

HLWYM HEmails

From: Stuart Stothoff
Sent: Monday, January 30, 2006 5:04 PM
To: 'Dani Or'
Cc: Roberto Pabalan
Subject: RE: more information

Dani

Since this is a bounding calculation suggesting that there is no deleterious effect, some rough assumptions on source are made.

My impression is that the calculations assume that dust is blown in from the outside by ventilation over the decades of ventilation, keeping its load of salt intact. This might be where winter/summer comes into play(?) Once ventilation ceases, the repository heats up past the temperature of deliquescence (again the salt stays put, although presumably deliquescence would also occur during the heating stage <Bobby - is this the assumption? Wouldn't some deliquescence occur during heating that would move brine onto the waste package before largely drying out at high temperatures?>). Only upon cooldown in this calculation does deliquescence occur to potentially relocate hot brine from the dust layer to the waste package at temperatures significantly in excess of boiling.

I think that the hydraulic question is whether the hot brine will contact the waste packages - the slides suggest that the saturation will remain stable over time under vapor exchange with the drift. The corrosion issue is whether this would do anything even if it does contact the packages, but certainly corrosion picks up dramatically for hotter brines. And my question is if corrosion is of concern from initial redistribution during the heating stage (presumably this would become very concentrated at high temperatures but would have a very thin layer).

stu

-----Original Message-----

From: Dani Or [mailto:dani.or@epfl.ch]
Sent: Monday, January 30, 2006 3:17 PM
To: sstothoff@cnwra.swri.edu
Subject: RE: more information

I see, this is indeed quite different. I think that there is a growth factor missing from your calculations (such as found with droplets nucleating around aerosols...). This could transform nm size particles to micron size droplets (see attached). Even with the "story" in the very nice ppt presentation you sent - I am not sure how the unsaturated layer over the waste package is formed... So dust settles (probably not much salt - UNLESS there is concentration in the thermal region above, flux-reflux...) If the surface is already moist, the dust will be trapped by capillary forces, otherwise may be held by electrostatic forces for the dry scenario. Water periodically adsorbs or desorbs based on RH, temperature and present dust composition - then what is the question? Note that the winter-summer cycle in RH is totally unrealistic in the drift where water is supplied from the rock..

Dani

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Co-Editor: Vadose Zone Journal
www.vadosezonejournal.org

From: Stuart Stothoff [<mailto:ssstothoff@cnwra.swri.edu>]
Sent: Monday, January 30, 2006 9:42 PM
To: 'Dani'
Subject: more information

Dani

Bobby clarified the issue somewhat and gave me the attached files.

Apparently what is thought to happen is that there are particular thermal conditions that foster deliquescence, in which salt in dust causes water vapor to condense and dissolve the salt. This is supposedly a fairly rapid (e.g., hours) one-time process once onset triggers, although I am not clear on whether the ambient vapor supply might limit the process rate.

DOE suggests that this film of water that has quite rapidly formed will be retained in pendular form within the dust coating on the waste packages. My original understanding was that it was forming on rubble and trickling down to the waste packages. The concern is whether it will instead migrate from the dust to the waste and cause problems there.

This is a considerably different problem than I offered up first. I can see that capillary forces hold more water at grain-grain contacts than at grain-surface contacts, but it is not clear a priori whether capillarity would keep water away from the metal. If I read the problem correctly, the upper bound for dust deposition is 26 mg/cm² of package area, with total volume of water forming a layer of 1.8 micron. Assuming porosity of 30 percent and particle density of 2.6 gm/cm³, this is a layer about 14 micron thick with saturation of 0.42. I would presume that the saturation value is probably not dependent on layer thickness.

My instinct suggests that it is not unreasonable to expect a film of water to form on the metal under this situation, since capillary effects should have filled in the contact points to a large extent. As is pointed out on the slides, whether this is sufficient for corrosion to occur is a different story.

What say you?

stu

-----Original Message-----

From: Bobby Pabalan [<mailto:rpabalan@cnwra.swri.edu>]
Sent: Monday, January 30, 2006 1:22 PM
To: Stuart Stothoff
Subject:

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Recipients:
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Tracking Status: None
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