



Project Information Sheet

Project full name (SUSONENCE)

Programme area:	Cleaner Production
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Partners:	C-Tech Innovation Ltd, UK; Coalesce Solutions Ltd, UK; Protection des Metaux SAS, France; Pragoboard s.r.o., Czech Republic; EIPC Services B.V., Netherlands International Project Management, Plating and Materials, France Coventry University, UK
Website:	www.susonence.eu
Benefits (max. 150 characters incl. space):	The project aims to achieve cleaner production via the use of sonochemical processes to reduce hazardous chemical usage and decrease generated waste.
Keywords:	Sonochemistry, chemicals, waste.
Sector:	C25.6.1 - Treatment and coating of metals.
Type of solution	Product, process, technology.
Duration:	01/07/2011 – 30/06/2014
Budget:	€1,326,998 (EU contribution: 50%)
Contract number:	ECO/10/272446/S12.596854

Summary

The major objective of the project is the first application of ultrasonically enhanced surface modification processes for removing surface layers, etching, and texturing a variety of substrates (metallic, polymer, ceramic) with greatly decreased chemical consumption that will enable a step-change in competitiveness within the surface finishing and printed circuit board manufacturing sectors, whilst significantly decreasing environmental impact.

The project aims to implement first industrial plants within partner SME's facilities in the metal finishing and printed circuit board-manufacturing sectors. Key factors in the potential uptake of the developed technology are considered to be the increasing costs of raw materials, energy, treatment of waste and ultimately the disposal of waste from site, which are all projected to continue to rise inexorably due to a combination of legislative demand in the instance of waste and escalating world demand, primarily from Eastern manufacturing areas. As a result, there is both a competitive need and an opportunity for significant cost benefits in the reduction of direct manufacturing overheads.

Expected and/or achieved results

The major outputs from the work are: industrial scale units matched to targeted sector manufacturing plants; arising IPR; detailed trial data; techno-economic modelling and a life cycle assessment to determine environmental impact. The main result indicators will be:

- Reduced use of toxic/ hazardous chemicals
- Waste minimisation/ diversion from landfill
- Reduced energy consumption



Reduced water consumption

The perceived market within Europe is the estimated 6000 surface engineering and PWB manufacturing companies that employ upwards of 80,000 people and have sales in excess of £8 billion. In respect of potential uptake of the developed technology it is considered that some 2,000 companies within Europe could adopt such within a ten to fifteen year timeframe. The market is driven by both cost and legislation and as both the cost of raw materials and the cost of disposal increases so will the number of companies adopting the technology.

Uptake of the technology will have environmental, economic and societal sustainability benefits by virtue of reduction in hazardous chemicals usage and associated cost savings, cost benefits from reduced energy, waste treatment and waste generation/ disposal as a manufacturing overhead reduction and greater competitiveness for the targeted manufacturing sectors within Europe.

Four diverse applications were selected on the basis of small-scale trials as having potentially significant commercial benefits for full-scale pilot plant operations at partner surface finishing and printed circuit board manufacturing facilities. These applications are with tin/lead barrel plating and etch pre-treatment of plastics and desmear and micro-etching in the surface finishing and PCB facilities respectively.

Deployed on tin/lead barrel plating, the Susonence technology has demonstrated enhanced quality over conventional processing in that the tin/ lead ratio is maintained at an optimum 60/40-alloy value and has eliminated all problems in the control of alloy stoichiometry. This was a serious issue because compositional variations in the plated alloys caused significant changes in alloy melting points and product solderability. Other significant benefits are cost and environmental related in that the use of Susonence technology has demonstrated a 20% reduction in surfactant additions and a 50% reduction in organic brightener additions for the tin/ lead plating chemistry.

The plating on plastics deployment of Susonence is of greater significance in that results at Promet have demonstrated that more benign chemistries may be deployed in obtaining equivalent pre-treatment to that obtained conventionally with hot, concentrated chrome/ sulphuric acid solutions. Whilst Promet does not undertake large volume plating on plastics operations, for a dedicated manufacturer of plated on plastics products the cost, health and safety, legislative and environmental benefits are considered significant.

A video of these installations may be seen on U-tube at the following web-address:

www.youtube.com/watch?v=dR6oQT3Q2ME

The printed circuit board manufacturing applications were demonstrated at Merlin Circuits Ltd in the UK via deployment on desmear and micro-etch applications.

In desmear operations, one is seeking to remove resin smearing within through-holes which has occurred during drilling operations and which would otherwise inhibit the subsequent adhesion of electrodeposited metal through the holes forming conducting cross-layer interconnects. Desmearing is traditionally carried out using hot, concentrated potassium permanganate solution. With Susonence technology deployed, an equivalent level of desmear was obtained using a 17% reduction in temperature, a 50% reduction in chemical concentration and a 75% reduction in immersion dwell times. Together these benefits accrue into productivity, cost, health and safety and environmental gains.

In micro-etching operations, whilst no significant gains appeared to be attainable by the deployment of Susonence within a standard etch process; what was demonstrated as significant was the ability of Susonence to achieve comparable etching at low chemical compositions.

What can be clearly seen from the deployment results are the potential benefits of Susonence technology across a variety of chemical process treatments in respect of all tenets of sustainability, viz environmental, economic and societal.