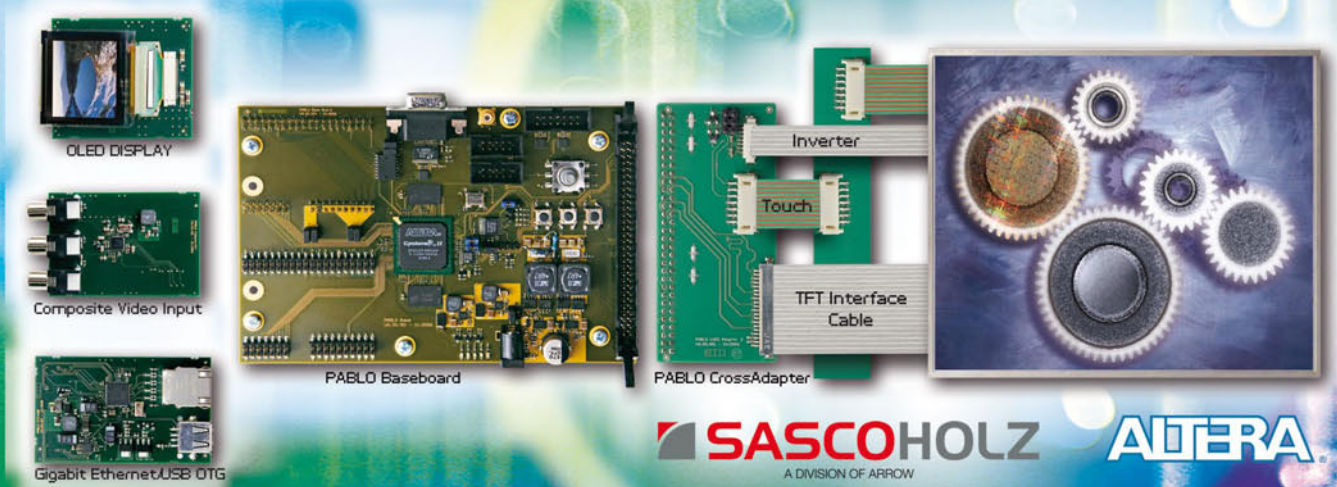
Das professionelle Elektronikmagazin

ELEKTRONIK PRAXIS

4 B19126
20. Feb. 2008
€ 9,20
VOGEL

Display-Controller auf FPGAs entwickeln



Translation and adapted version from German original: Elektronik Praxis 2008-02-05 online: http://www.elektronikpraxis.vogel.de/themen/elektronikfertigung/baugruppenfertigungtest/articles/107956/?ACMP=DMC-beleg

Subassembly production and testing
Pretreatment of surfaces

Plasma beam cleans and activates covering and sealing surfaces

05.02.2008 Author: Peter Langhof*

In the patented Openair process from Plasmatreat in Westphalia surfaces are treated with atmospheric-pressure plasma. The plasma applied by special jets cleans and activates

In the patented Openair process from Plasmatreat in Westphalia surfaces are treated with atmospheric-pressure plasma. The plasma applied by special jets cleans and activates the surfaces without the subassemblies coming into contact with electric voltage. The result is that paints, inks, adhesives or sealing compounds adhere in optimum fashion.

The process can be integrated into existing manufacturing processes and overall or in part allows continuous in-line operation at high speeds. If the jet is guided by a robot the most detailed contours can be cleaned, activated and coated with pinpoint precision.

Electrically neutral plasma beam

This is how it works. The systems based on a jet principle operate at atmospheric pressure and with the aid of an arc ignited in the jet and the working gas, air, generate a plasma that flows at zero potential onto the product to be treated. It contains particles that are sufficiently excited to initiate selective effects on the surface. The jets are operated by air, if need be with another desired process gas also, and by high voltage.

A characteristic of the Openair process is that the emergent plasma beam is electrically neutral which greatly extends and simplifies its use. Its intensity is so high that machining speeds of several 100 m/min are possible. Typical temperature rises during treatment, on plastic surfaces for example, amount to less than 20 °C.

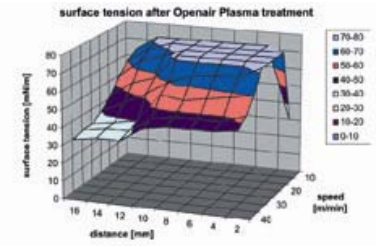
The system has a threefold action:

1. It activates the surface by selective oxidation;

2. It simultaneously discharges the surface;

3. It provides ultrafine cleaning and at the same time activates the surfaces of metals, plastics and glass. In addition the plasma energy of this system is used for forming coatings. An efficiency aspect is that the jet systems used can be integrated directly into new or already existing production lines.

Overall, the surface is activated which has a very positive effect on adhesion. Due to the process of discharging surfaces the process affords cleaning effects which exceed by far those of conventional systems. Here the user makes use of the high electrostatic discharging effect of a free beam of plasma. This effect is additionally positively



influenced by the very high speed of discharge of the plasma as a result of which loosely adhering particles are also removed effectively from the surface.

If the jet is guided by a robot highly detailed contours can be cleaned, activated and coated with pinpoint precision. When working on intricate workpieces Plasmatreat's experts adapt the tips of the plasma jet to the workpiece geometry. This adaptation is especially important when very complex, three-dimensional geometries having numerous undercuts have to be pretreated.

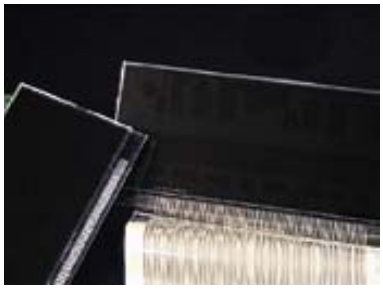
Plasma pretreatment in automobile electronics

Renowned suppliers to the automotive sector provide protection by using Openair plasma. These include the world market leader in vehicle safety systems, TRW, which protects highly sensitive sensors and control elements before they are penetrated by dirt and moisture.

Automobile electronics impose particularly high demands on the imperviousness of protective housings made of plastic or aluminium. The electronic system must withstand temperature fluctuations from -40 to 140 °C in tests and the housing must keep out any moisture, liquids and chemicals. In order to achieve the best possible leak-proofing, in modern manufacturing processes the joining surfaces of the packaging of the electronics are treated with plasma before the adhesive is applied.

This pretreatment cleans and activates the housing surfaces so powerfully that due to its now enhanced adhesive properties the subsequent adhesive joint is absolutely airtight. The pretreatment technique ensures not only high quality, it is also capable of in-line integration, can be checked and monitored and due to constant parameters the process is reproducible in accordance with ISO 9000.

Plasma pretreatment in display assembly



Wherever vibrations arise or movement occurs contact is made to displays having a film applied by heat sealing. The film establishes the connection between the printed circuit and the contact surface, the actual display, which usually consists of two thin glass plates. Bonding of the film ensues on the plate coated with ITO. Glass surfaces, however, are easily soiled during packaging, storage, processing or transport. Fingerprints or dust on the surface of the glass can scarcely be avoided without additional cleaning.

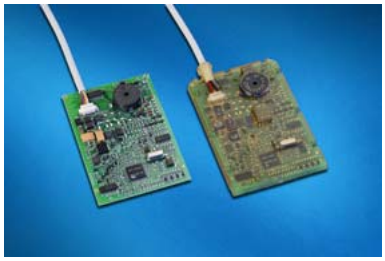
The short-term or long-term consequence of such soiling is segment errors which manifest themselves in that too few or too many fields appear in the display. The reasons are generally always the same: the film adheres poorly and particles present cause short circuits.

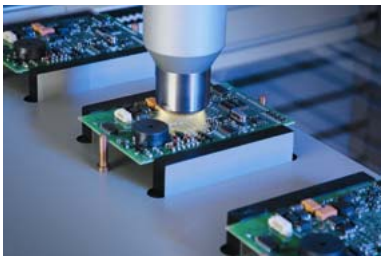
To date in most production processes the display glass is cleaned manually by means of a swab and solvent. Given this situation an average reject rate of 12 % is not surprising.

The situation is quite different among manufacturers that clean displays by pretreatment with atmospheric-pressure plasma. Here the reject rate drops radically to less than 1 %.

Furthermore, the protective film, ITO layer and pole filter are not damaged by the mild, zero-potential treatment and the entire in-line process, as in PCB cleaning, is absolutely environmentally friendly, monitorable and reproducible.

Plasma pretreatment in protective coating





The world-renowned security system manufacturer Honeywell Security AG in Novar places great value on the atmospheric-pressure plasma technology from Steinhagen in the manufacture of high-grade alarm systems. After the soldering process a hotmelt is applied to protect the electronics against moisture or mechanical damage.

In doing so the cleaning pretreatment with atmospheric-pressure plasma ensures that the melt adhesive adheres securely and does not become detached. The plasma jet directs the beam over every square centimetre of the printed circuit board. The ultrafine cleaning has the result that after the subsequent application of the hotmelt it adheres so well that the highest international protection standards IP 68 and IP 69K (resistance of electric equipment to high-pressure jet cleaning) are met.

After production such a printed circuit board is inserted into an additional housing and serves as keypad in the external entrance area of a complete, highly complex building intrusion detection system. Any failure of this keypad could interfere with the operation of the security installation. That is why Honeywell – going well beyond standard requirements – subjects each individual printed circuit board to a 12-hour underwater performance test.

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Editor: Claudia Mallock

Picture gallery

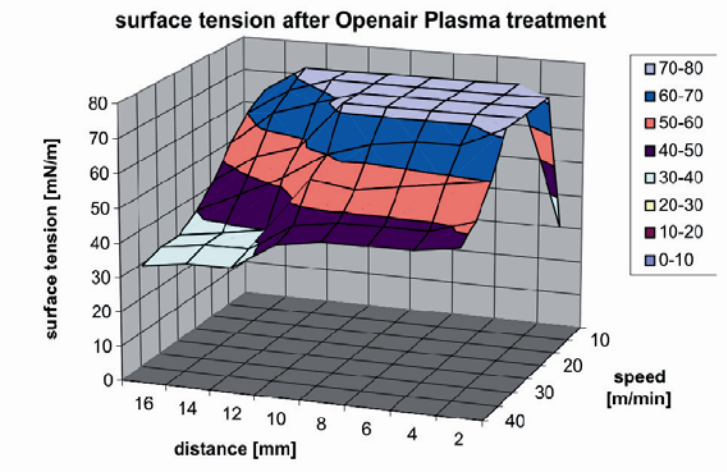

Diagram: Plasmatreat
The graph shows a plastic surface that was pretreated with plasma as a function of the spacing and speed. After treatment the surface becomes polar and its surface tension rises to > 72 mN/m with great processing latitude.

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Photo: Plasmatreat
Pretreatment and activation of the housing surfaces with atmospheric-pressure plasma – before application of adhesive – brings about optimum leak-proofing of the packaging of the electronics.

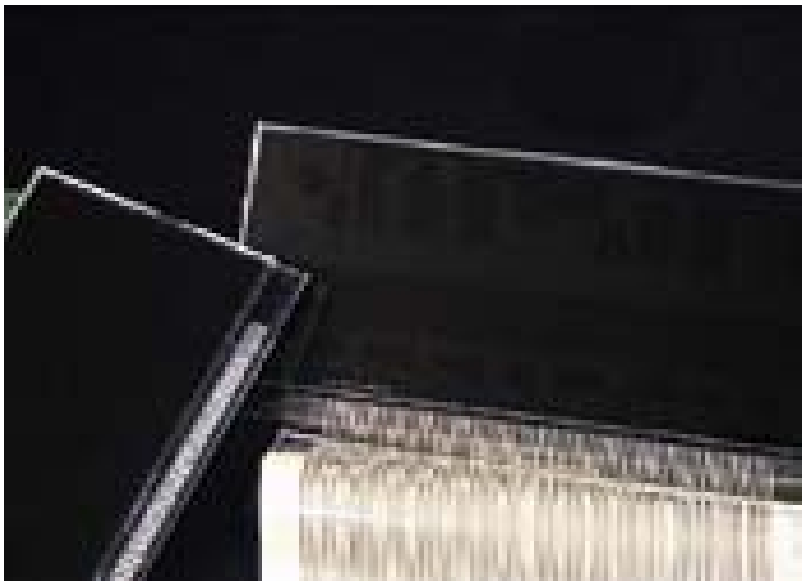

Photo Plasmatreat
High adhesion after plasma treatment: LCD display with heat-sealed film (right) and after tearing off the film (remaining film strip, left).

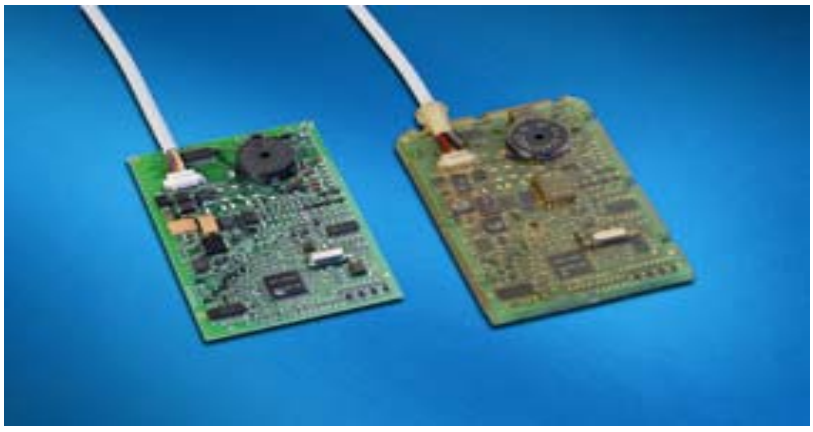

Photo: Plasmatreat
Before encapsulation with hotmelt the subassemblies are pretreated over their entire surface area with atmospheric-pressure plasma (left). The subsequent sealing with hotmelt protects the printed circuit board against moisture and mechanical damage.

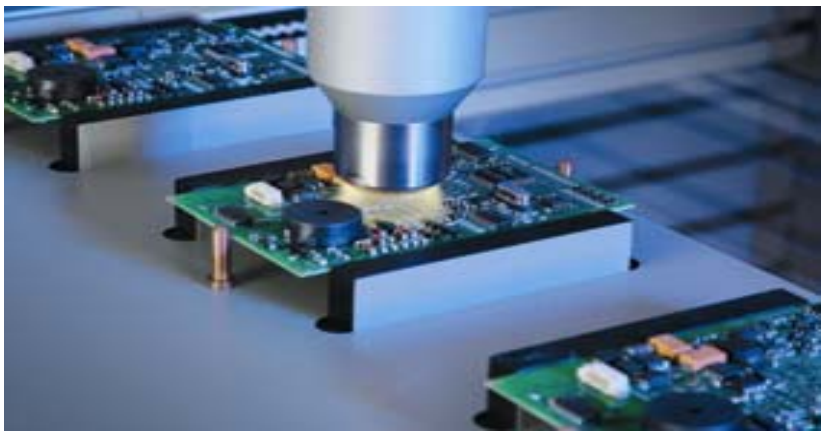

Photo Plasmatreat
To ensure long-term adhesion of the hotmelt, ultrafine cleaning and activation of the printed circuit board is carried out before sealing.

Photo: Plasmatreat
The electrically neutral plasma beam allows ultrafine cleaning, high activation and nano coating of surfaces.