DESIGN FOR MANUFACTURING 2008

"NO DESIGN FOR MANUFACTURING"

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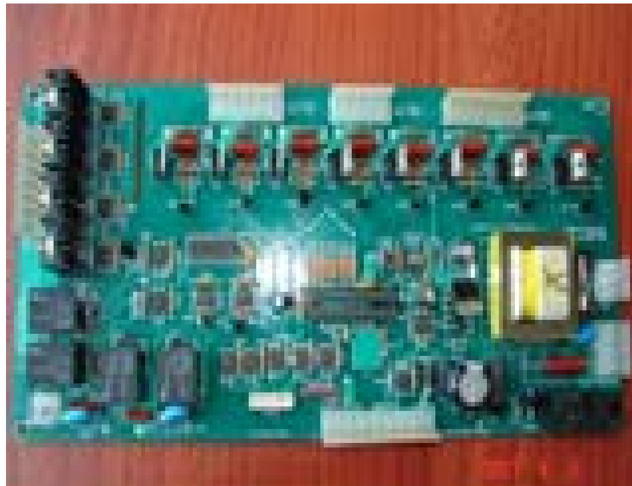
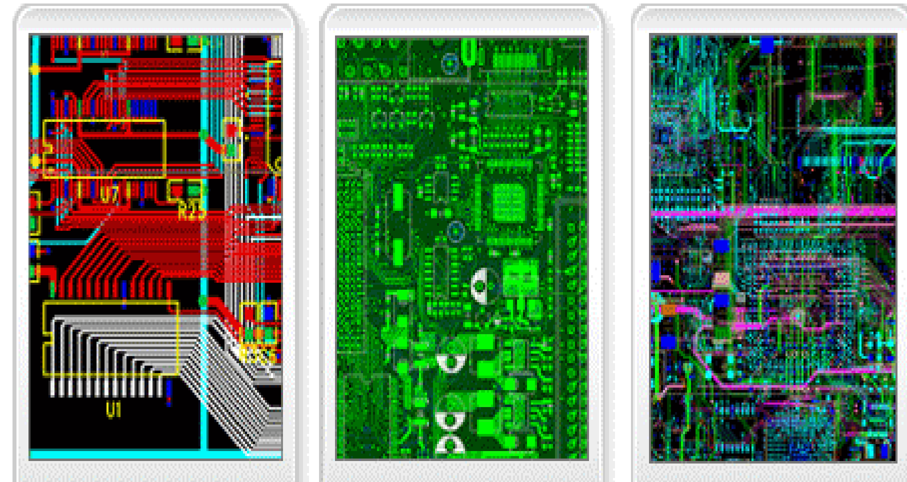
Introduction

- Concept of Project





- Electronic goods have an electrical circuit.
- Interconnection of resistors, inductors, capacitors, and etc.
- The normal circuit doesn't cross lines.
- Insulator on a cross point

Introduction (cont.)

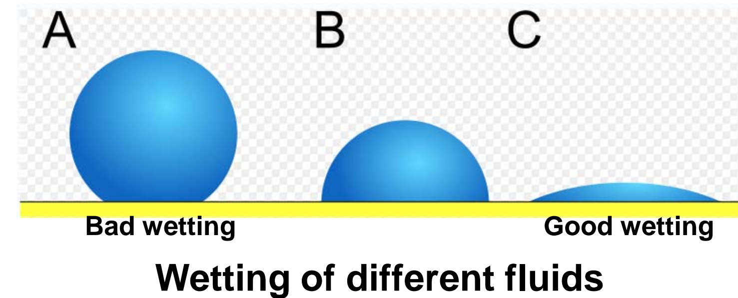
- **Objectives**
  - **All parts in an electrical circuit directly.**
  - **It is not necessary to make a complex design.**
  - **“No Design for Manufacturing”**
  - **New technique for an easy & fast way to make an electrical circuit.**

- **Preliminary research**
  - Solder & soldering
  - Useful in electronics and plumbing
  - Materials for soldering

Soldering

Material selection

- **Requirements**
  - Good wetting for any substrate
  - Good adhesive strength
  - Easy to manufacture
  - Melting temp. range : 100℃ ~ 170℃



Wetting of different fluids

- **Materials**

•Solder lead

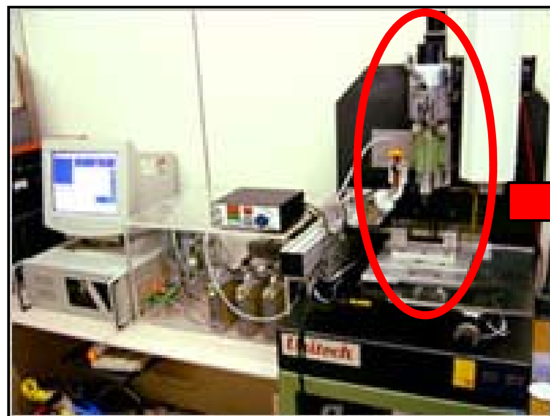
•Melting temp. : 168℃

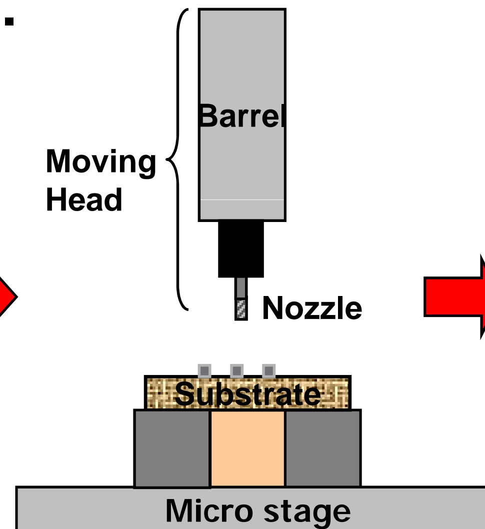
•Low melting point lead

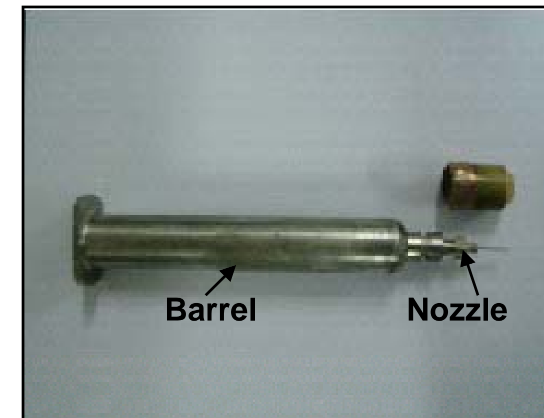
•Melting temp. : 105℃

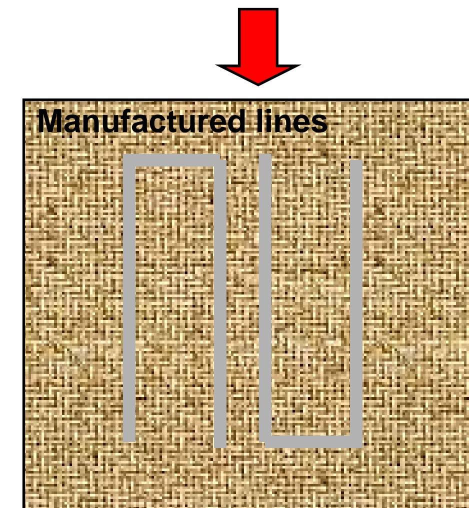
Equipment & Method

- Using RP machine.
- Putting solder in a barrel.





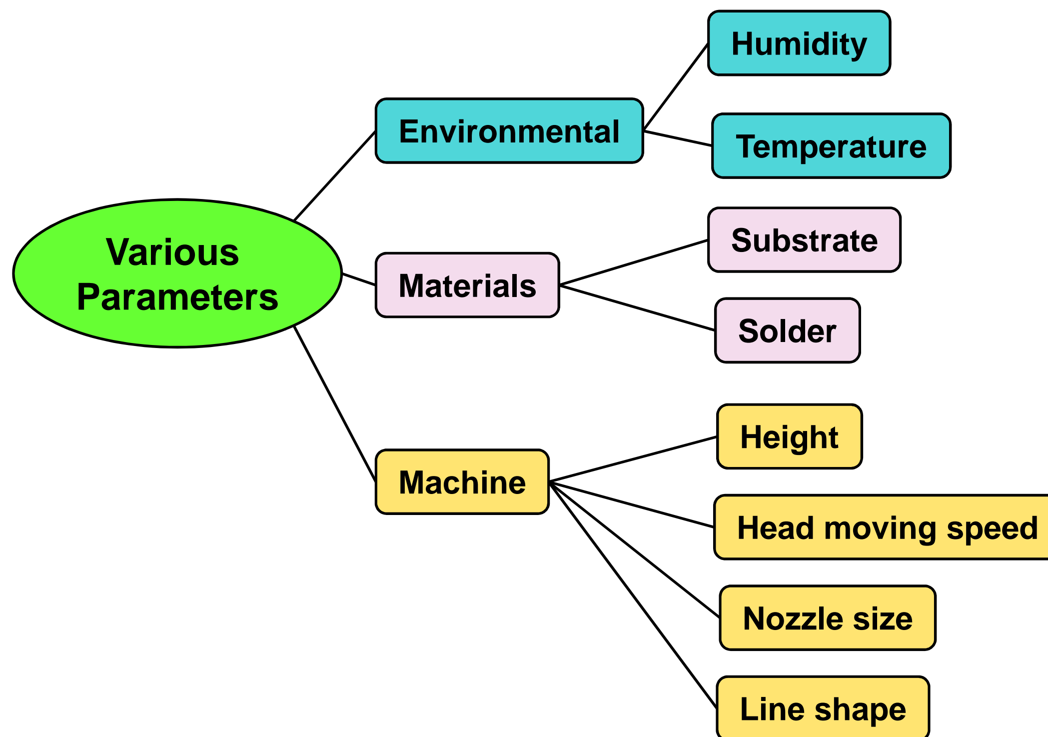


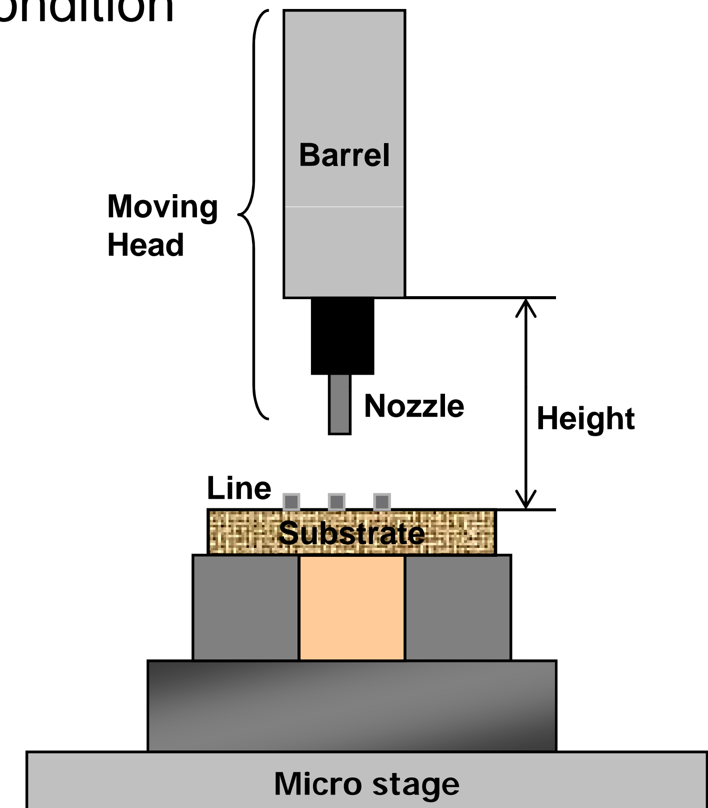


- Applying heat and pressure
- Liquid solder pressing out through the nozzle
- Moving head makes the lines
- Moving head is controlled by NC code

Equipment & Method (cont.)

- **DOE (Design of Experiments)**
  - Various parameters can affect the results.
  - To figure out the most effective parameter
  - To find the most suitable experimental condition





Future works

- **Make a line by RP machine**
  - Check the shape of line
  - Check the adhesive strength between solder & substrate
  - Check the conductivity
- **Make a simple circuit automatically**
- **Comparing**
  - Time, Cost, and etc.

Mission statement

Product Description	▪ Each part on a circuit board will connect directly ▪ Insulator will be used on a cross point ▪ All process will be conduct automatically by program
Key Business Goals	▪ New technique for an easy & fast way to make an electrical circuit ▪ It is not necessary to make a complex design ▪ Develop a new software
Target Market	▪ PCB (Printed circuit board) market ▪ All electronic products company
Assumptions and Constraints	▪ Adhesive strength between solder and substrate ▪ Printed line shape ▪ Automatic process ▪ Materials of solder
Stakeholder	▪ Purchasers and users ▪ Manufacturing operations ▪ Service cooperations ▪ Distributors

Brainstorming

Thank you

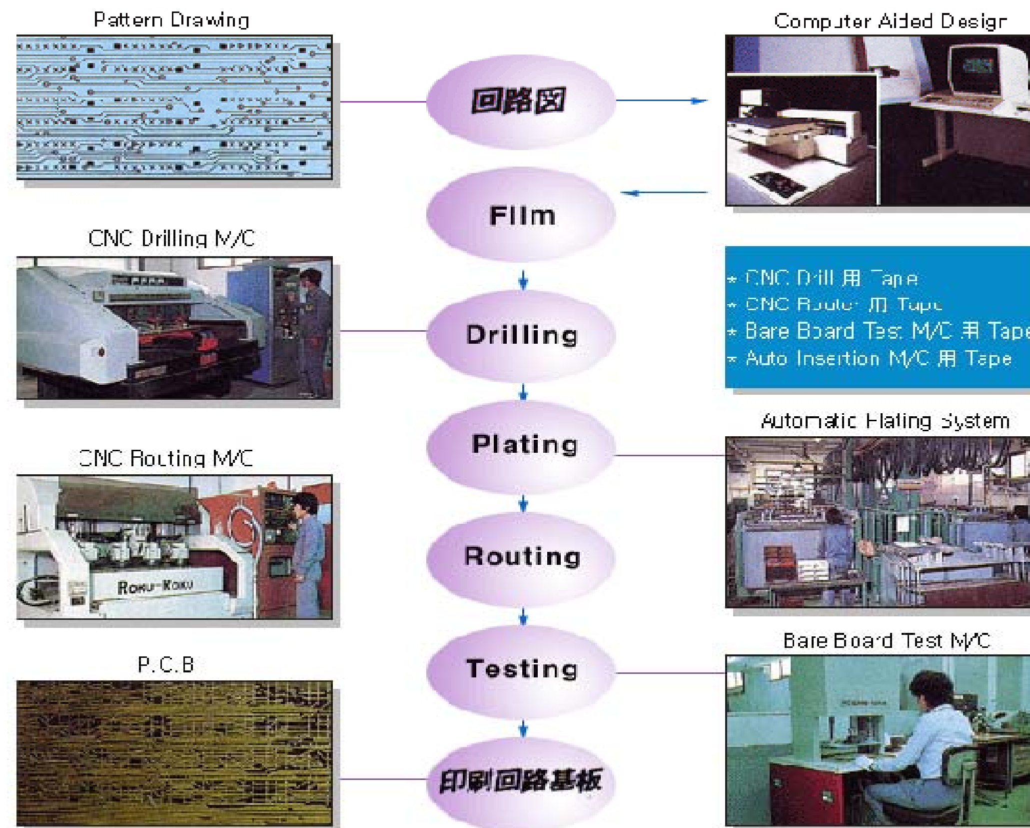
Appendix

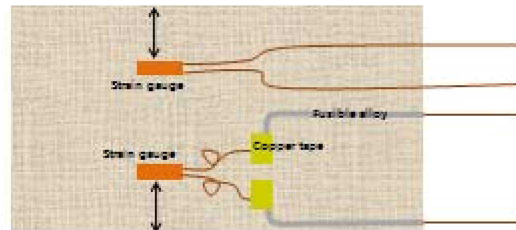
- ## Materials for soldering

합금계	표준화학조성 (mass%)						JISZ 3282의 기호	용융온도범위		인장강도 (MPa)실온	전단강도(Mpa)	
	조성원소							고상선	액상선		20℃	100℃
	Sn	Pb	Ag	Sb	In	Bi						
Sn-Pb	100						H63,A,B	232	232		22.1	19
	63	37					H60,A,B	183	183	53.1~51.5	37.9	
	50	40					H50S,A,B	183	188(189)	28.6~52.4	33.6~38.6	21.6
	50	50					H40S,A,B		216	32.2	18.4~30.0	24
	40	60					H10A,B		234		34.3	13.7
	10	90					H5A,B	275(268)	302		28.9	14.7
Sn-Pb-Ag	62	36	2				H62Bi58A	179*	197*		43.1	18.6
	10	88	2					268~275	290~300			
	5	93.5	1.5					296	301		23.8	15.7
	2	95.5	2.5					299	304			
Sn-(Pb) -Bi	42					58	H42Bi58A	139*	139	72.6+	50	19.6
	15	33				52		96*	96			
	34	42				24			146	44.1	34.3	17.7
	43	43				14	H43Bi14A	143	163	48.1		
	52	10				7.5			183	50		
Sn-Pb-Sb	35.5	62.7		1.8					243			
	30.5	67.9		1.6					250			
	20.5	78.5		1					270			
	5	92		3					285			
		98		2				300	314			
Sn-Ag	98.5		1.5				H96Ag3.5A	309	309			
	96.5		3.5					221*	221		37.8	22.6
	96		4					221	221	61.4	31.7	
	95		5					221	250(245)	55.1		

Appendix

- **Manufacturing process of PCB (Printed circuit board)**




Strain gauge
Fusible alloy
Copper tape
Strain gauge