

Ford Motor Company

S. Gratch
PLAINTIFF'S EXHIBIT

FD-633

Intra-Company Communication

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TO: Mr. J. R. Elwell ✓
cc: Messrs. J. V. Barnes
S. Gratch
R. J. Rumpf
R. L. Van Alsten

SUBJECT: Proposal for Cooperative Investigation of Cermet Brake Linings

As a result of the investigation on cermet type materials for brake lining application, promising compositions have been developed in the iron-graphite-sulphur system. In order to accelerate this development we have outlined our thoughts concerning work to be done.

Scientific Laboratory

The major variables to be studied in the iron-graphite-sulphur system are composition and microstructure.

Earlier results have shown that the coefficient of friction over a range of temperatures depends upon composition. For example, higher graphite promotes a low coefficient of friction at low temperatures and a high one at elevated temperatures. The effect of increasing sulphur is to increase friction at low temperatures and decrease it at elevated temperatures.

The importance of microstructure is emphasized by the drastic difference in friction behavior of liquid phase sintered and solid state sintered materials. Significant variations in friction have been observed for fixed compositions by varying only the initial particle size of the iron.

In conjunction with further studies on the effect of composition and microstructure on the friction behavior, the influence of sintering temperature and time must be considered. Data on the mechanical and physical properties of all specimens submitted for friction tests should be obtained. In addition, the Instrumentation Section should be requested to develop, where necessary, additional testing equipment for expediting the evaluation of basic properties of the materials under study.

Product Study Engineering Office

It appears that, at least initially, procedure C on the T. P. Chase machine should be used as the main method of evaluation. However, it would seem desirable to make certain modifications. For instance, drums of a composition similar to that in current automobile production should be used. A record should be kept of the microinch finish of the drum, and possibly a brief study of the effect of this finish should be made (it is reported that General Motors uses a

finer finish of the drums to be used with metallic linings than of those for organic linings). Certain competitive materials (e.g., General Motors' metallic linings, best available organic linings) should be evaluated on the T. P. Chase machines and the results should be correlated with actual vehicle performance data. Of course our own metallic linings should be tested on vehicles whenever the Product Study Engineering Office is satisfied that the laboratory results warrant such a study.

We would appreciate any comments, suggestions and criticisms of this proposal.

M. Humenik, Jr.

M. Humenik, Jr., Supervisor
Non-Metallic Materials Section
Applied Science Department
Scientific Laboratory

CONCUR:

E. D. Marande
E. D. Marande, Manager
Applied Science Department
Scientific Laboratory

EDM:bf

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