FineSol

Assembly of miniaturized PCBs by using low cost hyper-fine solder powders

Background

The total EU electronics industry employs ≈20.5 million people, sales exceeding €1 trillion and includes 396,000 SMEs. It is a major contributor to EU GDP and its size continues to grow fueled by demand from consumers to many industries. Despite its many positive impacts, the industry also faces some challenges connected with the enormous quantity of raw materials that it needs for sustainability, the huge quantity of Waste Electrical, Electronics Equipment (WEEE) generated and the threat of competition from Asia. To sustain its growth, to manage the impact of WEEE and to face the competition from Asia, the industry needs innovations in key areas. One such area is the drive for ultra-miniaturisation/ultra-functionality of equipment. The key current road block/limitation to achieving the goal of ultra- iniaturisation/functionality is how to increase the component density on the printed circuit board (PCB). This is currently limited by the availability of hyper fine pitch solder powder pastes..

FireSol Overall Objective

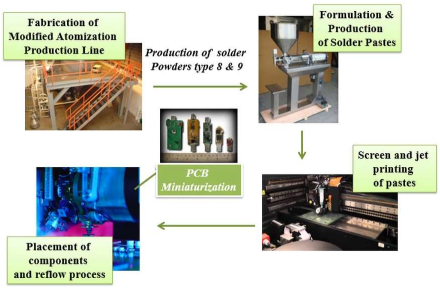
FineSol aims to deliver at first stage an integrated production line for solder particles with size 1-10 μm and to formulate solder pastes containing these particles. Thus, by proper printing methods (e.g. screen and jet printing) the fabrication of PCBs with more than double component density is achieved. Consequently, this effectively enables more than a doubling of the functions available on electronic devices such as cell phones, satellite navigation systems, health devices etc. The successful completion of the FineSol project lifts the ultra-miniaturisation/functionality road block and also enables reduction in raw material usage, reduction in WEEE, reduction in pollution and associated health costs and also a major reduction in EU energy demand with all its indirect benefits for environment and society.

Solder Powders
Successfully achieve miniaturization of PCBs via the delivery of functional, low cost, hyper-fine solder powders of type 8-9

Production
Deliver an integrated production line for hyper-fine lead free solder particles, formulate solder pastes containing these particles that, by proper printing methods will reach the targeted miniaturization of solder joints in mass production.

Miniaturization
Miniaturization in electronics and its potential impact as exemplified by the cell phone, have continuously decreased in size whilst offering more and more functions.

The Concept



How to achieve PCB miniaturization

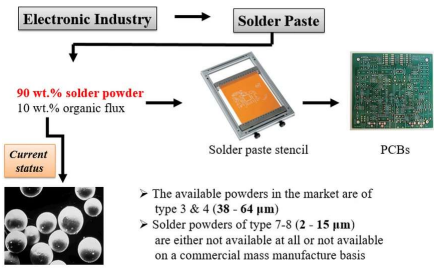
Finesol project targets to combine recent advancements in technological fields such as mechanical and chemical engineering as well as of automated control systems and NDT inspection methods, in order to successfully achieve miniaturization of PCBs via the delivery of functional, low cost, hyper-fine solder powders of type 8-9.

The project is divided in four main phases:

1. Development of an upscale prototype atomization machine for production of type 8-9 solder spheres. During the first phase the atomization machine is constructed based on integration of a modified atomization machine of high energy input with a coating sub assembly apparatus for the straight formation of an anti-oxidant protective monolayer coating on the formatted powders.
2. Formulation of proper solder pastes containing the produced coated solder spheres. Following, solder pastes are produced utilizing appropriate, environmental friendly fluxes, compatible with the organic coating of then solder spheres.
3. Assembly of PCBs in lower reflow temperature compared to the current state of the art by utilizing the produced solder pastes, followed by characterization utilizing NDT methods. The overall project closes with a series of demonstration activities.

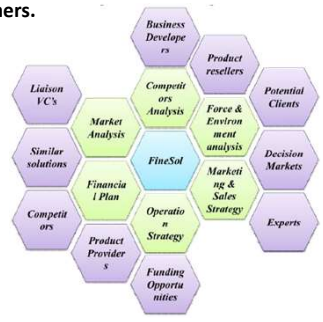
The current state of the art concerning the PCB's assembly is the utilization of solder pastes containing solder powders of type 3-4 with particle size distribution in the range of ~40 μm. Type 5-9 solder powders are either not available at all or not available on a commercial mass manufacture basis that results in extremely high costs. This limitation is due to various reasons such as:

- the state of powder metallurgy technology which is currently not capable of mass producing such fine powders on a commercial scale
- inability to protect from surface oxidation the produced powder that has as a consequence low quality soldering
- restricted ability of inspection of hyper-fine interconnections



Solder paste and particle size

4. Actions for successful of exploitation of results. The FineSol project gives emphasis on the successful exploitation of the results and thus has set up all appropriate actions toward this direction. Thus, in parallel to the technical implementation of the project actions related to lifecycle assessment of the new project, standardization of materials and process as well as to development of an attentive business plan takes place by the assigned partners.



Aspects of FineSol business model

Project Partners

CERTH CENTRE FOR RESEARCH & TECHNOLOGY HELLAS · Atomising Systems Limited · ebis AUTOMATYKA PRZEMYSŁOWA · C3 · SP Surface Technology Systems · Microsemi · ISQ · POLMECANIC · Artia Nano Engineering & Consulting · mat-tech innovative soldering & brazing · Prisma Electronics SA · APPLIED MATERIALS · EWF

www.finesol.org

Contact:

Coordinator
Prof. Dionysis Bochtis
Institute Director
d.bochtis@certh.gr
+30 2311 257651 | +30 2311 257650

CERTH CENTRE FOR RESEARCH & TECHNOLOGY HELLAS

iBO Institute for Bio-economy & Agri-technology
iBO | CERTH
6th km CharilaouThermi Rd.
57001 | Thermi | Thessaloniki | Greece
www.ibo.certh.gr | www.certh.gr