

AN ABSTRACT OF A THESIS

ENGINEERING ANALYSIS OF A POLYMERIZATION PROCESS

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Experimental design techniques have been used since the 1930's. In recent years there has been a revival of interest in experimental design methods because of their successful application in process development. Experimental design techniques coupled with statistical analysis can be effectively used for process development and trouble shooting, thereby leading to improved performance. The present study involves the use of experimental design techniques to optimize the process conditions for a typical polymerization process. The process parameters and conditions for the polymer synthesis were largely unknown. It therefore became essential to determine approximately the best process conditions while at the same time maintain good polymer quality. In order to achieve this a two-phase approach was used. The first phase involved identifying all factors critical as far as polymer quality was concerned. Since a large number of factors were involved, a preliminary screening experimental design was performed. A linear Plackett- Burman screening design was used for this purpose. The analysis of this design screened out factors not critical to the process. The screening study thus located the optimal region for critical factors and eliminate factors that were unimportant. The remaining factors were then investigated using a focused statistical design. A second order Box-Behnken design was used for this purpose. The analysis of this design showed factors as well as factor interactions that affected the polymer properties. The results obtained from both analyses were satisfactory and therefore helped in fairly optimizing the process conditions.

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