

The relationship between smoke yields and tipping materials of the cigarette under restricted conditions

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ABSTRACT : In order to minimize the trial frequency in the new filter cigarette design, we studied the relationship between major three independent variables. A Box-Behnken design involving filament denier (X_1 , 2.5-3.3d), porosity of the filter plug wrap (X_2 , 3500-16000CU) and porosity of the tip paper (X_3 , 400-1200CU) was used. Three independent factors (X_1 , X_2 , X_3) were chosen for their effects on the various responses and the function was expressed in terms of a quadratic polynomial equation, $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_{11} X_1^2 + \beta_{22} X_2^2 + \beta_{33} X_3^2 + \beta_{12} X_1 X_2 + \beta_{13} X_1 X_3 + \beta_{23} X_2 X_3$ which measures the linear, quadratic and interaction effects.

Twenty-nine trial numbers were obtained as a result of using 3^{**k-p} and Box-Behnken design and it is analyzed by the multiple regression analysis with backward stepwise in STATISTICA/pc under restricted conditions. Tar yields of the cigarette were affected by porosity of tip paper, filament denier and porosity of plug wrap in the decreasing order, and linear effect of tip paper porosity (β_3) and filament denier (β_1) were significant at a level of 0.01 (α). Based on the analysis of variance, the model fitted for Tar (Y_1) was significant at 5% confidence level and the coefficient of determination (0.90) is the proportion of variability in the data fitted for by the model.