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IVEY

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AGILE ELECTRIC: QUALITY ISSUES IN A GLOBAL SUPPLY CHAIN

Dhruv Dar, Sanjay Kumar and Vijay Aggarwal wrote this case solely to provide material for class discussion. The authors do not intend to illustrate either effective or ineffective handling of a managerial situation. The authors may have disguised certain names and other identifying information to protect confidentiality.

It was 6:00 p.m. on Friday evening and Suresh Kumar, vice-president of operations at Agile Electric (Agile), was winding up his work to leave for home. It had been a tough month at work and he was looking forward to a relaxing weekend with his family. As he was walking towards his car, he received a call on his cellular phone from his chief executive officer, Raj Reddy. The company's key customer, a U.S. company called Automek Inc, had informed Agile that its customer, Ford (referred to as original equipment manufacturer [OEM] in this case), had reported another failure on the field, which was caused by parts supplied by Agile. As this was the second field failure, the OEM was seriously considering recalling its cars from the market. Automek also mentioned that if the recall happened, the OEM was sure to charge it for the costs, and in turn it would charge Agile. Automek wanted a confirmation from Agile within 48 hours that a robust containment plan was in place and that an initial root cause analysis of the problem had been done. "Kumar, you better act fast on this or we will be in big trouble," said Reddy before he hung up the phone.

Kumar stopped in his tracks. This was the last thing he was expecting at the start of what he had hoped would be a good weekend. He wondered whether or not Agile was really responsible for the problem, as it was due to a faulty capacitor that had been procured from an Automek-recommended source based in the United States, over whom Agile had virtually no control. Further, his plant tested each assembly that left its premises and there was a strong probability that one of the downstream customers had not assembled or used the part properly. He wondered whether he should have his overstressed team return to work over the weekend to investigate the problem or pass the problem back to Automek.

THE PLAYERS

Automek

Automek was a large multinational auto component manufacturer headquartered in North America with plants all over the world. It supplied complete systems to many car manufacturers globally and had an

annual turnover in excess of US$10 billion.[1] This particular project was the first time that it had supplied components to the OEM. If this project succeeded it could hope to get much more business from the OEM in the future. Automek had strict quality and delivery requirements from its suppliers (see Exhibit 1).

Due to increasing manufacturing costs in the United States, Automek was continuously on the lookout for global low-cost sources. It was well aware of the risks involved in sourcing from countries with emerging economies but felt that there was no other way, especially due to the highly competitive North American market conditions. During its search Automek came across Agile in India and sent its technical team to assess this potential supplier. The team was satisfied with Agile's manufacturing facility and quality-focussed culture and approved it as a supplier of motors to Automek.

Agile

Agile Electric was set up as a subsidiary of Agile Japan in the mid-1990s for the development, production and sale of electric motors and their parts. Its plant was located in Chennai in the Southern part of India and supplied parts to both domestic and overseas automotive customers. The company had gradually expanded to have a number of divisions for making electrical, sheet metal and plastic parts. The plant was certified to QS 9000 standards, which were the global standards mandated by automotive OEMs for their tiered suppliers (see Exhibit 2). These standards were composed of International Organization for Standardization (ISO) 9000 standards plus automotive industry-specific requirements. Being certified as QS 9000 compliant implied that the company would have a certain minimum level of quality systems. Further, Agile had implemented a few of the best practices in manufacturing in its operations, such as workplace organization, dashboards and visual management, which were incorporated on the lines of Toyota Production Systems. Its sales turnover had reached US$56.2 million in 2007, and was expected to grow at five per cent annually for the next two years.

DEVELOPMENT AT AGILE

Development of Agile as a Supplier

In 1998, after due diligence, Agile received an order from Automek for the supply of electric motors to its North American operations. As electric motors were a running product for Agile and it was supplying a number of automotive multinational corporations, it had no problems in supplying these products to Automek. In 2002, since Agile's quality and delivery performance was good, Automek awarded it with business for a new product that was not in Agile's existing product portfolio. As it was in Automek's interest to see that the product was developed successfully, it deputed its engineers to work with Agile engineers for the development. The teams worked together to set up the manufacturing line to produce the product as per Automek's requirements. The product was successfully launched and Agile continued to supply with zero defects or delivery defaults. Based on the track record, Automek increased its sourcing from Agile by giving it more business. To ensure success, Automek continued to support the development at Agile by deputing its engineers to offer support in setting up Agile's manufacturing lines. Due to Agile's attractive pricing, more and more Automek plants in different countries started buying these parts from Agile. It eventually became a preferred supplier of Automek for electrical parts, was often quoted as an example of a low-cost high-quality sourcing model by the Automek global procurement organization and was showcased as an example of India's manufacturing capabilities by Automek's India-based procurement team.

[1] *Company records.*

Automek buyers were planning to source an actuator assembly from Agile. The supplies were to start in 2008, with the projected requirements being 50,000 units for the first year and increasing to 100,000 and 220,000 units in 2009 and 2010, respectively.

Development of Actuator Assembly at Agile

Automek's Sourcing Decision

Tom Smith, Supplier Quality manager at Automek, was on a call when John Arthur, Purchasing manager, walked into his cabin. They were planning to source the new actuator assembly from Agile and Arthur wanted Smith's concurrence on this.

> Smith: How can we go with Agile, they have no experience in manufacturing this critical product.
>
> Arthur: I know, Tom. But look at it this way. Agile is one of our most successful overseas suppliers. They have a record of just 70 PPM [parts per million] defects and no delivery defaults in the last three years of supply for all their parts. I am sure they will be able to develop this part successfully. And we will be saving the corporation a decent amount by buying from them in these tough times — Agile is asking US$7.20 per part whereas our local supplier will cost us US$16. Further, as this is a small sub-assembly, the logistics costs will not be more than US$0.80 per piece.

Smith enquired whether or not Automek engineers would work with Agile for the development, as done earlier. Arthur mentioned that due to the tight financial situation this might not be possible:

> But hey, come to think of it, haven't we given enough support to Agile already? Our engineers have been virtually camping there for the last three years working on new products. I am confident that Agile must have developed sufficient skills by now to develop their processes in-house. Let us try them out this time, I am sure they will be very successful. And anyway, you will be sending your Supplier Quality engineers to assess the suppliers. If there is anything grossly wrong they will definitely find out.

Smith agreed to talk to his supervisor and report to Arthur.

Agile Order Acceptance

It was a hot summer afternoon in 2004, and Reddy called a meeting of his management team to discuss the enquiry received from Automek for the supply of actuator assemblies. The business had the potential of growing over US$1million in three years, taking Agile's business with Automek to more than US$6 million by 2010. Agile's chief financial officer, Gajendran Srinivas, wanted to know the total investment required from its end and the return on investment. Kumar mentioned that preliminary studies had suggested that the investment in capital equipment would be approximately US$10,000, and the part would have a variable cost as follows: printed circuit board (PCB) assembly = US$3.41/piece, injection moulded parts = US$1.25/piece and internal operating variable costs of US$2/piece. This would lead to a suggested contribution of US$0.54 per piece.

Arun Rao, Agile's Development head, raised a concern that its Project and Operations teams had no experience in developing and manufacturing this assembly. He wanted the company to reject the business offer from Automek rather than take on the risk. However, Kumar countered:

> We have developed many products successfully for Automek and I am confident we will be able to deliver on this one also. Besides, our Automek business is increasing and I expect that they will soon become one of our top three customers. Further, they know our capabilities and have placed their trust in us, which means they feel we can make it.
>
> Rao: Okay, we can manage the in-house part of the process, but what about bought-out parts? This product has some very critical components and we have no idea where to get them from. And you know Automek and OEM have very high standards and expectations.
>
> Kumar: Automek has promised to support us in locating and developing the sub-tier suppliers, so we need not worry on this account. Also, since they are the ones who are finalizing these suppliers, we will not need to use our resources to manage them.

THE PRODUCT

The actuator assembly produced by Agile was basically a non-contact magnetic sensor that sensed the existing position (angle) of the throttle valve, compared it with its desired position and, based on the differential, sent the signal to the motor for actuation. This valve position determined the amount of fuel in the fuel and air mixture in the engine. A rich mixture resulted in higher power generation and thus higher acceleration.

Agile's main inputs for producing the actuator assembly consisted of the following: (a) a PCB on which various electronic parts such as resistors, capacitors and integrated circuits (ICs or chips) were mounted and (b) injection-moulded plastic parts. The PCB assembly supplier to Agile in turn required the following critical parts to produce the assembly: PCB (board), capacitor/resistor and IC. Thus there were a total of five critical part suppliers/sub-suppliers to Agile for producing the actuator assembly (see Exhibit 3).

The process for manufacturing the actuator assembly at Agile began on an assembly line on which the PCB assembly, plastic cover and gasket were assembled. On receipt at Agile, these parts were inspected visually for any imperfections and other defects. The PCB motherboard was then sheared into individual (daughter) boards and handed over to the assembly line. The assembly process started with the assembly of the cover and gasket. The next operation was fitting the PCB assembly on the cover, followed by hot mashing, soldering and potting operations. An important parameter that had to be maintained here was the quantity of sealant. If it was either more or less than required, this could be detrimental to the functioning of the finished product. Hence, there was a visual inspection to ensure that the quantity of sealant was within the prescribed limits. Next, the bonding strength of the PCB and cover was verified through two tests: an air pressure test and a push-out test. Apart from these mechanical tests, the assembly was also verified electrically through a connectivity test to ensure the proper functioning of each component and the complete circuit. A final visual check was carried out for component damage involving sealant quantity and the solder layer over the PCB.

The assembly operators had to be extremely careful when handling the PCB as it consisted of highly fragile parts that could be easily damaged if the operator accidently dropped the piece or exerted any kind of undue pressure on it, e.g., through tight clamping. The problem was that if the operator made such an

error that partially damaged any part on the PCB assembly, there was a chance that this problem might not get detected during testing at Agile and could malfunction in the field (see Exhibit 4).

Consistent with the automotive industry's practice, Automek, being a global auto component manufacturer, followed the part development process laid down by the Automotive Industry Action Group, known as the Advanced Product Quality Planning (APQP) process. This was an exhaustive process requiring in-depth work by both the supplier and customer, with the objective of reducing development time and also creating a flawless product launch. This was achieved by anticipating problems and establishing stringent controls at the development stage.

DEVELOPMENT OF TIER 3 SUPPLIER

Manufacturing Process Development at ECPL

Electronic Components Private Limited (ECPL) was an electronic parts manufacturer with two plants, one in Southern India and the other in North America. The arrangement was that the Indian plant manufactured products and shipped them to the North American operations, which tested them and shipped them to the final customers. ECPL's sales turnover was US$35.5 million in 2008, and was projected to grow annually at 10 per cent.[2] Its primary operation was the assembly of individual components such as capacitors, resistors and ICs onto a PCB using the surface mounted technology (SMT) process. As ECPL's customers were electronics product manufacturers, their quality levels and requirements were substantially different from automotive customers' requirements in terms of ruggedness due to different operating conditions.

ECPL was also an existing supplier to Agile, but these parts did not go through the SMT process. Agile proposed ECPL as a supplier for the PCB assembly to Automek. The Automek team audited ECPL and found some gaps in its quality systems. However, since ECPL had all necessary equipment to manufacture the product, as well as 5S and ISO 9000 certification, Automek gave the go-ahead to Agile to start development work with ECPL. Automek also asked Agile to work with ECPL in closing the gaps observed during its visit and provide regular updates to Automek on the progress.

Agile felt that ECPL would be the right supplier for the PCB assemblies that it required for producing the actuator assembly. Since it was a local company, Agile could get parts whenever it needed. However, ECPL management was reluctant as it was not used to the high volumes that Agile required and had almost no experience supplying product (directly) to the high-quality North American automotive market. Further, it was not aware of the sources for the critical components such as resistors, capacitors and ICs required to produce this part. Agile assured ECPL that Automek had promised to provide support in this activity and the supply of components that were from overseas suppliers. ECPL's business from this component would be US$750,000 annually by 2010. The only part that ECPL would have to source itself was the PCB, which was from a local supplier. Its initial projections showed that its capital investment for the business would be negligible, and the running costs would be as follows: cost of PCB = US$0.77 per piece, cost of other inputs = US$1.70 per piece and operating costs = US$0.80 per piece, leading to a contribution of US$0.14 per piece. Due to its relations with Agile and based on Automek's assurances of support for component sourcing, ECPL agreed to take up the contract. Its assumption was that Agile and Automek would take care of any issues arising from the overseas suppliers.

[2] *Data created by authors.*

ECPL suggested that Boards India Private Limited (BIPL), a US$28 million local manufacturing company, provide the PCBs. Automek agreed, as BIPL was an ISO 9000 certified organization. On being approached by ECPL, BIPL observed that the PCB required by ECPL was much smaller than its existing product range. It estimated that the cost of inputs would be US$0.32 per piece and operating costs would be US$0.20 per piece. Though the business did not look lucrative, it agreed to develop the part due to the big names involved in the supply chain. It thought that having Automek and OEM on its list of customers could possibly give a boost to its export business.

Manufacturing Process for PCB Assembly at ECPL

The PCB assembly consisted of a number of supplied parts such as the PCB board (from BIPL) and electrical components such as resistors, capacitors, inductors and ICs. The boards were baked in a furnace at 150 degrees Celsius to remove moisture and then fed to the SMT line. The SMT process started with the application of solder to the PCB, followed by placement of the individual components on the PCB using a pick-and-place method and then passing the assembly through an annealing furnace to bond the parts with the PCB with the help of solder. Finally, the PCB assembly was inspected and tested in three stages: visual checks using different levels of magnification, static test for the components and a dynamic test to verify the connectivity of the assembly (see Exhibit 5).

Automek deputed its engineers to India to visit BIPL. The team came up with an action list based on the gaps observed during the assessment. Automek asked Agile to work with BIPL on closing these gaps before the start of supply while also working with it on developing the PCB (see Exhibit 6).

START OF SUPPLIES

Capacitor Problem

In the first quarter of 2008, Agile completed the development of the actuator assembly at its end and shortly thereafter commenced supplies to Automek in small batches for trials at Automek and the OEM. In September 2008, it was just settling down when the OEM reported a failure in one of its cars that seemed to originate from the actuator assembly supplied by Agile. The OEM wanted a response from Automek concerning the failure, and Automek in turn asked Agile to find out the cause of the problem. While Agile was still working on the problem, the OEM reported another similar failure in the same week. Upon investigation, it found that this was due to the same problem as before, i.e., it originated from an actuator assembly supplied by Agile. The matter was serious now, as OEM and Automek were concerned that if the flow of defective parts continued after the production start-up, then they could face heavy warranty costs and product recalls. Agile was asked to speed up its investigation and report on the root cause of the problem. It was also asked to locate exactly when the problem had started so that the defective parts could be quantified, contained and prevented from reaching any customers in the future.

Meanwhile, Agile's investigation revealed that the failure had occurred due to a faulty capacitor supplied by its North American supplier. Agile's initial thought was that since the capacitor manufacturer had been recommended by Automek, then it (Agile) had no control over the matter and hence was not primarily responsible for the problem. It felt that it was Automek's responsibility to work with the capacitor manufacturer to resolve the issue.

As the resolution of the problem was getting delayed, both the OEM and Automek were concerned that they could still be receiving actuator assemblies with defective capacitors, which could cause them major

problems. In October 2008, the OEM asked Automek to suspend supplies of its product until it resolved the problem with Agile and the capacitor supplier.

Agile asked for support from Automek to pursue the case with the capacitor manufacturer, as it was not responding to Agile's request for a detailed investigation into the problem. Automek took up the matter with the capacitor manufacturer through regular follow-up. The capacitor manufacturer finally submitted its report, claiming that the parts were working properly when dispatched from its end to ECPL. It also mentioned that a crack (the cause of the defect) appeared to have formed due to excessive mechanical stress put on the capacitor, most likely (though not necessarily) during soldering of the capacitor to the PCB.

The suspicion now shifted to ECPL, since it conducted the capacitor assembly. Automek deputed its local and global Supplier Development (SD) engineers to work along with Agile SD engineers at ECPL to resolve the problem. The joint team audited ECPL's process thoroughly and observed many problems, though it could not pinpoint the precise cause of the problem.

Automek initiated discussions with ECPL for closure of these points. The process was slow, as the ECPL staff were not used to the stringent global automotive requirements. Also, since this was not a major business for ECPL, and it had only agreed to the project due to its relations with Agile, its management did not get directly involved with the developments — hence the action implementation process was left to the line personnel.

Global SMT Process Expert's Visit and Findings

In January 2009, under extreme pressure from the OEM to get to the root cause of the problem, Automek deputed its SMT process expert, James Roach, from the United States to work on the problem. After spending a week reviewing the processes at ECPL and Agile, he narrowed down on six possible causes for the problem. This was followed by a series of experiments and trials which located the problem as originating from the board shearing operation at Agile, i.e., the pressure imparted on the boards during shearing was causing a few capacitors to crack. This problem was not being detected at the final testing as there was no test that checked for shearing force.

The problem was finally resolved with the help of Automek's expert, which was a major relief for both Automek and Agile. With the root cause found and the problem completely resolved, supplies from Agile resumed normally.

OPTIONS

Option 1: The OEM would be charging Automek for the losses incurred due to the failures and delays. Further, Automek had also incurred losses due to production stoppages at its end and the resources spent in dealing with this problem on a daily basis for several months. Automek had to decide whether or not to pass these charges to the supply chain, and if so, to what extent? Various business aspects had to be considered.

Option 2: Automek had to decide whether or not it should invest in resources to transfer process knowledge and improve the processes of its tiered suppliers, Agile and ECPL, to avoid any more problems in this product in the future.

DEVELOPMENT OF TIER 4 SUPPLIER

ECPL proposed the use of BIPL, a local source from which it had procured PCBs in the past, though of a simpler variety. As BIPL was an ISO 9000 certified company, Agile agreed to ECPL's proposal.

Manufacturing Process Development at BIPL

The PCB manufacturing process involved drilling multiple holes in a large board using multi-spindle drilling machines, dry film lamination, image exposure and development, plating, etching, screen printing, solder masking, shearing (the large board into four parts) and finally carrying out conductivity tests and a visual check (see Exhibit 7). One of the most critical aspects was the plating operation, as any problem here meant that there would be no connectivity in the circuit. Cleanliness was also extremely important, since any dust (either from the atmosphere or from any of the mechanical metal-removing processes) would contaminate the surface, leading to improper deposition of metal during the plating operation.

High Resistance Problem

In June 2009, just when things were starting to run smoothly, Automek again received a message from the OEM that its electronic component assembly had failed in one of the cars. The OEM continued to investigate and observed that the failure had occurred due to high resistance in the internal circuit of the actuator assembly. Agile checked its records and did not find any defective parts produced on the particular day on which the part was created, nor could it find any abnormal observations. It felt that the part was okay when it had left its plant but had been possibly damaged during subsequent operations at OEM in fitting. As it was a burn-out issue, it thought that the OEM had subjected the parts to testing at a higher temperature than that specified. This had probably resulted in a solder joint becoming loose and causing the part to fail in the field. Agile felt that if it was a problem that had occurred in its assembly process or at ECPL's SMT process, the problem should have been detected in its final testing station, since it was designed to detect any problems of connectivity in the actuator assembly circuit.

While Agile was still debating whether or not this was really its issue, the OEM reported two more actuator assembly failures which, after investigation, were found to be due to the same reason, i.e., high resistance in the circuit caused by poor connectivity in the board. As this seemed to be a soldering failure, Automek and Agile assumed that it was due to ECPL's process. Meanwhile, the OEM's investigation narrowed the problem to a faulty PCB board that was supplied by BIPL.

Automek's Supply Quality manager scheduled a conference call between Automek, Agile and ECPL to discuss the high resistance problem that was threatening to become a major issue. The meeting was attended by teams from Automek and Agile, but ECPL did not participate. In the call, Kumar was questioned about Agile's plan to contain and resolve the problem of the boards from BIPL. No mention was made of the fact that Automek had approved BIPL after a quality audit. Kumar was wondering whether or not he should agree to work with BIPL to solve the problem. Firstly, BIPL was not interested in making any improvements, and secondly, the supplier had been assessed and approved by Automek. It was finally decided that both companies would jointly work with BIPL since the issue was snowballing into a major crisis and could lead to a recall of cars by the OEM.

The joint team audited both ECPL and BIPL (see Exhibit 8). Some of the team's key observations were as follows:

a. Process parameters, such as vacuum pressure, not adhered to at drilling station;
b. Chemical composition outside of defined specifications;
c. Copper bath temperature in plating tank was higher than the required specifications;
d. No tolerance limits were mentioned in many specifications, hence it was difficult to say whether or not the process was operating within the limits;
e. Plating thickness had a high amount of variation.

OPTIONS

Option 1: Neither ECPL nor BIPL were interested in spending their resources in making improvements, as this was a non-strategic business for them. Agile was seriously considering the option of asking Automek to supply it with the PCB assembly using its global network of suppliers so that Agile would no longer have the responsibility of managing these suppliers or parts.

Option 2: One view at Automek was that it should increase the margins of the various tiered suppliers so that their interest in improving processes would increase and product quality would improve.

Option 3: With so many problems in the supply chain, another option that Automek considered was whether it was worth buying from a 'best cost country' or if it should get the parts from North America itself? It was also aware that the developmental lead time for a change in source required lengthy internal and external (OEM-related) product approvals, running up to one year. Hence, if it went with this option it would have to decide how it would manage the supply chain for this period.

Exhibit 1

AUTOMEK'S QUALITY SYSTEM REQUIREMENTS FROM SUPPLIERS (EXTRACTS FROM THE CONTRACT)

- Should be certified to ISO 9000 and preferably to TS 16949
- Supplier is responsible for ensuring quality and quantity from sub-suppliers, even if these are specified by the customer
- Supplier should ensure zero defects from sub-suppliers
- All risks due to sub-supplier [are] supplier's responsibility
- If costs are incurred by the customer due to supplier-caused problems of quality or delivery, the same will be recovered from supplier
- In case of under-shipment, supplier will send the short quantity by expedited mode and bear all premium freight charges
- If short shipments result in any loss to Automek or their customers (due to supplier), all these losses will be recovered from the supplier
- In case of production stoppage at Automek due to supplies, a penalty will be levied on the supplier, apart from all other actual charges

Source: Agile's records.

Exhibit 2

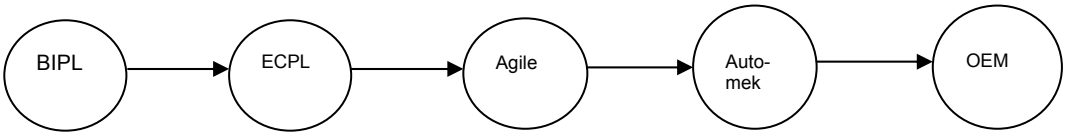
GLOSSARY

APQP	Advanced product quality planning
ECPL	Supplier to Agile Motors
BIPL	Supplier to ECPL
ECA	Electronic component assembly
PCB	Printed circuit board
IC	Integrated circuit
SMT	Surface mount technology
TS 16949	Automotive technical specifications (most automotive OEMs want their suppliers to subscribe to these specifications). These replaced QS 9000, which were the earlier automotive quality standards.
Tiers	The tier levels have been given with reference to OEM as the OEM, Automek as tier 1, Agile as tier 2, ECPL as tier 3 and BIPL as tier 4.

Exhibit 3

ACTUATOR ASSEMBLY SUPPLY CHAIN

Flow of Parts and Components



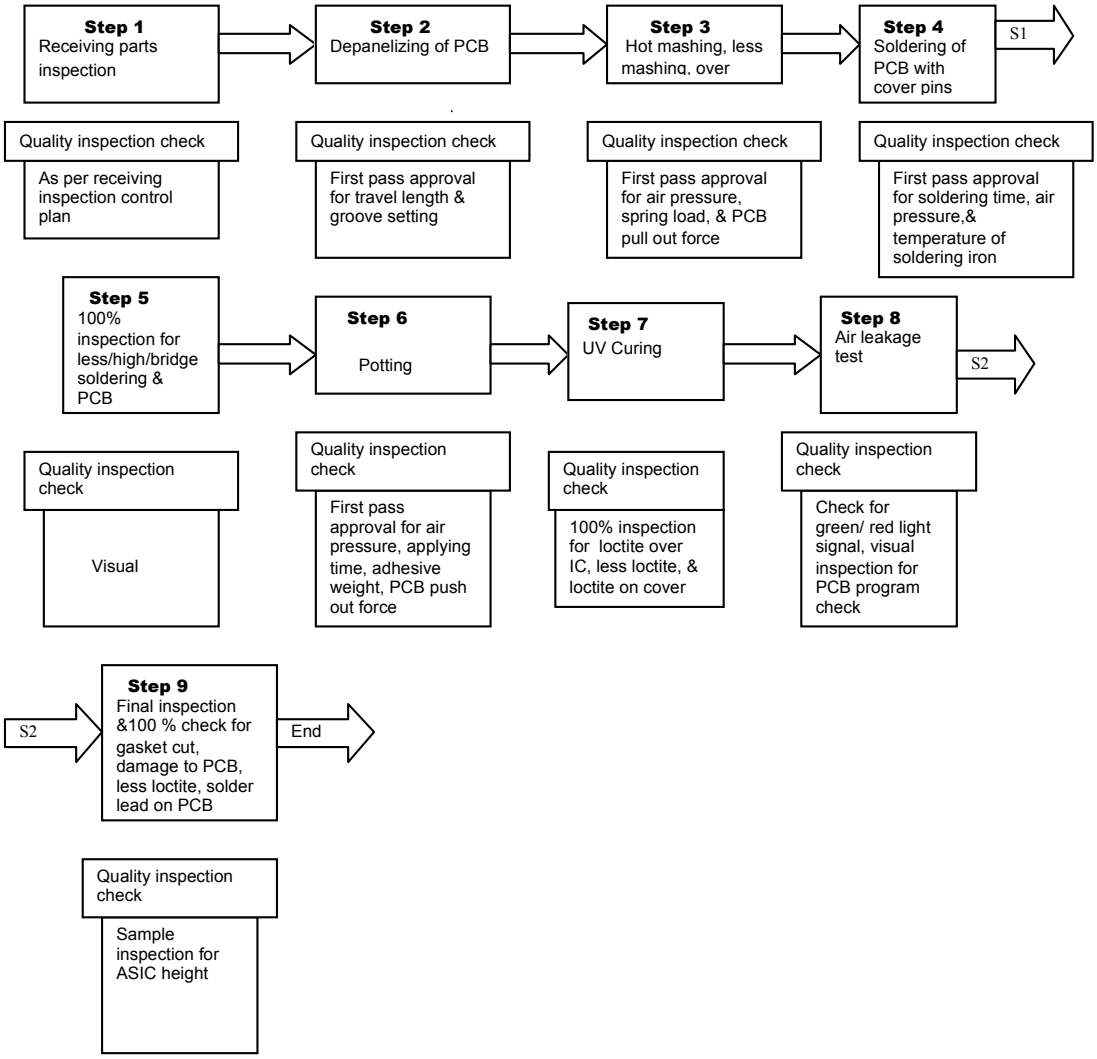
Key Component Supply Chain

Tier	Company	Product
1	Automek	Electronic component assembly (ECA)
2	Agile	Actuator assembly
3	ECPL	PCB assembly
4	BIPL	PCB

Source: Created by authors.

Exhibit 4

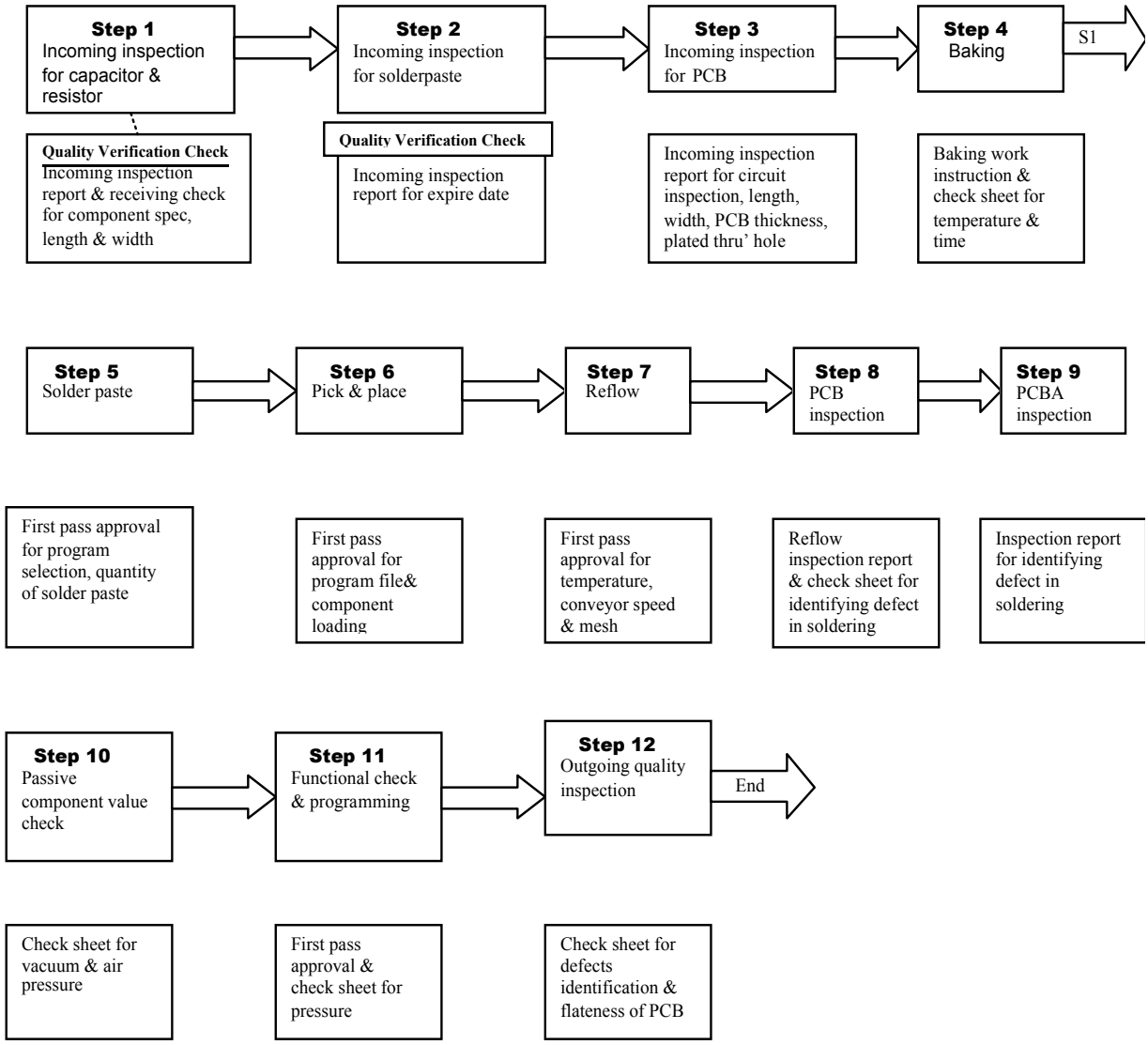
MANUFACTURING PROCESS AND CONTROLS AT AGILE



Source: Agile's records.

Exhibit 5

PCB ASSEMBLY PROCESS STEPS AT ECPL



Source: Created by authors.

Exhibit 6

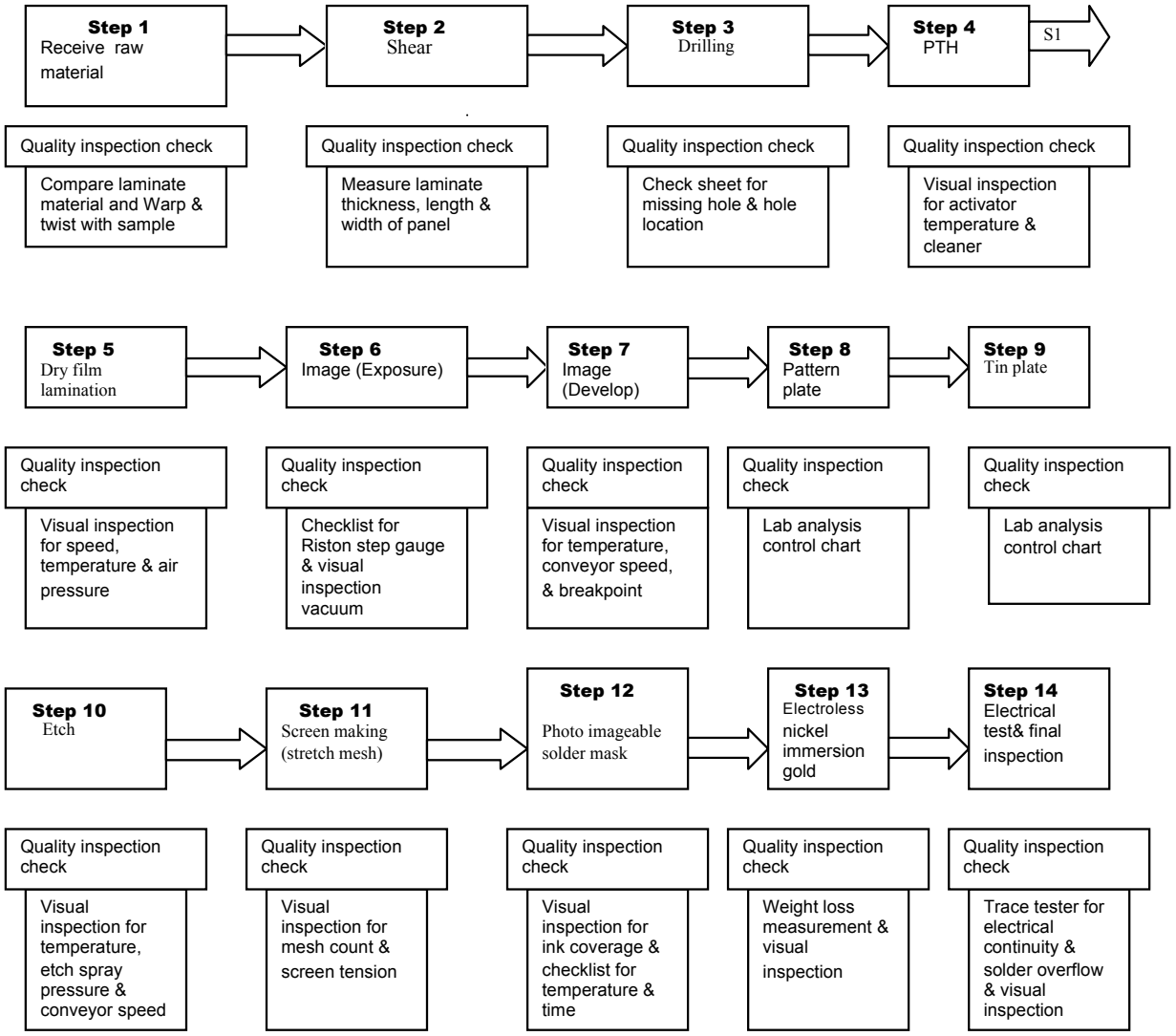
APQP PROCEDURE AT SUB-TIERS

Automek's Expectations from Agile Regarding Sub-tiers	Process Followed by Agile	Support Provided by Automek
Identify potential suppliers for new program	Both ECPL and BIPL identified by Agile	
Assess their sub-supplier against TS16949 requirements	Assessed along with Automek representatives	Automek visited both tiered suppliers for assessment
Work with suppliers to develop them to TS16949 requirements	Not done as process knowledge not available	Automek recommended sources where not available in India
Support suppliers in devp. of process flow, failure modes & control plan	Not done	Participated in technical reviews through conference calls, and follow-up for closure of action items identified during assessment
Technical reviews during development	Done with ECPL but not with BIPL	
Carry out Production Part Approval Process at suppliers	Done with ECPL but not with BIPL	
Ensure pre-launch containment at suppliers	Done with ECPL but not with BIPL	
All risks from sub-suppliers to be borne by the supplier	Assumed risks borne by Automek as suppliers approved by them	
Suppliers are responsible for the quality of parts from sub-suppliers even if they have been recommended by Automek	Expected Automek to assume risk of sources recommended by them, especially as these were based outside India	

Source: Agile data from Agile's records; Automek data created by authors.

Exhibit 7

PCB MANUFACTURING PROCESS AT BIPL



Source: Created by authors.

Exhibit 8

ECPL AND BIPL PROCESS CONTROL SUMMARY

Process Requirement	Internal Controls at ECPL	Internal Controls at BIPL
Incoming bought-out parts to be verified as per sampling plan	Procedure was followed, however, receiving inspection did not maintain traceability records for later reference	Procedure was followed, however, Rec Inspection did not maintain traceability records for later reference
Verification of product during various stages of manufacturing	Carried out as per laid down procedures	Carried out as per laid down procedures
Verification of process parameters during various stages of manufacturing	Not done too religiously	Done and data recorded, however, many processes permitted to run out of specifications on a regular basis
Overall effectiveness of process control system	Not to the level of automotive industry standards	Unsatisfactory - as system compliance is extremely poor

Source: Created by authors.