

# Petrographic examination of refractory damage to a burner pipe

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## Abstract

Refractories are integral parts of any pyroprocessing plant. Consequently, any failure will cause many hours of lost production. To make matters worse the duration of the production loss is exacerbated by long, cool down periods, before repairs can be carried out, and by slow heat-up rates which are necessary to protect the new refractory from thermal stress and spalling.

A cement kiln burner pipe operates in probably the harshest environment. The refractory which protects the burner pipe must withstand abrasion from clinker particles re-entering the kiln, chemical attack from aggressive volatile salts and high temperatures. Many different materials, designs and anchoring systems have been tried out, generally, with little success. One of the difficulties has been an evaluation of the factors which can cause a failure. To date one has had to rely on circumstantial evidence, with little benefit. To address this problem a more scientific approach has been taken, with techniques applied to unlock the 'critical evidence'. Petrographic analysis is one such technique; it has been long used to evaluate minerals and more recently it is being used to evaluate concrete.

Microscopical examination can reveal the 'critical evidence' required for interpretation of the sequence of events which occur during the service life of a refractory. This technique is applied to refractory concrete, and this paper discusses the evidence of a burner pipe refractory failure at a Queensland cement plant.