Thermal fatigue testing with repeatable temperature cycles on thermomechanical simulator

PRESENTER:
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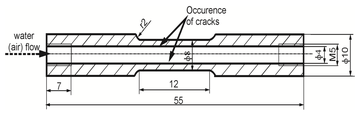
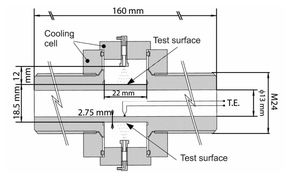
BACKGROUND: The motivation for the present work is to investigate the initiation of crack nucleation and microstructure evolution during thermal cycling. By understanding crack initiation and growth, better materials resistant to thermal fatigue can be produced. The problem is to reproduce the actual temperature field in the laboratory in a repeatable way, simulating conditions that occur in industrial practise. The presented test can be used for testing different materials under severe conditions with repeatable computer-controlled temperature and cooling during all thermal cycles.

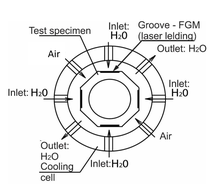
METHODS

1. Bore-hole specimen to test base material



2. Specimen for testing of surface layer

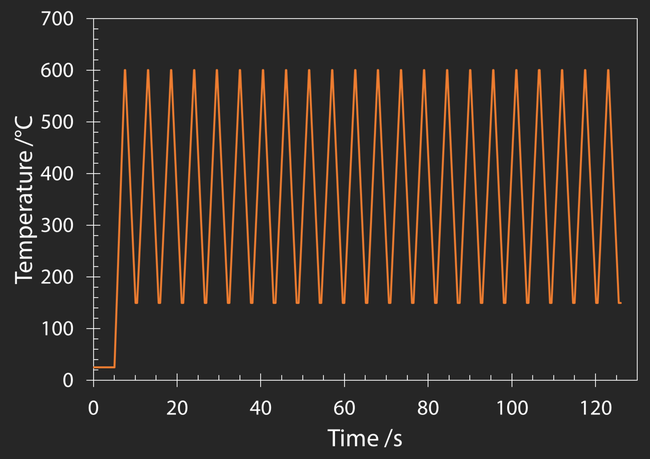


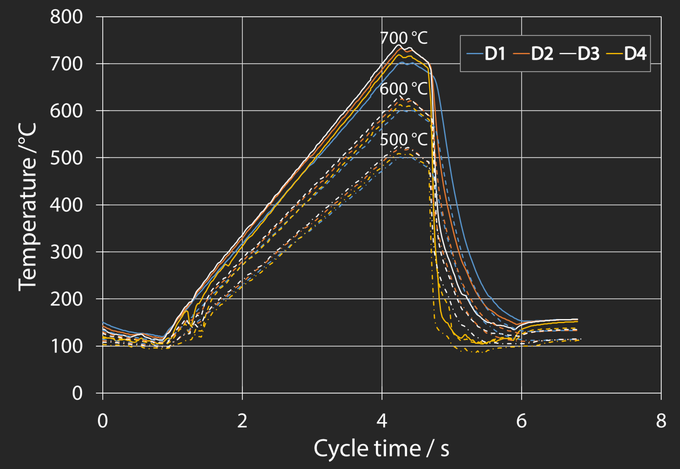


RESULTS

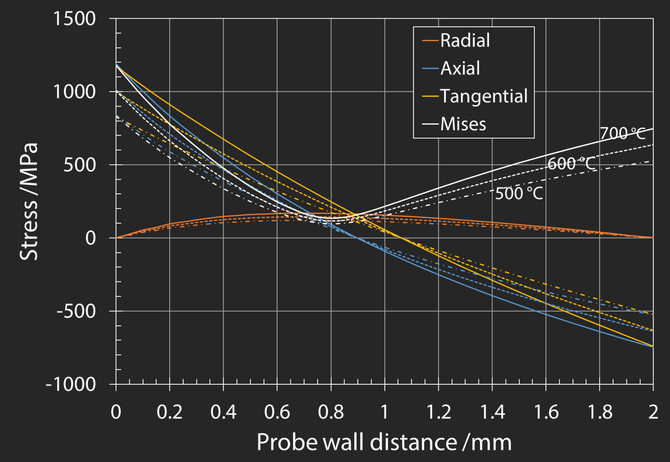
- Repeatable, computer-controlled thermal cycling in thermal fatigue testing.
- Simultaneous testing of different surfaces with reduced test time and increased accuracy of the results obtained.
- The tests allow different temperature gradients to be achieved at the same maximum test temperature.
- The origin of cracking and its propagation can be studied to improve the microstructure and thermal conductivity of the steel and reduce the thermal coefficient.

Repeatable thermal cycling in **thermal fatigue** tests of base material or surface layers.





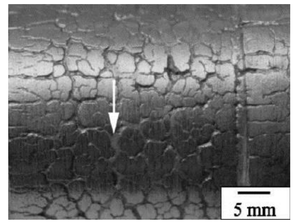
Stresses in the specimen wall are responsible for **thermal cracks** and **surface damage.**



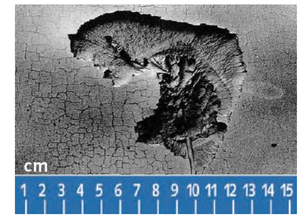
In-depth content

Thermal cracks and damage

- Thermal cracks

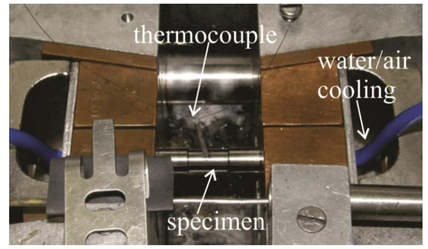


- Spalling

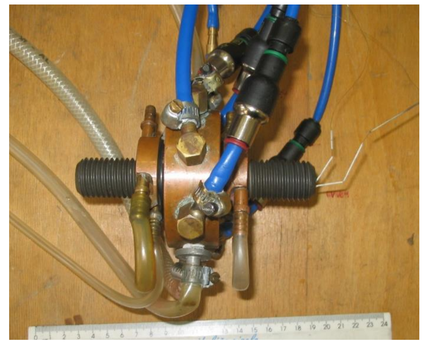


Thermal fatigue tests

- Testing of base material



- Surface layer testing



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