Surface technology

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What is Surface Engineering?
Why we are interested in surface technology?

An engineering component usually fails when its surface cannot adequately withstand the external forces or environment to which it is subjected.

The choice of a surface material with the appropriate thermal, optical, magnetic and electrical properties and sufficient resistance to wear, corrosion and degradation, is crucial to its functionality.

Sometimes technological progress and manufacturing efficiency may be constrained solely by surface requirements. For example, the fuel efficiency and power output of gas turbines or diesel engines are limited by the ability of key components to withstand high temperatures.




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However, it is often impractical, inefficient or uneconomical to manufacture components from a bulk material simply for its surface properties - far better to use a cheaper, more easily formed underlying material and coat it with a suitable high performance film. The resulting product conserves scarce material resources, performs better than the original and may well be cheaper to produce.

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Improving the functionality of an existing product is only one aim of surface engineering. New coatings and treatment processes may also create opportunities for new products which could not otherwise exist. For example, satellites could not function, nor could modern power plants operate safely, without the application of advanced surface engineering techniques.

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The economic benefits of surface engineering are enormous. According to a report by RCSE staff, in 2005 the value of the UK coating market is approximately £21.3 billion, and those coatings critically affect products with a value greater than £143 billion (Source: "2005 Revisited; The UK Surface Engineering Industry to 2010", A Matthews, R Artley and P Holiday).

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In brief, surface engineering is relevant to all types of products. It can increase performance, reduce costs and control surface properties independently of the substrate, offering enormous potential for:

•improved functionality.

•the solution to previously insurmountable engineering problems.

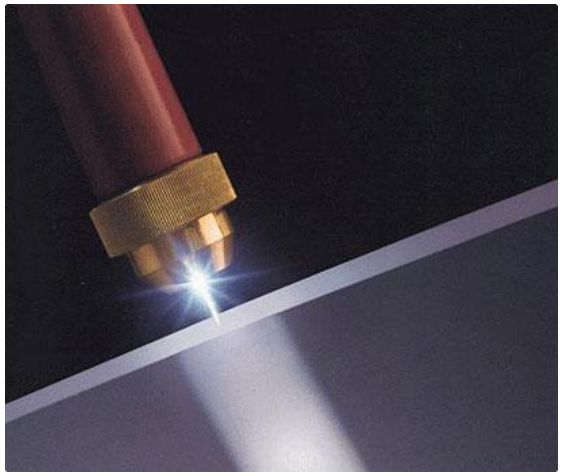
•the possibility to create entirely new products.

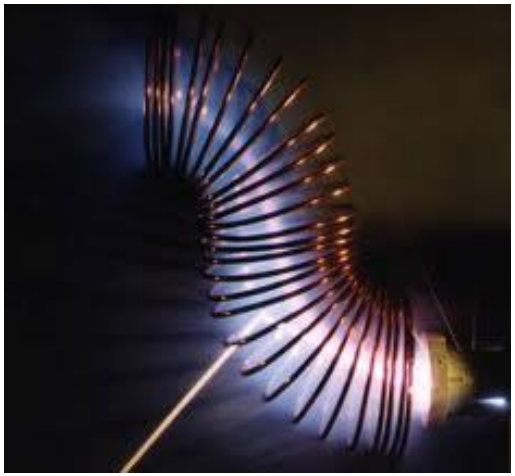
•conservation of scarce material resources.

•reduction of power consumption and effluent output.

(PISE) techniques

Surface engineering embraces a wide range of techniques, but it is the Plasma & Ion-based Surface Engineering (PISE) techniques which are attracting the greatest international interest. PISE techniques offer the most promising methods of improving surface quality to better control the structure and increase the reliability and reproducibility of coatings by precise process control. This is crucial, for example, in providing properties to withstand complex loading conditions in corrosive environments.





(PISE) techniques

The PISE techniques have several important advantages:

- large surfaces are easily treatable
- PISE is based on dry technology, avoiding the use of harmful solutions.
- unlike traditional techniques, the processes are virtually pollution free.
- such processes can be easily automated.
- properties such as corrosion and wear resistance, fatigue strength and biocompatibility, as well as the combination of these properties, are achievable and controllable.