

Creep-Rupture

Failure of components, systems and structures can lead to high costs loss of production and in some cases, even death. For clients potentially exposed to substantial risks, it is of paramount importance to ensure that threats to structural integrity are understood and appropriately managed.

Creep is the time dependent deformation of a material under load operating continuously at elevated temperature and can occur in both plastics and metals. Whether it's for civil nuclear, power generation, defence, oil or gas, over time creep can take effect leading to damage or even rupture. If left unchecked, this can lead to expensive, unexpected remedial work, unplanned outages and in extreme cases injury of people. With over 250 man years' experience in the civil nuclear industry with creep and its related processes, our specialist team is able to analyse and predict the effects of creep so that rupture does not occur.

EASL can supply a cost-effective and pragmatic assessment, providing an independent service with clear advice on which to base decisions. We provide a solution-focused approach, providing clients with peace of mind. Through our knowledge of material behaviour in a range of demanding applications, we can present a clear picture of the risks facing real world structures. We can thereby implement appropriate strategies to prolong structural lifetimes, including monitoring/inspection and well-timed replacement of component parts.

What is Creep Rupture?

Creep rupture refers to failure of a material, both metals and plastics, due to timedependent deformation under constant load, a process which typically occurs only at elevated temperatures; in metals at or above approximately one third of the melting temperature.

Creep rupture is principally the result of continuous, mechanical (primary) loading such as pressure rather than displacement-controlled (secondary) loading or cyclic loading. Under creep secondary or displacement-controlled loading, such as temperature or welding residual stresses, will relax and affect rupture to a lesser extent but can lead to different failure mechanisms. Assessments may need to account for secondary stresses.

Creep rupture behaviour of weldments is especially important due to the creation of material zones with creep properties different from those of the parent material. The highest creep rupture damage will typically occur in one of these zones in preference to the parent material. The redistribution of stress in these regions adds further complexity to assessments of these areas.

EASL's Creep Rupture Services

EASL carry out creep rupture assessments for new and existing designs, using validated material models and proven stress analysis techniques. Creep rupture also features in the design substantiation of high temperature components, through the use of specified stress limits for high temperature applications. Creep rupture assessments are routinely performed for structures at constant elevated temperature and constant stress, and for those under varying stress and temperature.

As creep is a potentially life-limiting mechanism, programmes of inspection to monitor the progress of creep in high temperature systems are sometimes required, and EASL have been involved in the implementation of ongoing creep monitoring programmes in high temperature plant. These require the calculation of remaining life supported by physical inspection of plant using non-destructive testing techniques.

Creep rupture assessment is offered as a stand-alone service or in conjunction with assessment of other time dependent failure mechanisms such as fatigue, creep-fatigue initiation, fracture and creep-fatigue crack growth.



Assessment of creep rupture as well as the real world consequences of structural failure provides assurance of safety and assists clients to allocate resources for remedial and monitoring programmes where required. Assessment therefore provides a cost-effective and efficient solution to managing creep-sensitive plant, and can prevent costly outcomes such as component failure, or the performance of unnecessary remedial work.

If you'd like to find out more about our previous work, take a look below at our case studies. If you'd like to find out more about our related services, take a look below at our solutions and other services. To see how EASL can help with your creep rupture needs, get in touch through our contact section.

Related Services

- Creep Fatigue Initiation Assessment
- Degradation Review
- Safety Case