EWF

European Federation for Welding, Joining and Cutting





Assembly of miniaturized PCBs by using low cost hyperfine solder powders

Introduction to the FineSol project

21st November 2015

Brussels

Summary

- FineSol
- Background of the project
- Overview of the project
- Objectives
- Technical structure of project
- Impact

FineSol



FineSol

ΕΚΕΤΑ
ΕΘΝΙΚΟ ΚΕΝΤΡΟ
ΕΡΕΥΝΑΣ & ΤΕΧΝΟΛΟΓΙΚΗΣ
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www.certh.gr
Coordinator

EUROPEAN FEDERATION FOR WELDING, JOINING AND CUTTING
EWF

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WP Leader

Background of the Project

Miniaturisation in Electronics



Past – Cell phones



Present – Smart phones



Future- Cell phones/Roll up video

Background of the Project

The problem to be solved…

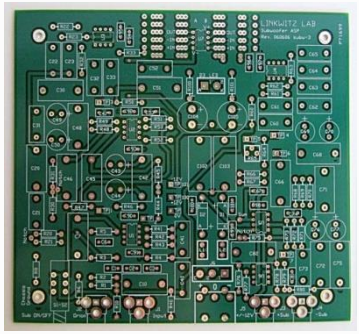
Electronic Industry → **Solder Paste**

90 wt.% solder powder
10 wt.% organic flux

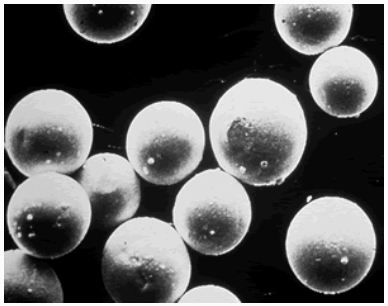
Current status



Solder paste stencil



PCBs



- The available powders in the market are of type 3 & 4 (**38 - 64 µm**)
- Solder powders of type 7-8 (**2 - 15 µm**) are either not available at all or not available on a commercial mass manufacture basis

Background of the Project

HYPERSOL project (GA number 262026)

Started at: 1st December 2010

Ended at: 31st July 2013

Main results:

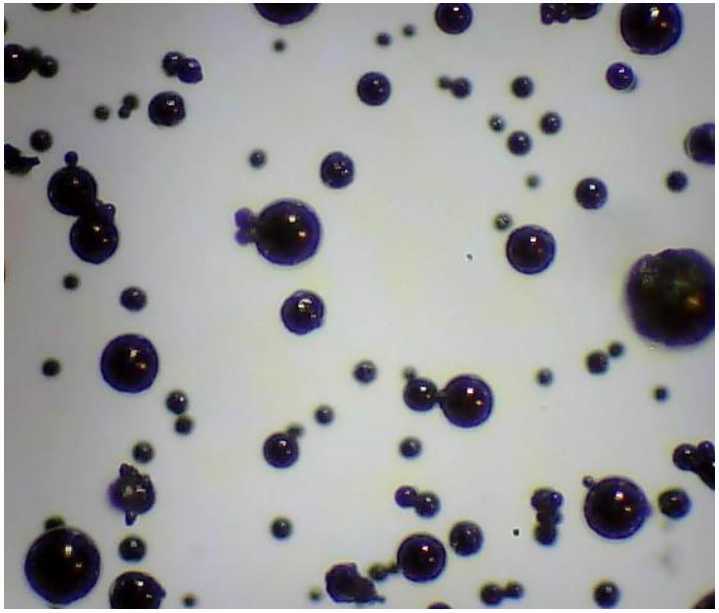
- **Design of HYPERSOL prototype machine**
- **Development of atomization sub-assembly and first trials**
- **Delivery of coating sub-assembly but not integration**
- **Literature review on suitable organic compounds**
- **Experimental results in organic coatings, first indications on suitable compounds**

Background of the Project

HYPERSOL project (GA number 262026)



HYPERSOL prototype
atomization machine



HYPERSOL solder particles
FineSol: eliminate the larger particles

Overview of the Project

7 SMEs: Prisma, Artia, CETRI, Abis, Polmec, ASL, Mat-Tech

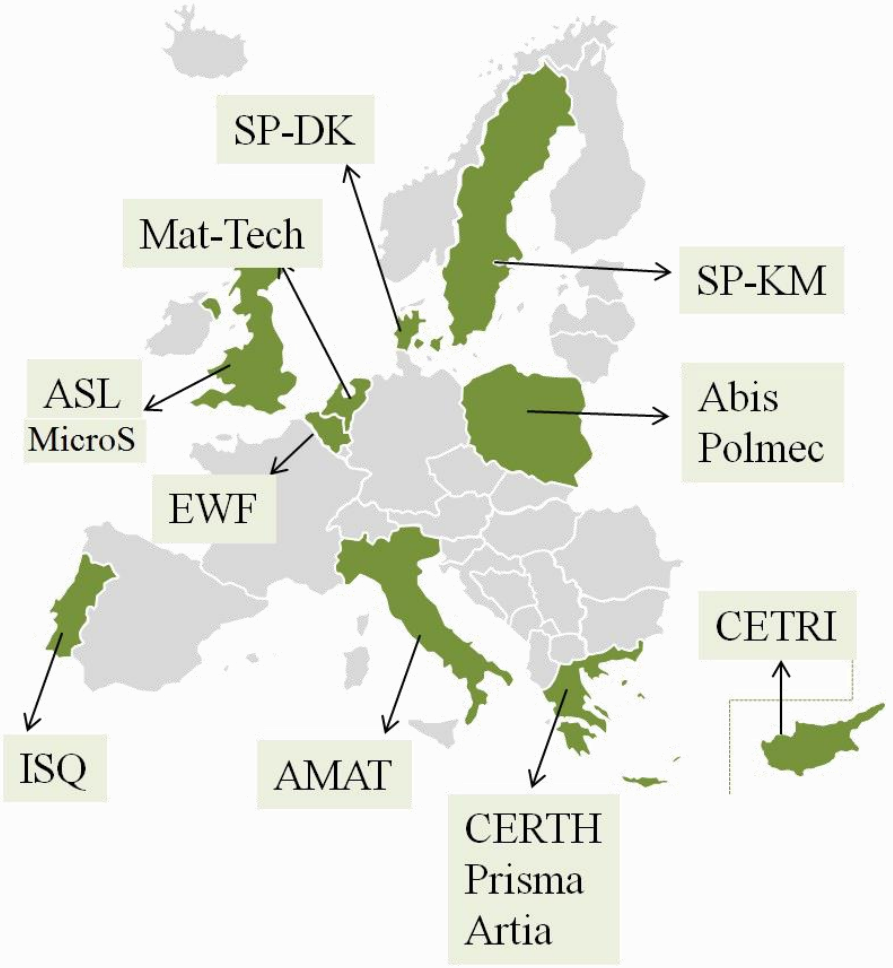
2 LEs: MSL, AMAT

5 RTDs: CERTH, SP-KM, SP-DK, ISQ

1 Association: EWF

Total Budget: 6.337.000€

Total Fund: 4.959.000€



Overview of the Project

Concept

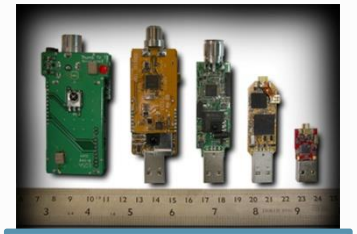


Fabrication of Modified Atomization Production Line

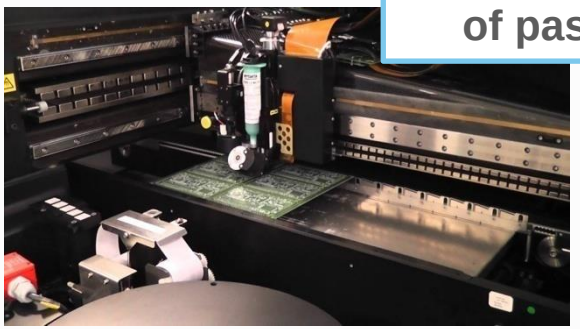
Production of solder Powders type 8 & 9



Formulation & Production of Solder Pastes



PCB Miniaturization



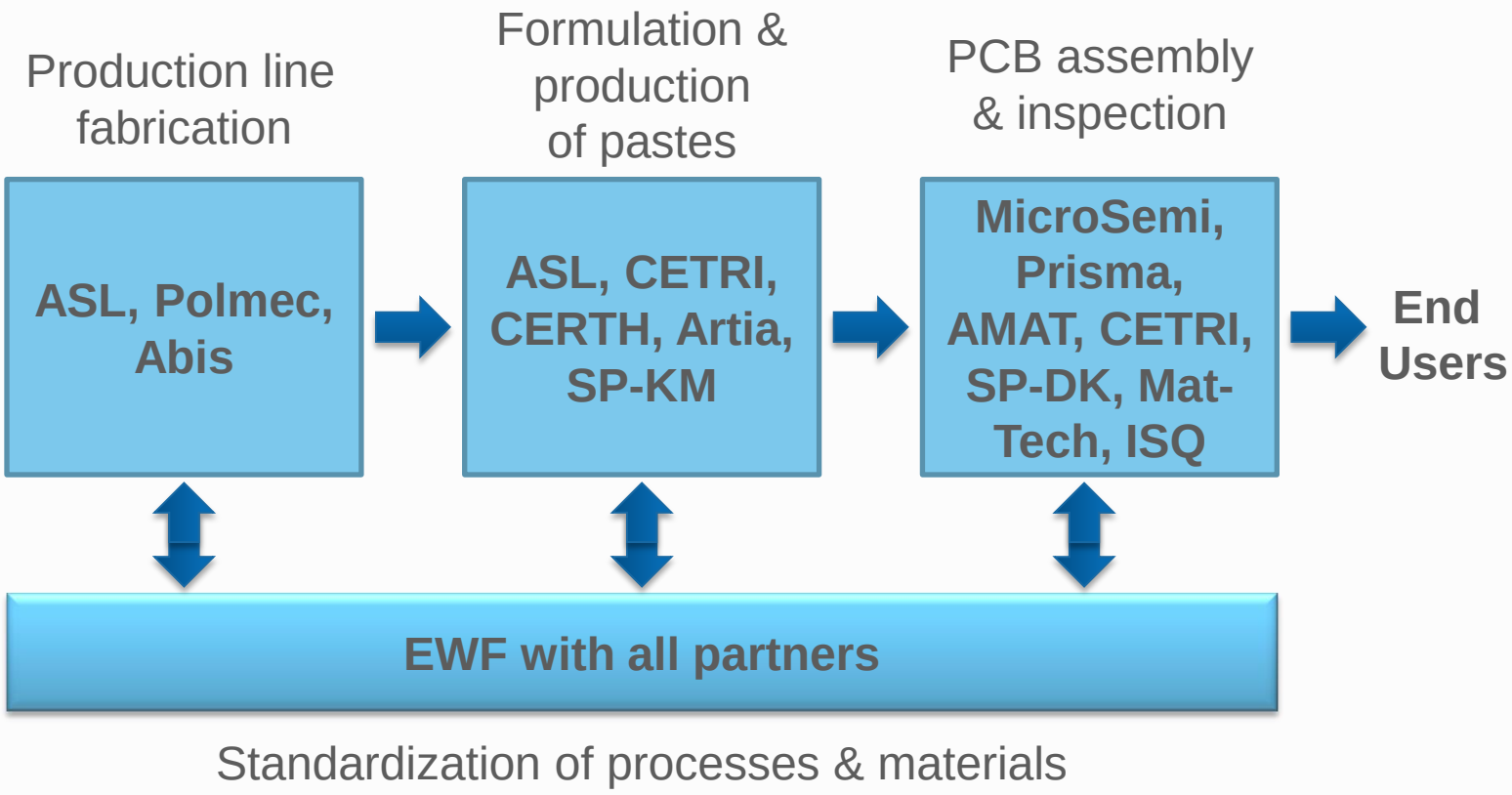
Screen and jet printing of pastes



Placement of components and reflow process

Overview of the Project

Supply Chain of FineSol



Objectives

Solder powder production

	Objective
1	Deliver specification and drawings of the overall FineSol prototype machine.
2	Develop the atomization and coating sub-assemblies and integrate them.
3	Design and build a real-time process control man-machine interface.
4	Increase the energy input up to 200% of the current state of the art in order to get solder spheres <10μm in a stable manner over long production runs with yields of > 70%.
5	Develop a sieving system based on cyclones able to five particle size distribution with 2% by weight of powder greater than 10 μm and less than 0.2% by weight above 20 μm
6	Run the prototype machine for several 24 hour shifts and determine the average production yield and CpK.
7	The total atomized production rate is targeted to be ~50 kg/hour and the system will be suitable for making powders of any solder with liquid metal temperature range 150-325 ^{o}C

Objectives

Solder paste production

	Objective
1	To select ligand coatings based on thermodynamic calculations or experimental results for the oxidation protection of tin as tin is the dominant component of most lead free soldering alloys used in the electronics industry.
2	To coat solder powders with 3 suitable monolayer coatings, identified by the thermodynamic calculations and select the best coating systems able to provide protection of surface oxidation higher than 90%, for the lead free solder pastes, assuring the compatibility of the coating with the low rosin fluxes that will be used during the production of solder pastes.
3	Production of low rosin (concentration lower than 1.5%) - environmental friendly - solder pastes containing type 8-9 solder powders, with excellent rheological behaviour.
4	Ensure extended shelf life (longer than 6 months) of refrigerated solder paste.

Objectives

PCB assembly

	Objective
1	To print the prepared type 8-9 solder pastes with various printing technologies, both manual and automatically (e.g. DEK ELA 265 printer or inkjet printer etc).
2	To use various bespoke stencils for the printing of solder with aperture sizes in the range of 300X300 μm (that is the SoA on current use of stencils) to 100x100μm and thickness less than 50μm.
3	To achieve a total saving of solder paste use up to 80% compared to current type 3-4 solder pastes.
4	To lower the peak temperature at reflow oven by 15oC and the overall duration by 10%.
5	To proceed to PCB assembly of at least 25 different designs of miniaturized PCBs via a component placement machine.
6	To test and inspect the produced PCBs.

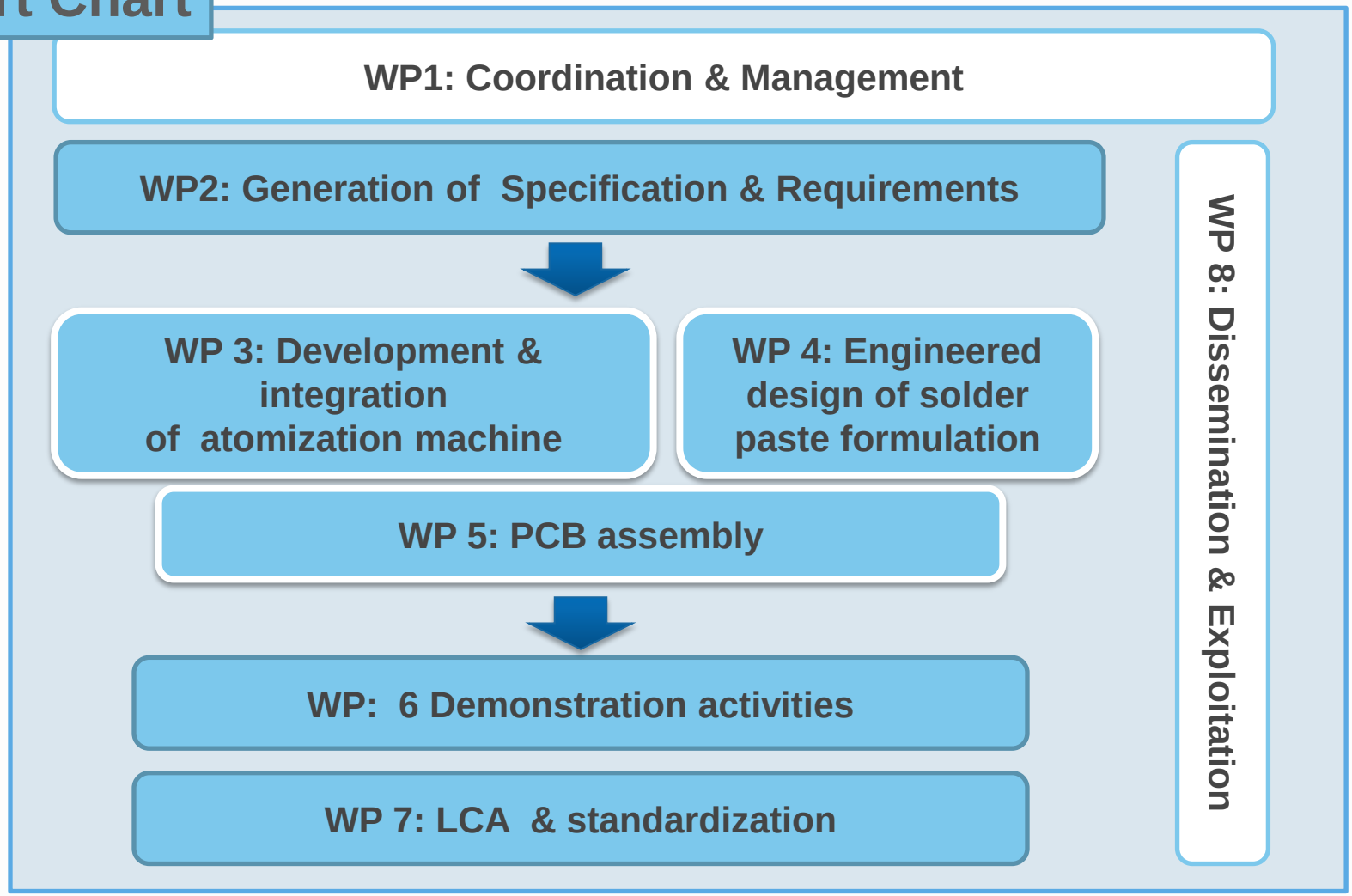
Objectives

Market uptake & Exploitation

	Objective
1	Evaluate, compare and understand the significance of environmental impacts from the technologies of FineSol project.
2	To verify the compliance with standards of all projects results.
3	Continuously update the initial business plan based on the progress of the project and conducting potential customers.
4	Protection of the knowledge that will be developed during the project – IPR issues.

Technical structure

Pert Chart



Exploitation

Direct technological impact

- Miniaturization of PCBs
- New designs and technologies in PCB assembly (e.g. 3D structures)
- Savings of soldering materials up to 70%
- Decrease of reflow temperature and reflow duration leading to decrease of defective PCBs

Other impacts

- Economic growth of EC electronic industry
- Reduction of Waste

Exploitation

Standardization

- Report on standardization
- Standardization and recommendation document

- **LCA** – life cycle assessment
- **Training** Activities via the EWF Network



Thank You!

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