

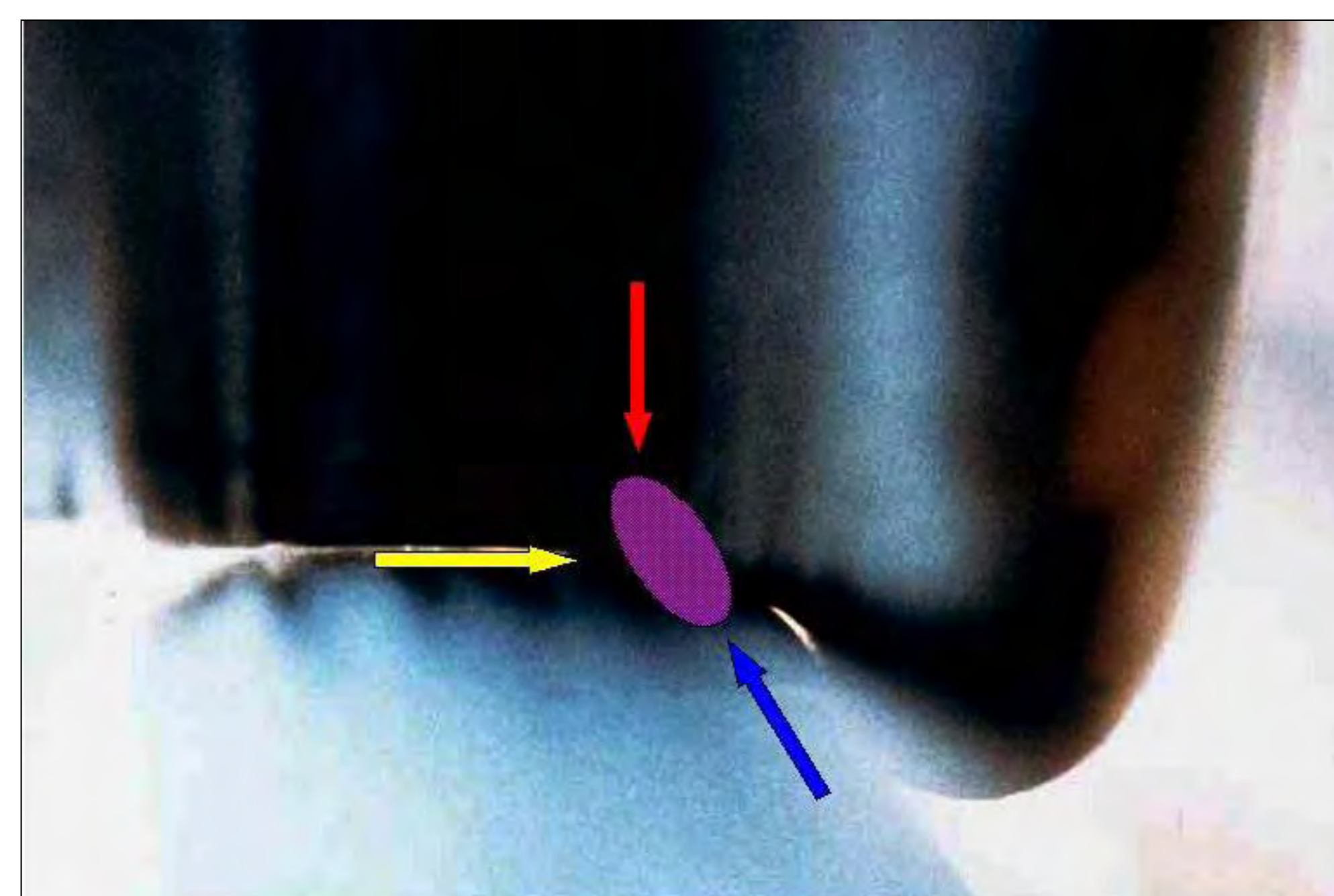
MATERIAL BEHAVIOUR IN WHEEL-RAIL CONTACT

OVERVIEW

Wheel-rail contact involves mixed rolling and sliding contact conditions, resulting in material degradation through:

- Plastic deformation
- Wear
- Rolling contact fatigue

Wheels subjected to tread braking may exhibit more severe degradation associated with the combination of mechanical and thermal loading.



UNDERSTANDING AND PREDICTING MATERIAL BEHAVIOUR

Wheels and rails are manufactured with pearlitic steels grades, ranging in hardness from 280BHN to 420BHN. Steel grades include plain carbon-manganese, low alloy and hypereutectoid compositions, in either as-rolled or heat-treated conditions.

Material degradation at the wheel-rail involves cyclic plastic deformation (ratcheting) of the near-surface layers.

The two most important material parameters are yield strength and ductility, which determine the onset of plastic deformation, and the number of cycles to failure. Shakedown theory can be used to examine and compare the behaviour of different material grades.

RESEARCH AND INDUSTRY SUPPORT ACTIVITIES

The major focus of IRT activities is improving the understanding and predicting the behaviour of different material grades, particularly in heavy haul operations.

Activities cover:

- Assessment of wheel and rail materials
- Development of improved wheel and rail materials
- Metallurgical examination of damaged and failed wheels and rails
- Monitoring of in-service performance

