Workshop on Fire Growth and Spread on Objects

Workshop Summary

During the final session of the workshop each presenter who was present was asked to provide a single impression or conclusion that they derived from the workshop. The following is a summary of these remarks.

Professor Yuji Hasemi
When trying to predict fire growth and spread it is critical to consider real materials (wood and PMMA are two typical examples), real behaviors and the fire scenario.

Professor Arvind Atreya
In order to develop better predictive capabilities for fire growth and spread it is critical that better models be developed for predicting the mass flux for the generation of gaseous fuels from solids. This requires a better understand of the pyrolysis processes that lead to gaseous fuel generation.

Dr. John de Ris
Dr. Sundstrom's description of how small changes in conditions in a room configuration can have a large effect on the outcome of a fire was very interesting. A room fire is complicated, and we have to respect this complexity.

Professor Patrick J. Pagni
Plots of heat release rate versus time for growing fires tend to have the same general shape (e.g., a t^2 curve). If allowed to grow unchecked, the fire will eventually reach flashover. There exist three approaches for mitigation: 1) detection followed by intervention, 2) controlling fuels to limit fire growth rate, and 3) controlling the ventilation to limit fire growth rate. Ventilation needs to be considered because it changes the rate of fire growth towards flashover. It should be kept in mind that each of the three strategies for limiting flashover can be effective on its own.

Dr. Richard E. Lyon
He seconds the comments of Pat Pagni. He feels that more effort should be given to developing a focused mission statement for the Reduced Risk of Flashover Program. As an example, when he considers fire in aircraft cabins, he wants to utilize materials that limit the fire growth and prevent flashover. What is the focus of the Reduced Risk of Flashover Program? Is the objective simply to do more research?

Prof. Charles M. Fleischmann
In mitigating flashover it is important to consider human factors. In New Zealand the poor, drunk, and children are most often killed. Improving furniture can make some reduction in fire losses. Is it possible to legislate these changes? He doesn't believe cost will be a limiting factor.

Professor James S. T'ien
He learned a lot and felt the workshop was worthwhile. It is obvious that computations have reached a point where they can be very useful for predicting fire growth and spread. With respect to flashover, it would be very useful to use the model to develop guidelines on how to modify material properties to reduce the chance of flashover.

Dr. Brain Lattimer
1. Test methods need to be developed that measure properties that differentiate between materials with regard to fire growth and spread.
2. More experimental data are required to validate models and confirm they are working as expected.
3. Models must be developed that engineers can routinely use. These should range from simple algebraic formulas to complicated CFD models that engineers can use to deal with the particular problem they face.

Dr. Archibald Tewarson
He agrees with Pat Pagni concerning approaches for limiting flashover, but adds that not only are materials important, but that geometry must also be considered. In his experience he has noted that there is an inverse correlation between the personal comfort of a chair and its heat release rate. People generally choose comfort. How can we bring comfort to products that are not capable of initiating flashover?

Dr. Vytenis Babrauskas
1. A product cannot cause flashover if it doesn't ignite. There is a need for ignition studies.
2. Should we decide on next year's funding based on previous year's Combustion Institute volume? We have to consider real fires. It is there that we should look to find questions to that need to be answered.
3. The NIST/BFRL Fire Dynamics Simulator has reached a point in its development where it can be useful for predicting fire growth and spread.

Dr. Björn Sundström
It is important to consider how the products of pyrolysis burn. Is it possible to develop models to describe this burning?

There is a need for active intervention to reduce the risk of flashover. The United Kingdom banned the use of polyurethane and this led to a decrease in fire deaths. We might look there and see why.

The single most important item responsible for flashover in homes is furniture. In general, if you tell me how big a chair is, I can tell you if it will generate a flashover. In the Gothenberg disco fire, two tons of furniture generated flammable gases that were responsible for the fire. Limiting the heat release rate of furniture would make a significant difference. When fires do occur, people must be able to escape.

Dr. Marc Janssens
He agrees with Vyto's third point concerning the Fire Dynamics Simulator. Vyto's paper of three years ago said models weren't so helpful for real simulations, but now the situation is totally different. We have come a long way. If Vyto rewrote his paper today, it would likely reach a different conclusion. He thinks that we should continue along the same track. In order to determine priorities for our research, it is important to listen to the audience that Kevin has. They will tell us what is missing and what is needed to make the models more useful. With little effort the models can be expanded to make them more useful for variable fuels.

Dr. Mark A. Dietenberger
Beware of wood. He feels that Kevin's assumption that 1/3 of the total energy released by a fire is loss by radiation is good estimate, but that it can be improved. Better estimates of soot yields would improve this estimation. Another area that needs attention is creeping flame spread.

Dr. Kevin B. McGrattan
Even though we argue about the details, there is general agreement that six or so parameters are required to adequately model flame spread. Measuring these parameters for a wide range of fuels and making the data available to the community would help greatly. There is a critical need for experimental data.

Dr. Stephen Welch
He is in general agreement with Kevin. He is encouraged that it will be possible to use material properties to develop models that are capable of predicting useful things.