

Lessons from catastrophic weld failures – Presentation summary

Geoff BOOTH

An engineering structure can be defined as one that carries loads or contains pressure and must fulfil specific requirements; namely safely to withstand loads and conditions arising for both what it does and where it is, for a defined period of time. Taking a broad interpretation, engineering structures have been used satisfactorily for millennia, but these very old installations are not severely loaded.

The industrial revolution and the increasing use of steam power in particular required structures to operate in much more challenging situations; for example, greater pressures, higher temperatures, more corrosive environments, and larger and more frequent applications of loads. In the 19th and early 20th century explosions of steam boilers were frequent and often led to loss of life. Eventually society stimulated the authorities to develop guidelines for the safe operation of boilers, describing suitable materials, maximum pressures and temperatures etc. These guidelines have been developed into very comprehensive codes and standards which are the building blocks of current design, not just for boilers but other structures such as bridges, cranes and ships. Nevertheless, the designer must always use engineering judgement and in some cases it is advisable to validate design concepts by experiment.

Even so, every year failures of welded structures still occur. A top-level analysis shows that factors contributing to the failure process include unforeseen loads and environmental conditions, inadequate weld quality, poor control of fabrication and inspection regimes, overlooked weld details such as repair welds and inappropriate materials and/or weld procedure. There are both engineering and human aspects to be considered and nothing is perfect, neither welds nor people.

