REPORT OF DISCUSSION GROUP ON POLYMERIC MATERIALS

Mst. Dr. Ir. J. M. Rigo

Universite de Liege
Liege, Belgium

Participants: Erik Brandt
Robert Copé
Philippe Eurin
Tore Gjelsvik
Jonathan Martin, Reporter
Larry Masters
Lars Oslund
J. M. Rigo, Discussion Leader
M. Piebrich
Christer Sjöström

1 INTRODUCTION

That there is a growing use of plastics in applications that require careful design is undeniable; that this growth rate is as high as desirable is questionable. A major barrier to more extensive use of plastics is the lack of confidence of end users in the reliability of polymers. This stems from the fact that accurate data on the service life of polymeric products exposed to different service environments are not usually available to aid materials selection and use.

A major source of the design data that are available is the raw material manufacturer. These data alone, however, are not enough. They often inspire in the user an unwarranted level of confidence since it is often unclear how these data correspond to performance in the field. A clear understanding of the properties of plastics is essential to ensure that design data are relevant and this understanding must be supported by knowledge of how to apply
these data to resolve problems in a cost-effective manner. For example, the consideration of cost-effectiveness in the selection and use of plastics requires knowledge of the service life of a product when it is subjected to its intended operating environment.

Important differences exist in the approach used by the building and construction technology and that used by advanced technologies in obtaining the data used in making selections between different materials. The building and construction industry is typically rather conservative in its selection of materials, relying on a performance listing of a product. This conservative approach is very resistant to the selection of new, innovative materials.

In order to obtain knowledge on the service behavior of a material, the building and construction industry relies heavily upon comparative data, in which the performance of a new material is compared to that of a "known" material under identical test conditions, and upon engineering judgment. Thus, service life is frequently addressed in a qualitative manner. The approach to generating service life data in advanced technologies is different in that heavy reliance is often placed upon accelerated test data for quantitative service life prediction. In the advanced technologies, the objectives of accelerated aging tests are:

1) To quantitatively predict the service life of a material or product;

2) To select the best product for a given application; and

3) To isolate and identify the causes and mechanisms of early degradation.

Implicit in these objectives is an understanding of the interrelationships among:

1. The performance properties of a product;

2. Changes in the chemical and physical properties of the materials as a function of time; and

3. The stress factors to which the product is exposed.

2 THE COMMONALITIES OF PROBLEMS

Despite the different approaches to service life prediction noted above, the Discussion Group noted a number of commonalities between service life prediction of polymeric materials in advanced technologies and in building and construction technology.