

Film feels the pressure to change colour

A colour-changing film offers a fast way of assessing pressure variation between surfaces, and could cost less than electronic sensors. Lou Reade reports

A pressure-sensitive film that reveals an instant 'pressure profile' could replace more expensive electronic sensors in a range of applications.

The film, dubbed Pressurex by US company SPI, is placed between touching surfaces. Tiny coloured capsules in the film burst under pressure – with higher pressures leading to a more intense colour. When used with analysis software, it produces a coloured 'map' of pressure distribution between the surfaces.

"If the pressure between surfaces can be measured down to a fine increment, then engineers can separate the theoretical contact from actual contact and see how that affects performance models," says Jason Blume, technical product manager at SPI.

The film could be used to replace strain gauges or load cells, which are "time consuming and difficult to interface", says SPI. In addition, the film could be more effective in harsh environments and on curved surfaces than standard pressure transducers.

Pressurex has been used in a number of applications, including: gasketed interfaces (to determine uneven or insufficient loading); heat sinks (to test thermal transfer); printing machines (to assess roller or nip defects); engine head gaskets; and electronic connectors. The company cites aerospace, automotive, medical and plastics moulding as other industry applications.

The film can be assessed using a colour chart – or sent back to SPI, which analyses it using colour matching and statistical software called Topaq – extracts statistical data and can produce information

such as total force, average pressure and total area.

Topaq equipment can also be bought or leased, allowing engineers to carry out their own analyses.

The advantage of a Topaq analysis, says the company, is that it produces a 3D multi-coloured topographical view of pressure distribution: the film alone produces different shades of pink.

"Topaq allows you to quantify – down to the pixel – the pressure distribution that was applied to the film," says Blume.

In one recent application, Futek – a US manufacturer of load cells, and torque and pressure sensors – was experiencing production problems when bonding strain gauges to sensors. The necessary clamp pressure for the adhesive was 50-75psi – but Pressurex film revealed that it was fluctuating between 50 and 200psi. Futek then redesigned the clamps to incorporate

silicone die springs, which regulated the pressure more precisely.

James Meiselbach, a mechanical engineer at Futek, had previously used Pressurex when he worked in the aerospace industry.

"We were having a problem with the main rotor blade of a helicopter," he says.

"Interference was causing a fatigue crack in one of the inner spar tubes of the rotor blade."

The answer was to use a large sheet of Pressurex into the bonding tool and pressurised it in the autoclave. The film showed the exact pressure that was causing the crack.

Pressurex is supplied in seven sensitivity ranges: the lowest covers 2-20psi, while the highest is 18,500-43,200psi.

A related product, Thermex, is used to determine a temperature profile between surfaces – so can find hot spots or low temperature zones. □

Enter 132 for SPI

Pointers

- Pressurex is a thin film that reveals an instant pressure distribution map between two surfaces

- It could replace strain gauges or load cells in some applications, especially those where curved surfaces are involved

- Seven sensitivities of film are available, covering pressures from 2psi all the way to more than 43,000psi

