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DISCUSSION OF PROPOSED CORROSION HAZARD ASSESSMENT WORK

I have had extensive conversations with Fred Clarke, Bill Abbott, Greg Smith and Caren Quisenberry regarding the subject project.

Fred Clarke (Benjamin/Clarke Associates) pointed out that combustion gas flows through the corrosion chamber (a lab desiccator) currently used in the NBS Cone Corrosimeter apparatus at the rate of 4.5 liters per minute, which produces one changeover every 2.5 minutes. (Space Velocity of 24/hr.). The gas that is trapped in the chamber for the 24 hour post-burn period actually is generated during the final 2.5 minutes of the 20 minute burn (For reference, the total output of the cone burner is about 24 liters per second). If the test material burns non-uniformally, the combustion gas at end may not be representative of the gas at the beginning.

To rectify this, Bill Abbott (Battelle) proposed using existing Battelle corrosion chambers of about 200 liter volumes. A partial vacuum could by pulled on a chamber before a burn started, and combustion gases could be metered and pulled into the chamber throughout the run. Muffin fans in the chamber would mix the combustion gas.

Under the current scheme, some combustion products are likely swept through the corrosion chamber. The new procedure alleviates this, and allows Clarke to make his corrosion hazard assessment. By generating data in the form corrosion/unit mass burned, Clarke can scale the results to fire models. An example could be a wastebasket fire igniting Noryl or PVC articles and then calculating relative amounts of resulting corrosion.

Separately, Rohrbach probes could be used to compare results from the new chamber to the old chamber. Combustion conditions could be altered to study those effects on corrosion.

Per Jim Hoover, DuPont is inclined to participate. DuPont has a spare NBS burner, which could be loaned to Battelle for this study. DuPont should pay for all extra polymers that it wants to provide and have tested.

Already we have pointed out some deficiencies in the NBS Cone Corrosimeter test. The Battelle Phase I and Clarke Corrosion Hazard Assessment work are new and necessary technical pieces. Together they will form another VI benchmark scientific work.

Regarding Battelle Phase II, speciation of the firegases, there have been recent advances in FTIR technology which could make this relatively straightforward. Nicolet contacted Greg Smith and Caren Quisenberry at Geon/BFG recently. Nicolet has adapted an FTIR to an NBS Cone Burner, with a prototype in operation at NIST and a second one planned soon for RAPRA in England. Abbott reported that the Battelle FTIR people can also do this work in Columbus, OH.

However, some GC/MS work is still required upfront to calibrate the system. Once calibrated, the FTIR can follow firegas concentrations throughout the burn generating new data.

According to Abbott and Clarke, the shortcomings with speciation are: some important, low level species will not be identified; and the corrosive effects of mixtures of gases are additive, if not multiplicative. [Compare to combustion toxicity where the effects of individual gases are not considered even additive with one another.] Thus, missing a small active component may leave an important gap in explaining the total corrosion picture. Nevertheless, speciating the combustion products from a material such as PE may show formation of formic and acetic acids, plus other components which can be quite corrosive, and thus dispel the notion that non-halogen containing materials should not cause corrosion from burning.

- A.J. Olson
3/12/93

REVISED CORROSIVITY BUDGET

1.	Battelle Phase I base cost - PVC, PE, Nylon - 200 liter corrosion chamber	$ 66,000
2.	Add Acrylic and Nylon	$ 10,000
3.	Cost of NBS Burner	$ 15 - 31,000
4.	Add Fluoropolymers ($ 5,000 ea.)	- 0 -
5.	Clarke's risk assessment (2 - 5 days at $1,000/day)	$ 6,000 max.
	Minimum cost to VI	$ 78,000
	Maximum cost to VI	$113,000

Notes:

1. Abbott agreed methodology stays the same
2. Abbott's estimate: $ 5,000/incremental polymer
3. DuPont may loan a spare NBS Burner
4. DuPont to pay for Fluoropolymers
5. Produces a hazard assessment comparing relative corrosivity to unit mass burned. Scaleable in fire models.

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