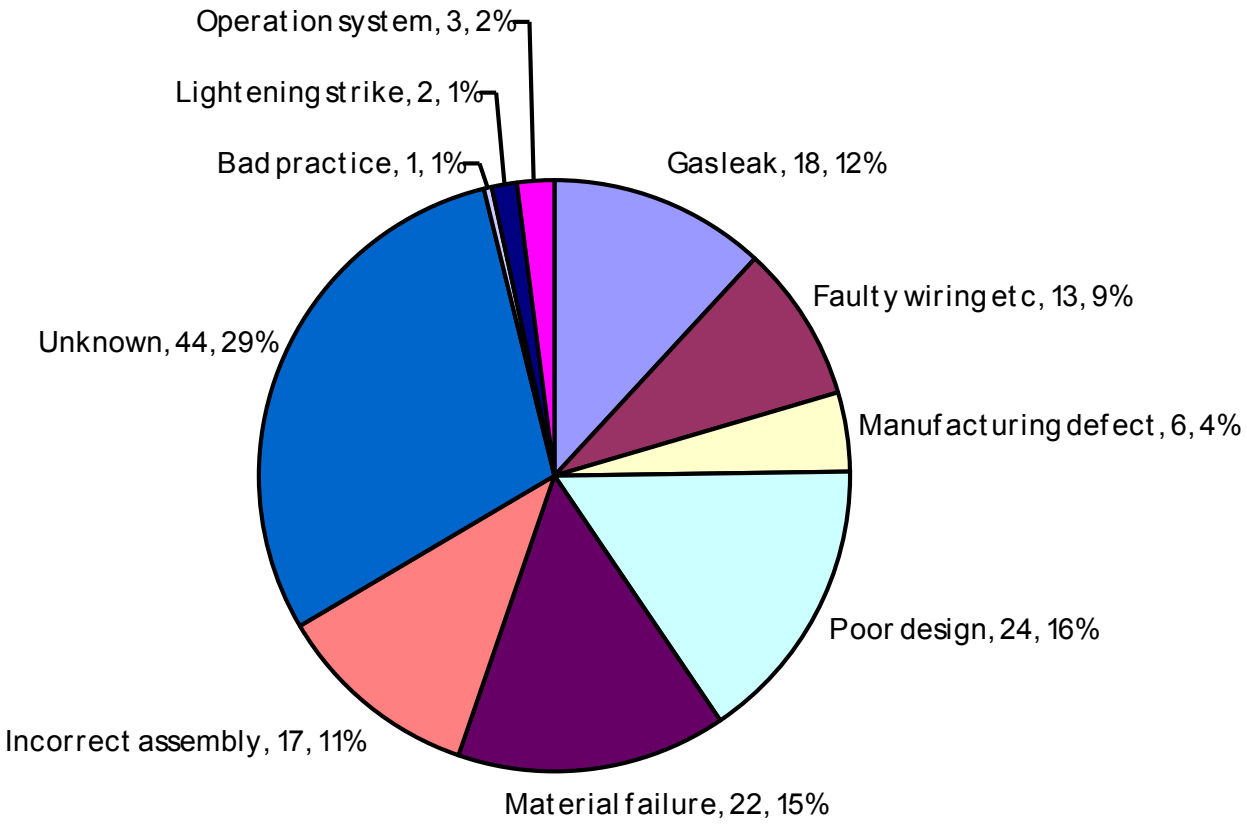
Safer, Stronger, Smarter Networks

SF_6 in Tank Failure

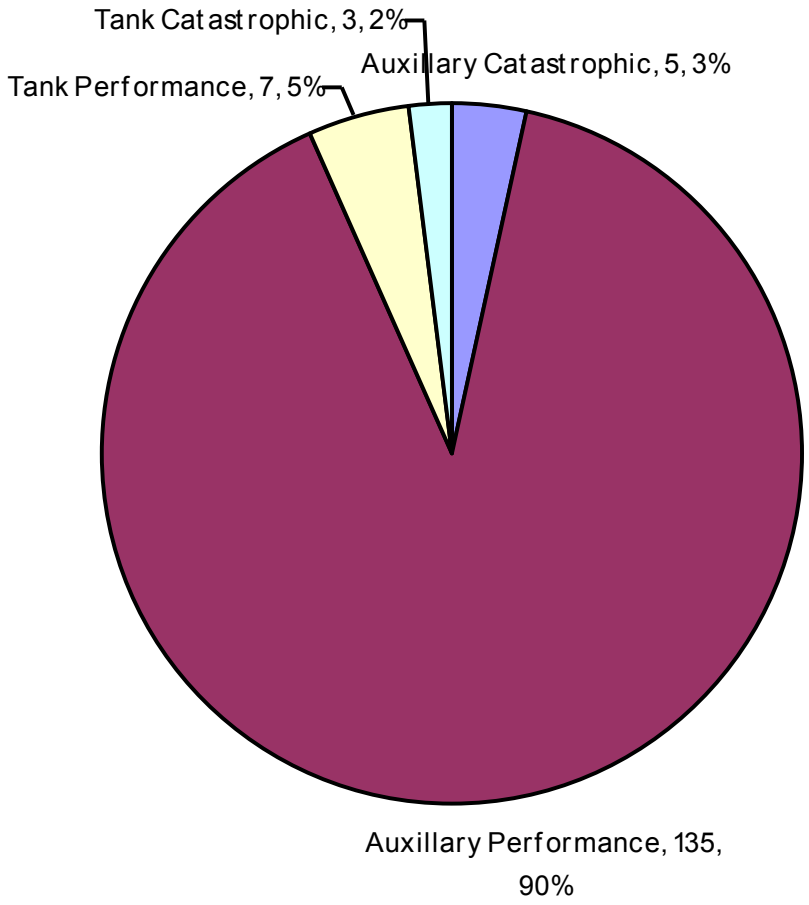
www.eatechnology.com

Defects and Failures



Failure and Defects of SF6 Equipment upto July 2006
(150 incidents in total)

Types of failures



Type of Failures

Catastrophic Tank Failures

- In tank catastrophic failures (<0.01% of population)
  - Alstom Saturn RT SF6 failure: degradation due to moisture ingress via a fractured pressure relief panel
  - Reyrolle ESR failure: ineffective sealing and degradation of the main ‘O’ ring
  - Reyrolle SMS failure: loss of gas due to crack in cast resin
- Manufacturers state operation at zero pressure, this assumes gas is new, in the cases above the units ‘breath in’ moisture and air, deteriorating the dielectric properties of the remaining gas
  - Alstom Saturn RT SF6 failure: degradation due to moisture ingress via a fractured pressure relief panel
  - Reyrolle ESR failure: ineffective sealing and degradation of the main ‘O’ ring
  - Reyrolle SMS failure: loss of gas due to crack in cast resin

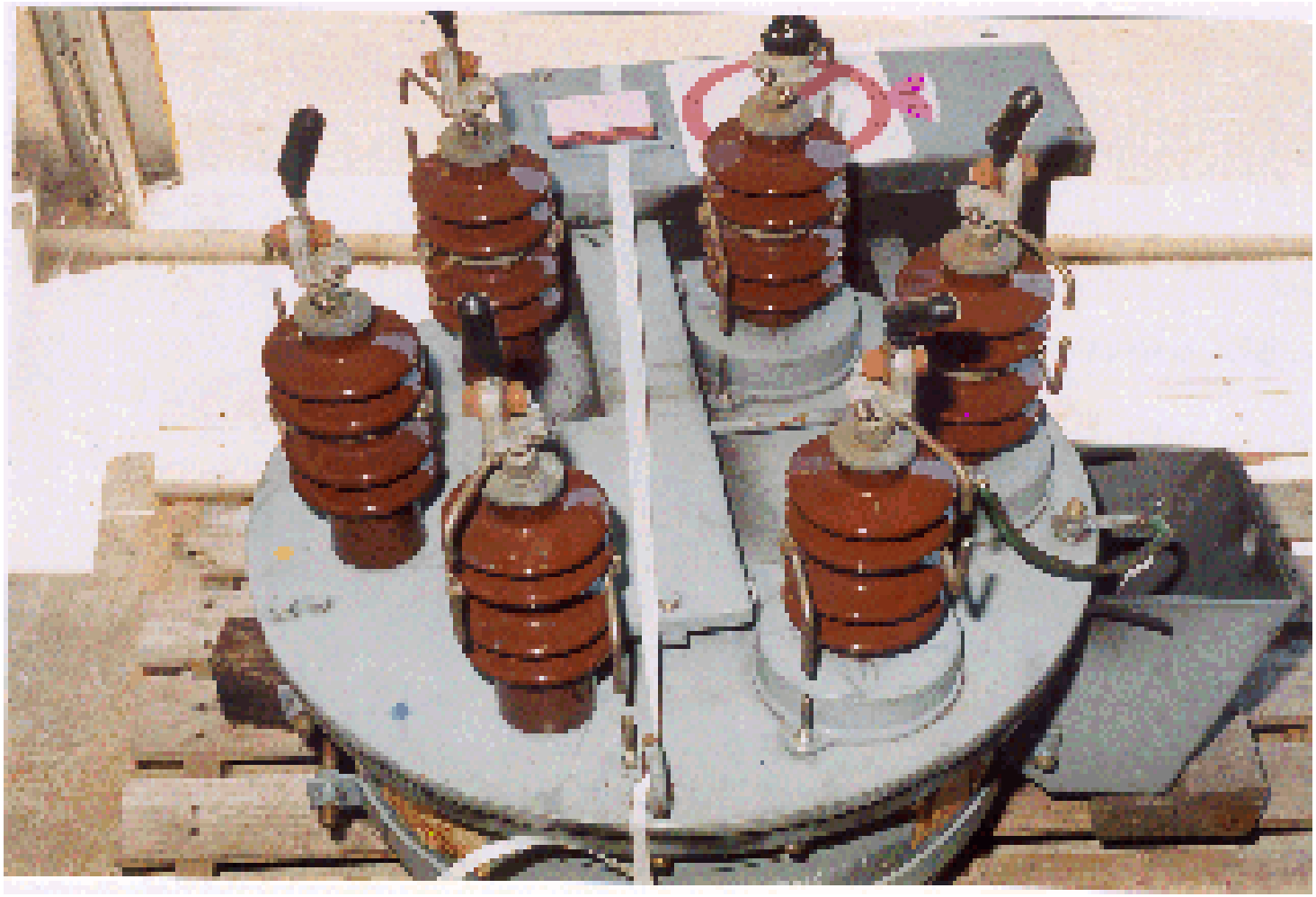
Gas Losses

- Many gas losses go unreported
- Losses may be as a result of failures of associated equipment
  - Cable boxes
  - Vts
  - Cts
- Losses due to faulty valves, cracked pipe work, cracked cast resin, ill fitted gaskets, degraded gasket materials
- Sealing systems have improved and gas loss with more recent models have decreased
- Gas pressure checks should be included in maintenance procedure
- Gas pressure dials can stick during a failure, if in doubt the pressure should be checked

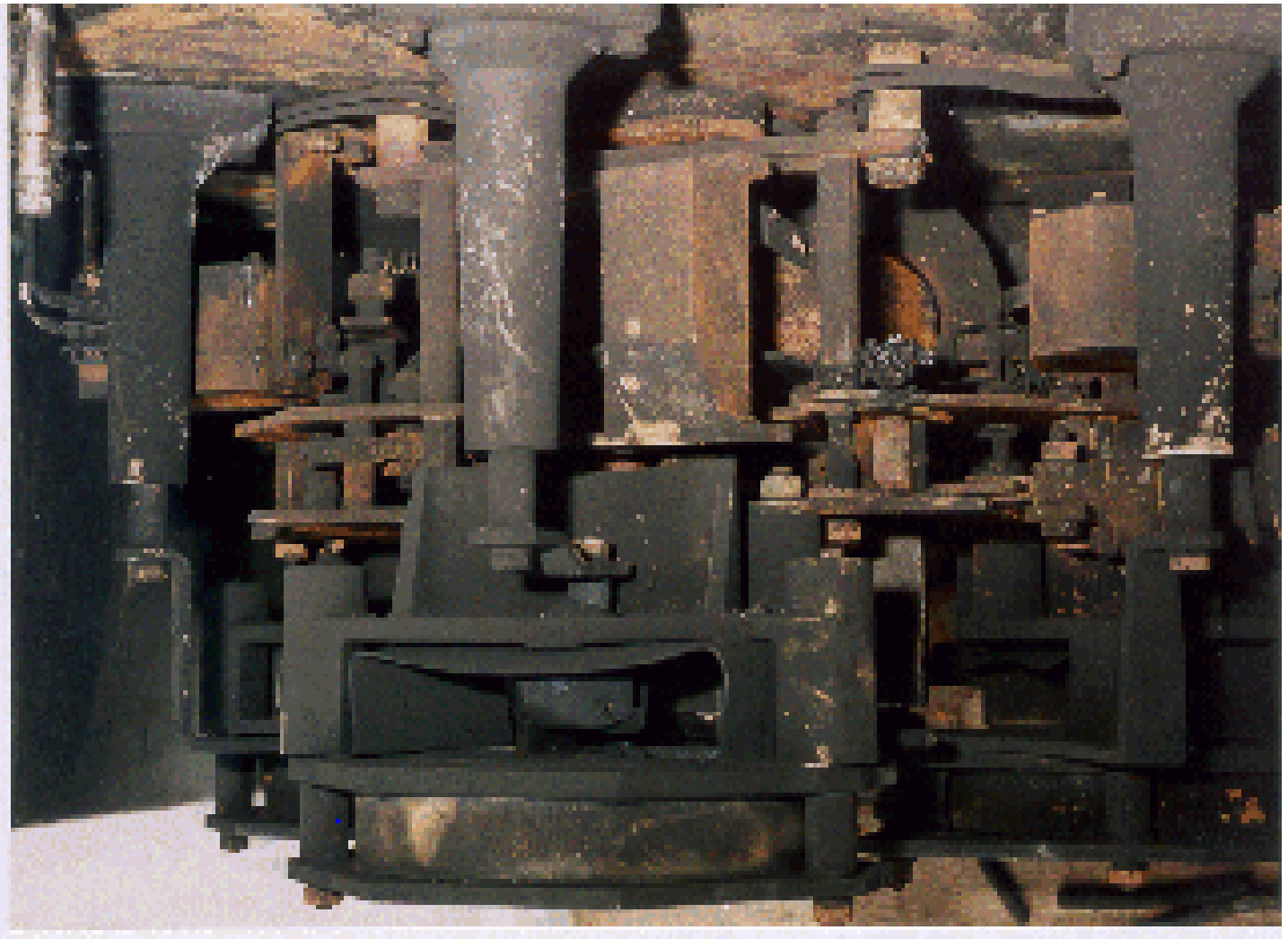
Other Failures

- Auxiliary equipment such as batteries and relays
  - Unreliable batteries: HS PMR, Reyrolle ESR, Whipp and Bourne GVR
  - Include battery inspection as part of maintenance
- Other failures due to
  - Poor quality control
  - Incorrect assembly
  - Materials failures

ESR Recloser case study

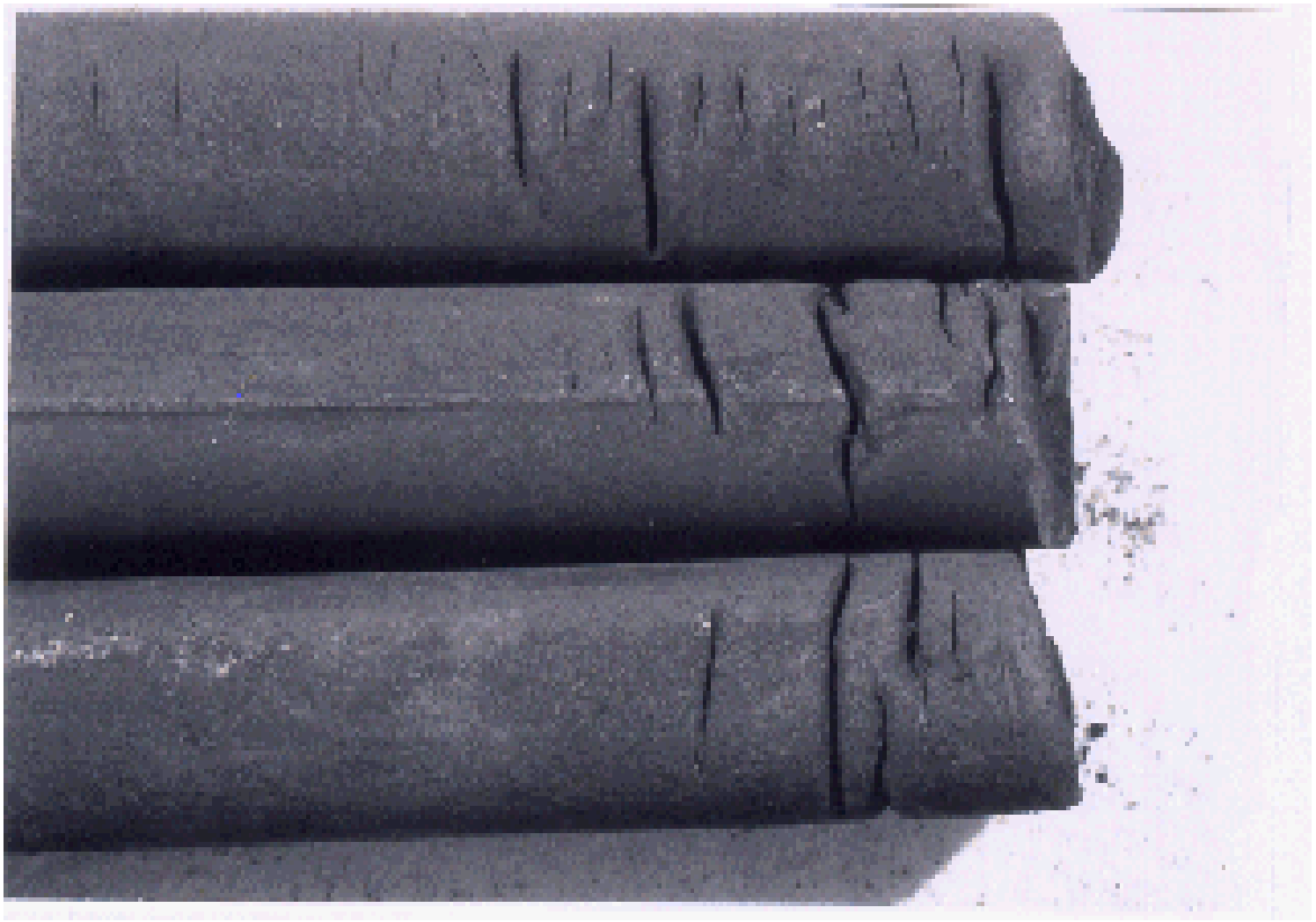


Internal Components

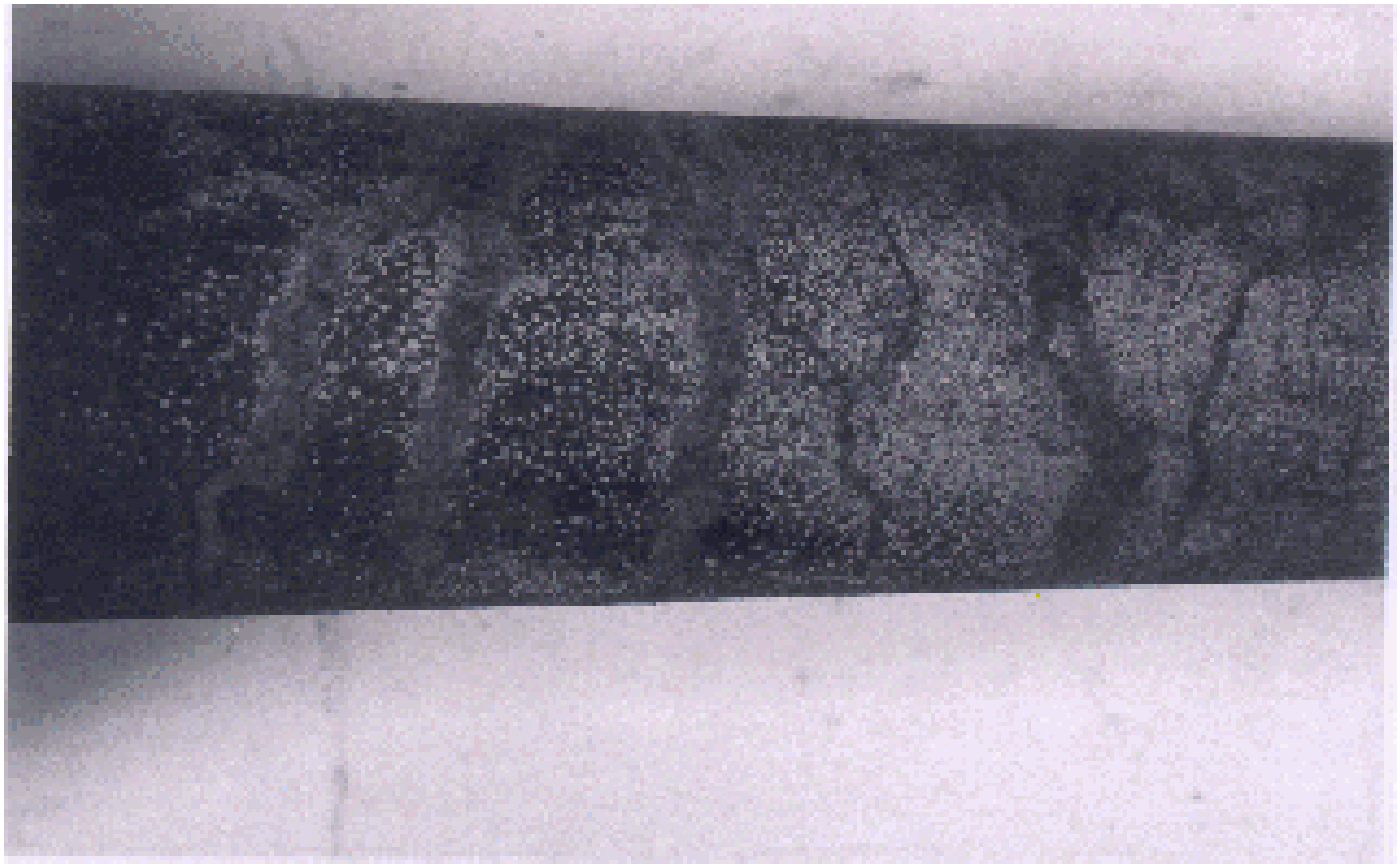


‘O’ Ring seal of ESR

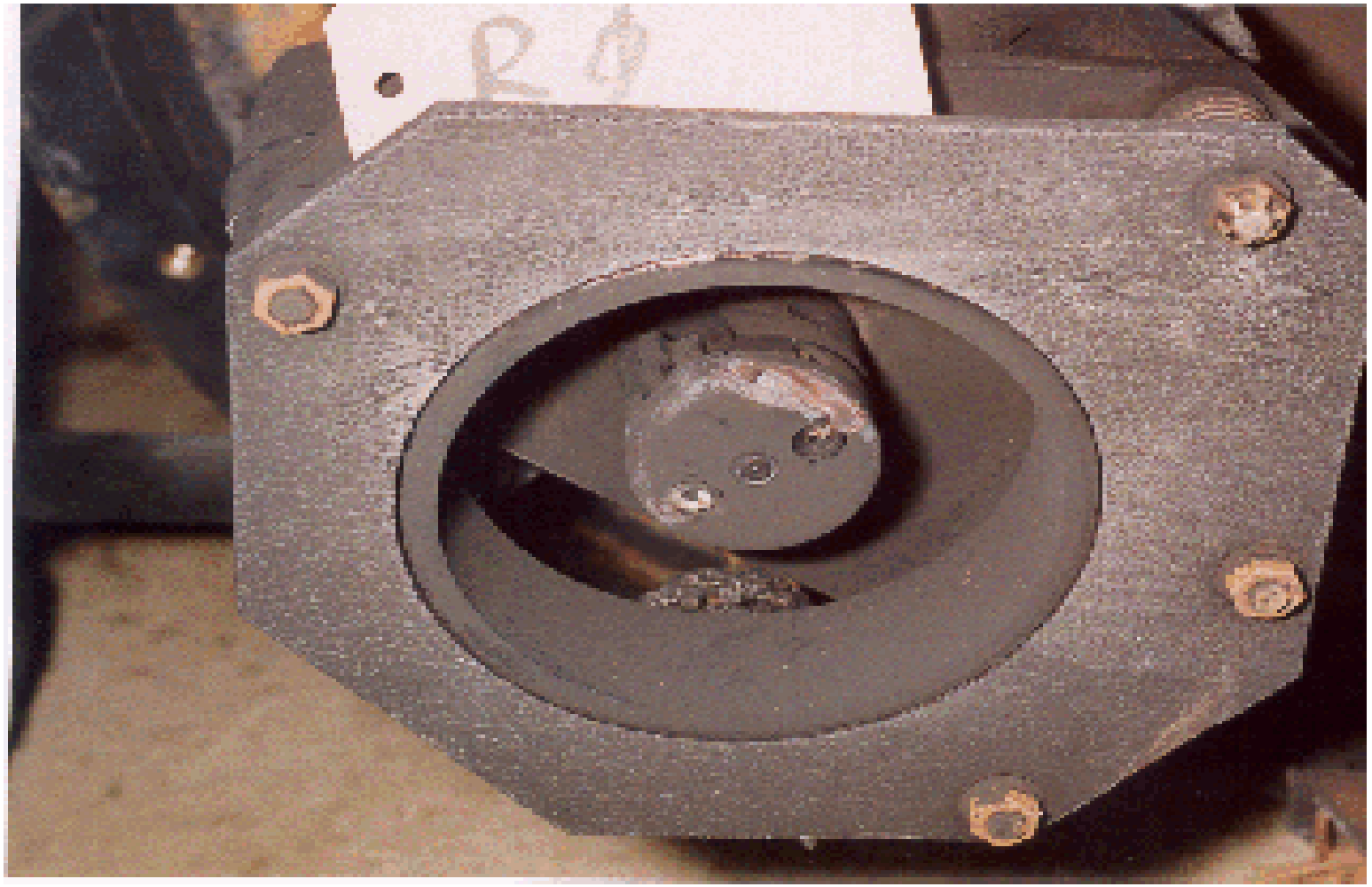
Perished ‘O’ Ring



Tracking of Epoxy Bushing



Arcing of Components



Conclusions

- Cloth across gas seal (present since manufacture)
- In correct seating of the ‘O’ ring
- Long term degradation of the rubber ‘O’ ring
- Reduction of SF6 gas and breathing in of air and moisture reduced the dielectric properties of the gas
- Arcing initiated from the bottom of the fixed contacts (phase voltage) to the bottom of the tank (earth)
- Further secondary arcing was initiated until the protection acted

Thank you

For further information

Call +44 (0) 151 347 2313 or Email sales@eatechnology.com

www.eatechnology.com
Australia | China | Europe | Singapore | UAE | USA

+971 (2) 650 3629
EA Technology Abu Dhabi
PO Box 46153, Abu Dhabi, UAE