

## Design of In-House Test Method for Assuring Packing Quality of Bottled Spirits

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**Abstract :** Whether shopping in a retail location or via the internet, consumers expect to receive their products intact. When products arrive damaged or over-packaged, the result can be customer dissatisfaction and increased cost for retailers and manufacturers. The packaging performance depends on both the transport situation and the packaging design. During transportation, the packaged products are subjected to the variation in vibration levels from transport vehicles that vary in frequency and acceleration while moving to their destinations. Spirits manufactured by this Company were being transported to various parts of the country by road. There were instances of package breaking and customer complaints. The vibration experienced on a straight road at some speed may not be same as the vibration experienced by the same vehicle on a curve at the same speed. This vibration may negatively affect the product or packing. Hence, it was necessary to conduct a physical road test to understand the effect of vibration in the packaged products. The field transit trial has to be done before the transportations, which results in high investment. The company management was interested in developing an in-house test environment which would adequately represent the transit conditions. With the objective to develop an in-house test condition that can accurately simulate the mechanical loading scenario prevailing during the storage, handling and transportation of the products a brainstorming was done with the concerned people to identify the critical factors affecting vibration rate. Position of corrugated box, the position of bottle and speed of vehicle were identified as factors affecting the vibration rate. Several packing scenarios were identified by Design of Experiment methodology and simulated in the in-house test facility. Each condition was observed for 30 minutes, which was equivalent to 1000 km. The achieved vibration level was considered as the response. The average achieved in the simulated experiments was near to the third quartile (Q3) of the actual data. Thus, we were able to address around three-fourth of the actual phenomenon. Most of the cases in transit could be reproduced. The recommended test condition could generate a vibration level ranging from 9g to 15g as against a maximum of only 7g that was being generated earlier. Thus, the Company was able to test the packaged cartons satisfactorily in the house itself before transporting to the destinations, assuring itself that the breakages of the bottles will not happen.

**Keywords :** ANOVA, Corrugated box, DOE, Quartile

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