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Optimized Platform for Technology & Solutions

无卤PCB切割
GETECH GAR1200
--UPH 提升 2 倍

Halogen-Free PCB
GETECH GAR1200 Routing
-- "2x UPH Increase"

用户 User
C Company Ltd.

行业类别
Industry Segment
Smart Phone

项目时间 Project Time
Mar-April 2014

产品 Products
4G Mobile Phones



项目背景 Background

C 公司是中国领先的EMS 制造商，以生产手机，消费数码电子和显示器产品为主，其中通信类产品在2014年第二季度有较大幅度的增长。

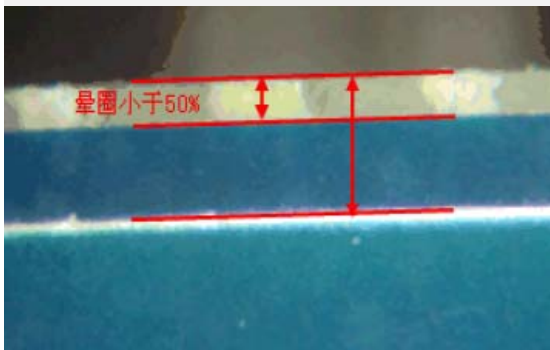
C Company Ltd. is a leading Chinese EMS manufacturer producing mobile, consumer digital and display products, particularly for the areas of communication with increasing demand in Q2 of 2014.

现有系统性能

现有切割机性能	单切割头
切割速度	30000
UPH <20 mm/s	合格
UPH >20 mm/s	未通过QC检查
UPH >35 mm/s	未通过QC检查

Current System Capability

Existing Router Performance	Single Spindle
Spindle Speed	30000
UPH <20 mm/s	Passed
UPH >20 mm/s	QC Failed
UPH >35 mm/s	QC Failed



PCB 切割部分 PCB Cutting Section

铜层之间的狭窄距离
Narrow distance from copper layer

客户需求 Customer Demand

C 公司目前使用其它品牌设备，由于对高性能，高速高精度PCB切割的需求，现有设备暂时不能达到此要求。此次评估的主要的目的是：挑选出可为210UPH 提供更高产能和更好PCB 切割品质的切割机。

C Company is using other supplier router for the time being. Due to the requirements of high performance, high speed and high accuracy PCB routing ,their current equipment cannot meet these demands definitely. The main objective for this evaluation is to produce better throughput of 210UPH from existing supplier and deliver good cutting quality.

挑战 Challenges

此项目的主要挑战来自于切割无卤PCB物料，而此物料比常用的FR4(易破碎物料) 更加易碎。

更多的困难是来自切割部分的铜层距离太近(0.7mm PCB厚度)。高速切割虽然可以提升产能，但是由于深层的裂缝也会导致切割的不稳定性。然而，如果放慢切割速度，切割品质会有所提高但产能却比高速切割降低一半。

The challenge was to cut Halogen-Free PCB material which is brittle than usual FR4 which can easily chip or crack out. Adding more to its difficulty is the copper layer which is too close(0.7mm PCB thickness) from the cutting section. Running too fast will create unstable cut with deeper crack but better throughput. While, if run slow, the cut section is finer but throughput may cut even to half.

方案实施 Solution Approach

综上所述，无卤切割的要点是：通过最佳的切割速度与良好的切割品质(无深层裂痕或碎裂)从而获得最佳产能。

GETECH GAR1200 是可以达到这一要求的，因为此设备可进行路径速度(rpm) 和工作台运行速度(mm/s) 的参数设置。在机器重复工作的过程中，切割精度也是至关重要的。根据我们的案例，我们已在3 sigma 中证明测试精度在 $\pm 10\mu\text{m}$ 范围中可达到CPK >2.0 .

As mentioned before, the key in Halogen-Free is to cut it smoothly by finding the optimum speed resulting to good cutting quality(no deep crack or chip) but generates better output.

This is possible with GETECH GAR1200, as we have parameters such as routing speed(rpm) and table speed(mm/s). The cutting accuracy is also very important looking on the repeatability of the machine to deliver the same cutting line over-and-over again. With our case, we have proven test accuracy of $\pm 10\mu\text{m}$ CPK >2.0 at 3 sigma.

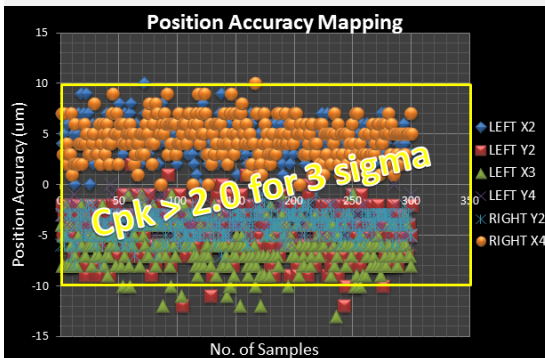
方案亮点 Solution Highlights

通过GETECH GAR1200 的方案设计，在初步评估报告中，C 公司手机生产线产能增加了212%: 从每小时210台增加到447台，因此，手机产线及采购部门对评估结果表示非常满意并透露购买意向.

The output was doubled up to 212%(from 210 to 447 units per hour) according to GETECH GAR1200 preliminary evaluation report. Customer is very satisfied and willing to invest by placing an order instead from their existing supplier.



切割品质达到17mm/秒
Cutting Quality at 17mm/sec



精确度检测 Accuracy Check
 $\pm 10\mu\text{m}$

Machine Model 机器型号	UPH (pcs)	Remark 备注
GAR1200	447	品质OK
其它切割机 Other Router	~ 210	品质OK

生产力 & 品质
Productivity & Quality

UPH 增长2倍, 达到标准
2xUPH increase, meet criteria



方案结论 Solution Impact

- ❖ 流程/品质改善:
同现有竞争对手产品相比, 接近无尘控制.
- ❖ 生产力提高:
切割过程中UPH提高2倍(210UPH - 447UPH).
- ❖ 精益制造:
节约操作员时间: 上料准备时间 < 1 分钟.
提出建议: 对自动化操作使用 IRM (在线切割机)
从而更好的节约时间和控制成本.
- ❖ 成本节约:
在无需要增加人力和空间成本的前提下, 有效提升产能.
- ❖ Process/Quality Improvement:
Almost ZERO dust controlled compared to existing competitor.
- ❖ Productivity Improvement:
Routing process UPH improves by 2x from 210 to 447 UPH.
- ❖ Lean Manufacturing:
Less idling time for operator allowing < 1min. loading preparation. Further improvement to recommend IRM(In-Line Routing Machine) for hands-free operation so as to save time and cost.
- ❖ Cost Savings:
No extra labor and space required for additional machines for higher capacity demand.

