

WEAR AND CONTACT MECHANICS: FROM CAR ENGINES TO APPLES VIA TEETH CLEANING

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Work at Sheffield can be divided into two main areas:

- solving industrial wear problems
- development and application of a novel ultrasonic technique for characterising machine element contacts and measuring oil film thicknesses

In solving wear problems, initial work focuses on understanding the wear failure; the next step is to develop component or specimen test apparatus to reproduce the wear mechanisms apparent and carry out studies to determine the critical parameters affecting wear and the final stage is to develop models and design tools to predict likely wear rates and help prevent the wear problems occurring in the first place.

The ultrasonic technique relies on the reflection of ultrasound from air pockets formed at the interface of two rough surfaces between contacting asperities. So where surfaces are conformal and there is relatively high metal-to-metal contact, there will be more ultrasonic transmission than there is at less conformal contacts. The proportion of reflected ultrasound can be related to the contact pressure at the interface. The technique can be applied to dry and partially lubricated contacts.

In this presentation the approach to solving wear problems will be outlined and some examples of its application will be given including:

- automotive engine valve recession
- railway wheel wear
- teeth cleaning

The fundamentals of the ultrasonic technique will be explained and some examples of its application to actual engineering component contacts will be shown. These will include:

- wheel/rail contact
- railway wheel hub/axle press-fit
- apples