



## Long Term Testing Apache Pipe Clamps

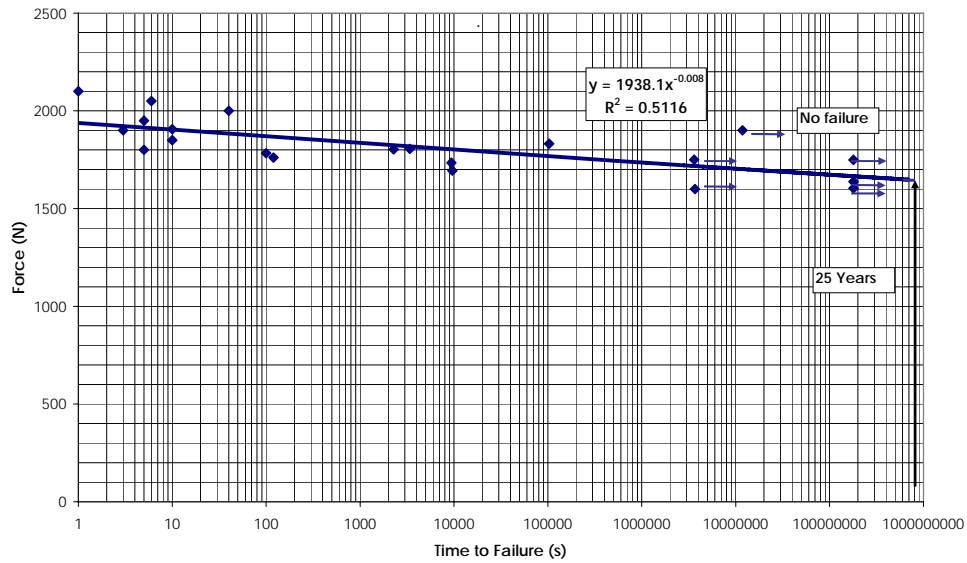
Following enquiries from BSS as to the high temperature performance of their Apache Pipe Clamps, Ellis Patents commissioned Rapra Technology Ltd to provide a prediction of the 25 year design safe working load at an operating temperature of 82°C.



Rapra decided that as the Apache Clamps are subject to a constant load during service, creep rupture testing was the most appropriate and direct suitable and direct method of quantifying the effect of time and load on the durability of the product. In this method, the time taken for a material to fail whilst being subjected to a constant applied load is measured. A series of tests were conducted to establish a force versus time to failure curve.

The performances of polymeric materials are temperature dependent, therefore the higher the temperature the shorter the time to failure at any given stress. This can be used to predict long term performance from shorter term accelerated testing at higher temperatures using the time-temperature superposition principal. This principal allows higher temperature data to be shifted in time to fit and continue lower temperature data. Creep rupture tests were conducted at a range of temperatures and loads. Using the time-temperature superposition principal a 25 year master curve was generated for creep rupture performance at 82°C, under static load conditions, as shown in Figure 1.

**Figure 1:** Master creep rupture curve for Apache AF-06-00-B hanger brackets at 82°C in air.



From the creep rupture curves produced a failure load for a 25 year static load, at 82°C was calculated. A safety factor was applied to give the safe working loads shown below.

**Figure 2:** Safe working loads for Apache Pipe Clamps

Clamp Size	SWL (Kg)
01	13
02	17
03	23
04	23
05	31
06	31
07	40
08	47
09	47
10	59
11	71
12	73
13	73
14	73
15	90
16	91