



バーチャル設計を用いたシャッタ機構の設計

A Virtual Parameter Design of a Shutter Mechanism for Fouling Prevention

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Virtual design has often been employed in past usability evaluations; results obtained by applying virtual design to a mechanical design are reported here. Virtual design was applied to the conceptual design of a dust shutter provided in a multifunction electrophotographic printer to improve the immunity of its image density sensor to fouling. Four evaluators, of whom three were well acquainted with the subject and one was not, made a sensory evaluation of the fouling of the sensor surface on a seven-grade scale in which fouling was treated as a smaller-is-better characteristic, and the proposed conceptual design was evaluated with respect to two types of fouling having different causes, derived from field reports of existing printers. The factor effects obtained as a result differed from one evaluator to another, but reproducibility was obtained for substantially all of them. On the basis of this all four evaluators conducted a design review, and were able to select the best proposed design on the basis of concrete, quantitative information, specifically, a factor effect diagram. An improvement effect was also obtained in a confirmation test carried out on an actual printer. During the process, information and findings that appear useful for the future development of virtual design were obtained, such as the zoned grading method, selection of a proposed design through consultation, and the treatment of knowledge.

Key words : Taguchi methods, quality engineering, S/N ratio, virtual parameter design, design review, conceptual design, knowledge, shutter mechanism

1. 背景と目的

本研究はバーチャル設計を機構設計に活用することで、開発上流での完成度を高め、より良い製品を開発することが目的である¹⁾。

多機能プリンタの長寿命化、高耐久化に伴い、疲労や摩耗、汚れなどの経時変化の影響を極小化して、耐久性を確保することが大きな課題となっている。その検証には数十から数百万枚もの印刷が必要となり、膨大な工数や費用が掛かるために加速実験やシミュレーションにて評価を行っている。しかし、汚れのような定量化が困難な問題は評価が難しく十分

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