

Watha Minsan 2011: Rapid Identification of Significant Factors in Complex System Using Applied Frequency Domain Experiments. Doctor of Engineering (Industrial Engineering), Major Field: Industrial Engineering, Department of Industrial Engineering. Thesis Advisor: Mr. Pornthep Anssornnitisarn, Ph.D. 288 pages.

This research presents applied frequency domain experiments as an effective method for screening factors of production. We compared the applied frequency domain experiments method with a 2^k factorial design and found that they require lower numbers of simulation runs than the 2^k factorial design. These experiments can be used for selecting main effect factors, interaction effect of factors and quadratic polynomial effect on responses.

To explain the method of applied frequency domain experiments, we designed a three-part experiment based on the following input factors 1) continuous input variables, 2) discrete input variables and 3) a mixture of continuous and discrete input variables. Assembly line production simulation and job shop simulation were established. For the first two variables, four main aspects were studied: 1) main effect, 2) effect order of the two factors, 3) effect order of the three factors, and 4) effect order of the main factors and external factors. For the third or mixed variables, two main aspects were studied: 1) main effect and 2) the effect order of the main factors and external factors.

According to the comparative studies conducted in this research, applied frequency domain experiments can be used to select factors almost as effectively as the 2^k factorial design. The experiments used 20 input variables and the applied frequency domain experiments method is able to select all the right main factors. It can also be used to investigate interaction effects of factors, and quadratic polynomial effects on responses, by running only 1,558 simulations.

Student's signature

Thesis Advisor's signature