

Fracture mechanics allows us to assess whether cracks will be safe under the applied loads. But even in cases where we can be reasonably sure that there are no cracks of any significant size (say more than a millimetre), there is still the possibility that fatigue loading or another mechanism can cause them to grow, as illustrated in Figures 8 and 9.

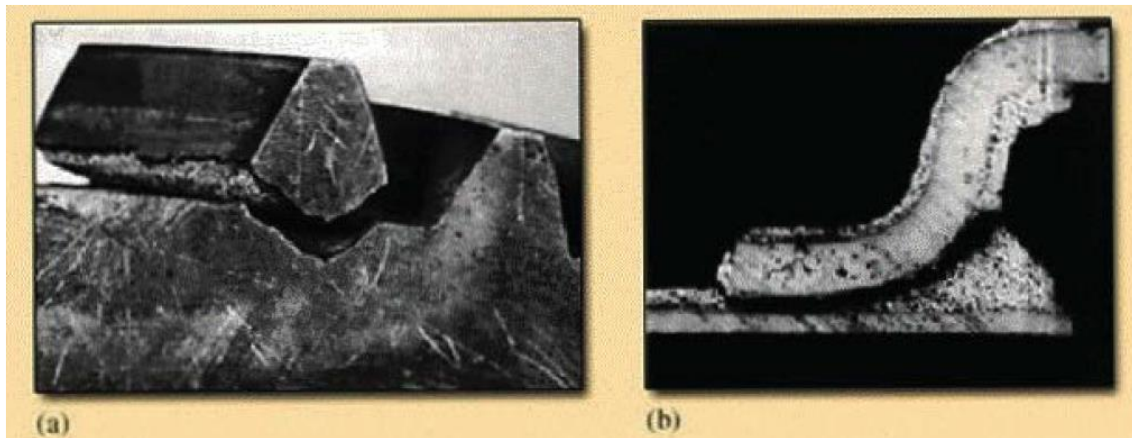


Figure 8 (a) Gear failure -tooth breakage from a fatigue crack that started at the root and arising from bending loads due to the contact driving torque; (b) fatigue failure in solder joint due to expansion and contraction stresses caused by thermal cycling.

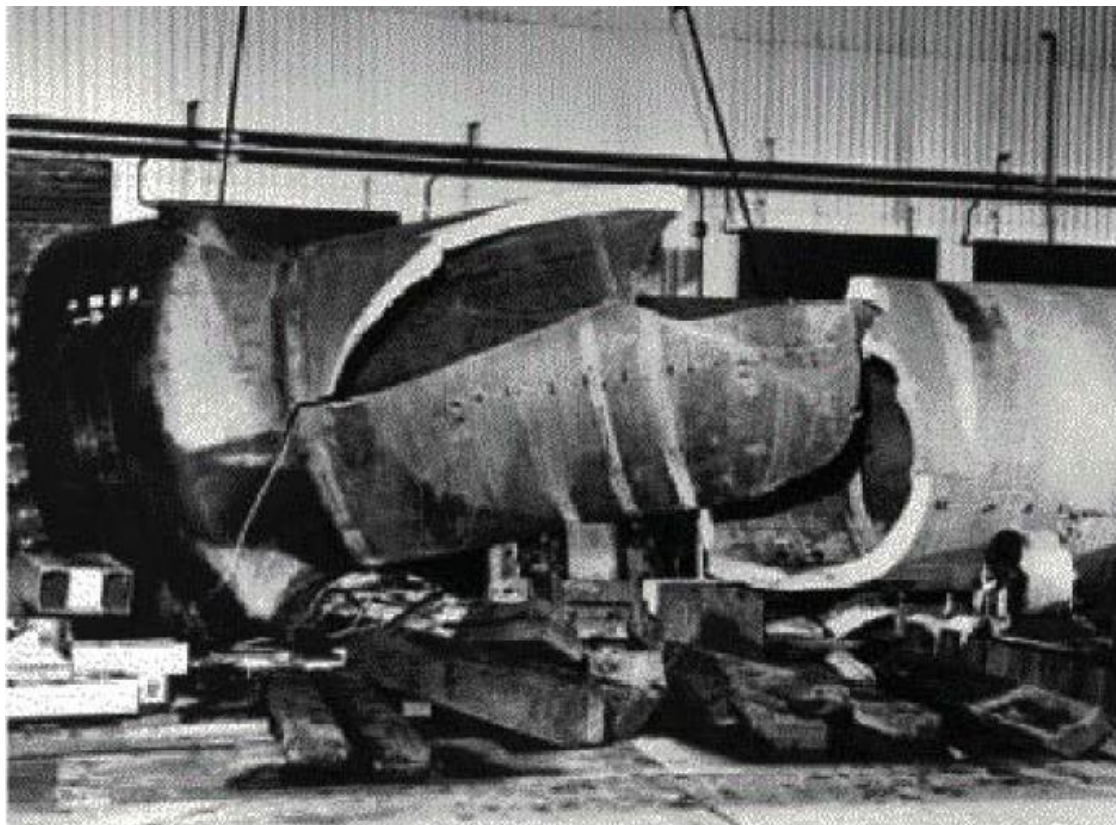


Figure 9 Steel pressure vessel, 1.7 m in diameter and 15 cm thick, that failed during a hydraulic proof test at 34 MPa. The crack that caused the accident grew from a small (5 mm) embedded welding crack