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CHEMICALS AND PLASTICS • RIVER ROAD, BOUND BROOK, NEW JERSEY 08805

To (Name)	Mr. R. W. Lasher	Date	July 18, 1978
Division	Chemicals & Plastics		
Location	New York, N.Y.	Originating Dept.	Research & Development
		Answering letter date	
Copy to	Dr. C. N. Merriam - BB Dr. W. P. Miller - SC Mr. R. N. Wheeler - SC	Subject	VCM in Coatings for Potable Water Tanks

My recent accident, among other things, contributed to delay action on your request to update my February 2, 1978 Report on the subject. To refocus the problem:

1. There is a need, voiced primarily by the Sales Force, to have data available so that it may be handed out when opportune.

2. My February 2, 1978 Report was written for internal circulation only.

3. Subsequent work by R. J. Petrochko, considering a computer evaporation model, yielded numbers much lower than mine, which were obtained without consideration for evaporation.

To assemble all of this work in a self-contained unit, I suggest to issue it as a Technology Letter. The readership for this will be varied; some of our data will be more meaningful to one segment than for another. For this reason, I recommend to include in it:

a. The calculation shown in my Feb. 2, 1978 Report.

b. The Derivation of Equations written by B. Y. Hill, and transmitted to R. J. Petrochko by letter dated Feb. 24, 1978.

c. The calculations performed by Petrochko for the case of a water tank, dated March 21, 1978, taking into account the computer evaporation model.

d. Copy of C. M. Hansen's article published in JOCCA in July 77, which was attached to my Report.

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We are aware of the continuing work being done at Bound Brook to confirm experimentally the computer model. The outcome of this work, expected in the near future, could confirm or modify the calculations. In either case, a report of that experimental work could be included in the Technology Letter, if appropriate.

Due to the multiplicity of internal sources, it appears that the indicated objectives would be better served without assigning authorship in the Technology Letter. The attachment is a rough, unedited assembly of the mentioned sources, so that you may have a better idea of what the final product may look like.

Please let me know whether you agree with this outline, so that we may proceed.

Thomas Ginsberg

TG:jmd
Attachments (4)

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The paper, which is short and very readable, comprises two major portions:

1) A review of the author's earlier work on solvent evaporation from drying vinyl films, and

2) Application of the author's conclusion to the problem of VCM retention.

It is important to realize that these two phases were conducted with different vinyl products. In the first phase, our VYHH was used, and the product is cited by name in several occasions. The second phase was carried out with a commercially available paint, made with a vinyl resin of undisclosed origin, having 16 ppm VCM.

Because of the obvious linkage that the casual reader may see between VYHH and the resin in the commercial paint, Mr. Hansen was contacted for a clarification. The reply, shown in the attached letter, dispels any connection.

At any rate, Mr. Hansen reports in the following sections the extremely important finding that no detectable VCM was encountered even in cases where the paint was seeded with 4,000 ppm VCM. In the subsequent conclusions, he states that:

"The dry film will never contain significant amounts of VCM, because the relative volatility will be high regardless of the solvent used".

Hypothetical VCM Concentration in a Water Tank

Union Carbide vinyl resins are certified having less than 0.2 ppm vinyl chloride monomer. It is an interesting exercise to find out the effect that 0.2 ppm in the resin would have in a typical water tank situation.

To that effect, we have selected arbitrarily Vinyl System No. 4 of the American Water Works Association, which is based on the Department of the Interior (Bureau of Reclamation) Specification VR-3. Union Carbide's starting Formula Suggestion to meet that Specification is VP-3010.

For our calculations, we have taken the case of a one-million gallon water sphere. The following assumptions have been made:

1) The tank is painted with AWWA System No. 4.
2) The paint formula used is VP-3010.
3) The vinyl resin contains 0.2 ppm VCM.
4) None of that VCM evaporates during drying. (This, of course, has been disproven by Hansen)
5) All the VCM contained in the vinyl resin migrates at once in a single filling of the tank.

Calculations:

Volume of sphere:

$$V = \frac{4}{3}\pi r^3 = 4.189r^3$$

$$r = \sqrt[3]{\frac{V}{4.189}}$$

1,000,000 gallons $\cong$ 133,690 ft.^{3}

$$r = \sqrt[3]{\frac{133{,}690 \text{ ft.}^3}{4.189}} \simeq 32 \text{ ft.}$$

Surface of sphere:

$$S = 4\pi r^2 = 12.57r^2$$

$$= 12.57 \times (32 \text{ ft.})^2 \simeq 13{,}000 \text{ ft.}^2$$

1-mil coverage of VP-3010 : approx. 330 ft.^{2}/gal.
for 6 mils dry, coverage $\simeq$ 55 ft.^{2}/gal.
for 13,000 ft.^{2}, approx. 236 gals. of paint needed.
Paint (VP-3010) has approx. 1.4 lb. vinyl resin per gallon.
$\therefore$ 236 gals. paint have $\sim$330 lb. $\sim$150kg. vinyl resin.

If vinyl has 0.2 ppm VCM = 0.2 mg/Kg

$\therefore$ 150 Kg x 0.2 mg/Kg = 30 mg. VCM

1,000,000 gals. = 8,330,000 lbs. water $\simeq$ 3,778,500 Kg =

= 3,778,500,000,000 mg.

30 mg VCM

$$\frac{\text{3,778,500,000,000 mg. water}}{\text{[illegible] VCM}} \simeq 0.000,000,000,000,12$$

= **0.12 part per trillion**

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