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## Evaluation of Ingredient Effects on Friction Brake Shoe Composite Using Taguchi Method

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**Abstract** — A special type of composite is used as train brake shoe material so that it fulfills various performance requirements. In the present work, a composite containing 9 ingredients that would be used as train brake shoe material was investigated to evaluate the ingredient effects on the coefficient of friction and wear volume loss. The Taguchi method was applied to find experimentally the ingredient and their percentage effects on coefficient of friction and wear volume loss. Ingredients of the friction composite except phenolic resin and barite, which were considered as determining factors were varied at 2 levels. Phenolic resin was always kept constant at 30 % volume and necessary volume % of barite was changed to compensate the change of other ingredients amount. Taguchi  $L_8$  orthogonal array which consisted of 7 factors with 2 levels each was applied to perform experiment. The result shows that graphite, fly ash and NBR have significant effect on coefficient of friction at lower and higher contact pressure; whereas, cast iron chip significantly affects the coefficient of friction only at higher contact pressure. Ingredients which have effect in increasing coefficient of friction tend to increase wear volume loss.

Keywords : *Ingredient effects, brake shoe composite, Taguchi method*

### INTRODUCTION

When a brake shoe presses against a pad or wheel tread, brake converts kinetic energy of the car or train into thermal energy by friction. The friction between a brake shoe and a pad or wheel tread reduces or control speed of the vehicle. Materials used on brake shoe must be able to stop or control the vehicle smooth and quiet. Brake material also should not cause excessive wear to the rotor or wheel tread. No single-phase material is suitable to fulfill the requirements of all the brake performances,

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