

Further Information about HDPE Mortars

K. L. Kosanke

Someone recently raised the question as to whether there could be potential problems with high density polyethylene (HDPE) mortars from contact with detergents and from exposure to sunlight. This article was drafted in response to a request to address those concerns and also to present an update on the status of acceptance of HDPE mortars by display companies and regulatory agencies.

With respect to HDPE and contact with detergents, it was suggested that some detergents may be capable of attacking HDPE. I knew of no such detergent and after checking with an expert in the field, Mr. David Tebeau of AFD, Inc., I still do not know of any such detergents. I do not feel there is any reason to avoid contact between HDPE and detergents; in fact most liquid detergents are packaged in polyethylene containers.

With respect to HDPE and exposure to sunlight, it was suggested that sunlight is capable of degrading the performance characteristics of HDPE. Specifically, it was suggested that while HDPE worked fine in England, problems related to sun damage might be encountered if it were used in the Middle East. First, as background, that component of sunlight that has the potential for damaging polyethylene is ultraviolet light. It should be noted that the transmission of ultraviolet light is mostly unaffected by cloud cover, and the ultraviolet exposure in both England and the Middle East will be much the same. While it is true that ultraviolet light will degrade unpigmented polyethylene, the material manufactured as general purpose pipe is strongly pigmented with carbon black to protect it from such degradation. The HDPE pipe used by the natural gas companies is only weakly pigmented with an orange colorant, yet the standard is to allow its use after 2 years of continuous exposure to sunlight. I would estimate that even a continuous 20 year exposure

of pigmented HDPE mortars would not be a problem.

With respect to the acceptance of HDPE by the fireworks industry, of the approximately 75 people that have provided feedback regarding HDPE mortars, only two have expressed significantly negative opinions.

The first, and most strongly voiced negative reaction, was from the owner of a display company that has recently invested very heavily in new steel mortars. His principal objection was that HDPE was not as strong as steel. This is true, but irrelevant providing HDPE has sufficient strength with the proper wall thickness. It is perhaps worth noting that many fireworks experts feel that a mortar should be only modestly stronger than is necessary to successfully launch the shells for which it was intended. This is because an overly strong mortar can contribute to the magnitude of the explosion in the event of a shell detonation within the mortar. It would be preferred if the gases produced by the detonating shell were safely vented at lower pressures from mortars that rupture without fragmenting. Another objection from this individual was because of his belief that the properties of HDPE varied significantly from batch to batch, which could make mortars unpredictable. This is not true, he is misinterpreting the data. There are several different HDPE resin types and their properties do vary significantly from one resin type to another; however, for a given resin type there is essentially no variation between batches. (Note that the preferred resin type is PE3408.)

The second negative reaction was from a co-operator of a display company who experienced difficulty in loading some types of shells into HDPE mortars. This was the result of the pipe used to make the mortars having an internal diameter less than called for in its specification. This can certainly be a problem as it is a some-

what common practice in the HDPE pipe industry. The industry controls the outside diameter of the pipe very closely, because of the method used to extrude the pipe. Then, in order to be certain that pressure ratings are met, there is a tendency to extrude the pipe with walls a little too thick, just to be on the safe side. The result is that the pipe is produced having an ID less than expected. This is not a problem for the vast majority of HDPE pipe users, but certainly can be a problem for users in the fireworks display industry. Thus when purchasing HDPE pipe it can be important to exactly specify the ID and wall thickness that must be met.

Finally, with respect to the acceptance of HDPE by regulatory agencies, their reaction has been cautiously positive. Both New York and

California, which have extensive state codes for fireworks displays, are allowing the use of HDPE mortars, at least on a trial basis while more field data is collected. The National Fire Protection Association, in their revision to the code for displays, will be including HDPE as an acceptable mortar type. However, the wording which had described HDPE (and paper) mortars as “generally considered not capable of producing dangerous flying debris” has been dropped. It was felt that this wording might cause some state regulators to become overly concerned regarding the use of steel mortars for displays.

All indications are that HDPE will be, or perhaps already is, the material of choice for display fireworks mortars.