

## TACHE OVALE DEFECTS IN INGOT AND CONCAST STEEL RAILS

Taches Ouales (internal transverse kidney shaped fatigue cracks in the rail head: rail failure types 111 and 211) are one of the four major causes of failures in plain rail and at the current level of about 1000 per year account for more than 15% of the total.

In rails rolled before 1968, these failures were shown to be caused predominantly by hydrogen embrittlement (shatter cracking) during the manufacturing stage. When the rail steel manufacturing process was changed from ingot to continuous casting (concast) in 1974, it was hoped that the number of tache ovale defects would decrease. The concast process should ensure that hydrogen levels are kept low, and British Steel also take further precautions.

However, earlier analyses of rail failure statistics indicated that the incidents of ingot and concast taches ouales were almost the same. An earlier investigation into the cause of taches ouales in concast rails met with little success as only two suspect rails were received for examination.

An attempt was made to rectify this situation by collecting and examining a suitable number of concast rails reported to contain tache ovale defects. It was thought that this was the best way to improve the classification procedure for tache ovale defects, and develop a more logical basis for dealing with them. This report details the progress made in achieving these objectives.

Although earlier analyses indicated similar failure rates, the tache ovale failure rate for ingot rails is considerably higher than for concast rails, at least in the present and recent past. No evidence of hydrogen embrittlement causing tache ovale defects in rails from continuously cast steel has been found.

Numbers of failures in rails from both types of steel production have been predicted for the next ten years, and a number of conclusions and recommendations have been made.