Attachment II: Study on Permeation

The NPRM references data from California concerning the durability of surface treatments at page 53071. What follows are the comments made previously to EPA staff concerning the implications and conclusions that could be drawn from the CARB durability data:

> The recently published evaporative emission control proposal for marine and motorcycle systems endorsed fluorination and sulfonation surface treatments as an enabler to reduce permeation emissions. It cites to California tests on treated HDPE tanks as examples of demonstrated durability (67 FR 53071, in h. Low permeability fuel tanks). The NMMA is concerned that the agency is overstating the results of CARB's recent slosh test project on six lawn mower tanks.
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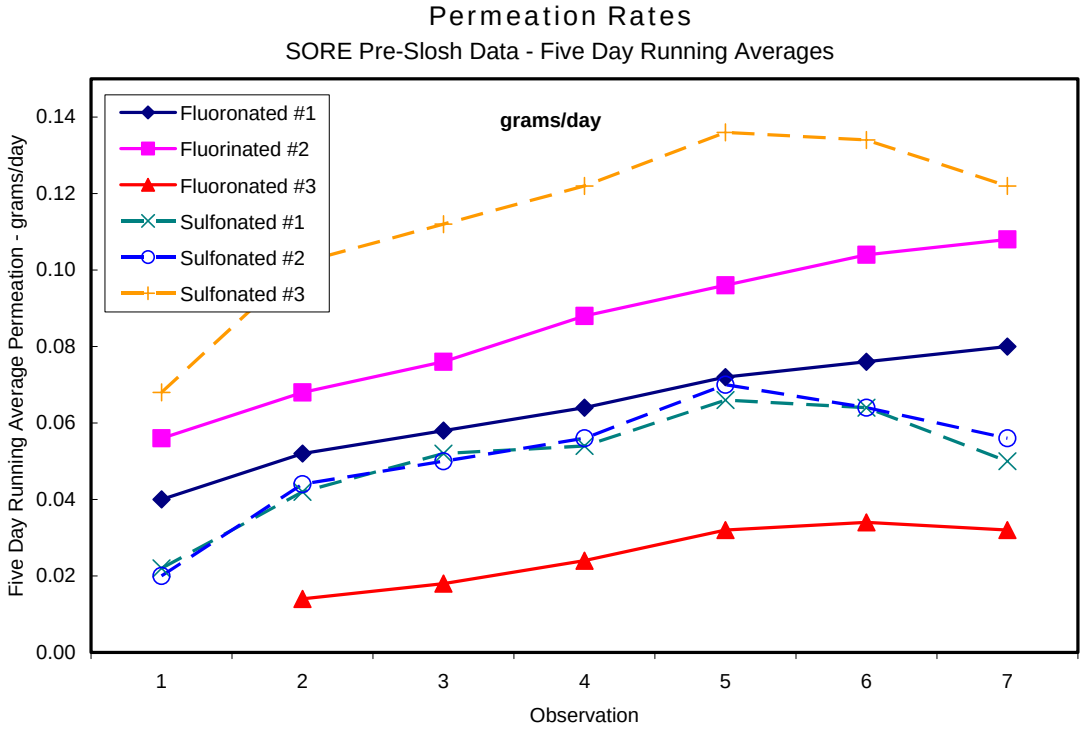
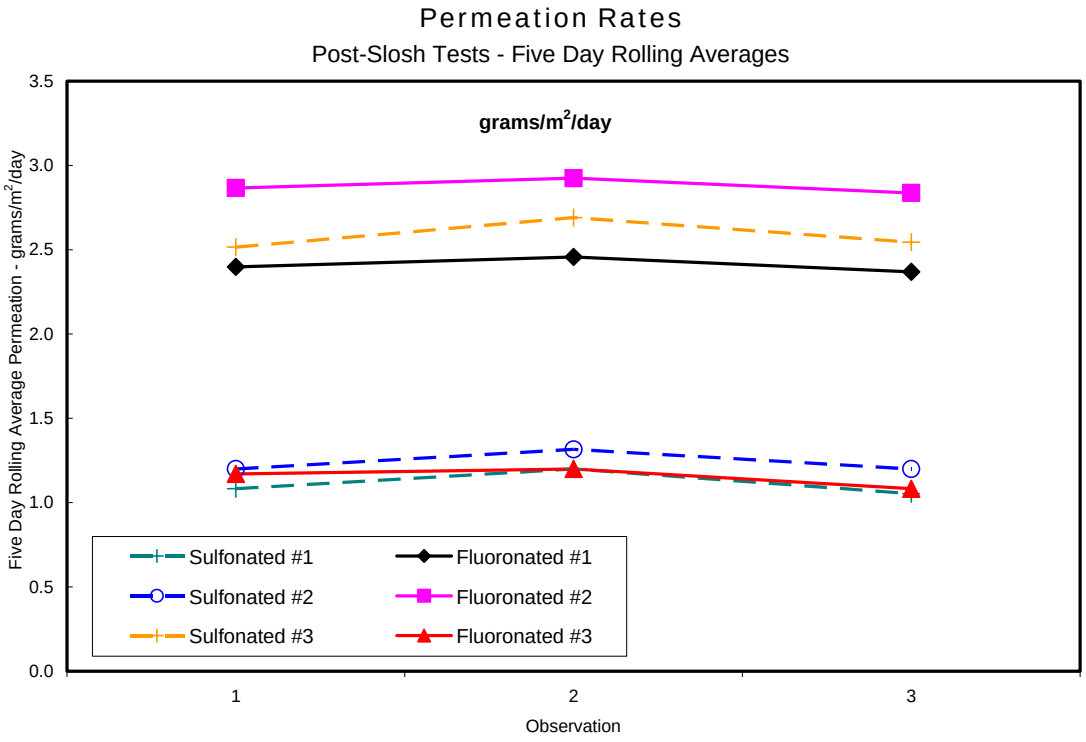
> The CARB project engineer shared his EXCEL spreadsheets with the daily details of the pre and post slosh weight loss. We have analyzed his data and sent him a brief critique. The following two pages are from the critique. I have added a third page that tries to put the post-slosh measurements into a grams per gallon per day perspective. I have also added comments on what I think are necessary proofs for a durability demonstration.



We took the pre-slosh data, and performed a 5-day running average from the first 5 days to the last five days, to see if the permeation had stabilized. The graph above

shows the results of the analysis. I used the grams/day vertical scale just to make it easier to correlate to your data sheet.

My concern is that two of the fluorinated tanks appear to be still increasing in average permeation. I also noticed that the sulphonated tanks appear to be decreasing for the last two observations? I concluded that the pre-slosh data was not stable, and should have continued until the permeation rate stabilized on all 6 tanks. If the permeation rate was decreasing, we should have had an explanation for that too.



The post-slosh data was analyzed in a similar fashion, using a 5-day running average. In that there were 7 days of data available (May 8-14), we had only three 5-day averages to examine. The plot above indicates that the post-slosh data was stable, at least for the short measurement period. I used the referenced surface area value to convert the post-slosh results to grams/M^2/day.

One concern for the post-slosh data is the wide divergence in the test results. Three tanks ranged from 1.1 to 1.3 grams/M^2/day. Three others ranged from 2.4 to 2.9 grams/M^2/day. One of the sulfonated tanks was in the high group, and one of the fluorinated tanks was in the lower group.

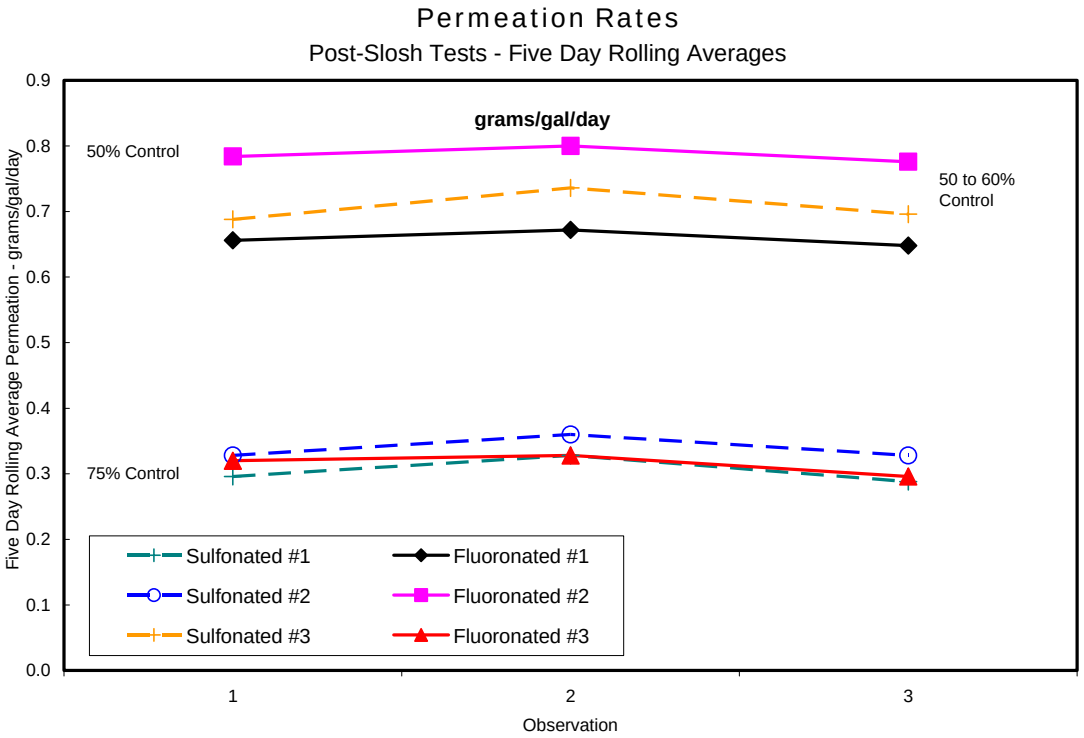
Is there any possibility that two of the tanks were misnamed? The data would make more sense if the three high ones were one treatment, and the lower values were the

other? If we can not answer this with high confidence, the results should be rejected, and the experiment re-evaluated, and probably repeated.

A second concern is that these data can not be used to support a 1.0 grams/M^2/day requirement, and not even 3.0 grams/M^2/day level. I feel that these tanks represented the best of all worlds for treatment, and evaluation. The tank treaters knew in advance that they were going to be evaluated, and the CARB staff ran the tests.

Concerning EPA

The tanks used for this evaluation were 1-quart capacity tanks. If we convert the permeation rate to grams/gallon/day, we get the post-slosh plot below:



The fluorinated #2 tank had the highest post-slosh permeation. It was 0.8 grams per gallon per day, or based on CARB's uncontrolled rate of 1.6 grams per gallon per day[1], had about a 50% control effectiveness.

[1] CARB's portable fuel-can rule established a base permeation rate of 1.6 g/gallon/day, based on their test results for untreated HDPE fuel cans.

Other factors beside simple one plane slosh can affect permeation. We have no data on the cumulative effects of:

- Long-term pressure-vacuum cycles with fuel in the tank
- Physical distortion caused by mounting stress
- High frequency vibration effects from the engine
- Elevated temperatures resulting from engine operation
- In-use fuel contaminants such as sour gas
- Exposure to ultra-violet rays (direct sunlight)

All of these, and more, must be evaluated before we decide we have established the durability, and the achievable control level, of a tank system.