

Proceedings of the 3<sup>rd</sup> Annual World Conference  
of the Society for Industrial and Systems Engineering,  
San Antonio, Texas, USA  
October 20-22, 2014

## **Comparison of an Unreplicated Factorial Design versus a Full Fractional Design for a Mixture Robust Process**

**E. Herrera, J. Sanchez, and H. Hajar-Rivera**

Instituto Tecnológico de Ciudad Juárez  
Mexico

Corresponding author's Email: [tomochic@hotmail.com](mailto:tomochic@hotmail.com)

**Author Note:** Ericka Herrera, Jaime Sanchez and Humberto Hajar are professors in the Industrial Engineering Doctorate Program at Instituto Tecnológico de Ciudad Juárez; Humberto Hajar and Jaime Sanchez are researchers in the field of Robust Parameter Design; the former is a member of Herrera's committee and the latter is a Thesis Director. Ericka Herrera is a PhD student at Tecnológico de Ciudad Juárez.

**Abstract:** The Robust Parameter Design (RPD) intends to make products and processes insensible to sources of variability. Therefore, it is important to identify the causes of variation in the process and the environment. However, if there are mixing factors in the process, then it must also consider the proportions of each of them and thereby obtain a robust product. In order to consider noise and mixing factors, crossed designs must be conducted. These designs require a lot of information across internal and external arrangements; unfortunately, it is not always possible to run a full factorial design and it is even more difficult to replicate it. This constraint, leads us to analyze an unreplicated design and compare it against a split design to evaluate the performance of both.

*Keywords:* Mixing, Robust Design, Split Design, Unreplicated