

Repairing the nuclear industry

Nuclear fission generates over 25 per cent of the electrical power in the UK. In France this proportion is greater than 70 per cent. Throughout the world there are 31 countries operating about 440 civil nuclear power systems to generate electricity.

As might be expected, throughout the operating life of nuclear plants there will be a requirement to replace or repair engineering components. For example, main reactor pressure vessels are made from steel sections that are welded together, as are the pipes that transmit steam from the reactor to the steam turbines. Due to the molten weld metal cooling and contracting, welding introduces stresses near the weld itself which can become a place of weakness.

It is clearly vital that the magnitude of these residual stress fields is known, but with so many variable parameters in processes such as welding, it is extremely difficult to quantify their amplitude and spatial distribution. Much of the research in the Solid Mechanics Group in the Department of Mechanical Engineering has been devoted to understanding how the presence of the residual stresses influences the fracture of steels. For example, the novel deep hole drilling method, developed at Bristol, provides complete, through-thickness measurements of residual stress which can be used to validate numerical models. Such measurements have now been performed on many large industrial applications – the wing of the new Airbus A380, offshore pipelines, and safety-critical

components from a nuclear power plant are just a few examples.

The repair or replacement of these components is a very cumbersome, costly and time consuming exercise which is responsible for long plant shut-down time and the corresponding loss of electricity production. For example, in the case of a nuclear reactor the lost revenue is in the order of 3.5 million euros per week. Here at Bristol we are continually looking at how we can use our expertise to develop novel methods for *in situ* monitoring of engineering components. This will enable us to assess the life of the component in much the same way as we have regular health checks. ■

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The risks and benefits of taking antidepressants

David Gunnell, Professor of Epidemiology in the Department of Social Medicine, is a member of the Expert Working Group looking into this highly charged issue. He is advising Britain's Medicine and Healthcare products Regulatory Agency on a large study looking at the possible links between some types of antidepressant and suicide.

