

Karrie Technologies Limited
Electronics Manufacturing Service Department

Innovation of FSC Server Assembly Line

INTRODUCTION

In FSC old line for 3U/5U server assembly, it was very large and could not be adjusted to meet different production's requirement, so we built a new type of flexible production line in June-2004.

Through one month's trial run , it shows good flexible and improvement in the process flow. So we built another line for new project---- 4U production in July-2004.

New concept of operation is generated from this project and it's also the guidelines for the design of other production flow in EMS to slim fat the resources.

August 24, 2004

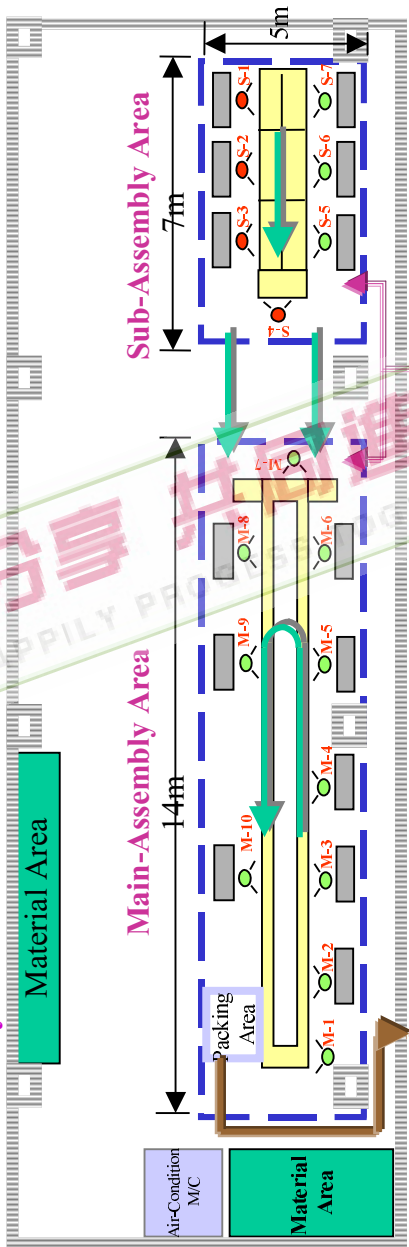
Edited by Gary Xie
Approved by Alan Li

Configuration of FSC Line (3U/5U)

Old Structure		New Structure
		
Dimension	Working Area	21 x 5 m
	Line Length	28 m
Working Stations	3U	13
	5U	17
Actual Output	3U	6 pcs/hour
	5U	5 pcs/hour
Line Cost (5U)	Main Line	RMB \$14,840
	Sub Assembly	RMB \$4,800
	Material Rack	RMB \$6,720
	Total Amount	RMB \$26,360
		17 x 3.5 m
		15 m
		11
		16
		7~8 pcs/hour
		6 pcs/hour
		RMB \$7,728
		RMB \$5,200
		RMB \$6,420
		RMB \$19,168 (Appendix 4)

Line Layout & Material Flow(3U/5U)

Old Line Layout

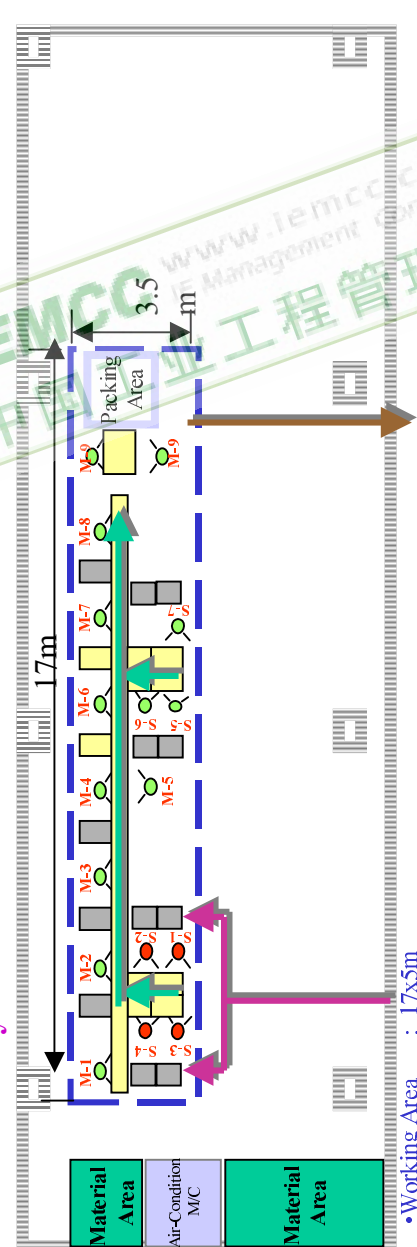


•Working Area : 14x5m (Main Assembly) + 7x5m (Sub Assembly)
•Working Stations : 3U ----- 11 pcs 5U ----- 17pcs

Old Line Station Flow

3U			5U		
Model No.	Process	Workers	Process	Workers	Workers
M-1	Chassis Inspection	1	Chassis Inspection	1	1
M-2	Install Power Cable	1	Stick the Clamps	1	1
M-3	Install the P-Bay	1	Fix PER/HDD Cage	1	1
M-4	Fix the PBNL	1	Fix the Cables	1	1
M-5	Install SPS & Fan	1	Install SPS & Fan	1	1
M-6	On-line Inspection	1	On-line Inspection	1	1
M-7	Function Test	1	Function Test	1	1
M-8	Install Drawer & Cover	1	Install Drawer&Cover	1	1
M-9	Final Inspection	1	Final Inspection	1	1
M-10	Packing	2	Packing	2	2
S-1	/	/	PER Assembly I	1	1
S-2	/	/	PER Assembly II	1	1
S-3	/	/	HDD Assembly	1	1
S-4	/	/	PER/HDD Assembly	1	1
S-5	Drawer Assembly I	1	Drawer Assembly I	1	1
S-6	Drawer Assembly II	1	Drawer Assembly II	1	1
S-7	Cover Assembly	1	Cover Assembly	1	1

New Line Layout



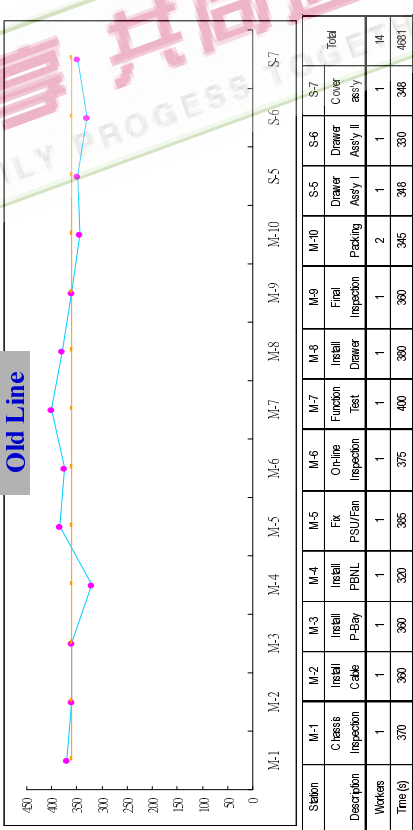
•Working Area : 17x5m
•Working Stations : 3U ----- 13pcs 5U ----- 16pcs

New Line Station Flow

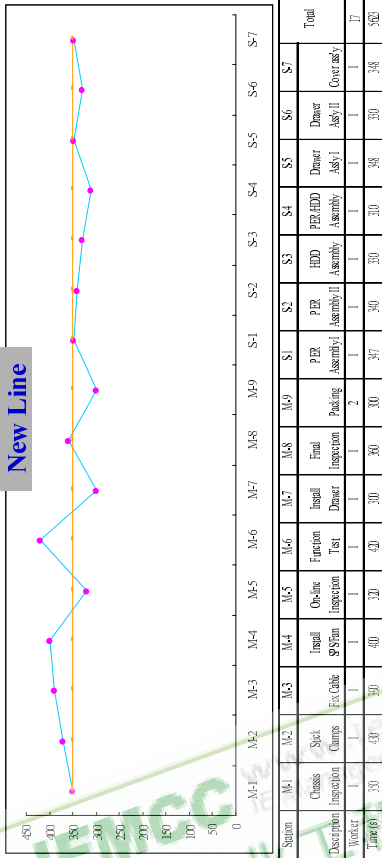
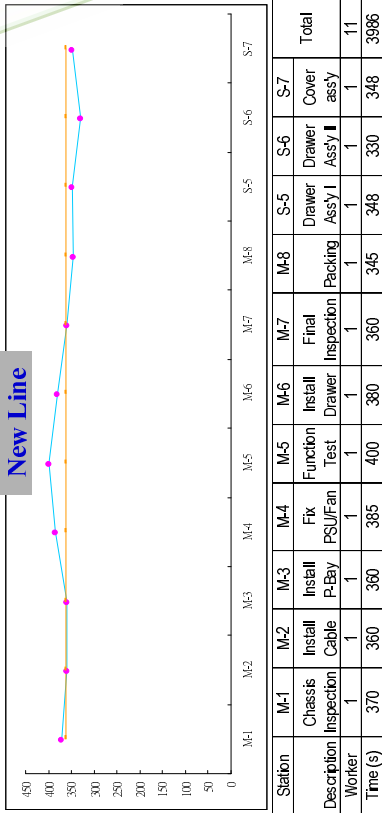
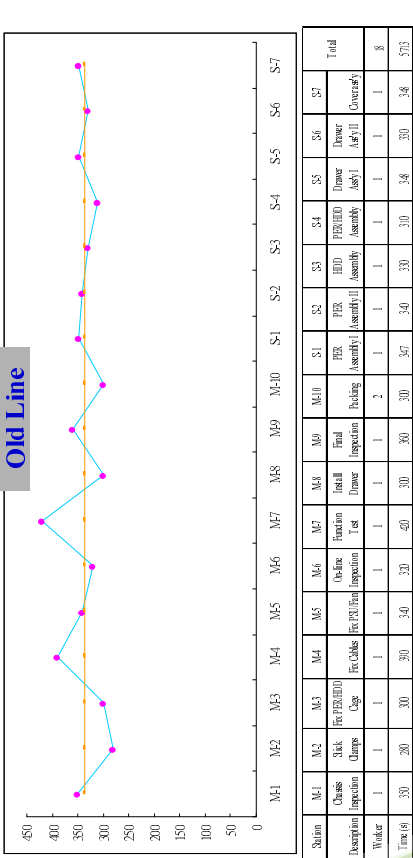
3U			5U		
Model No.	Process	Workers	Process	Workers	Workers
M-1	Chassis Inspection	1	Chassis Inspection	1	1
M-2	Install Power Cable	1	Stick the Clamps	1	1
M-3	Install P-Bay & PBNL	1	Fix the Cables	1	1
M-4	Install SPS & Fan	1	Install SPS&Fan	1	1
M-5	/	/	On-Line Inspection	1	1
M-6	Function Test	1	Function Test	1	1
M-7	Install Drawer & Cover	1	Install Drawer & Cover	1	1
M-8	Final Inspection	1	Final Inspection	1	1
M-9	Packing	2	Packing	2	2
S-1	/	/	PER Assembly I	1	1
S-2	/	/	PER Assembly II	1	1
S-3	/	/	HDD Assembly	1	1
S-4	/	/	PER/HDD Assembly	1	1
S-5	Drawer Assembly I	1	Drawer Assembly I	1	1
S-6	Drawer Assembly II	1	Drawer Assembly II	1	1
S-7	Cover Assembly	1	Cover Assembly	1	1

Line Balance (3U/5U)

3U Line Balance



5U Line Balance



Item	Old	New
Line Balance	80%	82.5%
Man Power	14 workers	12 workers
Cycle Time	400s	400s
Actual Output	6 pcs/hour	7~8 pcs/hour

Item	Old	New
Line Balance	66.7%	71.5%
Man Power	18 workers	17 workers
Cycle Time	420s	420s
Actual Output	5 pcs/hour	6 pcs/hour

Comparison of Old & New Lines (3U / 5U)

Item	3U			5U		
	Old	New	Saving Rate	Old	New	Saving Rate
Working Area	21 x 5 m	17 x 3.5 m	43.3%	21 x 5 m	17 x 3.5 m	43.3%
Line Balance	80%	82.5%	2.5%	66.7%	71.5%	4.8%
Man Power	14 workers	12 workers	14.2%	18 workers	17 workers	5.6%
Actual output	6pcs/hour	7~8pcs/hour	16.7%	5pcs/hour	6pcs/hour	20%
Total Cost	RMB 23,960	RMB 16,568	30.9%	RMB 26,360	RMB 19,168	27.3%
Process Flow	Maintain certain WIP for main assembly	Simplify the flow and decrease the WIP q'ty	/	Maintain certain WIP for main assembly	Simplify the flow and decrease the WIP q'ty	/
Flexibility	Unable to adjust the line length	Good flexible	/	Unable to adjust the line length	Good flexible	/
Material Supply	Need to take material from back side	Easy to take the material	/	Need to take material from back side	Easy to take the material	/

Conclusion:

Through comparing the old and new line's characteristics, we can believe that the new line has more flexible, lower cost and minimizing the working area. It is more suitable for our current production and we built another line for 4U production.

Station	Workers
M-1	150
M-2	150
M-3	170
M-4	155
M-5	155
M-6	155
M-7	155
M-8	155
M-9	155
M-10	155
M-11	155
M-12	155
S-1	155
S-2	155
S-3	155
S-4	155
S-5	155
S-6	155
S-7	155
S-8	155

Line Balance: 78.5%

Cycle Time: 180s

Daily Output: 150pcs

Appendix 1

Main Line Costing

Material List

NO	Description	Spec.	Q'ty	Unit Price (RMB)	Amount (RMB)
1	Roller	1m	2	40.00	80.00
2	Aluminium piece	1m	2	10.00	20.00
3	ESD Box	/	1	10.00	10.00
4	Angle Iron	30x30x1.8 (3m)	6	19.00	114.00
5	Triangle Iron	/	36	0.25	9.00
6	ESD Flat Board	600x550	2	20.40	40.80
7	Screw Driver	DLV8120JIE	1	2200.00	2200.00
8	Pipe Connector	63x32	1	6.00	6.00
9	Screw	M3x5	108	0.06	6.48
10	Plastic Boot	30x30	4	0.80	3.20
11	Man-haur	/	9.8 h	21.50	206.00
Total Unit Cost				RMB \$ 483.00	



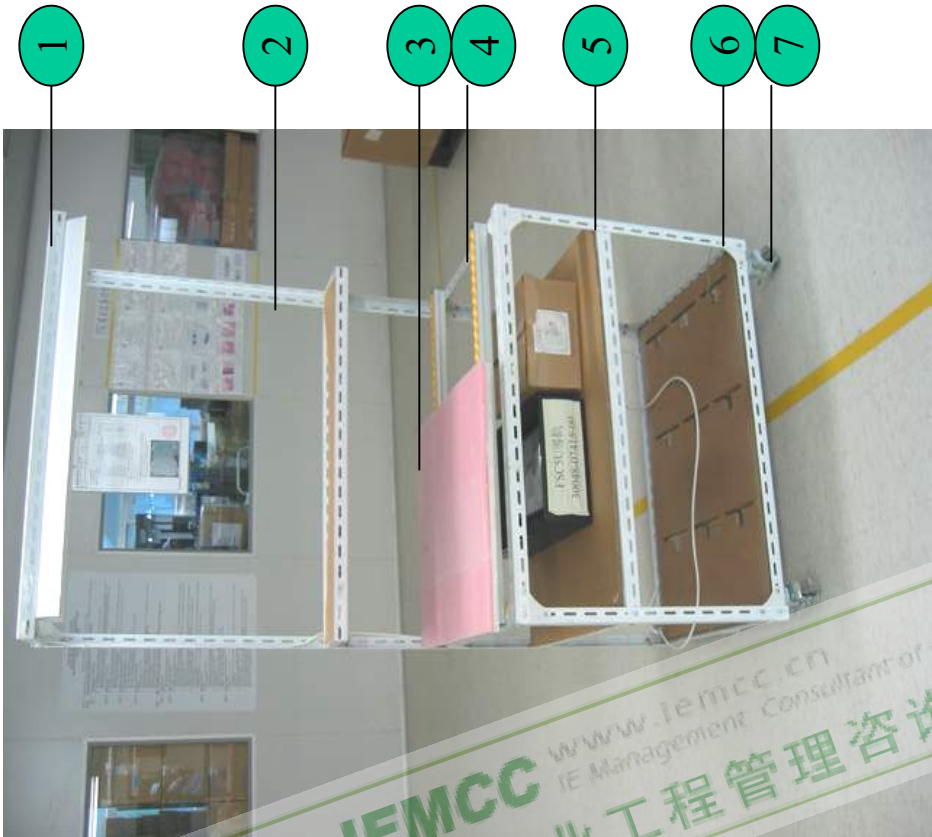
Note: The yellow item is not for every line unit, so the line unit cost is not include them (item 3, 7, 8)

Appendix 2

Sub-Assembly Table Costing

Material List

NO	Description	Spec.	Q'ty	Unit Price (RMB)	Amount (RMB)
1	Lamp Holder	30Wx1m	1	27.00	27.00
1'	Daylight Lamp	30W (Philips)	1	7.50	7.50
2	Angle Iron	30x30x1.8 (3m)	8	19.00	152.00
3	Board	600x600	1	12.50	12.50
4	Roller	1m	2	40	80.00
5	Screw	M3x5	198	0.06	11.88
6	Triangle Iron	/	66	0.25	16.5
7	Rubber Wheel	3"	4	60	240.00
8	Man-hour	/	11.4 h	21.00	239.4
Total Unit Cost				RMB \$ 650.00	

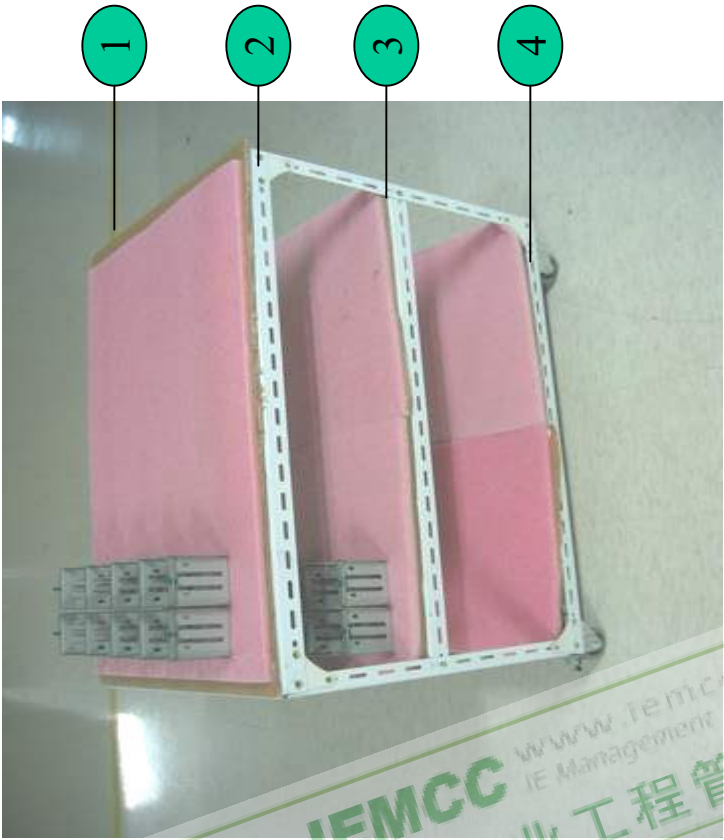


Appendix 3

Material Rack Costing

Material List:

NO	Description	Spec.	Q'ty	Unite Price (RMB)	Amount (RMB)
1	Angle Iron	30x30x1.8 (3m)	5	19.00	95.00
1'	Triangle Iron	/	24	0.25	6.00
2	Screw	M3x5	30	0.06	1.80
3	Board	600x600	1	12.50	12.50
4	Rubber Wheel	3"	4	60	240.00
5	Man-haur	/	7.8 h	21.00	164.7
Total Unit Cost				RMB \$ 520.00	



Appendix 4

FSC Line Cost

3U Line Cost

Item	Description	Old		New			Remark
		Q'ty	Unit Cost	Total Cost	Q'ty	Unit Cost	Total Cost
1	Main Line	28 m	530	14840	16 pcs	483	7728
2	Sub-ass'y Line	4 pcs	600	2400	4 pcs	650	2600
3	Material Rack	12 pcs	560	6720	12 pcs	520	6240
Total Cost				RMB \$ 23960	RMB \$ 16586		

5U Line Cost

Item	Description	Old		New			Remark
		Q'ty	Unit Cost	Total Cost	Q'ty	Unit Cost	Total Cost
1	Main Line	28 m	530	14840	16 pcs	483	7728
2	Sub-ass'y Line	8 pcs	600	4800	8 pcs	650	5200
3	Material Rack	12 pcs	560	6720	12 pcs	520	6240
Total Cost				RMB \$ 26360	RMB \$ 19168		

4U Line Cost

Item	Description	Q'ty	Unit Cost	Total Cost	Remark
1	Main Line	22 pcs	483	10626	
2	Sub-ass'y Line	8 pcs	/	/	No build, Share with 3U/5U
3	Material Rack	12 pcs	/	/	No build, Share with 3U/5U
Total Cost				RMB \$ 10626	

Appendix 5

List of Material & Manpower Cost

1. Purchasing Material Cost – 3U / 4U / 5U

材料名稱	材料規格	數量	單位	單價 (元)	小計 (元)	材料名稱	材料規格	數量	單位	單價 (元)	小計 (元)
(白色)萬能角鐵	40x40x1.8 3米長	300	條	19	5700	飛利浦光管	40W (長1米)	18	支	7.5	135
SS角螺絲		4200	個	0.06	252	彩色手噴漆	白色 40#	8	個	7.5	60
九佛燈罩	30W*1 (長1米)	8	個	27	216	椰樹毛刷	2"	2	個	2.5	5
九佛燈罩	40W*2 (長1米)	9	個	49	441	萬能角鐵	40x40x1.8 (長3米/條)	99	條	16.5	1633.5
手板鋸	/	1	把	5	5	鉤釘	Ø5 x 80	50	個	0.15	7.5
日豐護線套	3*1.0	100	米	1.75	175	膠腳	40*40	185	個	0.8	148
半元頭螺絲M4	M4*25	100	個	0.04	4	膠管	4" (長4米)	2	條	12	24
平墊	M6	240	個	0.03	7.2	螺母	M6	500	個	0.04	20
永紅三扁插頭	5A	10	個	1.5	15	螺杆	M6 (長2米/條)	5	條	3	15
灰色帶制萬向輪	3"活動輪	92	個	60	5520	電批	DLV8120JE	3	把	2200	6600
夾合板	12厘	1	塊	100	100	批咀		4	國	12	48
角碼		2850	個	0.25	712.5	直通		3	個	6	18
角螺絲		7	盒	25	175	中空平板	600x550x3層	25	塊	20.4	510
東帝排插	4孔位	20	個	21	420	導軌	1m--70pcs 0.8m--32pcs	92	條	40	3680
扁條	30*3.0 (4米/條)	15	條	26	390						
										總計	27036.7

2. Manpower Cost

Month	Apr	May	Jun	Jul	Total
Manhours (Hrs)	75.5	12	158	404.5	650
Price (RMB \$/Hrs)	21	21	21	21	21
Amount (RMB \$)	1585.5	252	3318	8494.5	13650