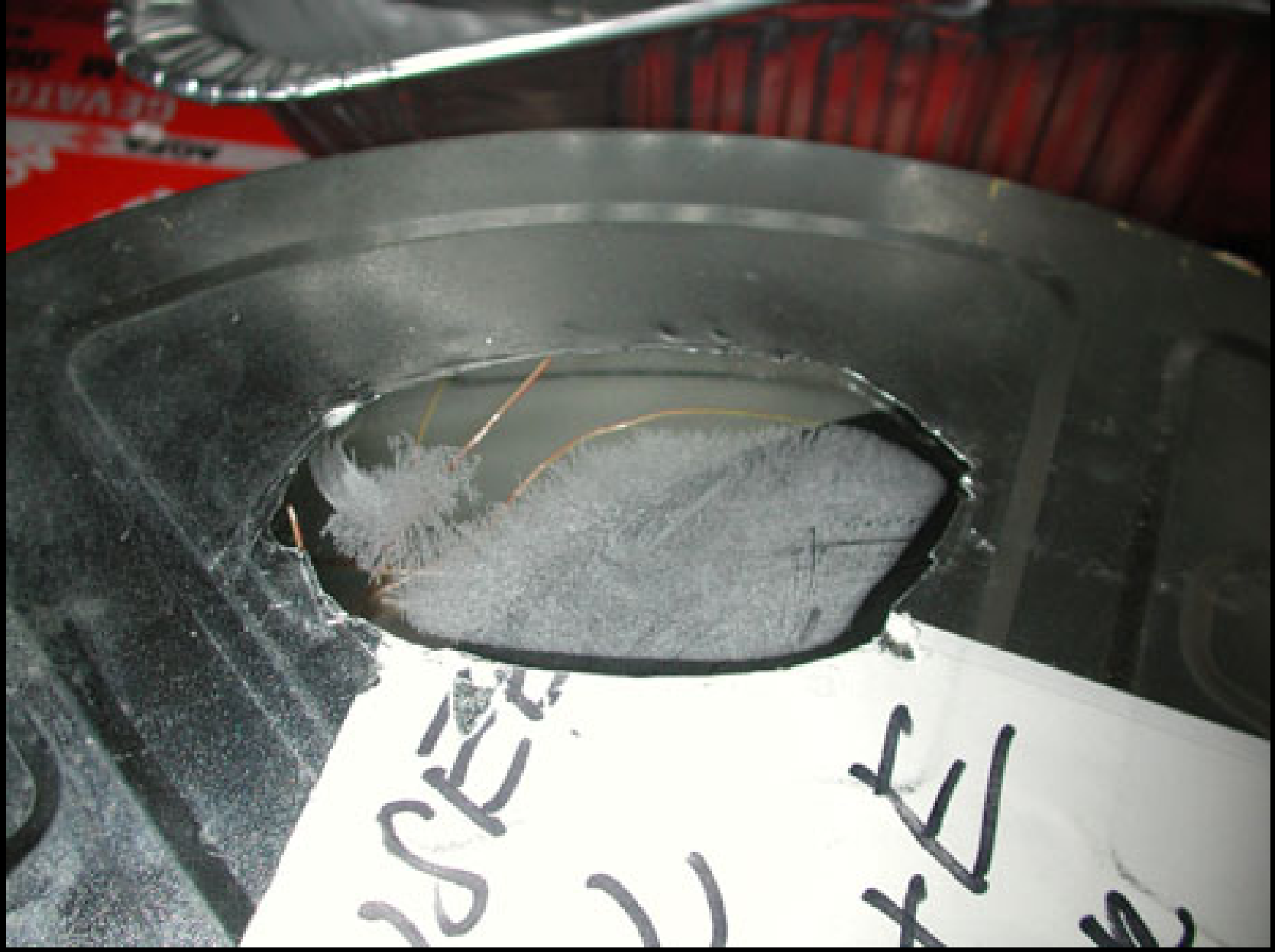
Lines of equal reaction rate for hydrolytic reactions

Low relative humidity only matches temperature reduction as a potent preservative when it is below 20%

What happens when a film can is put in a cold store?

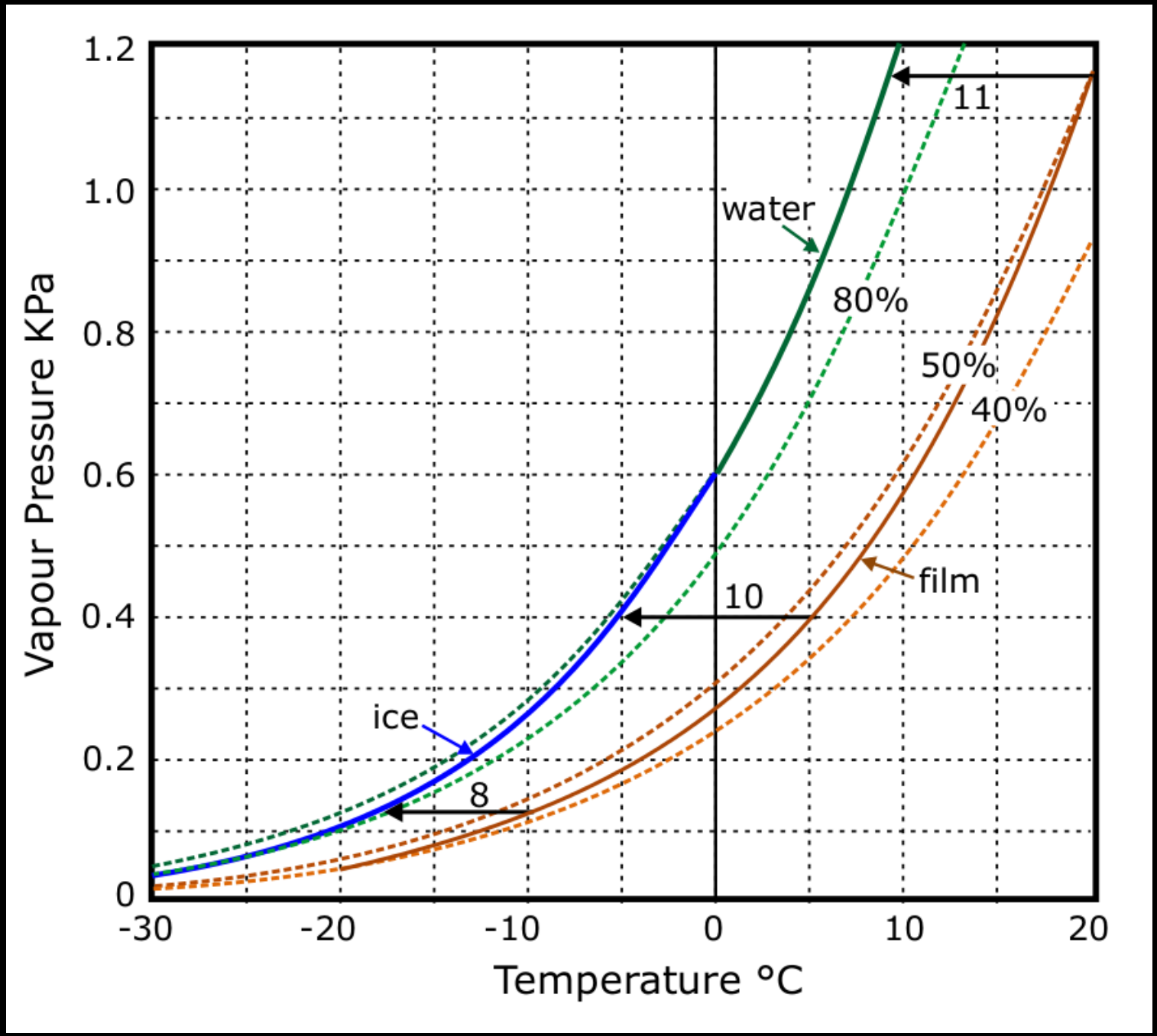


Notice that the can cools faster than the film



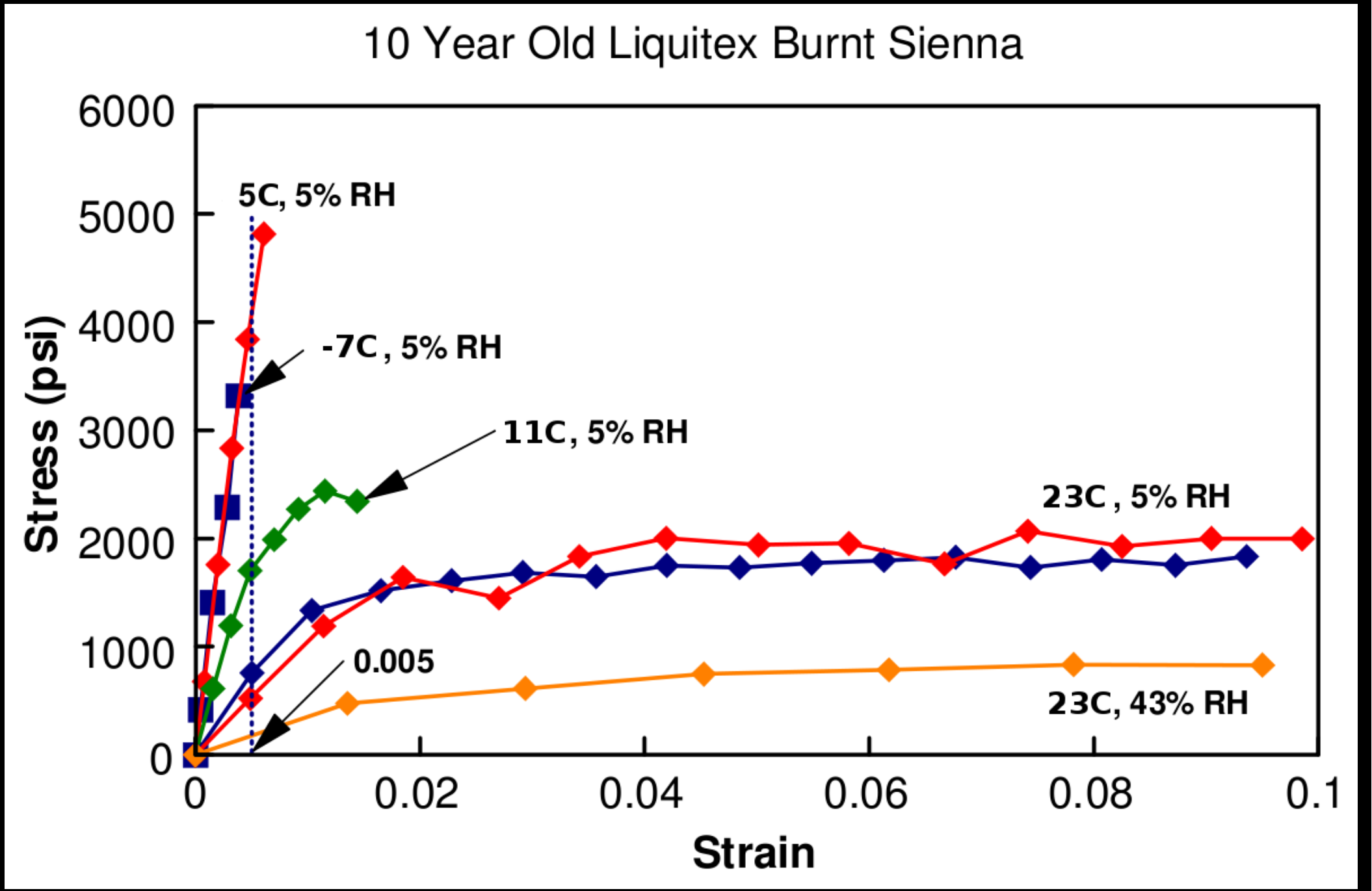
Moisture within the gelatin evaporates and condenses on the inside of the can

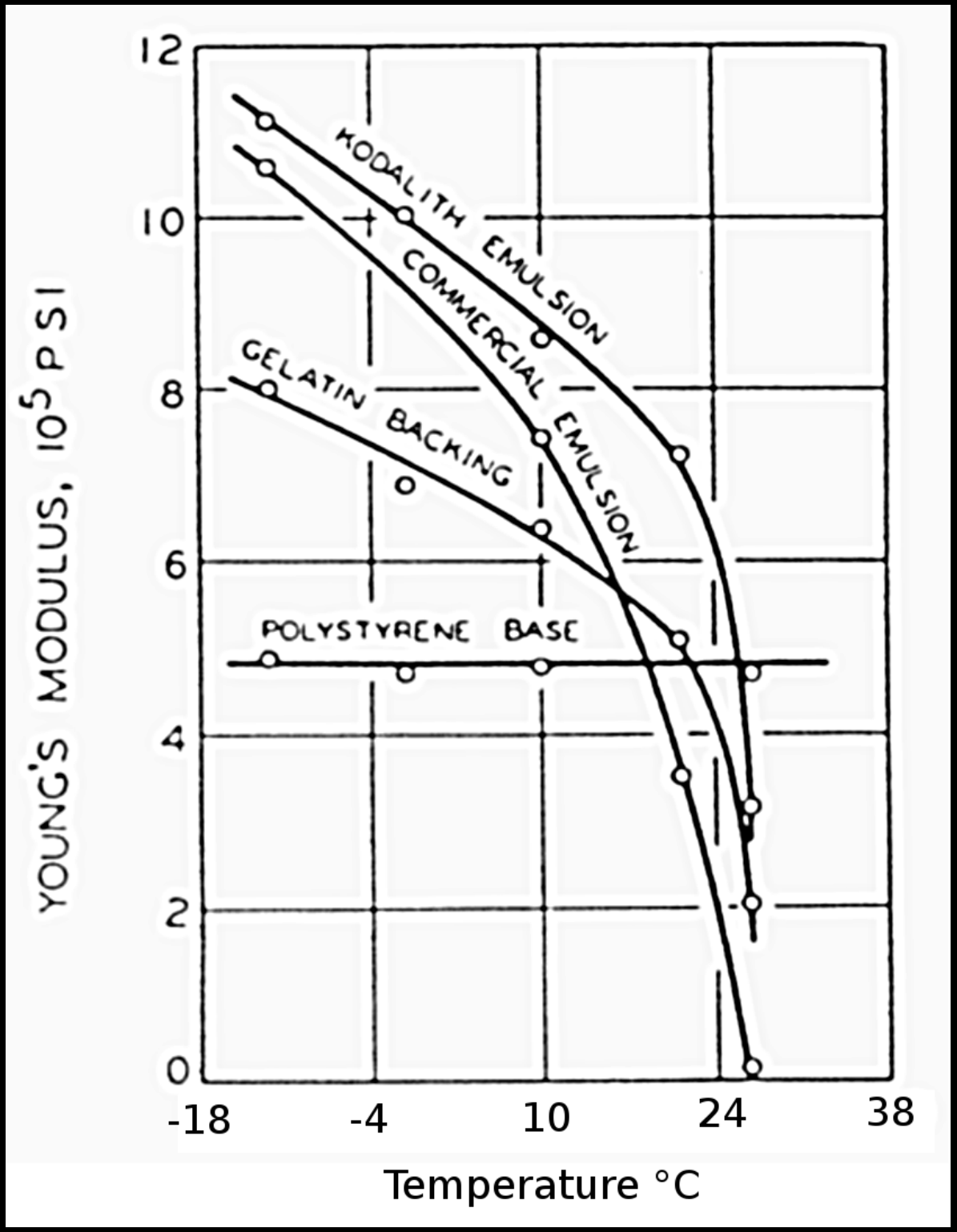
Two solutions



Any material equilibrated to 50% RH should be cooled so there is less than 8° temperature span within the container

But once it is cold - take care when handling it

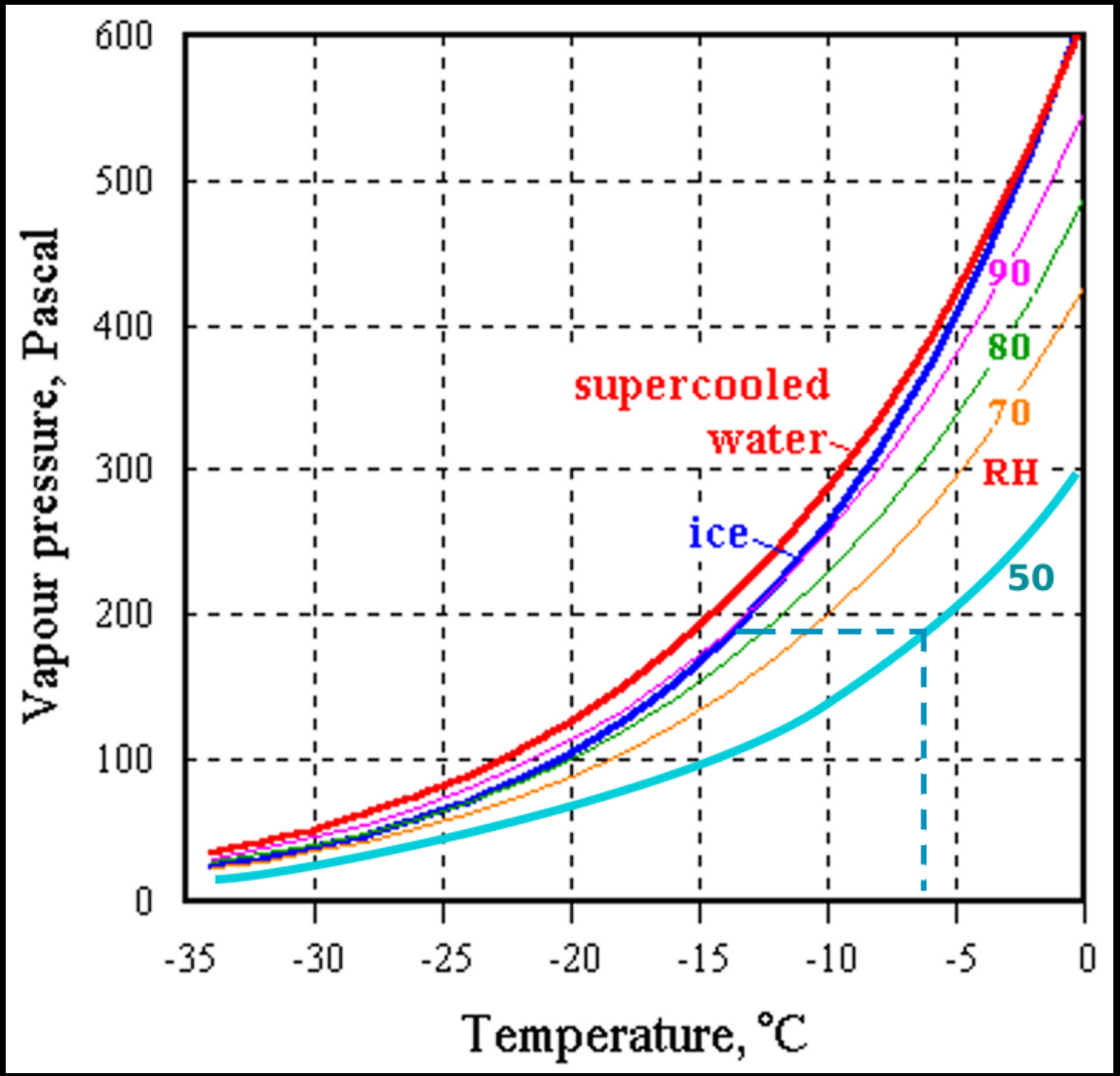




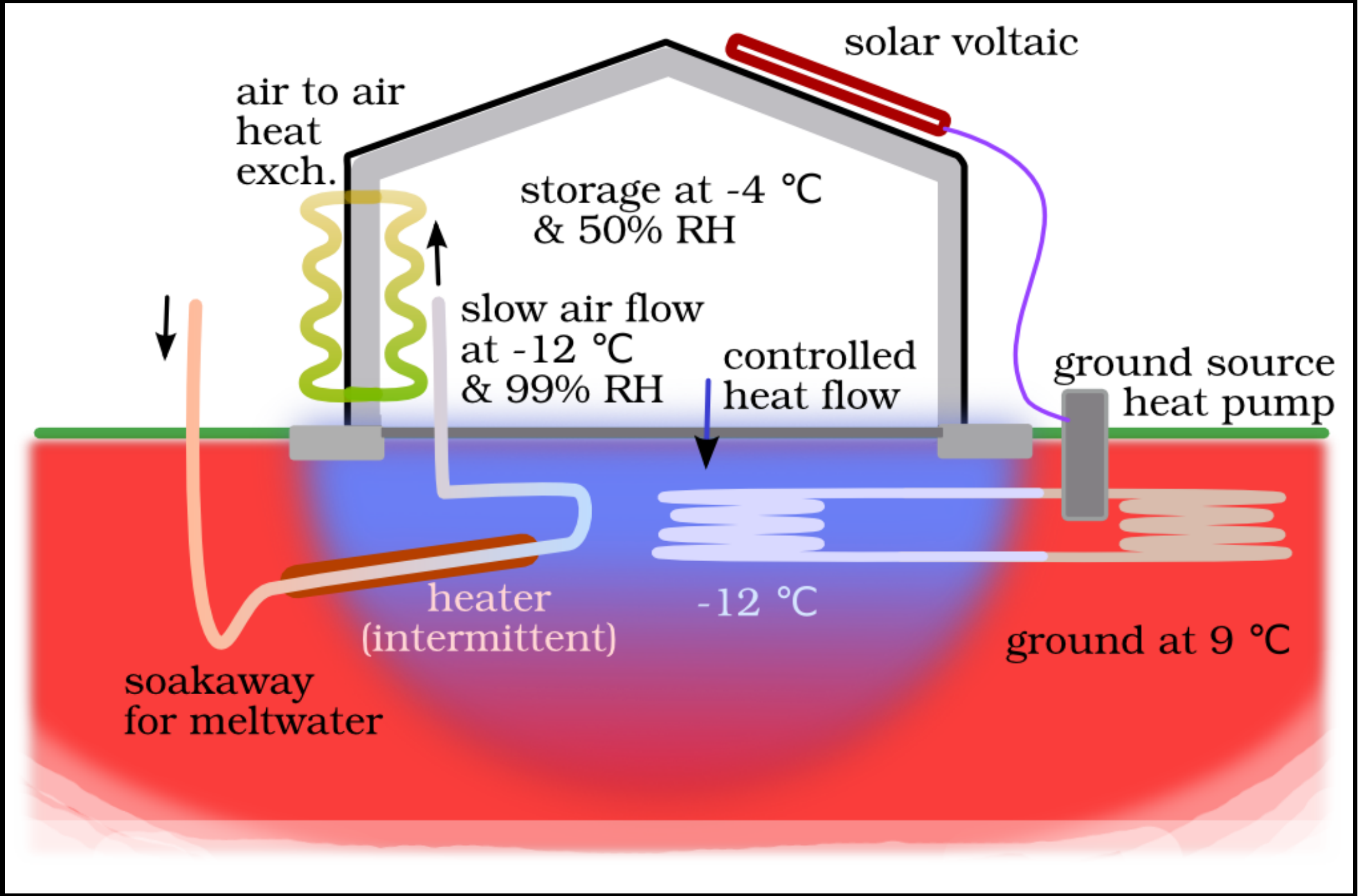
Film materials stiffen at low temperature, but not excessively.

This diagram is from Calhoun, who did pioneering work demonstrating the safety of repeatedly cooling and warming movie film.

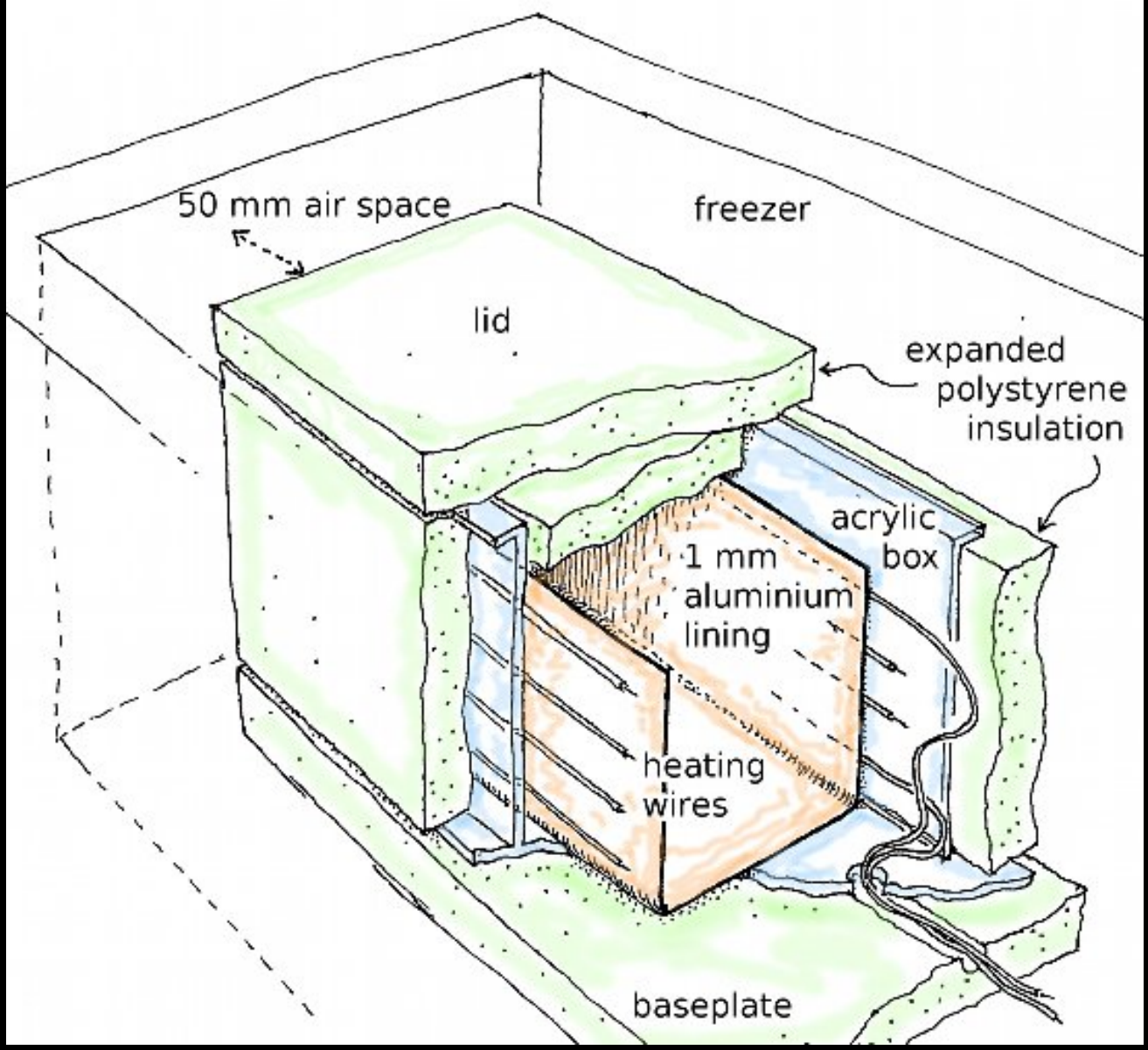
Cooling below the average ground temperature requires mechanical equipment. This is the roof of the Gaydon film store



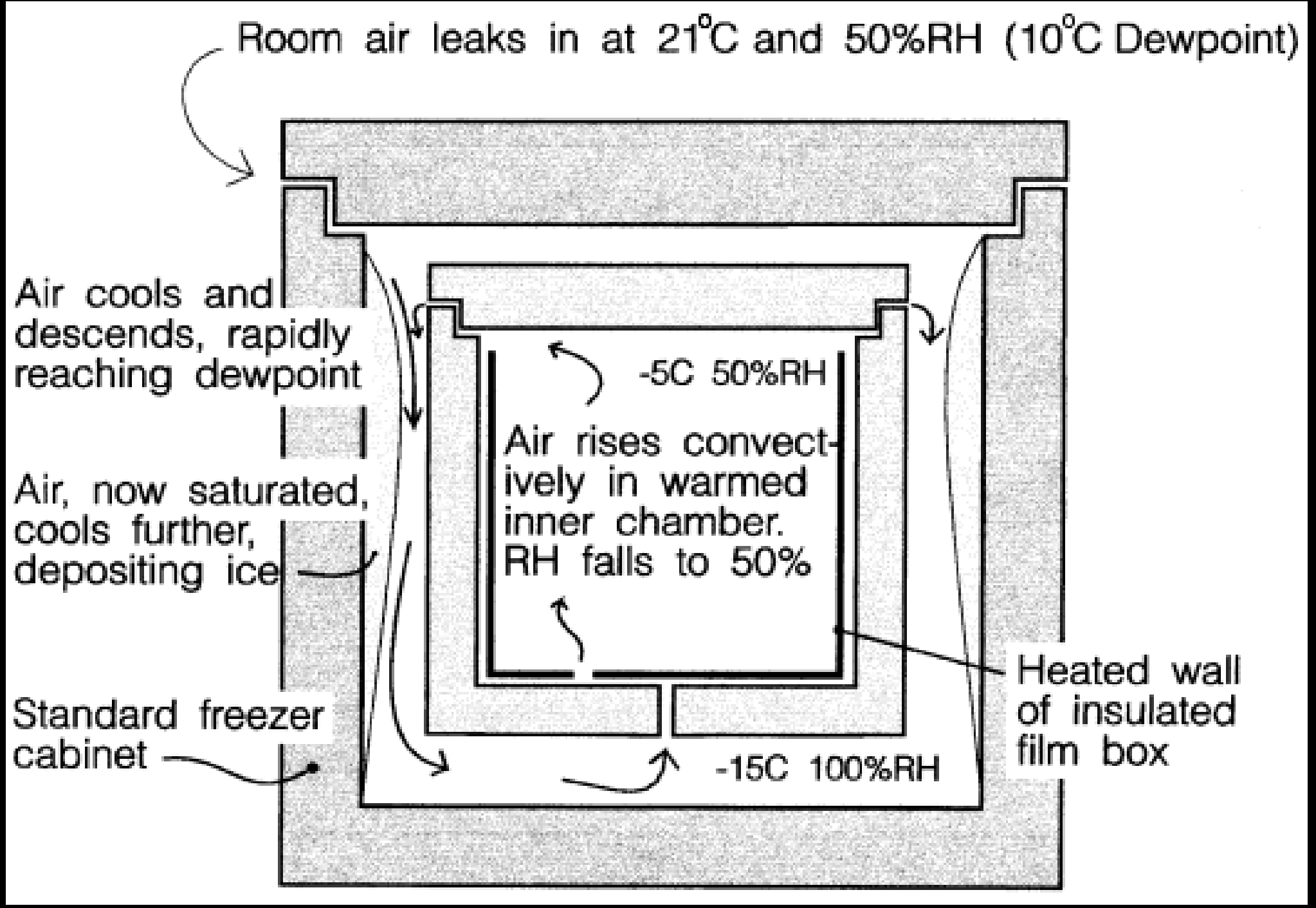
A reminder of how humidity control works - by overcooling air to condense water, then warming it up to reduce the RH. Ice complicates the picture, but the principle also holds good below zero degrees - a temperature which has no particular significance for materials in equilibrium with moderate RH.



There are low energy ways of keeping cool and dry



This "two temperature" solution can even be done with one temperature within the other, as in this small scale cold store with a heated, but still sub zero box, set within a colder box.



A cross section of the micro cold store

But cold storage brings other problems....

pause...