

CHAPTER 4 PROPOSED METHODS AND PROCEDURES FOR SUPPLIER QUALITY MANAGEMENT

This chapter describes the proposed methods to improve weak area of supplier quality management of MOLEX Thailand Ltd,. There are two main area that improvement needed , incoming quality control and supplier quality improvement at supplier side. All results will be fed back to supplier for acknowledgement and improvement action.

Proposal For Supplier Quality Management Improvement

Supplier Quality Management Improvement consists of 2 main sections.

4.1 Incoming Quality Control Improvement

- Incoming Quality Control Process
- IQC inspection plan
- Skip and Ship to Stock Program
- IQC data utilization to evaluate supplier performance

4.2 Supplier Quality Improvement

- Supplier Qualification Process
- Supplier Periodic Evaluation
- Supplier Disqualification Process

4.1 Incoming Quality Control Improvement

4.1.1 Incoming Quality Control Process

Single sampling plan with switching rules for normal, tightened and reduced inspection, *MIL STD105E* is proposed for incoming inspection. Single Sampling Plan *MIL STD105E* ($c = 0$) with switching rules, reduced normal and tightened. Policy MOLEX Thailand LTD accepts the product that meet zero defect ($c = 0$). Thus, sampling acceptance will be based on $c = 0$.

The critical dimension points are outer diameter of insulator of wire, thickness /concentricity between conductors and insulator. Functional tests are, bond strength test and solderability test. These test processes are to qualify whether the material can be used for production. IQC inspector will perform all inspection according to Single sampling plan with switching rules for normal, tightened and reduced inspection, *MIL STD105E* .

The work instruction (WI#QC015) as shown in figure 4.1 A-I, Incoming Quality Method, is developed then proposed for IQC inspection. The work instruction is a document that will advise the operator , IQC operator, QC operator and production operator to do his/her job step by step. IQC inspector will use the work instruction #QC015 "*Incoming Quality Method*" to be as a guideline to do inspection.


Molex (Thailand) Limited

WORK INSTRUCTION		WI #	QC015																					
TITLE : การตรวจสอบสินค้าเข้า Incoming Inspection Method		REV #	H																					
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	<p>1 ใบรับของจะถูกส่งมาที่ IQC โดยพนักงานคลังสินค้า</p> <p>The Receiving Note will be submitted to IQC area by warehouse personnel</p> <p>2 ผู้ตรวจสอบ IQC จะตรวจรายละเอียดตามใบรับของเช่น หมายเลขงาน , สัพพายเออร์ ถ้าหีบห่อที่บรรจุเสียหายมากจนก่อให้เกิดความเสียหายกับ ชิ้นงานภายใน เนื่องจากการขนส่ง ผู้ตรวจสอบจะต้องถ่ายรูป แล้วออกรายงานคุณภาพวัตถุ โดยแนบรูปไปด้วย</p> <p>IQC inspector will check the detail in the receiving note such as part no., supplier. If damaged package, poor package is found because of poor transportation. The inspector will have to take the photos and issue MQR report (Enclose the photo to this report) then distribute</p> <p>3 ผู้ตรวจสอบจะต้องเช็คว่าจะใช้กฎการปรับเปลี่ยนเป็นแบบ ปกติ, ผ่อนคลาย, เครื่องเครียด โดยจะต้องใช้ให้ถูกต้องสำหรับแต่ละผลิตภัณฑ์ (ดูใน Vendor History / Incoming Inspection Record)</p> <p>IQC inspectors will have to check what corresponding switching rules MIL STD 105E , normal, reduced, tightened they have to use correctly for each product (see in vendor history/incoming inspection record)</p> <p>4 Unit of the material is defined as below : หน่วยของวัตถุดิบ กำหนดดังข้างล่างนี้</p>																							
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Type of Raw Material ชนิดของวัตถุดิบ</th> <th style="text-align: center;">Big Unit หน่วยใหญ่</th> <th style="text-align: center;">Small Unit หน่วยเล็ก</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Terminal เทอร์มินอล</td> <td style="text-align: center;">Reel ม้วน</td> <td style="text-align: center;">a terminal เทอร์มินอล 1 ตัว</td> </tr> <tr> <td style="text-align: center;">Housing Water เฮ้าซิ่ง เวเฟอร์</td> <td style="text-align: center;">Bag ถุง</td> <td style="text-align: center;">a housing, a wafer เฮ้าซิ่ง เวเฟอร์ 1 ชิ้น</td> </tr> <tr> <td style="text-align: center;">Connector คอนเนคเตอร์</td> <td style="text-align: center;">Bag ถุง</td> <td style="text-align: center;">a connector คอนเนคเตอร์ 1 ตัว</td> </tr> <tr> <td style="text-align: center;">Tape, Wire, Cable, Tube เทปพันสายไฟ, สายไฟ, เคเบิล, ท่อ</td> <td style="text-align: center;">Reel ม้วน</td> <td style="text-align: center;">-</td> </tr> <tr> <td style="text-align: center;">Cable Tie เคเบิล ไท</td> <td style="text-align: center;">Bag ถุง</td> <td style="text-align: center;">a piece of cable tie 1 ชิ้นของเคเบิลไท</td> </tr> <tr> <td style="text-align: center;">Enclosure ตู้สำหรับสายไฟเบอร์ออฟติก</td> <td style="text-align: center;">Cabinet กล่อง</td> <td style="text-align: center;">-</td> </tr> </tbody> </table>		Type of Raw Material ชนิดของวัตถุดิบ	Big Unit หน่วยใหญ่	Small Unit หน่วยเล็ก	Terminal เทอร์มินอล	Reel ม้วน	a terminal เทอร์มินอล 1 ตัว	Housing Water เฮ้าซิ่ง เวเฟอร์	Bag ถุง	a housing, a wafer เฮ้าซิ่ง เวเฟอร์ 1 ชิ้น	Connector คอนเนคเตอร์	Bag ถุง	a connector คอนเนคเตอร์ 1 ตัว	Tape, Wire, Cable, Tube เทปพันสายไฟ, สายไฟ, เคเบิล, ท่อ	Reel ม้วน	-	Cable Tie เคเบิล ไท	Bag ถุง	a piece of cable tie 1 ชิ้นของเคเบิลไท	Enclosure ตู้สำหรับสายไฟเบอร์ออฟติก	Cabinet กล่อง	-	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> ORIGINAL 1998 AUG 19 MTR DOCUMENT </div>	
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Figure 4.1- A : Proposed Work Instruction For Incoming Quality Method

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WORK INSTRUCTION		WI #	QC015
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	<p>5) การใช้แผนการสุ่มเชิงเดียวที่เป็น Zero Defect ; 0.1% AQL (ดูตารางในหน้า 9) : Using Single Sampling Plan with zero defect acceptance 0.1% AQL (See the table in page 9)</p> <p>5.1) การตรวจก่อนขึ้นตอนก่อนทำการสุ่ม</p> <p><i>Initial Check before taking sampling</i></p> <p>ดูจำนวนของผลิตภัณฑ์ในใบรับของ, นับจำนวนม้วน,ถุง(หน่วยใหญ่), จากนั้นตรวจจำนวนชิ้นต่อม้วนตามกระดาษฉลากของแต่ละม้วน,ถุงของล็อตนั้น จำนวนจะต้องถูกต้องตามใบรับของทั้งจำนวนถุง, ม้วนและจำนวนชิ้นงานบนฉลาก ถ้าจำนวนถุง, ม้วน (หน่วยใหญ่) หรือ จำนวนชิ้น ไม่ตรงกับใบรับของ (จำนวนขาด) ให้ออกรายงานคุณภาพผิดปกติ โดยระบุว่า ส่งของขาด เพื่อขอคืน ส่วนที่ขาดไป จากนั้นให้สุ่มตรวจตามขั้นตอนต่อไป โดยใช้จำนวนจริงที่รับมา ในการ ทาขนาดการสุ่ม</p> <p>Observing the quantity of the product in the receiving note, counting the quantity of reel, bag (big unit) then check the quantity of part in according to the label on each reel, bag or that lot. If the number of reel, bag,(big unit) or total small unit (parts) is not correct(short) in according to the receiving note, issue MQR report and identify "Short Ship" and shortage quantity on it to claim for replacement of the shortage material. Then continue to inspect by using the actual quantity to find the sample size</p> <p>5.2) การสุ่มหน่วยใหญ่</p> <p>ขั้นแรก ผู้ตรวจสอบทำการสุ่มจำนวนของหน่วยใหญ่ (ม้วนของสายไฟ,เทป,เทอร์มินอล, ถุงของ เวเฟอร์, เซมิ) โดยใช้แผนการสุ่มเชิงเดียวตามข้างบน</p> <p>ตัวอย่าง, เทอร์มินอล 10,000 ชิ้น มาในรูปม้วน 10 ม้วน (1,000 ชิ้นต่อม้วน), สุ่มจำนวนม้วนตามแผนการสุ่มเชิงเดียว Zero defect โดยให้สอดคล้องกับกฎการสับเปลี่ยน</p> <p>สมมติว่า เทอร์มินอลชนิดนั้น ถูกตรวจสอบในระดับเครื่องวัด (กฎการสับเปลี่ยน), ดังนั้น 5 ม้วนจะถูกสุ่มมาตรวจ, ตอนนี้ เรามี 5 ม้วนถูกเลือกมาแล้ว จากนั้นให้ทำตามขั้นตอนต่อไป</p> <p>หลังจากที่ได้จำนวนของหน่วยใหญ่ ผู้ตรวจสอบต้องชั่งจำนวนชิ้น ว่าถูกต้องหรือไม่ ถ้าขาดเป็นจำนวนมากกว่า5%</p>		
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Figure 4.1- B : Proposed Work Instruction For Incoming Quality Method

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เช่น 1,000 ชิ้นต่อถุง ซึ่งนับได้ น้อยกว่า 950 ชิ้น ให้ทำการปฏิเสธ ล็อตนั้น การซึ่งนับให้ทำตามรายการผลิตภัณฑ์ที่หัวหน้า หรือ วิศวกรกำหนด


Big Unit Sampling

Firstly, inspector have to take sampling the quantity of reel, bag (big unit of wire, cable, tube, terminal, connector, wafer and housing) in according to single sampling plan with Zero defect.

For example, terminal 10,000 pieces were contained in 10 reels (1000 pieces per reel). Take sampling the quantity of reel per the single sampling plan with corresponding switching rules.

Assume that this terminal was inspected with tightened level. According to the sampling plan 5 reels will therefore be taken to inspect. Now 5 reels are selected, then follow by the next step.

After we know that how many big unit were taken sampling, IQC inspector will use the scale to count number of parts in each big unit (bag, box, etc.) If the quantity of product is short more than 5% such as 1,000 parts per 1 bag, actual result from scales is less than 950 parts. That lot is rejected. List of the product that will be counted by scales will be defined by supervisor or engineer.



5.3) การสุ่มหน่วยเล็ก

ขั้นที่สอง ผู้ตรวจสอบสุ่มจำนวนทั้งหมดของชิ้นงานของล็อตนั้นแล้วหาขนาดตัวอย่างสุ่มในแผนการสุ่มเชิงเดียวที่ Zerodefekt.

ตามตัวอย่างใน 5.2 ล็อตนั้นมี 10,000 ชิ้นดังนั้นขนาดตัวอย่างสุ่มตามแผนการสุ่มเชิงเดียว เป็น 315 ชิ้น

เราได้ว่า กำลังตรวจผลิตภัณฑ์ด้วยระดับเคร่งครัดของกฎการสับเปลี่ยน และให้ระมัดระวังว่า ระดับในแพคเกจ, คอนดล่ายหรือเคร่งครัด , ที่กำลังใช้อยู่)

สุดท้าย (จากข้อ 5.1 และ 5.2) เราจะได้ว่า ตัวอย่างสุ่มของหน่วยใหญ่ (ม้วน) เป็น 5 หน่วย (ม้วน) และ ตัวอย่างสุ่มของหน่วยเล็ก (เทอร์มินอล) เป็น 315 ชิ้น


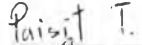

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Figure 4.1- C : Proposed Work Instruction For Incoming Quality Method

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WORK INSTRUCTION		WI #	QC015
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	<p>Small Unit Sampling</p> <p>Secondly, IQC inspector take a look at total quantity of part(workpiece) of that lot then find the sample size of small unit that will be taken in the single sampling plan with zero defect.</p> <p>According to the example in step 5.2, a lot contains 10,000 pcs, therefore sample size per the single sampling plan is 315 pieces (Remember that we are inspecting the product with tightened level of switching rules and be careful what level normal, reduced or tightened, you are using)</p> <p>Finally(from 5.1.1 and 5.1.2) we know that sample size of reel(big unit) is 5 reels and sample size of terminal(small unit) is 315 pieces</p>		
<p>3.4 ทำการตรวจสอบดังต่อไปนี้</p> <p>การตรวจสอบสินค้า การตรวจสอบด้วยตาจะถูกกำหนดแผนการสุ่มเชิงเดียวที่ Zero defect (ชนิดตัวอย่างสุ่มที่ส่งมอบหน่วยเล็กจะถูกตรวจสอบ) แผนการสุ่ม ชิ้นง ร (หน่วยเล็ก) จาก ทุก ๆ ม้วน (หน่วยใหญ่) ให้เท่า ๆ กัน ยกเว้น 3 315 ชิ้นทั้งหมดจะถูกตรวจสอบด้วยตา โดยแบ่ง 315 ชิ้น จาก 5 ม้วนเท่า ๆ กัน ดังนั้น 63 ชิ้น จากแต่ละม้วน จะถูกตรวจสอบด้วยตา ดังนั้น 63 ชิ้น จากแต่ละม้วนจะถูกตรวจสอบด้วยตา</p> <p>การวัดขนาด การใช้งาน ความสามารถในการควบคุม:</p> <p>ตัด 20 cm จากต้นม้วนของแต่ละม้วนที่ถูกสุ่มมา หลังจากนั้น สุ่มเลือก 1 ชิ้น จากเทอร์มินัลเหล่านี้ (20 cm) แล้วตรวจสอบด้วยตา, การใช้งาน, การแกะติดตะกั่ว, อื่น ๆ ตามเช็คลิสต์</p> <p>ตัดวิธีเดียวกัน, สายไฟและเคเบิล, ให้ตัด 20 cm จากต้นม้วนของแต่ละม้วนที่ถูกสุ่มมาหลังจากนั้น สุ่มตัด ชิ้นเล็ก ๆ 1 ชิ้นจากสายไฟ/เคเบิลที่ตัดมา เพื่อตรวจสอบด้วยตาตามเช็คลิสต์ จำนวนชิ้นของการวัดระยะจะเป็น 5 ชิ้นแล้วบันทึกค่าสูงสุดและค่าต่ำสุด ลงในใบบันทึกผล</p> <p>Perform inspection as follows,</p> <p>Visual inspection : Visual inspection will be done per the single sampling plan with zero defect at AQL 0.1 % (total sample size of small unit is inspected). Taking the parts(workpieces) equally</p>			
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Figure 4.1- D : Proposed Work Instruction For Incoming Quality Method

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from every reel (big unit). From 5.3, all 315 pieces are inspected visually. Deviding all 315 pieces by number of taken(selected) reel, in order to the small units in every reel are taken to inspect.

From the example, we have 5 reels and 315 pieces. 63 pieces of each reels(5 reels). is, therefore, taken to inspect.

Dimension inspection. Functional Test and Solderability Test

Cut 20 cm from the beginning of each reel that is taken sampling after that select randomly 1 piece from these terminals (20 cm) then inspect dimension, functional test, adhesion, etc according to checklist.

In the same way, wire and cable, cut 20 cm from the beginning of each reel after that cut a small piece of wire randomly, to inspect dimension per check list. The number of parts for dimension measurement will be 5 units per lot then record maximum and minimum value in the record

หลังจากที่บันทึกผลการตรวจสอบพร้อมด้วย จำนวนหน่วยใหญ่ และเล็ก ที่ลุ่ม ใน Vendor History / Incoming Inspection Record ตามแต่ละผลิตภัณฑ์

After that recording the inspection result , number of big unit is taken and number of small unit is taken in Vendor History / Incoming Inspection Record, if the product(material is supplied by customer , let inspector use Customer Supplied Part Inspection Record which is defined for each product

ถ้ายอมรับ (If accept) :

- ประทับตรา "Accept" บนใบรับของ ถ้าผลิตภัณฑ์ทั้งหมดในใบรับของที่ ยอมรับได้
Stamp "Accept" on receiving note if all of them are acceptable.
- ประทับตรา "Accept" บน Vendor History / Incoming Inspection Record เพื่อยอมรับผลิตภัณฑ์นั้น
Stamp "Accept" on Vendor History / Incoming Inspection Record to accept that product
- ย้ายผลิตภัณฑ์ที่ยอมรับได้เหล่านั้นจาก MFGIOC ไปยัง MFFG โดยระบบ AS 400 พร้อมด้วย Inventory Report และใบรับของ ให้กับคลังสินค้า

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
MFLH DOCUMENT CONTROL

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APPROVED BY	Name : Pompanom K.	Sign :	Date : ๑๖ Aug 97

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Figure 4.1- E : Proposed Work Instruction For Incoming Quality Method

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	<p>Transfer the accepted product from MFGIQC to MFFG (Warehouse) by AS-400 with Inventory report and Receiving Note(with ' Accept stamp) to warehouse</p> <p>6.2) ถ้าปฏิเสธ (If reject) :</p> <p>มีบางผลิตภัณฑ์ที่ถูกปฏิเสธ . ในใบรับของให้บันทึกรายละเอียด, รวมทั้ง หมายเลข MQR . ลงบนฉลาก ' Incoming Rejected' และใบรับของแล้วส่งเฉพาะใบนี้ให้กับคลังสินค้า. ส่วนฉลาก ให้ติดฉลาก 'Incoming Rejected' ลงบนผลิตภัณฑ์นั้น</p> <p>There are some rejected parts in a receiving note . the detail shall be recorded including Material Quality Report Number on both the ' Incoming Reject ' label and receiving note then send this receiving note to ware house. and stick 'Incoming Reject' label on that product</p> <p>บันทึกประวัติ 'Reject' ลงบน Vendor History / Incoming Record</p> <p>Stamp ' Reject ' on Vendor History / Incoming Record</p> <p>ส่งรายงานคุณภาพของวัสดุที่บกพร่องและ ผิดตรวจสอบของเสีย (MQR) Material Quality Report</p> <p>Issue Material Quality Report together with the defective samples</p> <p>If the rejected product is supplied by customer, the inspector have to release Customer Supplier Part Feed Back, and write down the report no. on customer supplied part inspection report</p> <p>สำหรับผลิตภัณฑ์ที่ถูกปฏิเสธ ส่งมาโดยลูกค้า, ผู้ตรวจสอบต้องออก Customer Supplied Material Quality Feed Back และ เขียนหมายเลขรายงาน (Report #) ลงบน Customer Supplied Part Inspection Report</p> <p>- ย้ายผลิตภัณฑ์ที่ถูกปฏิเสธจาก MFGIQC ไปยัง MFGIRJ พร้อมกับ Inventory Report ผ่านระบบ AS-400 เพื่อรอการตัดสินใจ ส่งใบรับของพร้อมกับรายละเอียดของเสียไปยังคลังสินค้า</p> <p>Transfer the rejected product from MFGIQC to MFGIRJ location with Inventory Report through AS-400 System in order to wait for final disposition Return receiving note with reject information to warehouse</p>	
PREPARED BY Name : Paisit T.	Sign : Paisit T.	Date : 28/08/14
APPROVED BY Name : Pompanom K.	Sign : 	Date : 9 Aug 17

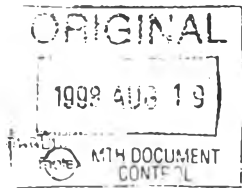
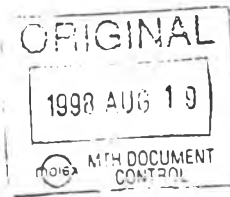
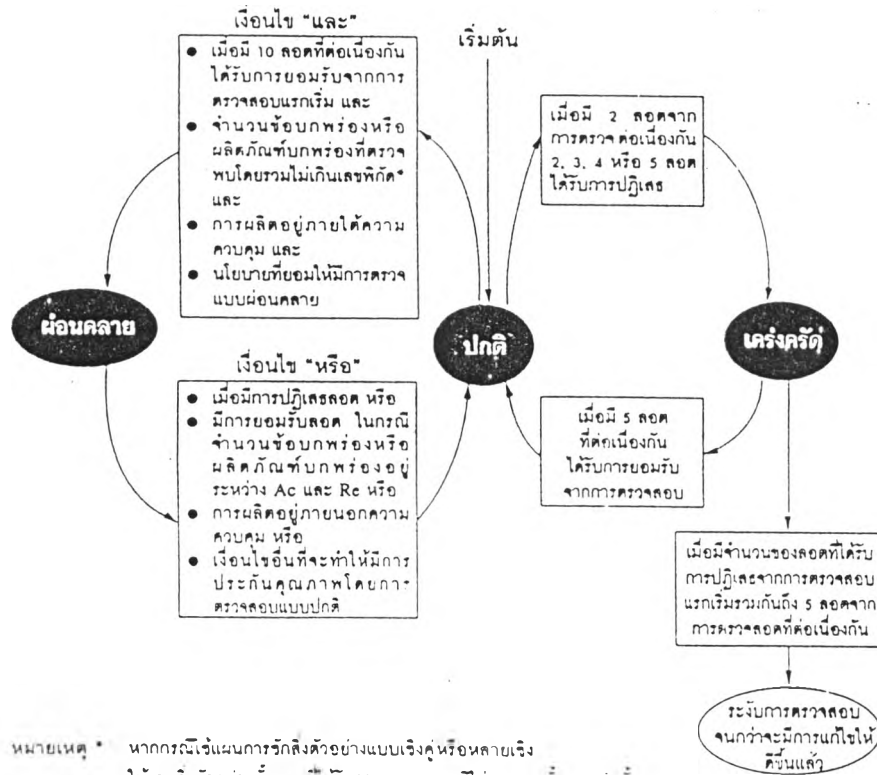


Figure 4.1- : Proposed Work Instruction For Incoming Quality Method

Molex (Thailand) Limited

WORK INSTRUCTION TITLE : การตรวจสอบสินค้าเข้า Incoming Inspection Method	WI#	QC015
	REV #	11
	REF.	THQA-0012
	PAGES	7 of 9



กฎการปรับเปลี่ยนตามมาตรฐาน MIL STD 105E

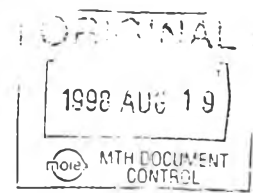
PREPARED BY	Name : Paisit T.	Sign : Paisit T.	Date : ๑๘/๐๘/๑๔
APPROVED BY	Name : Pompanom K.	Sign : [Signature]	Date : ๑๗ Aug 17

Figure 4.1- G : Proposed Work Instruction For Incoming Quality Method

Molex (Thailand) Limited

WORK INSTRUCTION TITLE : การตรวจสอบสินค้าเข้า Incoming Inspection Method	WI#	QC015
	REV#	H
	REF.	THQA-0012
	PAGES	8 Of 9

Tool / Equipment for IQC inspection
เครื่องมือสำหรับการตรวจ IQC



Tool /Equipment for incoming inspection	Abbreviation
Micrometer	M
Vernier Caliper	C
Measurescope	MS
Visual	V
Gauge(Pitch.Hole.Plug)	PG
Manual	MN
Push-Pull Gauge	PP
Solder Pot (Solderability Test)	SP
Ruler(Steel ruler)	R or SR
Microscope	S
Profile Projector	PF
Dial Thickness Gauge	TG

PREPARED BY	Name : Paisit T.	Sign : <i>Paisit T.</i>	Date : ๑๖/๐๖/๙๘
APPROVED BY	Name : Pornpanom K.	Sign : <i>[Signature]</i>	Date : ๑๖/๐๖/๙๘

THFN-0002-C

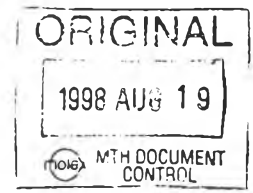
Figure 4.1- H : Proposed Work Instruction For Incoming Quality Method

Molex (Thailand) Limited

WORK INSTRUCTION TITLE : การตรวจสอบสินค้าเข้า Incoming Inspection Method	WI#	QC015
	REV #	H
	REF.	THQA-0012
	PAGES	9 Of 9

MIL STD 105 E with zero defect c=0
 Inspection Level AQL 0.1 %

Lot Size	Sample Size Code Letter	Reduced	Sample Size Code Letter	Normal	Sample Size Code Letter	Tightened
		I		II		III
		Sample Size		Sample Size		Sample Size
2 - 8	A	2	A	2	B	3
9 - 15	A	2	B	3	C	5
16 - 25	B	2	C	5	D	8
26 - 50	C	2	D	8	E	13
51 - 90	C	2	E	13	F	20
91 - 150	D	3	F	20	G	32
151 - 280	E	5	G	32	H	50
281 - 500	F	8	H	50	J	80
501 - 1,200	G	13	J	80	K	125
1,201 - 3,200	H	20	K	125	L	200
3,201 - 10,000	J	32	L	200	M	315
10,001 - 35,000	K	50	M	315	N	500
35,001 - 150,000	L	80	N	500	P	800
150,001 - 500,000	M	125	P	800	Q	1,250
500,001 - Over	N	200	Q	1,250	R	2,000



PREPARED BY	Name : Paisit T.	Sign : <i>Paisit T.</i>	Date : 11/03/98
APPROVED BY	Name : Pornpanom K.	Sign : <i>P.K.</i>	Date : 25 Aug 98

THEN-0002-C

Figure 4.1- I : Proposed Work Instruction For Incoming Quality Method

IQC inspector will inspect the material in corresponding to work instruction #QC015 single sampling plan with switching rules for normal, tightened and reduced inspection MIL STD105E . The result will be recorded in the formal report, vendor historical record. If that material is rejected, it will be moved to reject area belonging to QA responsibility. If accepted, the material will be stored in warehouse area. Figure 4.3 presents Incoming Quality Control Process in which the old incoming quality control process is illustrated in figure 3.2 of chapter 3.

According to methodology in section 2.2.9 Standard Sampling Plan, chapter 2. The single sampling plan ($c = 0$) MIL STD 105E is proposed to incoming inspection method as shown in figure 4.2 .

Lot Size	Sample Size Code Letter	Reduced	Sample Size Code Letter	Normal	Sample Size Code Letter	Tightened
		SampleSize		SampleSize		SampleSize
2 - 8	A	2	A	2	B	3
9 - 15	A	2	B	3	C	5
16 - 25	B	2	C	5	D	8
26 - 50	C	2	D	8	E	13
51 - 90	C	2	E	13	F	20
91 - 150	D	3	F	20	G	32
151 - 280	E	5	G	32	H	50
281 - 500	F	8	H	50	J	80
501 - 1,200	G	13	J	80	K	125
1,201 - 3,200	H	20	K	125	L	200
3,201 - 10,000	J	32	L	200	M	315
10,001 - 35,000	K	50	M	315	N	500
35,001 - 150,000	L	80	N	500	P	800
150,001 - 500,000	M	125	P	800	Q	1,250
500,001 - Over	N	200	Q	1,250	R	2,000

Figure 4.2: Single Sampling Plan ($c = 0$) MIL STD 105E for MOLEX Thailand LTD incoming inspection

It can be said that IQC inspectors do inspection based on incoming quality control process outline. The proposed work instruction (WI#QC015 "Incoming Quality Method") will advise the inspector to review the historical material quality in order to apply the switching rules for normal, tightened and reduced inspection based on Single Sampling Plan MIL STD105E.

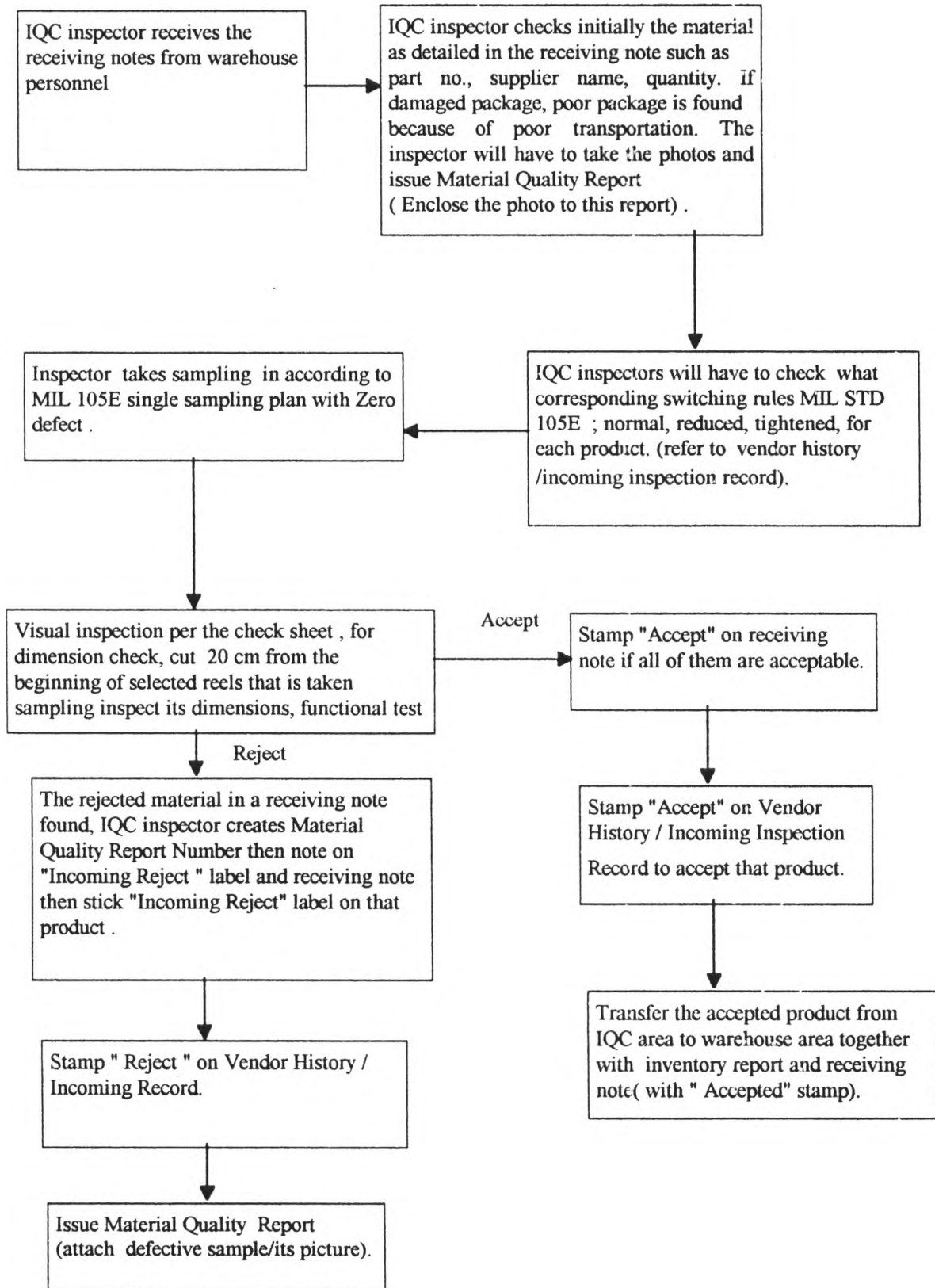


Figure 4.3: Proposed Incoming Quality Control Process (after implementation)

4.1.2 IQC Inspection Plan

Figures 4.4 - 4.7 present IQC inspection plans of PVC insulated wire that is the major material being supplied by local suppliers. IQC inspection plan is developed from supplier manufacturing process flow as shown in figure 4.8. IQC inspection plan (based on supplier manufacturing flow) is proposed to be used at IQC section in order to define upon the flow. Supplier manufacturing process describes the standard process which the material is produced. Potential failures are identified based on supplier manufacturing process then inspection checkpoints are defined to IQC checkpoints list in order to detect the material failure at IQC gate.

Supplier Manufacturing Flow will be asked by purchaser at the first time. After that this document will be passed to QA engineer to prepare IQC inspection plan. At this stage, QA engineer will communicate directly to the supplier. Purchaser will support upon QA requested.

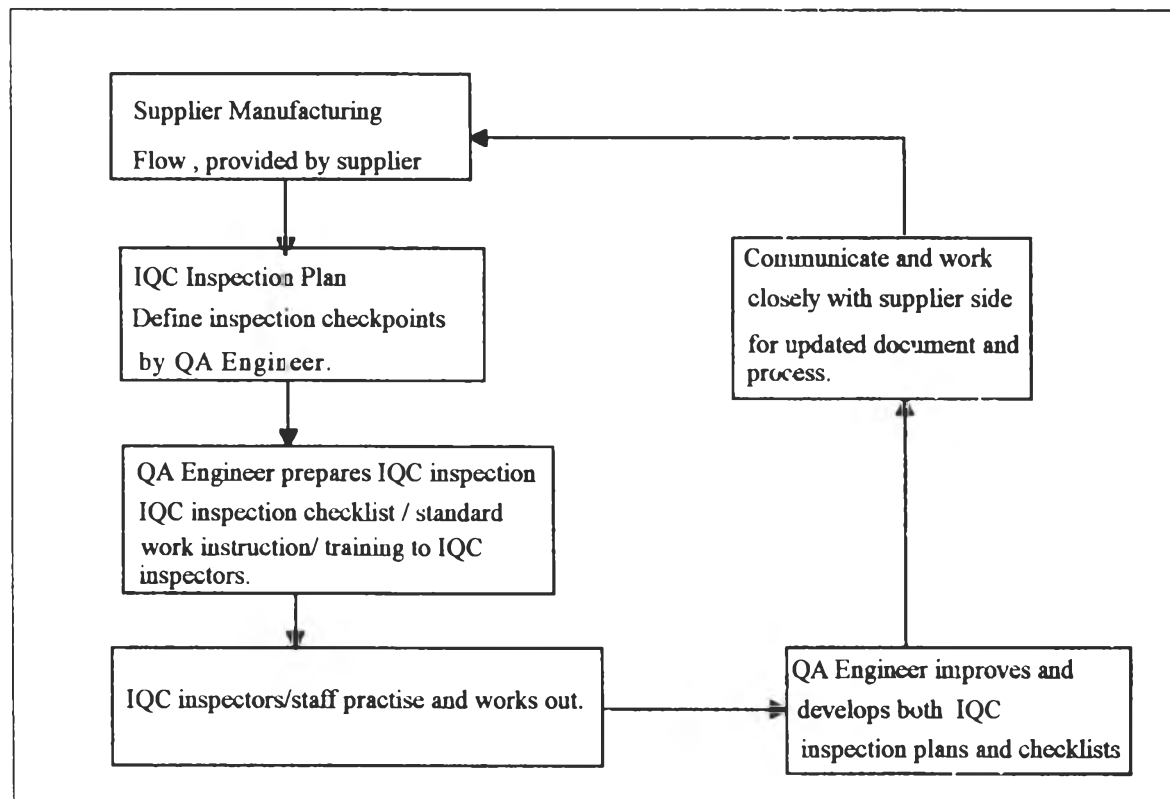


Figure 4.8 : IQC inspection plan outline and inspection checklist

Purchaser will be company representative who contact Sales representative of the supplier company. As a result, no one else could contact directly to the supplier, unless purchaser introduces MOLEX Thailand Ltd. staff to the supplier side. This is because purchaser have to make price negotiation, delivery and other business document submission.

Supplier B		MOLEX THAILAND LTD, IQC INSPECTION PLAN	Prepared by <i>Jarun M. ...</i>	Reviewed by <i>J. ...</i>
PRODUCT : HOOK UP WIRE		POTENTIAL FAILURE	FAILURE CHECK at IOC	Ref. no. &
FLOW	PROCESS NAME			
	1 COPPER INCOMING CHECK	N/A	Supplier checks on Overall diameter, Roundness, Elongation, Appearance, Winding Condition	Inspection procedure is based on supplier procedure, material certificate used
	2 TIN INCOMING CHECK	N/A	Supplier checks on Appearance, Purity based on supplier data, its specification	Inspection procedure is based on supplier procedure; material certificate used
	3 TIN COATING	N/A	Supplier checks on overall diameter, chemical test, roundness	Inspection procedure is based on supplier procedure
	4 IN PROCESS CHECK	Conductor damaged Incomplete Coating	Molex IQC checks on Conductor Surface Check, Poor coating/Solder Test, Conductor damaged/scratch	Visual /Function test - WI#062 - WI#010
	7 BUNCHING	N/A	Supplier checks on Strand direction and pitch, No. of strand wire, Individual wire OD, Cross section area by weight, Appearance	Inspection procedure is based on supplier procedure
	9 IN PROCESS CHECK	Conductor damaged Scratch	Molex IQC checks on Conductor surface check - Conductor damaged, - Incomplete soldering	Visual Inspection WI#QC062 WI#QC010
	7 PVC & COMPOUND INCOMING CHECK	N/A	Supplier checks on Appearance, Color, Moisture and his vendor data	Inspection procedure is based on supplier procedure

Start Operation
 Operation
 IQC gate
 End

Rev: 001
IQC: 005

Figure 4.4 A : Developed Incoming Inspection Plan For Supplier B

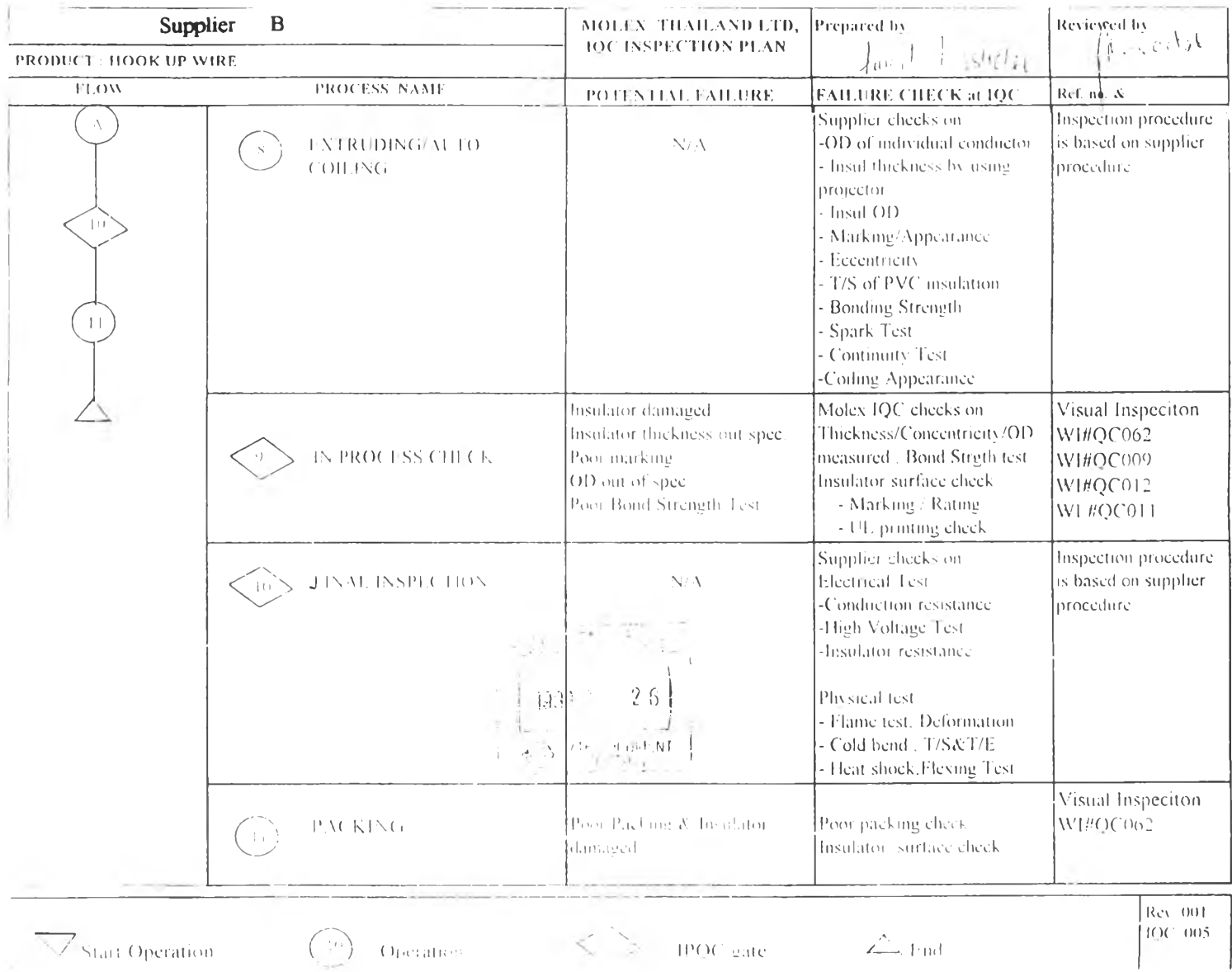


Figure 4.4 B : Developed Incoming Inspection Plan For Supplier B

Supplier F		MOLEX THAILAND LTD, IQC INSPECTION PLAN	Prepared by <i>[Signature]</i>	Reviewed by <i>[Signature]</i>
PRODUCT : HOOK UP WIRE				
FLOW	PROCESS NAME	POTENTIAL FAILURE	FAILURE CHECK at IQC	Ref no. &
▽	1 MATERIAL RECEIVED	N/A	Supplier checks every lots on elongation, dimension and COC and COA	Supplier SOP - PRO 002,005,007
①	2 WIRE DRAWING	N/A	Supplier checks once a day on O.D with thickness dial gauge	Supplier WI-ENG 002,004
◇	3 WIRE DRAWING INSPECTION	N/A	Supplier checks O.D twice/shift	Supplier SOP- QA 002
◇	4 ANNEALING/TIN PLATING	Conductor damaged Scratch	Conductor surface check -Conductor damaged -Incomplete soldering - Poor Coating	Visual Inspeccion WI#QC062 WI#QC010
◇	5 ANNEALING/TIN PLATING INSPECTION	N/A	Supplier checks on copper wire elongation and visual check , once / shift	Supplier SOP- QA-002
◇	6 STRANDING	Conductor damaged Scratch	Conductor surface check -Conductor damaged -Incomplete tinning	Visual Inspeccion WI#QC062
◇	7 STRANDING INSPECTION	N/A	Supplier checks on Visual Inspection, Counting Conductor, OD, Lay of wire	Supplier SOP-QA-002
①	8 INSULATING	Insulator damaged Insulator thickness out spec. Poor marking OD Out of spec Poor Bond Strength	Thickness/Concentricity measured . OD measured Insulator surface check - Marking / Rating - UL printing check Bond Strength Test	Visual Inspeccion WI#QC062 WI#QC009 WI#QC0012 WI#QC0011
▽	9			
△	10			

▽ Start Operation	① Operation	◇ IQC gate	△ End
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Rev 002
IQC 004

Figure 4.5 A : Developed Incoming Inspection Plan For Supplier F

Supplier F		MOLEX THAILAND LTD, IOC INSPECTION PLAN	Prepared by <i>[Signature]</i>	Reviewed by <i>[Signature]</i>
PRODUCT: HOOK UP WIRE				
FLOW	PROCESS NAME	POTENTIAL FAILURE	FAILURE CHECK at IOC	Ref. no. &
	INSPECTION	N/A	Suppliers checks on 1 O.D 2 Color Marking 3 Thickness 4 Elongation & Tensile strength 5 Flame Test 6 Bond Strength 7 Shrinkage Test	Supplier SOP- QA-002
	PACKING	IOC at Poor Packing & Insulator surface check	Poor packing check	Visual Inspeccion WI#QC062

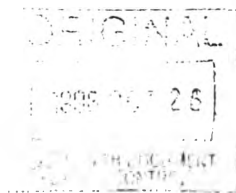


Figure 4.5 B : Developed Incoming Inspection Plan For Supplier F

Supplier A		MOLEX THAILAND LTD, IQC INSPECTION PLAN		Prepared by Pansil T 4/8/10/20	Reviewed by f. gsc. j. c.
PRODUCT : HOOK UP WIRE					
FLOW	PROCESS NAME	POTENTIAL FAILURE	FAILURE CHECK at IQC	Ref. no. & Measurement	
1	1 INCOMING TEST	N/A	N/A (Inspection procedure is based on supplier procedure ,material certificate used)	N/A	
2	2 3 DRAWING	N/A	N/A (Inspection procedure is based on supplier procedure ,material certificate used)	N/A	
4	4 5 TINNED	Conductor damaged Scratch Poor coating	Conductor surface check; -Conductor damaged -Incomplete tinning	Visual Inspection WI#QC062	
6	6 7 TWISTING/BUNCHING	Conductor damaged Scratch	Conductor surface check -Conductor damaged,	Visual Inspection WI#QC062	
8	8 PVC COMPOUNDING	N/A	N/A (Inspection procedure is based on supplier procedure ,material certificate used)	N/A	
9	9 10 EXTRUDE	Insulator damaged Insulator thickness/OD out spec. Poor marking Poor Bond Strength	Thickness/Concetricity/OD measured, Bond Strgth test Insulator surface check - Marking/Rating/UL printed	Visual Inspection WI#QC062 WI#QC010 WI#QC012 WI#QC011	
11	11 STORE& DELIVERY	Poor packing check Insulator Damaged	Poor packing check Insulator surface check	Visual Inspection WI#QC062	

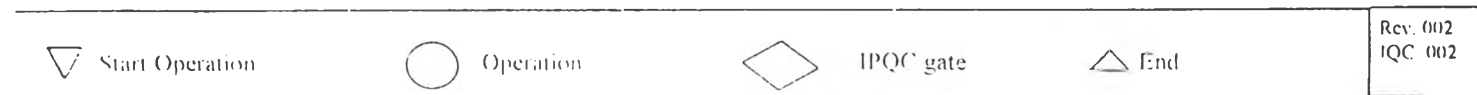


Figure 4.6 : Developed Incoming Inspection Plan For Supplier A

Supplier C		MOLEX THAILAND LTD, IQC INSPECTION PLAN	Prepared by Paisit T. 9/3/10/25	Reviewed by J. 9/3/10/25
PRODUCT : HOOK UP WIRE				
FLOW	PROCESS NAME	POTENTIAL FAILURE	FAILURE CHECK at IQC	Ref. no. &
	1 IQC (WIRE)	N/A	N/A (Inspection procedure is based on supplier procedure, material certificate used)	N/A
	2 DRAWING (MEDIUM)	N/A	N/A (Inspection procedure is based on supplier procedure, material certificate used)	N/A
	3 LQC (DRAWING MEDIUM)	N/A	Standard inspection done by supplier.	N/A
	4 DRAWING FINE	N/A	N/A (Parameter is controlled by supplier)	N/A
	5 LQC (DRAWING FINE)	N/A	Standard inspection done by supplier.	N/A
	6 ANNEAL	Conductor damaged Scratch	Conductor surface check -Conductor damaged. -Incomplete soldering	Visual Inspeccion WI#QC062 WI#QC010
	7 LQC (ANNEAL)	N/A	Standard inspection done by supplier.	N/A
	8 TINNED COATING	Conductor damaged Scratch Poor coating	Conductor surface check: -Conductor damaged. -Incomplete tinning -Poor Coating	Visual Inspeccion WI#QC062 WI#QC010
	9 LQC (TINNED COATING)	N/A	Standard inspection done by supplier	N/A
	10 BUNCHING	Conductor damaged Scratch	Conductor surface check. -Conductor damaged.	Visual Inspeccion WI#QC062
				Rev. 002 IQC 001

Figure 4.7 A : Developed Incoming Inspection Plan For Supplier C

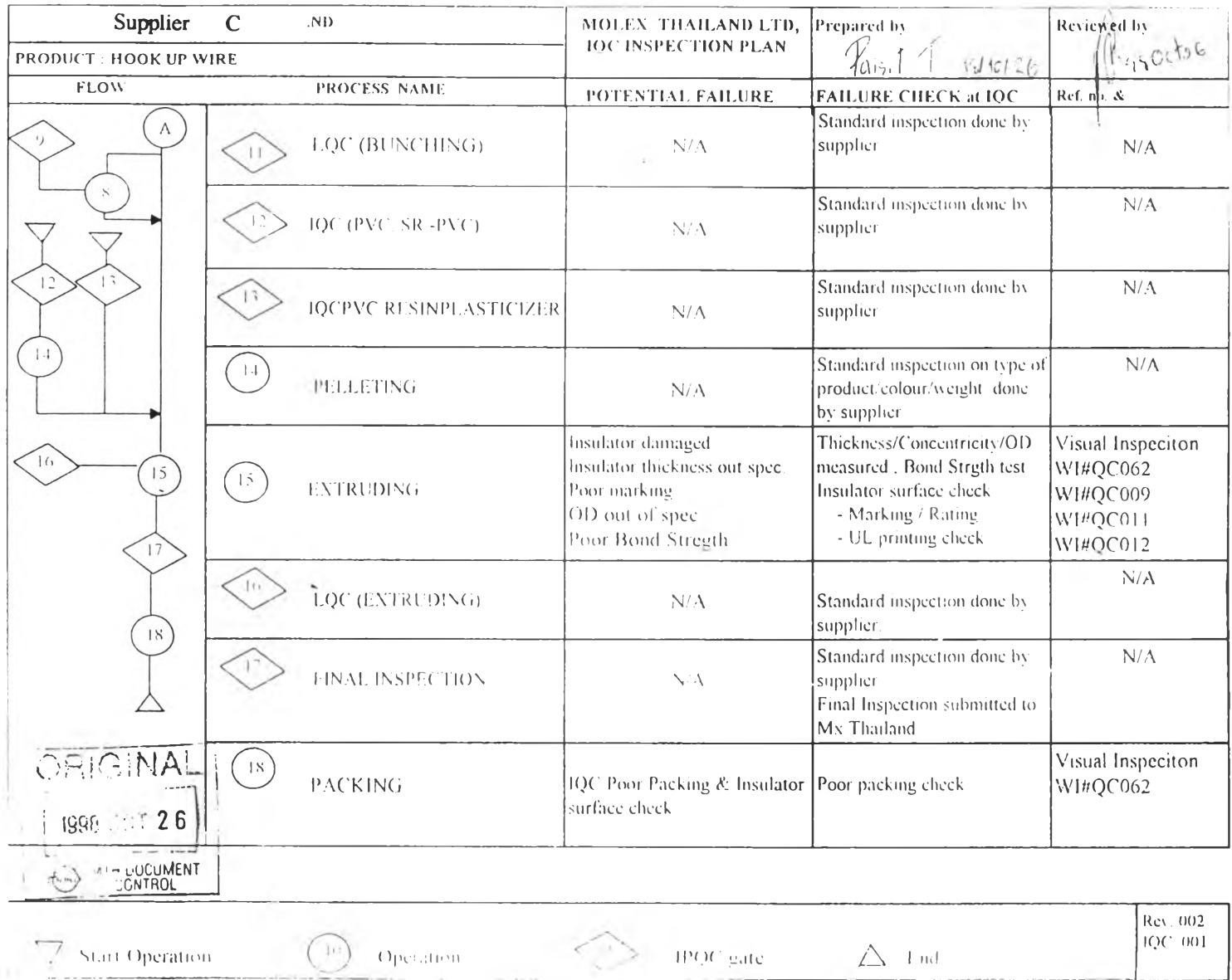


Figure 4.7 B : Developed Incoming Inspection Plan For Supplier C

After the flow has been received, IQC inspection plan will be prepared by QA Engineer then approved by QA Manager. After that, IQC inspection checklist will be prepared upon this IQC inspection plan.

Besides, there are certain functional test data that MOLEX Thailand Ltd. Company does not have capability to test, these test data therefore will be requested to supplier to provide company as quality inspection report. QA Engineer will feed back and make communication directly with the supplier in order to obtain additional test data

From figure 4.4, 4.5, 4.6, 4.7, IQC inspection plans have developed upon supplier manufacturing flow as shown in appendix III. Potential failures such as conductor damaged, insulator damaged, poor marking, have been identified. Conductor damaged/scratch could be occurred at anneal, tin coating and bunching process (supplier's process). Insulator damaged / Insulator thickness out of specification and bond strength and solderability failure could be occurred at extruding process. Those failure created problems to production process. As a result, IQC gate need to inspect upon these potential failures. All checkpoints will be defined by QA engineer. QA engineer defines the appearance checkpoints, dimension check (thickness measurement), and functional test (solderability and bond strength test).

IQC inspection checklist will have to be corresponding to IQC inspection plan. All checkpoints are inspected by IQC inspectors. QA Engineer have to provide standard work instruction and also train them, especially dimension measurement and functional test. The standard work instructions, WI#010: Bond Strength Test and WI#090: Thickness Measurement Method, were proposed to IQC inspection gate for dimension measurement and functional test.

Thickness of insulator means to thickness dimension of insulator that the supplier will have to meet UL standard and his product specification. Bond Strength means to bond strength between conductors and insulator. If bond strength is too high, it caused in broken conductors after cutting and stripping. If bond strength is too low, it causes in stripped length out of specification (stripping failure). Material quality problems are found either during incoming quality inspection or in the production line. The process will be as figure 4.9 below.

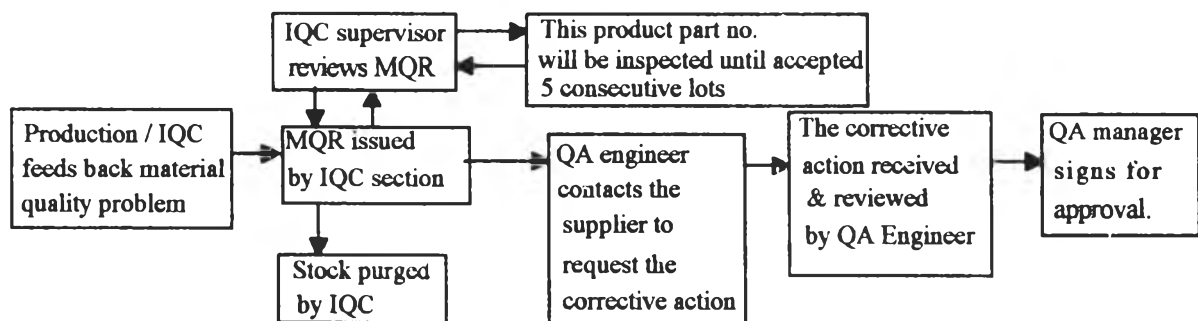
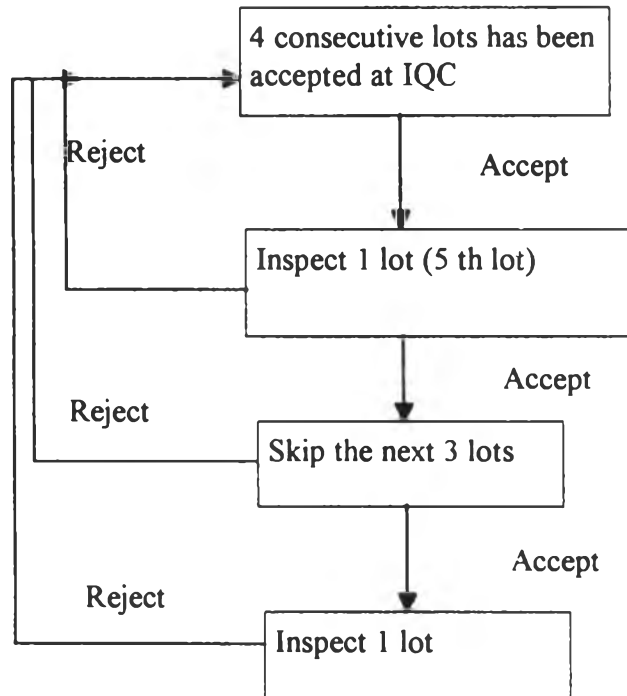


Figure 4.9 : IQC material problem and production complaint process

4.1.3 Skip and Ship to Stock Program (Reduced inspection and dock to stock program)

According to the existing procedure that has been used since 1994. The process is as below,



Appendix VIII presents the existing procedure for skip lot program for incoming inspection of MOLEX Thailand LTD. It can be seen that the process does not approach to ship to stock program. It is the simple method being used only for skip inspection process. This method consists of skip 3 lots then inspect the next lot. There is no process of recall the skipped lots when there is the rejected product that is found either in the production or IQC inspection. The procedure should have more detail in the action when the quality problem is found both at IQC and in production line. It should develop to ship to stock program.

Skip & Ship To Stock Program as shown in figure 4.10 is developed based on the existing procedure then proposed to MOLEX Thailand Limited company under supplier management team agreement. This program is to reduce IQC inspection for the suppliers whose products have met our target and conditions.

The meeting to set the conditions of the supplier who will apply to this program had been held within supplier management team then the team concluded that procedure to skip inspection and ship to stock program. The supplier will have to meet LAR(Lot Acceptance Rate) $\geq 98\%$

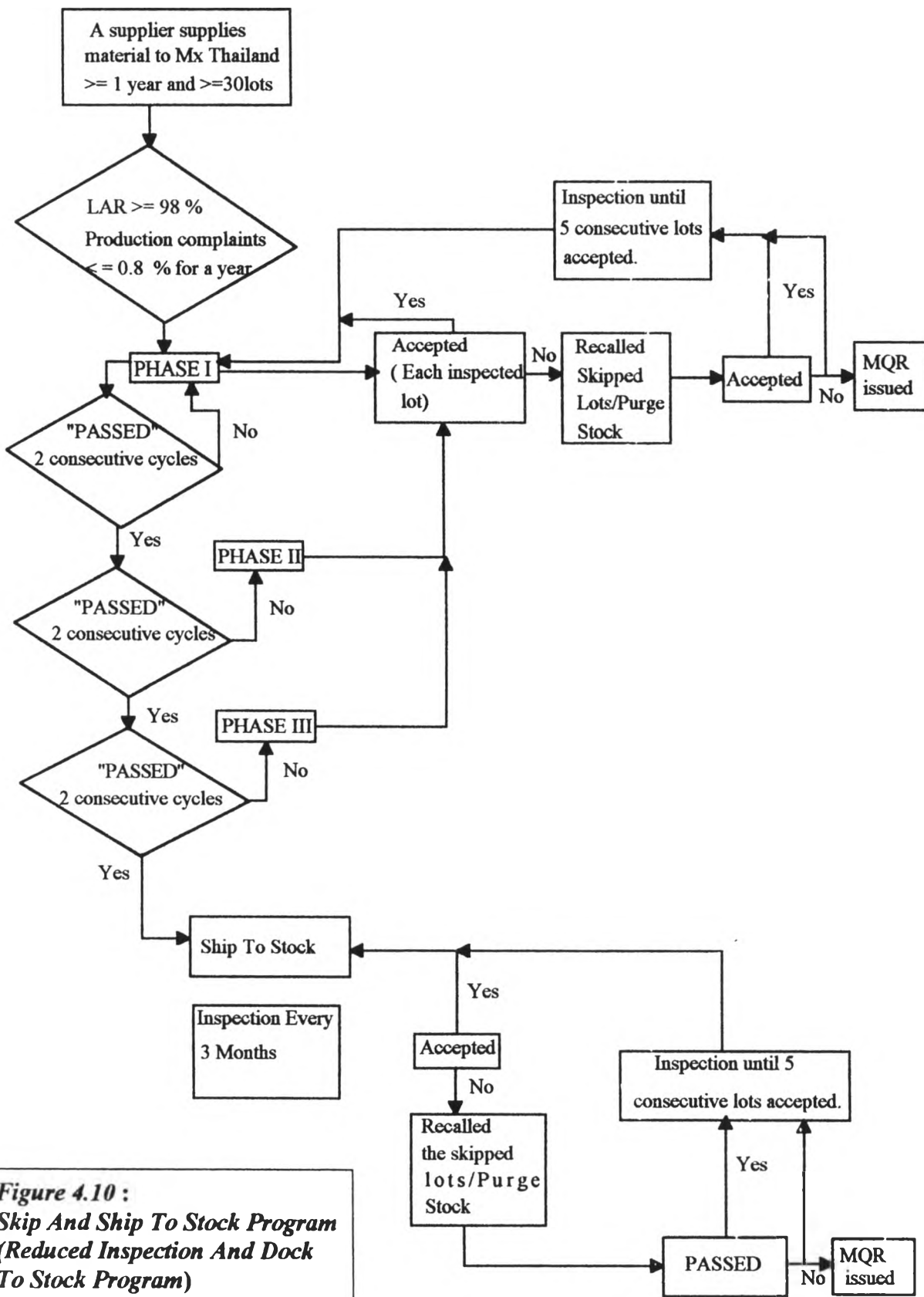


Figure 4.10 :
Skip And Ship To Stock Program
(Reduced Inspection And Dock
To Stock Program)

for 6 months minimum. These figures are the current performance of all suppliers including Molex supplier, major suppliers and indirect material suppliers. And also the suppliers will have to supply the product 30 lots at least over 6 months in the past and make business with Molex Thailand LTD over 1 year. These conditions are under the policy of the Molex Thailand LTD.

Skip and ship to stock program consists of three phases.

PHASE I : One cycle will be that 3 lots are skipped and then the 4 th lot will be inspected.

PHASE II: One cycle will be that 5 lots are skipped and then the 6 th lot will be inspected.

PHASE III: One cycle will be that 7 lots are skipped and then the 8 th lot will be inspected.

SHIP TO STOCK : Inspection once every 3 months .

After two consecutive cycles have been accepted in Phase I particular supplier and particular part no. can be shifted to Phase II. If the next two cycles are accepted in Phase II for particular part no. of that supplier. That part no. will be shifted to Phase III. After that, if two consecutive cycles have been accepted in Phase III for particular part no. of that supplier. That part no. will be applied to Ship To Stock program as shown in figure 4.10 : Skip And Ship To Stock Program Process.

The failure is found during each phase , that phase will be held until 5 consecutive lots passed during IQC inspection then start in the first cycle of that phase again. For ship to stock program shall be accepted until 5 consecutive lots accepted as shown in figure 4.10.

When the failure is found, the skipped lots will be recalled , Material Quality Report will be released to recall the skipped lots in order to inspect . After that IQC inspector will check in the inventory by taking sampling all available parts. This step will be also used when the defect is found in the production line.

4.1.4 IQC data utilization

Lot Acceptance Rate , Defect Per Million at IQC and Production Complaints are 3 factors that reflect the material quality. These 3 factors are proposed as goal to improve supplier quality material.

Lot Acceptance Rate is ratio between total accepted lots and total incoming lot. For example, supplier A supplies the material to MOLEX Thailand Ltd. , total 100 lots in a month. Incoming Quality Control section does inspection on the material in according to single sampling plan with switching rule as explained in/ *Incoming Quality Control Process* then 3 defective lots are found. Lot Acceptance Rate ,therefore is 97 %.

Defect Per Million , for example, total sample size of 100 lots is 4,000 parts that are taken sampling by IQC inspector, then 25 defective parts are found. Defect Per Million is $(25/4000) \times 10^6 = 6,250$ in that month.

Production Complaint: The material is released to use in production, when the production finds the defect during production. Production Complaint report will be issued to IQC section in order to claim supplier for the corrective action upon severity of the quality problem.

According to procedure of this study as explained in chapter 1, section 1.4.4 and 1.4.5. The data of rejection rate at IQC (Lot Acceptance Rate) and production complaint (Line Feed Back Rate). After that goal for lot acceptance rate at incoming inspection section and production complaint rate(Line Feed Back) had been establish as shown in table 4.1 and 4.2 below,

Current Performance LAR (Jan98 - May 98) = 97.63 %

	Total incoming lot	Total accep lot	% LAR	Supplier											
				A	% LAR	B	% LAR	C	% LAR	D	% LAR	E	% LAR	F	% LAR
Jan98	130	120	92.31	48	100	15	100	6	83.3	7	71.4	7	85.7	2	100
Feb98	167	164	98.2	44	100	41	100	6	83.3	41	95.4	1	100	0	100
Mar98	155	151	97.42	41	97.6	11	100	1	100	44	100	7	100	2	100
Apr98	279	276	98.92	104	100	25	100	1	100	43	100	33	94	1	100
May98	155	154	99.35	28	100	19	100	1	100	34	100	0	0	5	100
Total	886	865	97.63	265	99.57	111	100	15	94	169	94	48	95.43	10	100
10 % imprv.	-	-	98	-	99.6	-	100	-	94	-	94	-	95.5	-	100

Table 4.1: Lot Acceptance Rate during Jan 98 - May 98 and goal for 10 %

Source: IQC monthly report (Jan 98 - May 98) , MOLEX Thailand LTD.

Current Production Complaint (Jan98 - May 98) = 2.65 %

	Total incoming lot	Total Items	LFB rate (%)	Supplier											
				A	%LFB	B	%LFB	C	%LFB	D	%LFB	E	%LFB	F	%LFB
Jan98	130	6	4.62	48	2.08	15	0	6	0	7	0	7	0	2	0
Feb98	167	1	0.6	44	0	41	0	6	16.67	41	0	1	0	0	0
Mar98	155	1	0.65	41	2.44	11	0	1	0	44	0	7	0	2	0
Apr98	279	8	2.87	104	0	25	0	1	0	43	4.65	33	0	1	0
May98	155	7	4.52	28	7.14	19	0	1	100	34	2.94	0	0	5	0
Total	886	23	2.65	265	2.33	111	0	15	23.33	169	1.52	48	0	10	0
15 % imprv.	-	-	2.25	-	2	-	0	-	19	-	1.3	-	0	-	0

Table 4.2: Production complaint (Line Feed Back (% LFB)) during Jan 98 - May 98 and goal for 15 %

Source: IQC monthly report (Jan 98 - May 98) , MOLEX Thailand LTD.

Current Lot Accept Rate (Jan 98 - May 98), is 97.63%. and production complaint rate (% LFB) is 2.65 %. After implementing, supplier quality improvement plan. % LAR for all suppliers will be expected to increase to 98.00 % (10 % improved). and production complaint rate (% LFB) will be less than 2.25 %(15 %improved), (Goal 10% and 15 % improvement are assigned

by management team, this is the goal commitment for IQC improvement; MOLEX Thailand LTD). The sources of material quality problem will be focused on 6 major suppliers, supplier A, B, C, D, E, and F. It is supposed that if these suppliers can meet our target as shown in table 4.1 and 4.2 , for example % LAR goal for supplier A is equal to or more than 99.6 % and % LFB goal Production complaint rate (% LFB) is equal to or less than 2.65 %. It leads to overall suppliers goal achievements. These goal(figures) will be reviewed in the end of year 1998 after implementing this supplier quality improvement to MOLEX Thailand LTD.

These quality factors will be used to evaluate supplier performance. Goal for lot acceptance rate and production feed back rate is proposed to monitor and improve above three factors. QA engineer will have to work aggressively with the suppliers in order to receive the good material from supplier. This is also to reduce material quality problem at IQC. Material quality report will be requested to the supplier. The report can either come with the material every lot or be submitted every month by the supplier. IQC supervisor and QA engineer will have to review whether there is any problem that occur at supplier side so that the material can be considered in aspect of level of inspection or skip inspection. This document will be as support document for IQC section .

4.2. Supplier Quality Improvement

4.2.1 Proposed Supplier Qualification Process

Supplier Qualification Process is to justify whether the supplier manufacturing capability meets MOLEX Thailand LTD, company. The following steps as shown in figure 4.11: new supplier qualification process, are as follows,

4.2.1.1 New Supplier Requisition will be released by Buyer for acknowledgment

4.2.1.2 Rating Sheet for self assessment /quality system audit in figure 4.12 A-H. will be submitted to new supplier by buyer. This is to obtain the company and quality profile. This also is required when any supplier (existing) 's process or facility is changed. Supplier will do the self assessment (An example of self assessment/quality system audit result is shown in appendix IV)

Supplier Management Team is responsible to qualify the new supplier. SMT : Supplier Management Team consists of

1. Buyer (Purchaser)
2. Product Engineer
3. Production Engineer
4. QA Engineer

NEW SUPPLIER QUALIFICATION PROCESS

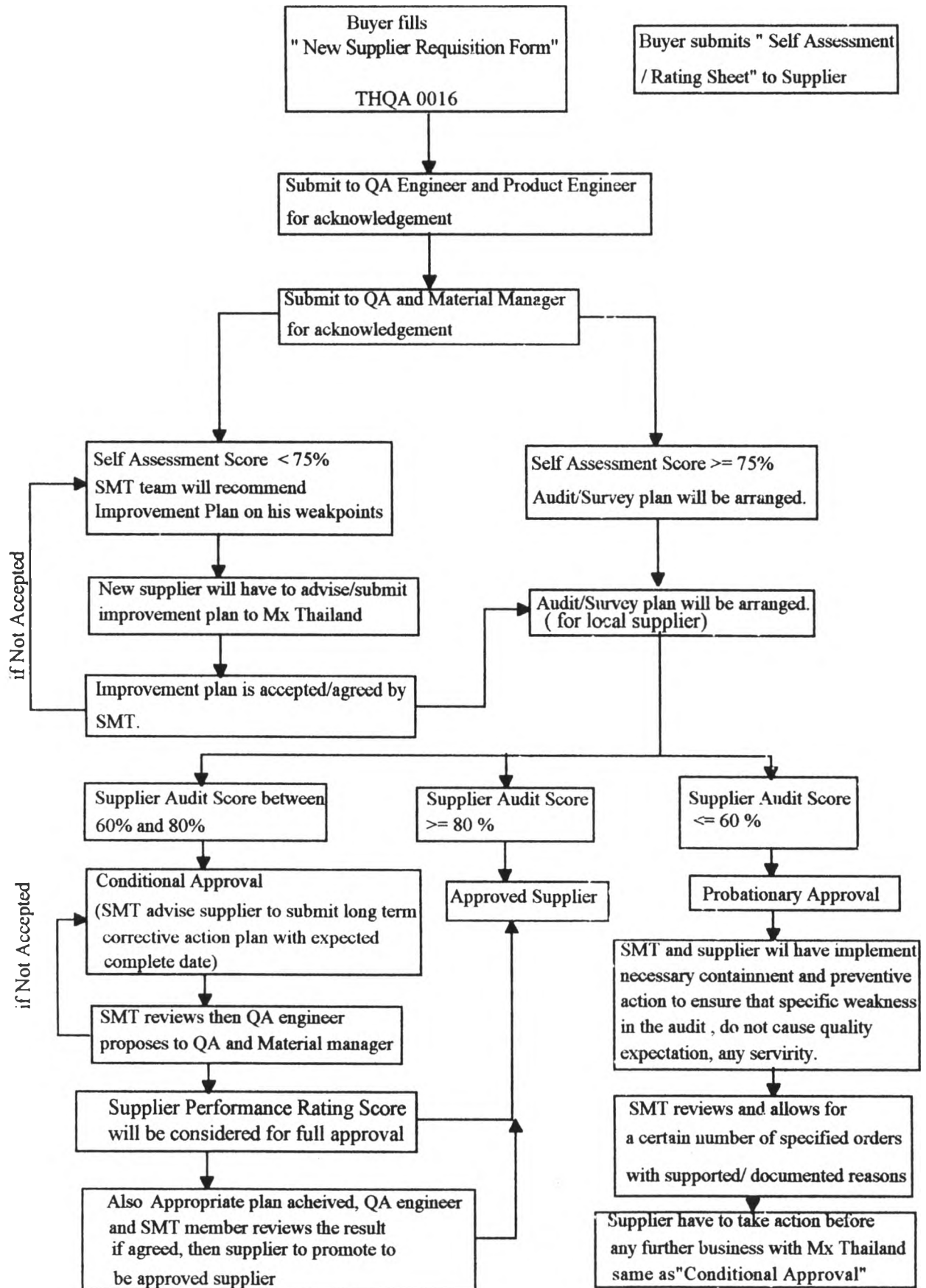


Figure 4.11: Proposed Method For New Supplier Qualification Process

Section 2 : Quality System Evaluation

QUALITY SYSTEM EVALUATION RESULT

Supplier		Rating					Weight	Total
Date	Feb 27, 98	No System	Significant Deficiency	Need Improvement	Satisfactory	Outstanding		
		0-20	21-40	41-70	71-85	86-100		
Sub System								
1.	Management & Personnel System					83.33%	16.67%	
2.	Documentation				78.57%		7.86%	
3.	Procurement			68.75%			6.88%	
4.	Manufacturing and Material Control					83.33%	16.67%	
5.	Final Acceptance				75.00%		7.50%	
6.	Statiscal Method				75.00%		15.00%	
7.	Calibration				75.00%		7.50%	
Previous Score :					Score for this Year :		72.07%	
Comment : <i>Conditional Approval</i>								
Auditor's Team Signature :		<i>Rajiv T. 18/03/03</i> QA Engineer <i>Pranish 11-03-03</i> Product Engineer <i>3/ 28/03/03</i> Purchaser(Buyer)						
1) 0-20 No System		3) 41-70 Need Improvement			5) 86-100 Outstanding			
2) 21-40 Significant Deficiency		(4) 71-85 Satisfactory						

Figure 4.12 A: Proposed Self Assessment /Quality System Audit Rating Sheet

RATING SHEET FOR SELF ASSESSMENT AND QUALITY SYSTEM AUDIT

1. Management & Personnel System		Rating					Score
Item No.	Description	No System	Significant Deficiency	Need Improvement	Satisfactory	Outstanding	
		0	1	2	3	4	
1.1	Are quality objective and responsibilities defined, then distributed through company ?					4	4
1.2	Does all support organization understand the roles to achieve customer satisfaction ?				3		3
1.3	Are quality objectives used to guide planning (production) ?				3		3
1.4	Is the formal quality manual developed and implemented ?					4	4
1.5	Are operators/inspectors trained and certified before being allowed to work ?				3		3
1.6	Does training program exist both all operators and staffs ?				3		3

83.33%

Figure 4.12 B: Proposed Self Assessment /Quality System Audit Rating Sheet

RATING SHEET FOR SELF ASSESSMENT AND QUALITY SYSTEM AUDIT

3. Procurement / Material Control		Rating					
Item No.	Description	No System	Significant Deficiency	Need Improvement	Satisfactory	Outstanding	Score
		0	1	2	3	4	
3.1	Is there a formal procedure to handle customer complaints and provide appropriate corrective action ?				3		3
3.2	Is Quality History considered along with Price , Delivery & Service when making sourcing decision ?				3		3
3.3	Are vendors expected to conform to specification , and SPC is applied in supplier control ?			2			2
3.4	Is surrounding at storage controled such as temperature, shelf life of the products, humidity ?				3		3
3.5	Are the material needs properly specified ?				3		3
3.6	How are incoming inspection procedures documented and followed effectively ?				3		3
3.7	Are there the procedures to make disposition on te defective material and store it effectively ?				3		3
3.8	Is there an effective supplier certification program and is it verified ?			2			2

68.75%

Figure 4.12 D: Proposed Self Assessment /Quality System Audit Rating Sheet

**RATING SHEET FOR SELF ASSESSMENT AND
QUALITY SYSTEM AUDIT**

2. Documentation		Rating					
Item No.	Description	No System	Significant Deficiency	Need Improvement	Satisfactory	Outstanding	Score
		0	1	2	3	4	
2.1	Does the system ensure that current (up dated) customer specification is available for manufacturing ?					4	4
2.2	Does the system ensure that current (up dated) material specification is available for procurement ?				3		3
2.3	How well is customer specification assured before an order is accepted ?				3		3
2.4	Is there a process/document to inform customer about process or material change after the product is approved ?				3		3
2.5	Is there the procedure for specification control, drawings and proces flow chart ?				3		3
2.6	Are obsoleted documents handled, treated ?				3		3
2.7	How are the procedures distributed to operations where quality needed ?				3		3

78.57%

Figure 4.12 C: Proposed Self Assessment /Quality System Audit Rating Sheet

RATING SHEET FOR SELF ASSESSMENT AND QUALITY SYSTEM AUDIT

4. Manufacturing		Rating					
Item No.	Description	No System	Significant Deficiency	Need Improvement	Satisfactory	Outstanding	Score
		0	1	2	3	4	
4.1	Is there a manufacturing flow chart which defines the flow from assembly until packaging the product including inspection control ?					4	4
4.2	Are Process Capabilities studied and maintained on all certifical processes ?			2			2
4.3	Are there process inspections activities, test operations that are specified / performed properly ?					4	4
4.4	Is the inspection result used for preventive and corrective action ? How well is it used ?				3		3
4.5	Is there housekeeping activity and it is followed continuously ?				3		3
4.6	Are the material in process/storage identified and controlled ?					4	4

83.33%

Figure 4.12 E: Proposed Self Assessment /Quality System Audit Rating Sheet

RATING SHEET FOR SELF ASSESSMENT AND QUALITY SYSTEM AUDIT

5. Final Inspection Gate		Rating					Score
Item No.	Description	No System	Significant Deficiency	Need Improvement	Satisfactory	Outstanding	
		0	1	2	3	4	
5.1	Are SPC techniques used to indicate product acceptability conforming to spec ?				3		3
5.2	Are final product inspection procedure documented/followed ?				3		3
5.3	Are there the procedures for packaging and shipment ?				3		3
5.4	Are final inspection results used to make disposition to the products ? How well is it documented, maintained ?				3		3
5.5	Are inspectors trained in according to procedure or job instruction to ensure their skills ?				3		3
5.6	How the facilities and equipments maintained properly ?				3		3

75.00%

Figure 4.12 F: Proposed Self Assessment /Quality System Audit Rating Sheet

**RATING SHEET FOR SELF ASSESSMENT AND
QUALITY SYSTEM AUDIT**

6. Statistical Technique		Rating					Score
Item No.	Description	No System	Significant Deficiency	Need Improvement	Satisfactory	Outstanding	
		0	1	2	3	4	
6.1	To what extent is Statistical technique applied for your manufacturing ?				3		3
6.2	To what extent is SPC implemented for all processes ?				3		3
6.3	Are operators trained the use of Statistical techniques and apply properly ?				3		3
6.4	Are charts implemented properly and use to monitor the processes continuously ?				3		3

75.00%

Figure 4.12 G: Proposed Self Assessment /Quality System Audit Rating Sheet

RATING SHEET FOR SELF ASSESSMENT AND QUALITY SYSTEM AUDIT

7.		Calibration					
Item No.	Description	Rating					Score
		No System	Significant Efficiency	Need Improvement	Satisfactory	Outstanding	
		0	1	2	3	4	
7.1	Are there calibration and maintenance adequately ?				3		3
7.2	Are calibration and maintenance's program planned and documented ?				3		3
7.3	Are tools & equipment that use for inspection, qualified ? and also pass international standard ?				3		3
7.4	How well are records kept, detail show the tools that are used to calibrate the equipment ?				3		3
7.5	Are personnel who perform calibration / maintenance trained and qualified ?				3		3

75.00%

Figure 4.12 H: Proposed Self Assessment /Quality System Audit Rating Sheet

4.2.1.3 After receiving *Rating Sheet for self assessment /quality system audit* from the supplier.

If score is equal or more than 75%. SMT will arrange to audit the supplier for new supplier qualification.

If score is less than 75 %. SMT will review the weakness then recommend that supplier to advise his improvement plan. After the improvement plan has been accepted by SMT. Audit schedule will be planned .

4.2.1.4 Results Of SAS (Supplier Audit Score) and Disposition :

Approved Suppliers - Suppliers who obtain score 80 % up will be approved (full approval) .

Conditional Approval - SAS is between 60 - 80 %, SMT will review the capability of the supplier in short term whether he can meet each subsystem as declared in quality system evaluation sheet.

However, a long term corrective action plan with expected complete date to achieve approved supplier level must be submitted by the supplier. The progress of this plan will be tracked by QA engineer. SMT will audit supplier quality system for full approval.

Probationary Approval - SAS is less than 60 %. Approval need to be obtained and supported by documented reasons. It will be valid for a certain number of specified orders. The improvement plan need to be submitted and the supplier need to be qualified by SMT in order to continue the business in long term. Reaudit/survey will be done in order to qualify them.

4.2.2 Supplier Periodic Evaluation

Supplier Periodic Evaluation is the process to do supplier performance rating by utilizing IQC data and supplier data (SPC application method) as explained below.

Supplier Periodic Evaluation result will have to be agreed by supplier management team(SMT) of MOLEX Thailand Ltd, . Supplier management team (SMT) consists of QA Engineer, Product Engineer , Production Engineer and purchaserSMT has established on what quality factors that will be measured on the quality of the product(material) and defined weight(score) for each quality factors. There are 4 tems for supplier rating that consists of price(30%), supplier quality(40%), delivery(20%), short shipment(10%). Price, Delivery and Short shipment score will be responsible by purchaser. This study will implement in aspect of supplier(material) quality rating 40%. Score 40 % in supplier quality subject, is extended to be 80

marks in order to be more comfortable in giving the score to each quality factors. Finally, supplier periodic evaluation (supplier performance rating) will be determined by the following quality factors;

<u>Factors</u>	<u>Weight (Score): Full score 80 marks</u>
- LAR(Lot Acceptance Rate)	15 of 80 marks
- Defect Per Million (DPM)	15 of 80 marks
- Production Complaint (Line Feed Back) and Customer Complaint	15 of 80 marks
- Responsiveness & Effectiveness of CAR	15 of 80 marks
- Ship To Stock Program	10 of 80 marks
- SPC Utilization	10 of 80 marks

4.2.2.1 Lot Acceptance Rate (LAR) 15 marks and DPM (Defect Per Million)15 marks is as in the definition. These two quality factors(30 of 80 marks; 37.50%) will be rated for products that are rejected at incoming inspection section that is considered as first priority for product quality detection. Therefore, 30 of 80 marks will be given for quality at incoming inspection section. These two quality factors are very important in aspect of quality assurance to the products that have to be high quality from the supplier site

4.2.2.2 Material Quality Problems 15 marks . This quality factor will be 15 of 80 marks(18.75%). This score is in the same level of priority as LAR and DPM in 4.2.2.1. Three production complaint items are targeted in each quarter because there were 4.6 items(avg) had occurred over the 4 th quarter(97) and only one customer complaint on the raw material is targeted.

-Production Complaint (Line Feed Back): Production feeds back the defects, causing by the material. 5 marks will be deducted for every raw material lot which is involved in production line.

-Customer complaint. End customers feed back the product causing by the raw material . 15 marks will be deducted for a customer complaint.

4.2.2.3 Responsiveness & Effectiveness of CAR 15 marks. 15 of 80 marks(18.75%) for this quality factor is to reflect the responsiveness and effectiveness of the corrective action effectively same as LAT DPM and material quality problem because this is important issue if the supplier does not respond in time that is supplied that the quality problem has not been solved then quality problem recurrence will be found repeatedly when the products arrive MOLEX factory.

- CAR responsive time(Year To Date) :

8 days complete corrective action report = 7.5 marks

15 days complete corrective action report= 6 marks

> 15days complete corrective action report = 5 marks

- Effectiveness of CAR will be measured by problem recurrence after CAR from supplier has been effective. Three consecutive lots will be monitored.

The three consecutive lots are accepted : Score = 7.5

If 1 of 3 lots is rejected Score=5

If 2 of 3 lots are rejected Score=3

If 3 of 3 lots are rejected Score=0

4.2.2.4 Ship to stock program performance(STS program) 10 marks. This quality factor priority is less than three previous quality factors. This factor is selected to rate the supplier performance because this factor concerns with reducing incoming inspection that means labour cost and time reduction. 10 of 80 marks(12.5%) is considered for this factor.

Suppliers who make business with MOLEX Thailand Ltd, company more than 1 year . And also LAR \geq 98% and Production complaint rate less than 0.8% for 6 months continuously. Conditions had been established by SMT discussion. Weight will be given by significance of each phase.

Phase	Weight(By Significance)
100 % lot inspection	10
Phase I	15
Phase II	20
Phase III	25
Ship To Stock (STS)	30

For example, supplier A supply 10 parts to MOLEX Thailand Ltd, and 10 parts stay at following phases,

Phase	No. of part	Weight	Score
100% Lot Inspection	4 of 10	10	4
Phase I	3 of 10	15	4.5
Phase II	2 of 10	20	4
Phase III	1 of 10	25	2.5
STS	0 of 10	30	0.0
Total Score			15

Total score is sum of % ship to stock program in each phase multiply by weight of each phase.

Rating score for ship to stock program performance shall be calculated from full score of STS program (10%) multiply by total summation score from 8.2.3.1 then divided by 30%. From example, score is 15 therefore rating score is $[(15 * 10\%) / 30\%] = 5$

4.2.2.5 SPC Utilization (10 marks) : 10 of 80 marks(12.5%), this is to ensure whether the supplier manufacturing is in state of control in the long term.

- 0% for suppliers who have no SPC utilization
- 5% for suppliers who have SPC utilization
- 10% for suppliers who have SPC utilization and show the stable /capable process (Cpk > 1.33)

4.2.2.6 Total score of product quality score will be filled in the report as shown in figure 4.13 A-C:Proposed Report For Quarter Supplier Performance Ranking Result .

- Score 75-80 : Excellent level
- Score 60-74 : Satisfactory level
- Score 45-59 : Need improvement plan on the weak point item
- Score Less than 45 : Disqualification will be considered .

Periodic review , SMT team will feed back the result of supplier performance rating as the example shown in figure 4.13 quarter supplier performance ranking report, to suppliers and follow up the corrective action or improvement plan project/program by quarter after submitting the supplier perform ranking report to them, even the outstanding quality issues will be discussed during on the site visit. And the suppliers performance rating results of the other suppliers are shown in appendix V.

If the product quality score of any supplier is lower than 45 %. SMT will propose to disqualify that supplier then deleted from approved supplier list. Supplier who obtain excellence level can be considered to be approved supplier.



QUARTER SUPPLIER PERFORMANCE RANKING REPORT

Supplier Name : Supplier C

Product : Wire & Cable

Time Frame : From JUL To SEP

Quality Factors	Actual Data	Weight FULL SCORE	Score
1)LAR(Lot Acceptance Rate)	100 %	15	15
2)Defect Per Million (DPM)	0 ppm	15	15
3)Production Complaint (Line Feed Back) and Customer Complaint	0 issue	15	15
4)Responsiveness & Effectiveness Of Corrective Action Report	-	15	15
5)Ship To Stock Program	-	10	3.3
6)SPC Utilization	-	10	10
<i>Total score of product quality score</i>		80	73.30

Average Score Of This Period : 57

Recommendation :

HR Silvine Thailand supplier has supplied 7 lots over the last three months, you have good performance in almost quality factors which Mx Thailand expects. Mx Thailand hopes you will maintain your quality performance, especially in factors of SPC utilization, responsiveness and effectiveness of the corrective action.

Figure 4.13 A: Proposed Report For Quarter Supplier Performance Ranking Result


QUARTER SUPPLIER PERFORMANCE RANKING REPORT

PRODUCT : WIRE & CABLE							
SUPPLIER	Quality Factors	Full Score	Actual Data	Rating CY 1998		Rating CY 1999	
				July - Sep	Oct- Dec	Jan - Mar	Apr - Jun
Supplier C	1. Lot Acceptance Rate(LAR)	15	100 %	15			
	2. Defect Per Million	15	0 ppm	15			
	3. Material Quality Problem	15	0 issue	15			
	4. Responsiveness	10	-	15			
	5. Ship To Stock Program	10	-	3.33			
	6. SPC Utilization	10	-	10			
	Total Product Quality Score	80		73.3			
B:	1. Lot Acceptance Rate(LAR)	15	100%	15			
	2. Defect Per Million	15	0 ppm	15			
	3. Material Quality Problem	15	0 issue	15			
	4. Responsiveness	10	-	15			
	5. Ship To Stock Program	10	-	5			
	6. SPC Utilization	10	-	0			
	Total Product Quality Score	80		65			
C:	1. Lot Acceptance Rate(LAR)	15	97.73%	10			
	2. Defect Per Million	15	9,906 ppm	13			
	3. Material Quality Problem	15	1 issue	10			
	4. Responsiveness	10	-	7.5			
	5. Ship To Stock Program	10	-	3.33			
	6. SPC Utilization	10	-	10			
	Total Product Quality Score	80		53.83			
D:	1. Lot Acceptance Rate(LAR)	15	94.74%	7			
	2. Defect Per Million	15	10,818 ppm	13			
	3. Material Quality Problem	15	0 issue	15			
	4. Responsiveness	10	-	15			
	5. Ship To Stock Program	10	-	3.33			
	6. SPC Utilization	10	-	0			
	Total Product Quality Score	80		53.30			

Figure 4.13 B: Proposed Report For Quarter Supplier Performance Ranking Result



QUARTER SUPPLIER PERFORMANCE RANKING REPORT

SUPPLIER	Quality Factors	FULL SCORE	Actual Data	Rating CY 1998		Rating CY 1999	
				July - Sep	Oct - Dec	Jan - Mar	Apr -Jun
E:							
	1. Lot Acceptance Rate(LAR)	15	100%	15			
	2. Defect Per Million	15	0	15			
	3. Material Quality Problem	15	1	10			
	4. Responsiveness	10	-	7.5			
	5. Ship To Stock Program	10	-	3.33			
	6. SPC Utilization	10	-	0			
Total Product Quality Score	80			50.83			
F:							
	1. Lot Acceptance Rate(LAR)	15	100%	15			
	2. Defect Per Million	15	0 ppm	15			
	3. Material Quality Problem	15	2 issues	5			
	4. Responsiveness	10	-	7.5			
	5. Ship To Stock Program	10	-	3.33			
	6. SPC Utilization	10	-	0			
Total Product Quality Score	80			45.8			

- Score 75-80 : Excellent level
- Score 60-74 : Satisfactory level
- Score 45-59 : Need Improvement Plan on the weakpoint item
- Score Less than 45 : Disqualification

- ABOVE IS THE PERFORMANCE RATING OF SUPPLIERS WHO SUPPLY TO MOLEX THAILAND

- YOU ARE SUPPLIER WHO OBTAINS SCORE: 73.30
LEVEL: A (Satisfactory)

NOT REQUIRED (CORRECTIVE ACTION / IMPROVEMENT)

REQUIRED (CORRECTIVE ACTION / IMPROVEMENT) PLEASE ADVISE YOUR IMPROVEMENT PROJECT PROGRAM NEED CORRECTIVE ACTION WITHIN 21 DAYS

PREPARED BY: [Signature] QA Engineer (SMT Representative) DATE: 16/11/07

REVIEWED BY: [Signature] QA Manager DATE: 28 Oct 07

Figure 4.13 C: Proposed Report For Quarter Supplier Performance Ranking Result

4.2.3 Supplier Disqualification Process

Supplier disqualification process is to terminate business between MOLEX Thailand Ltd. company and supplier because supplier can not meet MOLEX Thailand Ltd. company expectation. The quality of material has not been solved effectively and also, the responsiveness from supplier is very poor. The supplier can be disqualified upon supplier periodic evaluation result. Disqualification process is also considered if the material quality problems have never been solved effectively by supplier. QA engineer will propose to management based on evidences such as material quality problem (reject rate), responsiveness. Management team will involve with this proposed method.

The finished goods that used the product of the supplier who is supposed to be disqualified, will be transferred to other suppliers who have better performance. Supplier periodic evaluation result will be used to consider what supplier we should buy from. All support data will be submitted to management team to approved this supplier disqualification proposal. Figure 4.14 presents Supplier Disqualification Process.

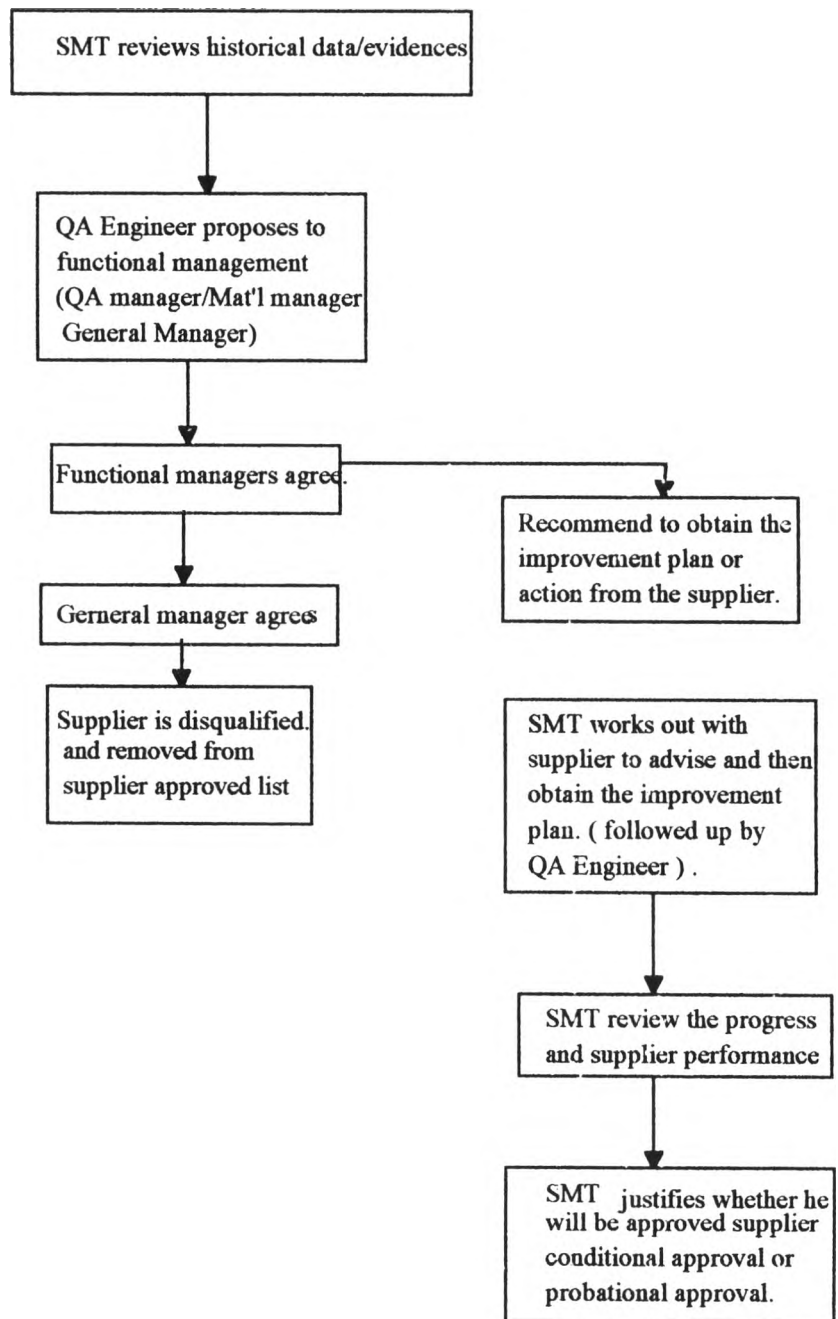


Figure 4.14 : Supplier Disqualification Process

In conclusion, the step of study in according to proposed method will be as follows,

