Alicia Mullins

From: Randall Fedors
Sent: Thursday, October 12, 2006 6:57 AM
To: 'Dani Or'
Cc: Chandrika Manepally
Subject: vapor diffusion

Greetings Dani,

I've been hearing the past week that the CNWRA wants to get you back working after shutting down consultants all summer. I hear you've been jet-setting as usual. All I get to go to is Las Vegas (poor me).

There is an issue that will come up next week at a meeting in San Antonio that I wanted to ask you about. The question revolves around relative humidity in the tunnels when the temperature has dropped below boiling. At what point will liquid water (other than deliquescence) remain on the waste package when dripping occurs. I think the issue revolves around how much evaporation can occur when the relative humidity is likely very high. The relative humidity should be high because the temperature is dropping. The drift wall should be the source of the moisture to maintain relative humidity in the drift. The drift wall temperature should be fairly close to that of the waste package when the temperatures are dropping below boiling. The temperature difference is something we have to look more closely at, because our old modeling provides temperature differences of a degree or two, and on up to 5-7 degrees celcius. Chandrika can check on our CFD model results to see how much convection has equilibrated the temperature difference between the drift wall and waste package at locations below boiling.

My position now is that dripping on the waste package, when the waste package is below boiling temperature, will remain a liquid; i.e., evaporation is much less than the dripping flow rate. This is a defensible position, but some evaporation will occur no doubt.

The performance assessment staff want to lower the temperature at which liquid water can remain on the waste package because of the heat source. A gradient in vapor content is suggested, such that diffusion will keep the relative humidity near the waste package at some low value (low enough that evaporation dominates flow rate). This of course, suggest the easy approach is to estimate the relative humidilty and compare the evaporation rate with the flow rate. However, air flow can prominently dominate evaporation, as I am sure you would tell me.

We have not integrated models of in-drift gas-phase flow with our porous media flow models, something that might help clarify exchange of moisture.

So, until we do some work on the convection issue, and more work on refining the temperature difference, we are left to addressing the diffusion model presented by PA staff.

What are your thoughts on this? Do you have any insights that will straighten out my thinking?

Cheers,
Randy